Effectiveness of the Otago Exercise Programme in falls reduction among community-dwelling older people in Southeast Asia: a systematic review

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ABSTRACT

Background: Falls are common in older people and a leading cause of injury. Exercise programmes are available for falls prevention, including the Otago Exercise Programme (OEP). The Southeast Asia region has a rapidly ageing population with unique aspects to consider in falls prevention. This systematic review aims to explore the effectiveness of OEP in Southeast Asia for falls prevention.

Methods: A literature search conducted in April 2020 of PubMed and Google Scholar databases was performed to identify randomised controlled trials on OEP in Southeast Asia.

Results: Three studies met inclusion criteria for the systematic review. The studies in Malaysia and Thailand did not identify any differences in the rate of falls with the modified OEP intervention compared to conventional treatment. The study from Indonesia inferred a reduced fall risk with improved Timed Up and Go with the intervention, but did not quantify fall rates.

Conclusion: The three studies identified used a modified OEP, with limited evidence of efficacy or reduction in fall rates. Further research is required, particularly randomized controlled trials to evaluate OEP for falls prevention in Southeast Asia.

Keywords: Accidental falls; Secondary prevention; Southeast Asia

INTRODUCTION

Falls are a common and serious problem for older people. Nearly one-third of those aged 65 years or older fall each year. It is one of the leading causes of injury among this age group, with approximately 10% to 15% resulting in serious injuries. Most of the severe injuries are fractures, especially hip fractures. Up to 75% of hip fracture patients will not regain their premorbid level of function.[1]

Patients admitted after a fall are also at high risk for disability and residential care placement. Other serious consequences include head injuries, pain, fear of falls, depression, and social isolation. Patients who develop fear of falling also subsequently limit their activities, which leads to further functional decline, muscle weakness, disability, and risk of further falls. These patients often fear losing their autonomy and may not volunteer information about restricted mobility or falls to clinicians.[2]

There are different types of exercise programmes available, which are designed to reduce functional decline and prevent falls. These programmes have considerable diversity in the mode of delivery and exercise prescription, including the setting, type of exercise, levels of supervision, duration and intensity of the programme. However, there are specific components of exercise programmes which contribute to reduction in falls. A Cochrane review found that falls prevention strategies which target two or more components of strength, balance, flexibility or endurance were effective in reducing the rate of falls and number of people falling. This can be achieved via supervised group activities such as Tai-Chi or an individually prescribed home exercise programme.[3] Fall prevention programmes which challenge participants' balance and provide a higher dose of exercise appeared to have a greater reduction in fall rates.[4]

Otago Exercise Program. The 'Otago Exercise Program' (OEP) is a falls prevention programme that includes lower limb strengthening and balance exercises. The OEP was initially developed by Campbell and Robertson for the New Zealand Accident Compensation Corporation

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(ACC), which provides treatment and rehabilitation under a universal, no–fault accidental injury scheme in New Zealand.[5] The OEP was shown to be effective in reducing the annual incidence rate of falls and risk of mortality, and is a cost-effective intervention, particularly for adults aged over 80 years.[6]

The OEP is a muscle strengthening and balance retraining programme delivered at home, performed by physiotherapists or trained providers such as community nurses. It is usually carried out over twelve months, during which a trained provider makes approximately five home visits and monthly phone calls to encourage adherence. The OEP comprises five strengthening exercises and 12 balance exercises. Participants are instructed to perform the exercises three times a week. In addition, participants are instructed to walk twice a week for 30 minutes. Depending on the individual's strength and mobility, the exercises can be progressed by adding weights or increasing repetitions.[7]

Falls in Southeast Asia. The Association of Southeast Asian Nations (ASEAN) consists of eleven countries namely, Brunei, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. The population in the Southeast Asia region is growing at an accelerated rate, with the proportion of older people likely to surpass South Asia, North America and Europe by 2050.[8] For a rapidly ageing population, it is crucial to consider how to reduce the risk of older people developing ill-health and dependency through active ageing and preventing complications such as falls.[9]

A greater percentage of older people in Southeast Asia tend to live a sedentary lifestyle, with increased dependence on family members.[10] These sociodemographic and cultural differences may have implications in planning interventions for fall prevention in Southeast Asia. In addition, the OEP has been applied mainly to developed countries, and the applicability and benefits of the programme in Southeast Asia requires further evaluation. This systematic review aims to explore the effectiveness of OEP in Southeast Asia in terms of fall prevention.

