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IMPACT OF BASOPHOBIA ON BALANCE AND FUNCTIONAL OUTCOMES IN PATIENTS WITH STROKE

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1- Abstract

Background: Patients with a stroke are more likely to have a fear of falling (FoF), which has been associated with reduced physical activity, deconditioning, uncertainty, and, finally, a loss of independence due to their limited mobility and balance.
Purpose: To determine how basophobia affects patients with chronic stroke in terms of their ability to balance and function. Methodology: There were two equal groups of 80 stroke patients. Study group (A) experienced basophobia, whereas the control group (B) did not. The overall stability index (OSI) and fall risk index (FRI) were evaluated using the Biodex balance system; gait dysfunction and the ability to carry out dual tasks were evaluated using the dynamic gait index (DGI); balance issues were assessed through the Berg balance scale (BBS) and the timed up and go test (TUG); while the fear of falling was measured with the 16-item Fall Efficacy Scale-International (FES-I). Results: the experimental group (group A) showed a notable improvement over the control group (group B) on the 16-item FES, TUG, FRI, and OSI, while the BBS and DGI showed significant decreases. Conclusion: Stroke patients with FoF showed poor dynamic balance, which was associated with poor performance, limited mobility, and an increased risk of falling.

KeyWords: Stroke, Basophobia, Risk of falling, Functional outcomes

2- Introduction

Stroke is a cerebrovascular disease that impairs physical function by causing inadequate blood flow or brain hemorrhage. Motor deficits brought on by stroke include muscle paralysis, a reduction in cognitive function, trouble carrying out daily chores, anxiety, despair, and low self-efficacy. The likelihood of falling is higher among individuals with a stroke, as they may have difficulty maintaining balance and attention due to weaker leg muscles or impairments in walking (Xu et al., 2018; Kongwattanakul et al., 2020).

Balance deficits are among the most prevalent motor impairments following a stroke, impacting roughly 83% of individuals, and can heighten their risk and apprehension about falling (FoF) in certain patients (Monfared et al., 2015). Falls can also cause emotional distress for a patient, as well as physical harm (Alenazi et al., 2018). This is because patients can become frightened of falling (FoF) even when they are not physically harmed (Jefferis et al., 2014).

Stroke survivors also face emotional and social challenges, including reduced quality of life due to physical impairments and changes in appearance. Changes in their situations can lead to reduced social connections, which in turn may result in financial difficulties (Lee et al., 2020).

Basophobia refers to the fear of falling, which is associated with disturbance in walking and balance that leads to a decrease in physical fitness, elevated anxiety, decreased activity levels, an increased

risk of hospitalization, and a loss of independence (Schinkel-Ivy et al., 2016).
Self-imposed limitations on function may cause patients with a high FoF to become even less functionally capable of engaging in everyday activities (Lavedán et al., 2018; Liu et al., 2018). So, FoF may be an independent risk factor that contributes to falls, even in stroke survivors who have never fallen (Guan et al., 2015 and Kamide et al., 2021).
One of the primary reasons for the heightened risk of falls among individuals who have survived a stroke is the mental component of fall- related self-efficacy, or FoF. According to research, between 60 and 70 percent of long-term stroke survivors are unsure about their capacity to prevent falls, which frequently results in increased anxiety and issues with mobility and balance (Park & Cho, 2021).

False beliefs about one's danger of falling and real assessments of diminished balance skills might give rise to a fear of falling. Therefore, an excessively pessimistic expectation of the chance of falls may indicate that stroke survivors who were afraid of falling had diminished balancing abilities and a fearful anticipation of falls (Liu et al., 2019). Therefore, this study explored how basophobia affects balance and functional results in individuals who have experienced a chronic stroke.

3- Methods

3.1. Design:

There was only one blind assessor in this case-control study. The study protocol, clinically registered under the number NCT06899451, was approved by Banha University's physical therapy research ethical committee (PT. BU. EC. 13). A written consent form was signed by each patient before they were enrolled in the study.

