Journal of Physiotherapy 60 (2014) 85–89

Journal of PHYSIOTHERAPY

journal homepage: www.elsevier.com/locate/jphys

Research

Normative scores on the Berg Balance Scale decline after age 70 years in healthy community-dwelling people: a systematic review

Stephen Downs [a], Jodie Marquez [b], Pauline Chiarelli [b]

[a] Transitional Aged Care Service, Bellingen Hospital, Bellingen, Australia; [b] Discipline of Physiotherapy, School of Health Sciences, University of Newcastle, Callaghan, Australia

KEYWORDS

Berg Balance Scale
Normal values
Literature review
Meta-analysis
Aged

ABSTRACT

Questions: What is the mean Berg Balance Scale score of healthy elderly people living in the community and how does it vary with age? How much variability in Berg Balance Scale scores is present in groups of healthy elderly people and how does this vary with age? **Design:** Systematic review with meta-analysis. **Participants:** Any group of healthy community-dwelling people with a mean age of 70 years or greater that has undergone assessment using the Berg Balance Scale. **Outcome measurement:** Mean and standard deviations of Berg Balance Scale scores within cohorts of elderly people of known mean age. **Results:** The search yielded 17 relevant studies contributing data from a total of 1363 participants. The mean Berg Balance Scale scores ranged from 37 to 55 out of a possible maximum score of 56. The standard deviation of Berg Balance Scale scores varied from 1.0 to 9.2. Although participants aged around 70 years had very close to normal Berg Balance Scale scores, there was a significant decline in balance with age at a rate of 0.7 points on the 56-point Berg Balance Scale per year. There was also a strong association between increasing age and increasing variability in balance (R^2 = 0.56, $p < 0.001$). **Conclusion:** Healthy community-dwelling elderly people have modest balance deficits, as measured by the Berg Balance Scale, although balance scores deteriorate and become more variable with age. **[Downs S, Marquez J, Chiarelli P (2014) Normative scores on the Berg Balance Scale decline after age 70 years in healthy community-dwelling people: a systematic review. *Journal of Physiotherapy* 60: 85–89]**

Introduction

The Australian Institute of Health and Welfare has found that 65-year-old Australians have increasing life expectancy, both of years lived with disability and years lived without disability.[1] With the percentage of Australians aged 85 years and older expected to increase from 2% in 2013 to 3.5% in 2033,[2] the costs of disability in older Australians can be expected to substantially increase unless disability can be prevented and treated more efficiently. Falls are a major contributor to injury with subsequent disability in the elderly, and poor balance is associated with increased risk of injurious falls.[3] The development and implementation of effective and cost-efficient strategies to prevent falls in older people is therefore an urgent challenge for health care. Such strategies require accurate and comprehensive measurement of balance ability.

The Berg Balance Scale was developed in 1989 using health professional and patient interviews, which explored the various methods used to assess balance.[4] Thirty-eight component balance tests were originally selected and then refined through further interviews and trials to 14 items, each scored from 0 to 4, making a possible total score between 0 and 56, with a higher score indicating better balance. Although the Berg Balance Scale was originally developed to measure balance in the elderly, it has since been used to measure balance in a wide variety of patients.

The convergent validity of the Berg Balance Scale has been established across several different domains. Hospital inpatients with a lower Berg balance score have been found to have a significantly higher chance of being discharged to nursing home accommodation.[5] Among community-dwelling veterans, progressively lower Berg Balance Scale scores are associated with increased risk of injurious falls.[3] Responsiveness to change was established in a trial enrolling sedentary older people, where those who exercised improved their Berg Balance Scale scores and reported fewer falls, compared to a control group.[6] The Berg Balance Scale also had greater ability than four other performance measures to predict the onset of difficulty in activities of daily living in older adults.[7]

Normative data are important when interpreting any balance tool, both for clinicians and researchers. Knowledge that a person or a group of people has significantly worse balance than a healthy person of the same age may assist the identification and effective management of balance problems. The effect of interventions to improve balance can be assessed by comparison to normative data

http://dx.doi.org/10.1016/j.jphys.2014.01.002

for balance from healthy elderly people in specific age cohorts. Knowledge of the variability of the Berg Balance Scale in groups of healthy elderly people can be used to interpret individual results and to help establish the sample sizes required for future studies.

An earlier review[8] searched for the phrase 'Berg Balance Scale' and, despite finding 511 articles, did not identify any published review of normative data of the Berg Balance Scale.

