



The association between regular yoga and meditation practice and falls and injuries: Results of a national cross-sectional survey among Australian women

Holger Cramer^{a,b,*}, David Sibbritt^b, Jon Adams^b, Romy Lauche^{a,b}

^a Department of Internal and Integrative Medicine, Kliniken Essen-Mitte, Faculty of Medicine, University of Duisburg-Essen, Essen, Germany

^b Australian Research Centre in Complementary and Integrative Medicine (ARCCIM), Faculty of Health, University of Technology Sydney, Sydney, Australia

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ABSTRACT

Introduction: Falls are the leading cause of injuries in women across all ages. While yoga has been shown to increase balance, it has also been associated with injuries due to falls during practice. This study aimed to analyse whether regular yoga or meditation practice is associated with the frequency of falls and fall-related injuries in upper middle-aged Australian women.

Methods: Women aged 59–64 years from the Australian Longitudinal Study on Women's Health (ALSWH) were queried regarding falls and falls-related injuries; and whether they regularly practiced yoga or meditation. Associations of falls and falls-related injuries with yoga or meditation practice were analysed using chi-squared tests and multiple logistic regression modelling.

Results: Of 10,011 women, 4413 (44.1%) had slipped, tripped or stumbled, 2770 (27.7%) had fallen to the ground, 1398 (14.0%) had been injured as a result of falling, and 901 (9.0%) women had sought medical attention for a fall-related injury within the previous 12 months. Yoga or meditation was practiced regularly by 746 (7.5%) women. No associations of falls, fall-related injuries and treatment due to falls-related injury with yoga or meditation practice were found.

Discussion: No association between yoga or meditation practice and falls or fall-related injuries have been found. Further studies are warranted for conclusive judgement of benefits and safety of yoga and meditation in relation to balance, falls and fall-related injuries.

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1. Introduction

Falls are the leading cause of non-fatal injuries that lead to treatment in an emergency room in women across all ages; however the total number of falls and falls-related treatments linearly increases with age [1,2]. About half of all injuries that require treatment in upper middle-aged women are falls-related [1]; and falls are an important risk factor for disability and disablement [3]. In middle-aged women, falls most often occur during ambulation but are also frequently associated with sports and other rigorous physical activity [2].

Yoga is gaining increased popularity as a therapeutic and preventive medicine approach [4–7]. A number of clinical studies suggest that yoga might increase balance and hence decrease the

risk of falling [8–11]; and it has also been shown that many women prefer yoga over other approaches when considering fall prevention strategies [12].

It has however been argued that yoga practice might itself be a risk factor for falls-related injury: although very rarely, yoga has been associated with contusion, fracture, and nerve damage due to falls; injuries resulting in emergency treatments [13,14]. It thus remains unclear whether regular yoga practice decreases or even increases the risk of falling in upper middle-aged women.

The aim of this study was to examine whether regular yoga or meditation practice was associated with the frequency of falls and fall-related injuries in upper middle-aged Australian women.

2. Methods

This analysis was conducted on data obtained from the Australian Longitudinal Study on Women's Health (ALSWH), which was designed to investigate multiple factors affecting the health and wellbeing of women over a 20-year period. Women in three

* Corresponding author at: Kliniken Essen-Mitte, Klinik für Naturheilkunde und Integrative Medizin, Knappschafts-Krankenhaus, Am Deimelsberg 34a, 45276 Essen, Germany. Fax: +49 201 174 25000.

E-mail address: h.cramer@kliniken-essen-mitte.de (H. Cramer).

age groups were randomly selected from the national Medicare database in 1996 [15], with the respondents having been shown to be broadly representative of the national population of women in the target age group [16]. For this sub-study, analyses focused on 10,011 women from the 1946–1951 cohort, who at the 2010 survey were aged between 59 and 64 years. Ethics approval was gained from the relevant ethics committees at the University of Newcastle and the University of Queensland.

2.1. Fall and injuries

Women were asked if they had: slipped, tripped or stumbled; a fall to the ground; been injured as a result of the fall; and needed to seek medical attention for an injury from the fall during the previous 12 months. Questions were answered on a yes or no basis.