3.2. Participants:

Between September 2024 and March 2025, 80 instances of chronic ischemic stroke, involving both sexes, were referred by a neurologist to the physical therapy outpatient clinic at the Faculty of Physical Therapy in Cairo, Egypt.
The trial was open to patients who were 45 years of age or older, had experienced an ischemic stroke at least six months after the stroke, were getting therapy at the outpatient clinic, and were ambulatory without the need for a walking aid. Exhibited acceptable cognitive (as indicated by a Montreal Cognitive Assessment score of above 26), spasticity of the upper and lower extremities ranging from (grade 1+: 2) on a modified Ashworth scale, and a history of falls as reported on their neurologist referral form.
Patients with vision and cognitive impairments, musculoskeletal problems (e.g., severe arthritis, complete hip arthroplasty, knee surgery, lower limb fractures within the last 6 months), contractures due to a fixed deformity and/or leg length discrepancy, and unstable medical conditions (e.g., unstable angina, unstable hypertension) were excluded from the study.

3.3. Procedure

Two equal groups were assigned, with 40 patients in each group: group A (Study Group), including patients with a history of falls and basophobia. Group B (Control Group) includes patients without basophobia and either had or did not have a history of falling. At the site where they were recruited, the same physical therapist performed the procedure in both locations.

3.4. Outcome measures:

All patients were evaluated using the following assessments.

3.4.a Functional outcomes assessment

The Timed Up and Go Test (TUG) was used to assess a person's ability to get out of a chair, walk three meters to a cone, then get back into the chair and sit down. Older adults and those with balance problems were more likely to fall if they took more than 13.5 seconds to finish the TUG (Ng & Hui-Chan, 2005).

The Dynamic Gait Index (DGI) assessed the patient's ability to maintain walking balance while adjusting to various activities, was used to evaluate dual-task performance. Eight common gait exercises (such as altering speed, turning, looking around, stepping over or around obstacles, and moving up stairs) were given to patients to complete while keeping their balance in various scenarios. Every task has a score between 0 and 3, with a maximum score of 24. Better functional mobility without assistance is indicated by a higher total DGI score (Shumway- Cook et al., 1997).

3.4.b. Risk of falling and balance assessment.

The Berg Balance (BBS) Scale assessed the patient's ability to balance and their awareness of their risk of falling. This scale comprises 14 distinct tasks that ask patients to execute a variety of challenging postures and movements to assess their balancing abilities. Each task is graded from 0 to 4, with a total maximum score of 56. A significant risk of falling is indicated by a score of 44 or below (Berg et al., 1995).

The Biodex Balance System, developed by Biodex Medical Systems Inc. in Shirley, NY, evaluates a person’s capability to sustain dynamic stability of posture under dynamic stress to measure and train neuromuscular control. The Biodex Balance System was used in our study to calculate the risk of falling by calculating the total stability index in degrees, which was then converted to the Biodex fall risk index (FRI) following the standard procedures described below. The Biodex balancing device was adjusted to the most stable support surface (level 8), and the patients stood on the platform with their eyes open after taking off their boots and being fully briefed about the test then asked to remain vertical with their center of gravity in the middle of the platform while they gazed at a screen 30 cm in front of their faces. (Prometti and others, 2016).

3.4.c Fear of falling assessment

In community-dwelling people and older people with chronic stroke, the FES-I demonstrated sufficient ability to distinguish fallers from non- fallers. The 16 items on the FES-I are rated on an ordinal scale of 1 to 4, where 1 denotes little concern and 4 denotes great concern. Higher ratings denote lower levels of self-efficacy; scores range from 16 to 64 points (Reguli & Svobodová, 2011). It is advised that the 28-point cut- off value be used (Faria-Fortini et al., 2021).

3.5. Sample size

The sample size for this study was determined using G power software (version 3.1.9.2; Franz Faul, University of Kiel, Germany), revealing that a total of 40 patients per group were necessary. The study was conducted with a significance level (α) set at 0.05, an effect size of 0.94, and a power of 80%.

3.6. Statistical analysis:

A chi-squared test and an unpaired t-test were conducted to assess the characteristics of subjects across the groups. The normality of the data was determined using the Shapiro-Wilk test. To check for homogeneity of variance among the groups, Levene's test was utilized. Using an unpaired t-test, groups

were compared on BBS, DGI, 16-item FES, TUG, FRI, and OSI. To indicate significance, the threshold for statistical tests was established at $p < 0.05$. All statistical analyses were conducted using version 25 of the statistical software for social sciences (SPSS) (IBM SPSS, Chicago, IL, USA) on a Windows platform.

