

ORIGINAL ARTICLE

Climbing Stairs After Outpatient Rehabilitation for a Lower-Limb Amputation



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Abstract

Objective: To study the necessity and ability to climb stairs in persons after a lower-limb amputation (LLA) and the relation of this ability with personal and clinical variables.

Design: Cross-sectional study.

Setting: Outpatient department of a rehabilitation center.

Participants: Persons with an LLA (N=155; mean age \pm SD, 64.1 \pm 11.2y; 73% men).

Interventions: Not applicable.

Main Outcome Measures: The necessity to climb stairs was assessed with the Prosthetic Profile of the Amputee. Several indicators of the ability to climb stairs were assessed including: (1) independence in climbing stairs with a handrail and (2) without a handrail, according to the Locomotor Capabilities Index; (3) numbers of floors actually climbed, according to a rating scale; and (4) limitations in climbing stairs, according to the Climbing Stairs Questionnaire (range, 0–100, with higher scores indicating less limitations). Multivariate logistic regression analysis was used to investigate the associations between the ability to climb stairs and personal and clinical variables.

Results: Of the participants, 47% had to climb stairs. The ability to climb stairs was: (1) 62% independently climbed stairs with a handrail and (2) 21% without a handrail; (3) 32% didn't climb any stairs, 34% climbed half a floor or 1 floor, and 34% climbed \geq 2 floors; (4) the median sum score (interquartile range) of the Climbing Stairs Questionnaire was 38 (19–63), indicating marked limitations. Older participants and women were less able to climb stairs with and without a handrail.

Conclusions: A considerable number of persons with an LLA have to climb stairs in their home environment. Many of them, especially older participants and women, are particularly hampered in their ability to climb stairs.

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Persons with a lower-limb amputation (LLA) report that climbing stairs is an important issue,¹ but this issue has not yet been studied in great detail.² Furthermore, climbing stairs has only been investigated in persons with an LLA as a superficial, secondary outcome.³⁻⁵ Based on these studies, between 42% and 80% of persons with an LLA are able to climb stairs independently.

In daily clinical practice, climbing stairs in persons with an LLA could be very important. This is particularly the case if there is a necessity for the person to climb stairs within, or in order to, enter their house. However, even if this is not the case, climbing stairs

may still be of great importance in order to access other places, which have not been adapted for the mobility-impaired person. Important aspects of the ability to climb stairs are safety, independence during stair climbing, the number of flights of stairs the person can negotiate, and whether limitations are perceived. If a person lives alone and is not able to climb stairs independently, or is only able to climb a small number of steps, the home environment would need to be adapted, the person would need to move to another house, or they would need admission to a long-stay care facility. Generally, if a person does not perceive any limitations, they would not seek help within the health care system.

There are many factors that may influence the ability of persons with an LLA to climb stairs. When amputation is caused by vascular

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problems, the ability to climb stairs decreases.⁶ The use of an auto-adaptive prosthetic knee^{7,8} improves the ability to climb stairs when compared with a standard prosthetic knee. Patients using different prosthetic feet have shown no preference during climbing stairs.^{9,10} However, these studies only investigated young persons with trauma as the cause of LLA, and hence these results cannot be generalized to older adults where cause of amputation varies. Persons with an LLA of older age or with more comorbidities were less able to climb stairs.⁶ Most persons with an LLA who underwent rehabilitation in a nursing home were unable to climb stairs after completing their program.⁶ Based on these results, the ability to climb stairs seems to be a more relevant issue in persons with an LLA undergoing rehabilitation treatment outside a nursing home, that is, in inpatient or outpatient rehabilitation center settings.

The first objective of this study was to describe in detail the necessity and ability to climb stairs in persons with an LLA at the end of outpatient treatment in a rehabilitation center. The second objective was to analyze the relations between the ability to climb stairs and personal and clinical variables.

