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Research

A behavioural intervention increases physical activity in people with subacute spinal cord injury: a randomised trial

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KEY WORDS

Spinal cord injury
Motor activity
Behaviour modification
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Physical therapy



ABSTRACT

Questions: For people with subacute spinal cord injury, does rehabilitation that is reinforced with the addition of a behavioural intervention to promote physical activity lead to a more active lifestyle than rehabilitation alone? **Design:** Randomised, controlled trial with concealed allocation, intention-to-treat analysis, and blinded assessors. **Participants:** Forty-five adults with subacute spinal cord injury who were undergoing inpatient rehabilitation and were dependent on a manual wheelchair. The spinal cord injuries were characterised as: tetraplegia 33%; motor complete 62%; mean time since injury 150 days (SD 74). **Intervention:** All participants received regular rehabilitation, including handcycle training. Only the experimental group received a behavioural intervention promoting an active lifestyle after discharge. This intervention involved 13 individual sessions delivered by a coach who was trained in motivational interviewing; it began 2 months before and ended 6 months after discharge from inpatient rehabilitation. **Outcome measures:** The primary outcome was physical activity, which was objectively measured with an accelerometer-based activity monitor 2 months before discharge, at discharge, and 6 and 12 months after discharge from inpatient rehabilitation. The accelerometry data were analysed as total wheeled physical activity, sedentary time and motility. Self-reported physical activity was a secondary outcome. **Results:** The behavioural intervention significantly increased wheeled physical activity (overall between-group difference from generalised estimating equation 21 minutes per day, 95% CI 8 to 35). This difference was evident 6 months after discharge (28 minutes per day, 95% CI 8 to 48) and maintained at 12 months after discharge (25 minutes per day, 95% CI 1 to 50). No significant intervention effect was found for sedentary time or motility. Self-reported physical activity also significantly improved. **Conclusion:** The behavioural intervention was effective in eliciting a behavioural change toward a more active lifestyle among people with subacute spinal cord injury. **Trial registration:** NTR2424. [Nooijen CFJ, Stam H, Bergen MP, Bongers-Janssen HMH, Valent L, van Langeveld S, Twisk J, Act-Active Research Group, van den Berg-Emons RJG (2016) A behavioural intervention increases physical activity in people with subacute spinal cord injury: a randomised trial. *Journal of Physiotherapy* 62: 35–41]

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Introduction

People with spinal cord injury (SCI) receiving inpatient rehabilitation are physically active during therapy sessions. However, after discharge from inpatient rehabilitation, daily physical activity levels are known to decline to a level that is severely low compared with the general population and also low compared with people with other chronic diseases.^{1,2} In addition to maintaining sufficient physical activity, interposing of breaks in sedentary time is another independent aspect of physical behaviour that is thought to be important for optimal health.^{3,4} For people with SCI, increasing the amount of physical activity is known to: reduce the risk of cardiovascular disease; prevent or reduce secondary health problems, such as pressure areas; and improve physical fitness and quality of life.^{5,6} Thus, it is important

to prevent a decline in physical activity levels and promote an active lifestyle in the home situation of people with subacute SCI.

Physical capacity can be regarded as a prerequisite for an active lifestyle. Higher physical capacity may allow individuals to perform activities in daily life more proficiently, faster, with less difficulty and for longer periods.⁷ Nevertheless, people with SCI often have poor physical capacity.⁸ In recent years, it has become increasingly recommended that the highest possible level of physical capacity is attained during inpatient rehabilitation.^{5,9} However, higher physical capacity may not automatically lead to a more active lifestyle; a behavioural change may also be needed.¹⁰

Behavioural interventions are thought to be necessary to achieve a change in behaviour. Previous studies of people with SCI have tended to show positive effects of behavioural interventions on physical activity.^{11–16} However, all of those studies were performed

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on people with SCI in the chronic phase. Furthermore, only one study¹³ used objective measures of physical activity; the others used self-reported measures, which might have permitted bias.¹⁷ Moreover, only two of six studies^{14,15} reported on the long-term effects, which was a limitation because the new behaviour will only be clinically relevant if it is maintained after the intervention.

In the present study, it was hypothesised that regular rehabilitation including a physical exercise intervention reinforced with the addition of a behavioural intervention to promote physical activity would lead to a more active lifestyle than regular rehabilitation including a physical exercise intervention. Therefore, the primary objective of the study was to determine the effect of adding the behavioural intervention on physical activity. A secondary objective was to determine the effects on physical capacity, health, participation and quality of life; these outcomes will be reported in a separate publication.

Therefore, the research question for this randomised, controlled trial was:

For people with subacute SCI, does rehabilitation that is reinforced with the addition of a behavioural intervention to promote physical activity lead to a more active lifestyle than rehabilitation alone?