4. RESULTS

- Subject characteristics:

Subjects' characteristics are demonstrated in table 1. There was no significant difference between groups in age, weight, height, BMI, duration of illness, degree of spasticity, sex and affected side distribution ($p > 0.05$). Table 1. Basic characteristics of subjects.

	Group A	Group B	t-value	p-value
	Mean ± SD	Mean ± SD		
Age (years)	50.40 ± 4.94	51.03 ± 3.50	-0.65	0.52
Weight	77.45 ± 8.40	76.03 ± 4.96	0.92	0.36
Height	173.28 ± 8.67	172.53 ± 6.98	0.43	0.67
BMI (kg/m²)	25.73 ± 1.07	25.39 ± 0.86	1.57	0.12
Duration of illness (years)	17.58 ± 6.31	17.90 ± 5.59	-0.24	0.81
Degree of spasticity	2.38 ± 0.49	2.48 ± 0.51	-0.89	0.37
Sex, n (%)				
Males	32 (80%)	30 (75%)	χ^2 = 0.29	0.59
Females	8 (20%)	10 (25%)		
Affected side, n (%)				
Right	19 (47.5%)	22 (55%)	χ^2 = 0.45	0.50
Left	21 (52.5%)	18(45%)		

SD, standard deviation; $\chi 2$: Chi squared value; p-value, probability value. Comparison of BBS, DGI, 16-item FES, TUG, FRI, and OSI among groups:

There was a significant increase in BBS (MD = -17.38, d = 5.80) and DGI (MD = -9.87, d = 6.09), and a significant decrease in the 16-item FES (MD = 15.2, d = 8.29), TUG (MD = 4.65 sec, d = 0.99), FRI (MD = 0.74, d = 1.91), and OSI (MD = 1.03, d = 3.68) in group B compare with group A (p

< 0.01). (Table 2).

Table 2. Comparison of BBS, DGI, the 16-item FES, TUG, FRI, and OSI between the study group (A) and the control group (B):

	Group A	Group B	MD	95% CI		t-value	p value	d
	Mean ± SD	Mean ± SD		Lower limit	Upper limit			
BBS	34.75 ± 2.82	52.13 ± 3.17	-17.38	-18.71	-16.04	-25.90	0.001	5.80
DGI	8.58 ± 1.36	18.45 ± 1.84	-9.87	-10.59	-9.16	-27.33	0.001	6.09
16-item FES	52.70 ± 1.99	37.50 ± 1.66	15.2	14.38	16.02	37.06	0.001	8.29
TUG (sec)	36.13 ± 5.00	31.48 ± 4.36	4.65	2.56	6.74	4.43	0.001	0.99
FRI	2.90 ± 0.33	2.16 ± 0.44	0.74	0.56	0.91	8.40	0.001	1.91
OSI	3.01 ± 0.30	1.98 ± 0.26	1.03	0.90	1.15	16.38	0.001	3.68

SD, standard deviation; MD, mean difference; CI, confidence interval; p-value, probability value, d, Cohen effect size

5. DISCUSSION

The current study assessed how stroke patients' functional results and balance are impacted by basophobia. Based on the results of the current research, the patients in the study group (group A) displayed significant enhancement compared to the control group (group B) in their performance on the BBS, DGI, and the 16-item FES, TUG, FRI, and OSI. This was in line with Delbaere et al., 2004 who discovered that fear of falling reduces confidence in mobility, which worsens functional impairments.

The findings of the present study indicated that the patients in the study group (group A) exhibited a considerable decrease in their ability to perform two tasks simultaneously, which was measured by the DGI, as well as their balance, evaluated through the BBS, in comparison to the control group (group

B). These results are corroborated by Guan et al., 2015; Man-Di Ng et al., 2017; & Kongwattanakul et al., 2020 who concluded that muscle function, postural control, mobility, and FoF can have an impact on walking abilities during the chronic phase of a stroke.

In keeping with Schmid et al., 2015 who found that those with chronic stroke who were fearful of falling performed markedly worse than those who had never fallen, the current study's results showed a significant decline in the study group's BBS and DGI. While Schmid et al., 2015 reported that patients with chronic stroke who did not experience FoF scored higher on the BBS than those who did, other studies revealed no appreciable difference in the total BBS score between those who feared falling and those who were not during the acute phase of stroke.

Recent findings from a study by Brustio et al., 2018 indicate that high levels of FoF can lower a patient's level of activity and self-efficacy while also adversely affecting their ability to participate in social activities and their return to society.