Methods

Participants

Participants were recruited between 1998 and 2008 in the outpatient department of the Rehabilitation Center 'Tolbrug, 's Hertogenbosch', in the Netherlands. Patients were at the end of their outpatient rehabilitation treatment because of a recent LLA (in some cases this had been preceded by inpatient rehabilitation). They had to meet the following inclusion criteria: aged ≥ 18 years; currently wearing a prosthesis; and be able to understand and fill in questionnaires. The study protocol was approved by the Research Ethics Committee of the Jeroen Bosch Hospital, 's Hertogenbosch. All participants gave informed consent.

Procedure

Data on personal (age, sex) and clinical variables (amputation cause and level, type of prosthetic knee and foot, and comorbidities) were extracted from medical records. The number of comorbid conditions was assessed by physicians using the Functional Comorbidity Index (FCI).¹¹ The FCI consists of a list of 18 items addressing several diagnoses, the presence of which (yes/no) is scored. The sum score is calculated by counting the items scored with yes. A study examining the construct validity of the FCI has shown that physical functioning decreases with an increase in the FCI score ($r = -.47$).¹¹ To obtain the most reliable FCI score, we used a method described previously.¹² Two investigators (F.A.d.L. and an independent physician) scored the presence of all 18 diagnoses independently, and, in case of disagreement, each score was discussed until consensus was reached.

The participants received a questionnaire about climbing stairs from the therapists on the penultimate day of treatment. This questionnaire comprised, among other things, questions about the

necessity and the ability to climb stairs. Participants were asked to fill in the questionnaire at home and bring it with them on the last day of treatment. Participants who returned questionnaires with missing data were contacted by telephone by an independent physician and were subsequently asked to provide the missing data.

Measurements

Necessity to climb stairs

To measure the necessity to climb stairs, we used the Dutch version of the Prosthetic Profile of the Amputee (PPA).⁵ The PPA is a patient-reported outcome measure assessing factors related to prosthetic use in persons with an LLA. Three questions of the PPA, specifically addressing the necessity to climb stairs in the house and in entering or leaving the house, and their interference with daily activities were used (appendix 1). The test-retest reliability of these 3 items is moderate to substantial (Cohen $\kappa = .45-.73$).¹³

Ability to climb stairs with and without a handrail

To measure the perceived independence in climbing stairs, we used the Locomotor Capabilities Index (LCI).^{5,13,14} The LCI forms a part of the PPA. Four questions of the LCI specifically address independence in stair climbing: go up the stairs with a handrail, go down the stairs with a handrail, go up a few steps (stairs) without a handrail, and go down a few steps (stairs) without a handrail. These items have 4 response options: able alone, able if someone is near me, able if someone helps me, or unable. The construct validity and the test-retest reliability of each item of the LCI is good.^{13,15}

Number of stairs climbed

To measure the number of floors climbed, we used a simple rating scale with 8 response options: 0, 0.5, 1, 2, 3, 4, 5, or 6 floors. Participants were instructed to rate the maximum number of floors that they climbed in daily life, with no reference to a specific time frame or type of stair.

Limitations in climbing stairs

To measure the perceived limitations in climbing stairs, we used the original Dutch version of the Climbing Stairs Questionnaire.¹⁶ It consists of 15 items with dichotomous response options. The sum score is calculated by adding scores for the 15 items. This sum score is subsequently standardized (range, 0–100, with higher scores indicating less limitation in climbing stairs). Patients can mark a 16th item if they do not climb stairs at all because of their health, and these patients are given a score of 0. The items of the Climbing Stairs Questionnaire form a reliable and hierarchic scale.¹⁶ Items and hierarchy in persons with an LLA¹⁶ are shown in appendix 2. The questionnaire has been tested in persons with an LLA and exhibited good construct validity (8 of 10 hypotheses not rejected) and test-retest reliability (intraclass correlation coefficient = .79).⁶

Data analysis

We described the necessity and ability to climb stairs and personal and clinical characteristics of the participants with the mean \pm SD for continuous variables, the median (interquartile range) for ordinal variables, and counts (percentages) for dichotomous and categorical variables. Regarding the ability to climb stairs, persons who need to climb stairs were compared with persons who do not, by using the Mann-Whitney *U* test.

List of abbreviations:

FCI	Functional Comorbidity Index
LCI	Locomotor Capabilities Index
LLA	lower-limb amputation
PPA	Prosthetic Profile of the Amputee

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