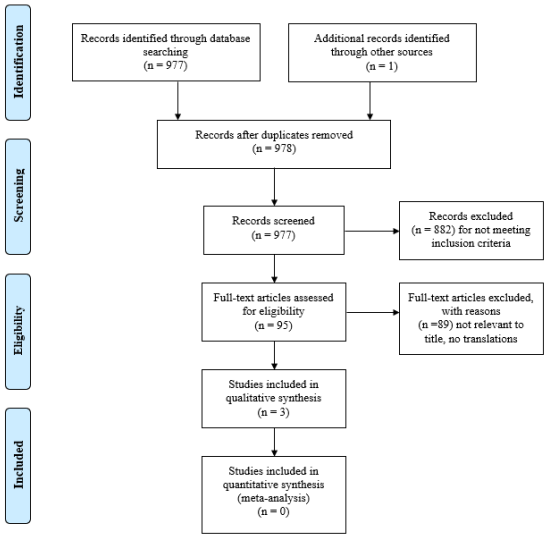

Figure 1. PRISMA Flow Diagram

METHODS

A literature search was conducted using the PubMed and Google Scholar databases for relevant articles published up to 30th April 2020. The literature search was conducted between 15 March and 30 April 2020. This was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Statement. Inclusion criteria for the review were randomised controlled trials of the OEP published in English and conducted in the geographical region of Southeast Asia. The search terms 'fall prevention' OR 'Otago Exercise Programme' AND 'Southeast Asia' OR 'Indonesia' OR 'Malaysia' OR 'Singapore' OR 'Philippine' OR 'East Timor' OR 'Brunei' OR 'Cambodia' OR 'Laos' OR 'Myanmar' OR 'Thailand' OR 'Vietnam' were used in the literature search. The titles and abstracts of articles were manually screened to decide whether they met the inclusion criteria specified above. If a study appeared relevant based on the title or abstract, the full text was obtained and evaluated further for appropriateness for inclusion in the review. This systematic review did not require ethics approval or informed consent as there was no direct patient contact, and only previously published data were included.

RESULTS

The search strategy generated 977 articles, of which three met inclusion criteria for this review, as shown in *Figure 1.* The studies described are organised based on countries, with the findings summarised in *Table 1.*

Malaysia

The fall intervention in this study was slightly modified from the original OEP, as the walking component was removed and home visits were replaced with hospital-based assessments. Participants in the intervention group had an initial assessment by physiotherapy at baseline and prescribed exercises at the appropriate intensity. Participants were required to carry out the exercises daily for at least five times per week. Exercises consisted of an individually-tailored combination of five to eight strength and balance exercises, which were progressed at follow-up clinics. At the final visit, they were encouraged to continue with their exercises as much as possible and to participate in Tai Chi and other community group-based exercises.

This study did not find any significant difference in fall recurrence, rate of falls or time to first falls over 12 months with the intervention compared to conventional treatment. The authors suggested a need to consider cultural differences in behavior and outcomes post-fall.[11]

Thailand

Participants randomised to the intervention were provided with a four-month multifactorial falls prevention programme. The exercise component was based on the

Table I: Summary Table of OEP studies in Southeast Asia

Author citations	Study objective	Study design	Participants	Conclusion	Intervention
Tan, et al., 2018[11]	To evaluate the effect of a personalized home-based exercise program to improve postural balance, fear of falling, and falls risk in older fallers with knee OA and gait and balance problems	Randomized controlled trial	Fallers with both radiological OA and a Timed Up and Go (TUG) score over 13.5 seconds 41 fallers (Intervention, 17; Control, 24)	For older fallers with OA and gait and balance disorders, modified Otago exercise program benefits through improvement in postural control No observable trend in reduction of fall recurrence	Modified Otago exercise program
Suttanon, Piriyaprasarth, Krootnark, & Aranyavalai, 2018[12]	To evaluate feasibility and effectiveness of a fall prevention intervention program for older people in Thailand	Randomized-controlled trial	277 community-dwelling older people (Intervention, 131; Control, 146)	For community dwelling older people in Thailand, the intervention was not effective in reducing falls. Home-based balance exercise could be practically implemented in older community-dwelling people in Thailand	Falls prevention program focusing on balance exercise
Kiik, Vanchapo, Elfrida, Nuwa, & Sakinah, 2020[13]	To investigate the effect of a 12-week Otago 'training' to reduce the risk of falls and health status among elderly with chronic illness	Simple random sampling	42 elderly living in a social elderly institution (Intervention, 21; Control 21)	'Otago training improves health status and reduces the risk of falling among the elderly'. Improved TUG with intervention Fall rates as an outcome was not measured	'Otago training'