Regarding the 16-item FES, TUG, FRI, and OSI the current findings revealed that there was a significant increase in the study group (group A) compared to the control group (group B), which is consistent with Park & Cho, 2021, who discovered that FoF impeded daily activities, functional mobility (as judged by TUG scores), and balance ability. This is explained by the fact that Patients who have experienced a stroke and exhibit weakness in their lower extremities tend to avoid many daily tasks due to fear of falling (FoF). This suggests that the strength of lower limb muscles has a stronger association with FoF related to daily activities than with other physical capabilities. To effectively reduce FoF, individuals with weakened lower extremity muscles should be supported and provided with strategies to adapt to their reduced muscle strength in everyday life, along with undergoing long-term rehabilitation focused on increasing muscle strength.

In the same context, Borode et al., 2023 discovered that the study group took longer to complete the TUG test than the control group. This suggests that, in comparison to the control group, the study group had poorer dynamic balance and a higher chance of falling. An unstable posture and a compromised base of support may be the cause of this, which raises the risk of falling and the likelihood of falling.

The recent study's findings were corroborated by Bueno et al., 2019 who discovered that stroke patients reduced dynamic posture was linked to higher fear of falling (FoF), which caused anxiety when attempting to perform a motor task and when attempting to maintain balance in dangerous circumstances.

According to Park & Kim's 2019 research, being terrified of falling can undermine an individual's confidence in performing daily chores. This concern frequently leads to a more sedentary lifestyle, which can create further health problems, including muscle weakness and atrophy, especially in the legs, and these challenges can diminish the quality of life for elderly individuals and stroke survivors.

Furthermore, Joshi & Sorani (2021) recommended caution when using BBS or walking speed to assess fall risk for individuals who have had a long-term stroke. They also stated that because falls are common while walking, when assessing a person's fall risk, the primary focus should be on reactive balance and how they interact with their surroundings. The findings of Joshi and Sorani trial support the results of Liu et al. (2018)

study who stated that fear avoidance behavior, which involves limiting physical activities due to a lack of confidence in one's balance, is an important part of research on fear of falling.

In conclusion, the present study revealed a significant link between falls and the fear of falling among individuals who have experienced long- term stroke, which is accordance with Polat et al., 2019, who indicated that fifty percent of patients who have at least one fall after leaving the hospital develop a fear of falling, and this problem is predicted to endure in the following years.

6. Strengths and Limitations:

In our study, we used different measurable results, including the Biodex balance system. We also included functional outcomes like DGI and TUG because they are more related to the risk of falling than static measures. Understanding the association between basophobia and balance is critical for developing more effective treatment interventions and rehabilitation programs. However, administering multiple tests may be difficult for patients, increasing the likelihood of dropout. This danger has been minimized by motivating and explaining the possible benefits to patients and their families, as well as offering feedback and recognition after each examination. One limitation was the low sample size of females to differentiate the sex effect on fear of falling. These limitations might restrict how broadly the findings of the current study can be applied. Lastly, additional research is advised to examine the impact of sex, the negative consequences of hormonal changes in females, and how menopause affects stroke patients' fear of falling.

7. Conclusion

Stroke patients who had basophobia demonstrated poor dynamic balance, which increased their risk of falling, causing poor performance and mobility.

8. A Conflict of Interest

The authors state that no financial or commercial relationships that might raise the possibility of a conflict of interest existed throughout the research's execution.

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10. References

1. Alenazi, A. M., Alshehri, M. M., Alothman, S., Rucker, J., Dunning, K., D'Silva, L. J., & Kluding, P. M. (2018). Functional reach, depression scores, and the number of medications are associated with the number of falls in people with chronic stroke. PM & R: The Journal of Injury, Function, and Rehabilitation, 10(8), 806–816. https://doi.org/ 10.1016/j.pmrj.2017.12.005.

2. Berg, K., Wood-Dauphinee, S., & Williams, J. I. (1995). The Balance Scale: reliability assessment with elderly residents and patients with an acute stroke. Scandinavian journal of rehabilitation medicine , 27(1), 27-36.