The study questions for the systematic review were:

1. What is the mean Berg Balance Scale score of healthy elderly people living in the community and how does it vary with age?
2. How much variability in Berg Balance Scale scores is present in groups of healthy elderly people and how does this vary with age?

Method

Identification and selection of studies

A literature search was undertaken to locate all relevant published studies. Electronic searches of MEDLINE, CINAHL, Embase, and the Cochrane Library databases from 1980 to September 2012 were conducted using 'Berg Balance Scale' as the search term. No keywords related to intervention type or health condition were used and no methodological filters to identify particular study designs were used. All potentially relevant papers were identified by screening the abstracts and assessed for inclusion. Data were extracted by two authors (SD and PC), with any disagreements adjudicated by a third author (JM).

The a priori criteria for studies to be included in the review are presented in Box 1. Studies were excluded if the participants were hospital inpatients or resided in an aged care facility. Studies in which subjects had health conditions likely to significantly affect their balance were also excluded, as were studies in which healthy elderly subjects with extremes of balance (either minimal or maximal deficits) were excluded, or gait aid users were excluded. Where there were inadequate details of methods or results, an email was sent to the author where possible to seek further information.

Assessment of characteristics of trials

Participants: The inclusion and exclusion criteria and the country in which the data were collected were extracted for each trial. The sample size and the mean age of the participants were also extracted, along with whether the participants were enrolled as an observational cohort, an intervention group, or a control group.

Outcome: Means and standard deviations were extracted for baseline Berg Balance Scale scores. Where variability data were presented as other statistics, these were converted to standard deviations.

Box 1. Inclusion criteria.

Design
- Any study design reporting baseline data on an unselected cohort
- Original research report (ie, not literature review)

Participants
- Community dwelling
- Free of health condition likely to affect balance
- Mean age at least 70 years

Outcomes measures
- Berg Balance Scale mean
- Berg Balance Scale variability

Data analysis

Meta-regression analysis of the mean Berg Balance Scale scores was conducted. Where studies provided participant groups stratified by age, analysis was conducted using subgroups rather than pooled data. In studies where subjects were listed by age decade without provision of the mean age within the data, the mean age was assumed to be the mid-point of the decade. Where studies provided data for treatment and control groups in a trial, the baseline data for each group were included in the analysis separately.

To account for differences in the statistical power of the studies included in the meta-regression analysis, samples with larger numbers and samples with homogenous balance scores are weighted more highly when calculating the overall relationship between age and Berg Balance Scale score. Conversely, small samples and samples with highly variable balance scores were given less weight.

The relationship between the mean age of a sample and the standard deviation of the Berg Balance Scale scores of the sample was investigated using linear regression analysis, with weighting for sample size.

Results

Flow of studies through the review

After duplicates were removed, 859 articles were found containing the term 'Berg Balance Scale' in their abstract, title, or keywords. Hand searches of reference lists revealed one additional relevant paper. Of these, 17 were deemed relevant and included in the analysis. Figure 1 presents the flow of studies through the review and the reasons for exclusion. The main reasons for exclusion from the study were: the participants had significant health conditions or limited mobility; the participants were too young; the participants were hospital inpatients; and the authors reported inadequate details about the participants,

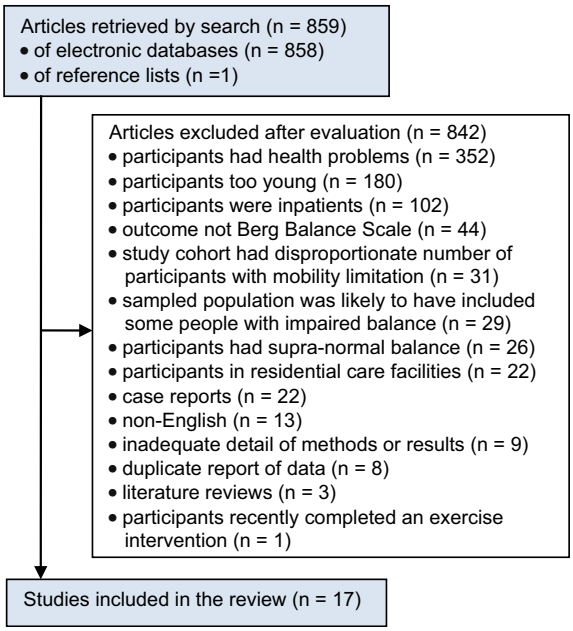

Figure 1. Flow of studies through the review.