2.2. Yoga practice

The women were also asked how often they had practiced yoga or meditation in the last twelve months, with responses being categorized as follows: 'never', 'rarely' and 'sometimes' as non-regular practice; and the response 'often' as regular practice.

2.3. Confounders

Women were further asked about health problems and diseases. Those with a possible influence on the outcome of interest were extracted from the data and included in the analysis. Confounders included diseases such as osteoarthritis, rheumatoid arthritis, Parkinson's disease or depression; and symptoms such as dizziness and loss of balance. In addition, women were asked about their alcohol consumption; which was classified as low vs. high risk according to the National Health and Medical Research Council (NHMRC) [17].

2.4. Statistical analyses

Chi-squared tests were used to compare socio-demographic characteristics between those women who regularly practiced yoga and meditation vs. those who did not.

Multiple logistic regression analyses were conducted to determine whether yoga and meditation practice (independent variable) was associated with the four types of falls-related events (dependent variables). Adjusted odds ratios with 95% confidence intervals were computed for all independent variables. Analyses were adjusted for socio-demographic characteristics and confounding variables. Statistical significance was set at p -value < 0.05 (i.e. $\alpha = 0.05$). All analyses were conducted using the statistical program Stata 11.1.

3. Results

Of the 10,011 women who returned a completed questionnaire, 4413 (44.1%) had slipped, tripped or stumbled, 2770 (27.7%) women had a fall to the ground, 1398 (14.0%) women had been injured as a result of a fall, and 901 (9.0%) women had sought medical attention for an injury from a fall, within the previous 12 months. Also, yoga or meditation was practiced often by 746 (7.5%) women.

Table 1 shows the association between the four falls-related events and the practicing of yoga or meditation. There was a slightly lower percentage of women who regularly practiced yoga or meditation who slipped, tripped or stumbled ($p = 0.323$) and/or had a fall to the ground ($p = 0.314$), compared to those women who did not. However, neither of these associations was statistically significant. A similar distribution of women who did or did not practice yoga or meditation often was observed between women who had or had not been injured as a result of a fall ($p = 0.599$) and/or women who did or did not seek medical attention for an injury from a fall ($p = 0.523$). Neither of these associations was statistically significant. The output from the adjusted logistic regression models used to determine the association between practicing yoga or meditation often and the four falls-related events is presented in Table 2. Women who regularly practiced yoga or meditation were less likely to have slipped, tripped or stumbled (OR = 0.92; 95% CI: 0.79, 1.08), had a fall to the ground (OR = 0.90; 95% CI: 0.76, 1.08), and/or sought medical attention for an injury from a fall (OR = 0.93; 95% CI: 0.70, 1.22), compared to women who did not practice yoga or meditation regularly. Conversely, women who regularly practiced yoga or meditation had 1.04 (95% CI: 0.83, 1.29) times higher odds to have been injured as a result of a fall in the previous 12 months. However, none of these associations were statistically significant.

4. Discussion

This is the first study to investigate associations between yoga or meditation practice and falls on the basis of a cohort study.

This study found that a large number of women slipped, tripped or had a fall within the past 12 months, and about one in ten women had an injury or needed medical attention as a result of the fall. The study further found that 7.5% of the women practiced yoga or meditation regularly. Regression analysis however revealed no association between regular yoga and meditation practice and the frequency of falls and fall-related injuries.

There were two more plausible outcomes of this analysis. First, one might have thought that yoga may be able to reduce falls and fall-related injuries. Several trials have indeed investigated the effects of yoga on balance and fall prevention in older adults or diseased patients; and most of them found beneficial effects [8–11,18]. The effects are considered results of increased postural awareness [19,20] and proprioception [19–21], as well as increased muscle strength [22–24]. Results of the trials however have to be

Table 1

The bivariate association between practicing yoga or meditation often and four falls-related events, for 9822 Australian women aged 59–64 years.