3. Borode, A. O., Awotidebe, T. O., Ademoyegun, A. B., Borode, A. O., Falokun, I. G., Omisore, O. B., ... & Adedoyin, R. A. (2023). Interrelationship Among Fear of Falling, Gait Characteristics, and Dynamic Balance in Stroke Survivors–A Case-control Study. Turkish Journal of Neurology, 29(4), 241-248. DOI:10.4274/tnd.2023.08684

4. Brustio, P. R., Magistro, D., Zecca, M., Liubicich, M. E., & Rabaglietti, E. (2018). Fear of falling and activities of daily living function: mediation effect of dual-task ability. Aging & mental health, 22(6), 856-861. https://doi.org/10.1080/ 13607863.2017.1318257.

5. Bueno, G. A. S., Gervásio, F. M., Ribeiro, D. M., Martins, A. C., Lemos, T. V., & de Menezes, R. L. (2019). Fear of falling contributes to a cautious gait pattern in women exposed to a fictional disturbing factor: a non- randomized clinical trial. Frontiers in Neurology, 10, 283. https://doi.org/10.3389/fneur.2019.00283.

6. Delbaere, K., Crombez, G., Vanderstraeten, G., Willems, T., & Cambier, D. (2004). Fear-related avoidance of activities, falls, and physical frailty. A prospective community-based cohort study. Age and ageing, 33(4), 368-373. https://doi.org/10.1093/ageing/afh106.

7. Faria-Fortini, I., Polese, J. C., Faria, C. D., Scianni, A. A., Nascimento, L. R., & Teixeira-Salmela, L. F. (2021). Fall efficacy scale–international cut- off score discriminates between fallers and non-fallers, individuals who have had a stroke. Journal of bodywork and movement therapies, 26, 167-173.

8. Guan, Q., Jin, L., Li, Y., Han, H., Zheng, Y., & Nie, Z. (2015). Multifactor analysis for risk factors involved in the fear of falling in patients with chronic stroke from mainland China. Topics in stroke rehabilitation, 22(5), 368-373. https://doi.org/10.1179/ 1074935714Z.0000000048

9. Jefferis, B. J., Sartini, C., Lee, I. M., Choi, M., Amuzu, A., Gutierrez, C., & Whincup, P. H. (2014). Adherence to physical activity guidelines in older adults, using objectively measured physical activity in a population-based study. BMC Public Health, 14, 1-9. http://www.biomedcentral.com/1471 - 2458/14/382.

10. Joshi, P., & Sorani, D. (2021). Effects of Balance and Cognition Exercises on Fear of Fall in Stroke Patients: Assessor Blinded Randomized Trial. International Journal of Health Sciences and Research (www.ijhsr.org), 11(11), 1-6. DOI: https://doi.org/10.52403/ijhsr.20211101.

11. Kamide, N., Sato, H., Sakamoto, M., & Shiba, Y. (2021). The effect of the interaction between fall-related self-efficacy and gait function on the occurrence of falls in community-dwelling older people. Aging clinical and experimental research, 1-8.

12. Kongwattanakul, K., Hiengkaew, V., Jalayondeja, C., & Sawangdee, Y. (2020). A structural equation model of falls at home in individuals with chronic stroke, based on the International Classification of Functioning, disability, and Health. PLoS One, 15 (4), Article e0231491. https://doi.org/10.1371/journal.pone.0231491 .

13. Lavedán, A., Viladrosa, M., Jürschik, P., Botigué, T., Nuín, C., Masot, O., & Lavedán, R. (2018). Fear of falling in community-dwelling older adults: A cause of falls, a consequence, or both? PLoS one, 13(3), e0194967.

14. Lee, S., Oh, E., & Hong, G. R. S. (2018). Comparison of factors associated with fear of falling between older adults with and without a fall history. International Journal of Environmental Research and Public Health, 15 (5), 982. https://doi.org/10.3390/ ijerph15050982.

15. Lee, Y. J., Kim, J. J., & Oh, M. H. (2020). Differences in cognitive function, self-esteem, and life satisfaction of the elderly with mild dementia according to cognitive intervention programs. Journal of Korea Entertainment Industry Association, 14(6), 209-219.

16. Liu, T. W., Ng, G. Y. F., & Ng, S. S. M. (2018). Effectiveness of a combination of cognitive behavioral therapy and task-oriented balance training in reducing the fear of falling in patients with chronic stroke: study protocol for a randomized controlled trial. Trials, 19(1), 168. https://doi.org/10.1186/s13063-018-2549-z

17. Liu, T. W., Ng, G. Y., Chung, R. C., & Ng, S. S. (2019). Decreasing fear of falling in chronic stroke survivors through cognitive behavior therapy and task-oriented training. Stroke, 50(1), 148-154.

