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Title

Relationship between SIGAM/WAP Mobility Grades and Pedometer Step Counts in Transtibial Amputees

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Summary

The number of steps taken by unilateral transtibial amputees is higher with increasing SIGAM/WAP mobility grades, resulting in a moderate positive relationship. Step counting using a pedometer is an easy, affordable and reliable way to assess actual walking activity.

Introduction

Walking is an important aspect of prosthetic use after lower limb amputation. The SIGAM/WAP mobility scale is used increasingly in the Netherlands to measure mobility of lower limb amputees. This scale consists of six grades (A-F) and reflects prosthetic-related mobility. Grades are assigned by algorithm after completion of a questionnaire. Grade A or B is assigned for non-ambulators, grade C is assigned when walking indoors, grade D when walking outdoors using walking aids, grade E when walking aids are used occasionally and F when walking without walking aids over more than 50 meters.

Existing mobility scales have certain disadvantages: ordinal scaling makes comparison difficult and they rely considerably on the self-reported estimation of walking efforts by the amputee. Objective and continuous measurements of walking activity may enhance the understanding of functional prosthetic use after lower limb amputation.

Methods

Participants were selected from patients who received rehabilitation treatment after lower leg amputation, between Dec 2006-Jan 2009. Unilateral amputees who completed rehabilitation treatment were eligible for inclusion. Participants had to use their prosthesis for walking (SIGAM/WAP grade C or higher).

All participants wore a Yamax SW-200 pedometer during two periods of seven consecutive days, with four weeks between both periods. This pedometer has been found to be as accurate as a specifically designed accelerometer among unilateral lower limb amputees. The pedometer is more affordable and easier to use. SIGAM/WAP mobility grades were assigned at the start of each measurement period. Daily step counts were calculated by dividing the total number of recorded steps by the number of days the amputee actually walked (diary reported). The relationship between SIGAM/WAP grades and step counts was determined by use of Spearman's rank correlation coefficient.

Results

A total of 20 unilateral transtibial amputees (16 male, 4 female) completed all measurements. Mean age was 63.4 years (range 40-85). Vascular pathology was the reason for amputation in 17 (85%) of the participants. SIGAM/WAP grades ranged from Db-F, meaning that all amputees walked outdoors to a certain extent. SIGAM/WAP grades changed between measurement periods in three participants. Step counts ranged from 81-9559 steps per day. Most participants were graded SIGAM/WAP Db (6/20) or F (9/20). Other assigned SIGAM/WAP grades were Dc (3/20) and E (2/20).

Eighteen participants walked all 7 days, two walked on 5 or 6 days in the measurement weeks. The number of steps taken daily was higher in participants with higher SIGAM/WAP grades, as reflected by a correlation coefficient of 0.657 ($p=0.002$) and 0.671 ($p=0.001$) for the first and second period respectively. Within specific grades, step count ranges were large and considerable overlap in step counts between grades existed. Step counts were slightly higher during the second measurement period (442 more steps; 95% CI: 68-816, $p=0.023$). Test-retest reliability of step counting was very high with an intraclass correlation (ICC) of 0.933 (95% CI: 0.840-0.973, $p<0.001$).

Conclusion

A moderate positive relationship between SIGAM/WAP grade and daily step count was found. Considerable overlap in step count ranges between SIGAM/WAP grades was observed. Step counting using a pedometer is an easy, affordable and reliable way to assess actual walking activity in community-dwelling unilateral transtibial amputees.

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