Method

Design

This study, named Act-Active, was a single-blind, multicentre, randomised, controlled trial with blinding of the research assistants who performed the measurements. The first author randomised the participants to an intervention group or a control group by a concealed allocation procedure. Randomisation was stratified by level of injury (tetraplegia versus paraplegia) and completeness of injury (motor complete versus motor incomplete). A lesion between C5 and T1 was defined as tetraplegia, and a lesion below T1 as paraplegia. A motor complete lesion was defined as AIS grade A or B, a motor incomplete lesion as AIS grade C or D.¹⁸ Block randomisation was by a computer-generated random number list prepared by an investigator with no clinical involvement in the trial. Random group allocation (1:1) was performed for each rehabilitation centre and within each stratum.

Participants, therapists and centres

Research assistants at rehabilitation centres with specialised SCI units enrolled participants during inpatient rehabilitation. Inclusion criteria were: diagnosed with SCI, initial inpatient rehabilitation, dependent on a manual wheelchair, able to handcycle, and aged between 18 and 65 years old. Exclusion criteria were: insufficient comprehension of the Dutch language to understand the purpose of the study and its testing methods, and progressive disease or a psychiatric condition that could interfere with participation. The usual staff at the specialised rehabilitation centres administered the rehabilitation. The behavioural intervention was delivered by a physiotherapist or occupational therapist trained in motivational interviewing. The four Dutch rehabilitation centres that were involved were: Rijndam Rehabilitation Institute in Rotterdam, Adelante in Hoensbroek, Heliomare in Wijk aan Zee, and Hoogstraat in Utrecht.

Intervention

All participants in both groups received usual care, which included a handcycle training program and advice on physical activity after discharge. The structured handcycle training program was performed during the last 8 weeks of inpatient rehabilitation. This handcycle training was scheduled three times per week and consisted of an interval training protocol on an add-on handcycle. Details of the handcycle training and results on physical capacity

have been described elsewhere.¹⁹ The advice about physical activity after discharge was unstructured and focused mainly on sports and not on daily activities. After inpatient rehabilitation, all participants continued rehabilitation as outpatients.

Participants in the experimental group received an additional behavioural intervention. This intervention aimed to increase the amount of everyday physical activity after discharge from inpatient rehabilitation. Thirteen individual face-to-face sessions with a coach were planned, each session having a maximum duration of 1 hour. For practical reasons, some sessions after discharge were conducted by telephone. Two sessions were scheduled per month beginning 2 months before discharge and ending 3 months after discharge; thereafter, in the following 3 months there was one session per month. Each physiotherapist or occupational therapist who acted as coach for the behavioural intervention was trained in motivational interviewing, as based on the transtheoretical model. Motivational interviewing has been shown to be an effective method for altering behaviours.²⁰

Each session began with the participant proposing the topics of conversation for that session. The behavioural intervention had four main components. The first component was feedback on daily wheelchair activity using bicycle odometers. A bicycle odometer was attached to the wheelchair and registered the distance travelled per day. The participant was instructed to keep track and to set goals toward increasing the travelled distance. The second component was formulation of action plans on how and when to be physically active and formulation of coping strategies for dealing with barriers that could hinder the actual performance of an action plan. The next component was a home visit by the coach in the first month after discharge, during which the coach helped to optimise the home and the environment of the participant for an active lifestyle. The last component was the provision of additional information at the request of the participant on relevant topics related to physical activity, such as possible health benefits.

Outcome measures

Measurements were performed at four scheduled assessment points: 2 months before discharge from inpatient rehabilitation, which was before the start of the interventions (baseline); 1 or 2 weeks before discharge from inpatient rehabilitation (discharge); 6 months after discharge from inpatient rehabilitation, which was within 1 month after completion of the behavioural intervention; and 1 year after discharge from inpatient rehabilitation. Each participant's start in the study was determined based on the planned discharge date, as estimated by the rehabilitation physician.

Objective measurement of physical activity

Physical activity was measured objectively with an ambulatory monitoring system^a (Figure 1), with body-fixed three-axis

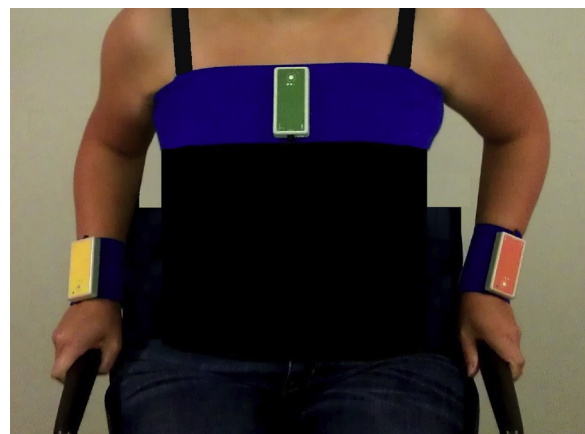


Figure 1. Activity monitor^a used in the study.

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