18. Man-Di Ng, M., Hill, K. D., Batchelor, F., & Burton, E. (2017). Factors predicting falls and mobility outcomes in patients with stroke returning home after rehabilitation who are at risk of falling. Archives of Physical Medicine and Rehabilitation,98(12),2433–2441. https://doi.org/10.1016/j.apmr.2017.05.018 .

19. Monfared, R. S., Boroumand, S., & Hassani Mehraban, A. (2015). Effectiveness of video games on balance and fear of falling in chronic stroke patients. Iranian Rehabilitation Journal, 13(1), 74-68.

20. Ng, S. S., & Hui-Chan, C. W. (2005). The timed up & go test: its reliability and association with lower-limb impairments and locomotor capacities in people with chronic stroke. Archives of physical medicine and rehabilitation, 86(8), 1641-1647. https://doi.org/10.1016/j.apmr.2005.01.011

21. Park, J., & Kim, T. H. (2019). The effects of balance and gait function on the quality of life of stroke patients. NeuroRehabilitation, 44(1), 37-41. https://doi.org/10.3233/NRE-182467

22. Park, S., & Cho, O. H. (2021). Fear of falling and related factors during everyday activities in patients with chronic stroke. Applied nursing research, 62, 151492. https://doi.org/10.1016/j.apnr.2021.151492

23. Polat, B. S. A., Yiğit, Z., Köklü, K., Köylü, N., & Sonkaya, A. R. (2019). A neurological approach to fear of falling in patients with stroke: fear of falling in patients with stroke. Medical Science and Discovery, 6(12), 305-
309. DOI: https://doi.org/10.36472/msd.v6i12.320

24. Prometti, P., Olivares, A., Gaia, G., Bonometti, G., Comini, L., & Scalvini, S. (2016). Biodex Fall Risk Assessment in the Elderly With Ataxia: A New Age-Dependent Derived Index in Rehabilitation: An Observational Study. Medicine (Baltimore), 95(10),e2977. https://doi.org/10.1097/md.0000000000002977

25. Reguli, Z., & Svobodová, L. (2011). Česká verze diagnostiky strachu z pádů u seniorů FES-I (Falls Efficacy Scale International). Studia sportiva, 5(2), 5 - 12.

26. Schinkel-Ivy, A., Inness, E. L., & Mansfield, A. (2016). Relationships between fear of falling, balance confidence, and control of balance, gait, and reactive stepping in individuals with sub-acute stroke. Gait & Posture, 43, 154–159. https://doi.org/ 10.1016/j.gaitpost.2015.09.015.

27. Schmid, A. A., Arnold, S. E., Jones, V. A., Jane Ritter, M., Sapp, S. A., & Van Puymbroeck, M. (2015). Fear of falling in people with chronic stroke. The American Journal of Occupational Therapy , 69(3), 6903350020p1-6903350020p5. https://doi.org/10.5014/ajot.2015.016253

28. Seung-Jun Hyun, Jin Lee & Byoung-Hee Lee(2021). The Effects of Sit-to- Stand Training Combined with Real-Time Visual Feedback on Strength, Balance, Gait Ability, and Quality of Life in Patients with Stroke: A Randomized Controlled Trial. Int. J. Environ. Res. Public Health,18, 12229.

29. Shaikh, M., & Hosseini, H. A. (2016). Fear of falling in patients with chronic stroke: differences in functional gait and balance measures according to the level of concern about falling. Journal of Rehabilitation Sciences & Research, 3(2), 35-38. https://doi.org/10.30476/jrsr.2016.41091

30. Shumway-Cook, A., Gruber, W., Baldwin, M., & Liao, S. (1997). The effect of multidimensional exercises on balance, mobility, and fall risk in community-dwelling older adults. Physical therapy, 77(1), 46-57. https://doi.org/10.1093/ptj/77.1.46.

31. Xu, T., Clemson, L., O'Loughlin, K., Lannin, N. A., Dean, C., & Koh, G. (2018). Risk factors for falls in community stroke survivors: A systematic review and meta-analysis. Archives of Physical Medicine and Rehabilitation, 99(3), 563–573. https://doi. org/10.1016/j.apmr.2017.06.032.