Falls-related events		Regular yoga/meditation practice		<i>p</i> -value
		No (<i>n</i> = 9076) <i>N</i> (%)	Yes (<i>n</i> = 746) <i>N</i> (%)	
Slipped, tripped or stumbled	No	5013 (55.2)	426 (57.1)	0.323
	Yes	4063 (44.8)	320 (42.9)	
Had a fall to the ground	No	6523 (71.9)	549 (73.6)	0.314
	Yes	2553 (28.1)	197 (26.4)	
Been injured as a result of a fall	No	7801 (86.0)	636 (85.3)	0.599
	Yes	1275 (14.1)	110 (14.8)	
Sought medical attention for an injury from a fall	No	8246 (90.9)	683 (91.6)	0.523
	Yes	830 (9.1)	63 (8.5)	

Table 2
Output from four logistic regression models showing the association between practicing yoga or meditation often and four falls-related dependent variables, for 9822 Australian women aged 59–64 years.

Dependent variable	Independent variable		Odds ratio ^a	95% C.I.	p-value
Slipped, tripped or stumbled	Regular yoga/meditation practice	No	1.00	–	
		Yes	0.92	0.79, 1.08	0.307
Had a fall to the ground	Regular yoga/meditation practice	No	1.00	–	
		Yes	0.90	0.76, 1.08	0.254
Been injured as a result of a fall	Regular yoga/meditation practice	No	1.00	–	
		Yes	1.04	0.83, 1.29	0.741
Sought medical attention for an injury from a fall	Regular yoga/meditation practice	No	1.00	–	
		Yes	0.93	0.70, 1.22	0.590

^a Adjusted for the following confounders: osteoarthritis, rheumatoid arthritis, osteoporosis, depression, dizziness, eyesight problems, alcohol consumption.

interpreted with care because of their often low quality and/or the underutilizing of appropriate measures of balance. It is also not established that effects found for balance tests are associated with lower risk of falls in everyday situations, and whether such effects are limited to patients with severe impairments in balance.

Second, one might also have thought that yoga practice is associated with increased frequency of falls, especially during yoga practice. Adverse events and side effects are poorly reported in randomised controlled trials [25], and case reports mainly focus on noticeable and extraordinary events [25,26]. It is however plausible that certain yoga poses (one leg stand, head stand, hand stand) may be too demanding. Depending on the qualification of yoga teachers, the physical status of practitioners and the inclusion of such demanding practices the prevalence of falls and injuries may be quite heterogeneous. For example, a case of a 67-year-old woman has been reported who practiced a yoga pose with both her feet behind her neck and all body weight on hands [13]. When she accidentally lost her balance and fell over in this position, she injured both sciatic nerves and reached only partial recovery during the next few months. However, cases of such serious injuries due to yoga-related falls are rare: in a nation-wide survey among Japanese yoga teachers, only 9 cases of moderate or severe yoga-related falls were reported; some of them however requiring discontinued class participation, medical examination or even emergency transport [14]. About 25% of all long-term practitioners have ever been injured during their yoga practice [14,27,28]; but the risk of yoga-associated injuries has been estimated as only 1.45 per 1000 h of yoga practice [29]; and falls are only a minor cause for yoga-related injury [14,27]. Overall, the risk of yoga-related injuries does not exceed the risk related to other forms of moderate intensity exercise such as stretching or walking [25].

This study has several limitations. Yoga and meditation practice were investigated as one item, therefore results for yoga and meditation practice may have been different if analysed separately. Furthermore data are based on self-reports and women may not have recollected all falls and injuries correctly, especially falls without consequences. They also did answer the question on a yes/no basis rather than reporting the number of falls and related events, which would have been more informative.

However, the ALSWH is a comprehensive and well-respected source for epidemiological data; and the large number of participants as well as the inclusion of the most important confounders within the regression models, represent the strengths of this analysis.

5. Conclusion

No association between yoga or meditation practice and falls or fall-related injuries have been found. Further studies are warranted for conclusive judgement of benefits and safety of yoga and meditation in relation to balance, falls and fall-related injuries.

Conflict of interest

None.

Contributors and their role

Holger Cramer and Romy Lauche conceived the analysis, interpreted the data and drafted the manuscript. David Sibbritt performed data analysis, participated in conception of the study and analysis; and critically revised the manuscript. Jon Adams participated in conception of the study and analysis; and critically revised the manuscript. All authors read and approved the final manuscript.

Ethical approval

Ethics approval was gained from the relevant ethics committees at the University of Newcastle and the University of Queensland.

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