OEP, with a modification in the length of the programme and number of visits. While the original OEP required five visits over six to twelve months, participants in this study underwent the programme for four months with two visits. The reduced duration was to allow feasibility of providing the intervention due to limited staffing and funding support. However, the frequency of exercises was increased from three days in the original OEP to at least four days per week. Exercise booklets with illustrations and instructions were also provided to enable participants to continue exercises at home.

While this study showed that the home-based balance exercise programme can be implemented safely by older people in the communities, this intervention was not effective in reducing falls.[12] This may be contributed by the shorter duration of intervention provided in this study.

Indonesia

In this study, the intervention was an exercise program adapted from the OEP conducted as a group twice-weekly for 12 weeks. Each session was done over 40 minutes, including warming-up and cooling-down. The exercises consisted of 12 movements; namely warming-up, front knee strengthening, back knee strengthening, side hip strengthening, calf raises, toe raises, sit to stand, heel walking, toe walking, one leg stand, sideways walking and cooling-down. The study found that the 'Otago training' was associated with reduced risk of falls and improved physical and mental health status. However, the decreased risk of falls was quantified using a surrogate measure, the Timed Up and Go Test, rather than actual fall rates or incidence.[13]

DISCUSSION

There were a limited number of intervention studies for falls prevention using the Otago Exercise Programme. Only three studies were carried out in three of the 11 Southeast Asia countries, namely Malaysia, Thailand and Indonesia. Although international studies on falls prevention have been performed for at least three decades, only four studies were available from Southeast Asia published after 2000. These studies also tended to replicate findings of existing international studies.[14]

While the OEP is an exercise-based programme done by participants at home for a year, all three studies used a modified OEP intervention. The changes made were moving assessments to hospital and removing the walking aspect, shortening the duration of the program, and adapting the intervention into a group activity.[11-13] In the two studies that measured fall rates, the modified OEP did not appear to reduce falls compared to standard treatment.

There are several possible reasons for this. Firstly, the filial piety culture adopted by many Asian societies resulted in older people living a sedentary lifestyle. Dependence on younger family members may result in older Asians being less motivated to carry out the

exercises at home.[10] This may mean that the OEP is less useful for older people in Southeast Asia, which relies heavily on participants to carry out the prescribed exercises to improve their lower limb strength and balance, which translates to reduced falls. It may be useful to utilise this cultural value of filial piety and familial bonds to ensure the OEP programme is practiced consistently by participants by actively involving family members in the programme. As there is a possible dose-response relationship between OEP and fall prevention, a shorter duration or abbreviated version of OEP may be insufficient to gain expected benefits from the programme, as experienced in Thailand.[12]

As falls are multifactorial, studies on important intrinsic and extrinsic risk factors for falls are required to plan which interventions are useful for Southeast Asia. [15] For example, the different cultures and ethnicities, traditional housing and differences in daily routines, such as a preference for eating bought meals rather than home cooking may have implications in planning fall prevention interventions. Home modifications in patients with falls also did not appear to influence falls risk.[10]

CONCLUSION

There are limited OEP intervention studies in Southeast Asia. Current available studies modified the OEP, with limited evidence of efficacy. It is unclear whether this is due to deviations away from the original OEP protocol, or the OEP approach is less effective in this region. Further research is required, particularly adequately powered randomised controlled trials to evaluate the original OEP approach for fall prevention in Southeast Asia, taking into account the different local and cultural contexts. This review also demonstrates the importance of confirming that benefits from interventions can be applied to different populations and settings.

Conflict of Interest Statement

The authors do not have conflicts of interests to declare.

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