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## Physical activity in hard-to-reach physically disabled people

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# General introduction



## Bio psychosocial perspective on health

During the past three decades, the perspective on health shifted from a one-dimensional biomedical perspective towards a multidimensional bio psychosocial perspective<sup>1,2</sup>. Induced by this shift, health was defined as the ability to adapt and to self-manage, in the face of social, physical and emotional challenges, since 2009<sup>3</sup>. As explained in the bio psychosocial model, health status is determined by an interaction between biological factors (e.g. diseases or disabilities), psychological factors (e.g. coping, mental wellbeing), and social factors (e.g. interaction with others). Health Related Quality of Life (HRQoL) is a typical example of a bio psychosocial health construct. HRQoL is increasingly used as an outcome measure when evaluating effects of treatments, interventions, and policy in health care<sup>4,5</sup>.

## Physical activity in the general population

During the day, people spend various amounts of time being physically active<sup>†</sup> for instance by participating in sports<sup>‡</sup>, active transport, leisure time physical activity, work or daily life activities. Being physically active benefits bio-, psycho- and social health<sup>6-8</sup>. As a result of being physically active, muscle strength and heart and lung capacity improves, and body fat decreases. These changes decrease the risk of lifestyle related chronic diseases, such as diabetes type II. Participation in physical activity improves mental health, reduces the risk on depression, and improves social interaction<sup>9-11</sup>. The health enhancing effects of physical activity are worldwide advocated through the Exercise is Medicine paradigm<sup>12</sup>. Physical activity is described as the 'best buy' for public health, because of its preventative effects for lifestyle related diseases and its relatively low costs<sup>13,14</sup>.

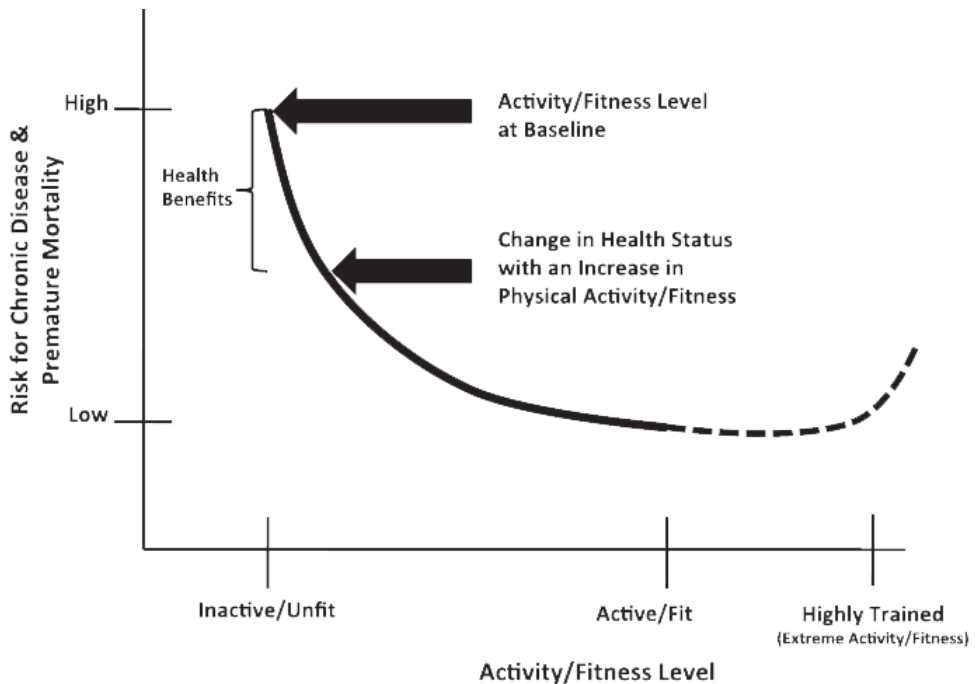
The Dutch Health Council (Dutch: Nederlandse Gezondheidsraad) recommends adults to participate at least 150 minutes per week in moderate or vigorous physical activity, and to perform muscle strength- and bone density increasing activities<sup>15</sup>. Worldwide, many people do not fulfil the physical activity recommendations, and are

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<sup>†</sup> Throughout this thesis, physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure<sup>111</sup>.

<sup>‡</sup> Throughout this thesis, sports participation is defined as an activity involving physical exertion with or without game or competition elements, with a minimal duration of 30 minutes for at least two times a week, and where skills and physical endurance are either required or to be improved<sup>142</sup>.

thereby named inactive<sup>5, 7</sup>. However, a curvilinear relationship between the amount of physical activity and health risk exists (figure 1). Also relatively minor increase in physical activity results in relevant health benefits, especially in inactive people, indicating that doing something is better than doing nothing<sup>8</sup>.



**Figure 1:** Theoretical curvilinear relationship between physical activity level and health risk, figure from Warburton and Bredin (2017)<sup>8</sup>.

Due to for instance improved technology and urbanisation, people tend to become less physically active<sup>7,16</sup>. The increased tendency towards physical inactivity is a major burden on health worldwide, due to an increase of non-communicable diseases. The proportion of deaths due to physical inactivity is similar to smoking and obesity nowadays<sup>6</sup>. By the accompanying health care costs, and costs caused by productivity losses, the economic burden of physical inactivity was estimated to be at least 67.5 billion dollar worldwide in 2013<sup>17</sup>. Hence, physical inactivity is a global pandemic<sup>17,18</sup>.

<sup>5</sup> Throughout this thesis, physical inactivity is defined as not achieving 150 min of moderate-intensity activity or 75 min of vigorous-intensity activity per week, or an equivalent combination, regardless of the weekly frequency<sup>7</sup>.

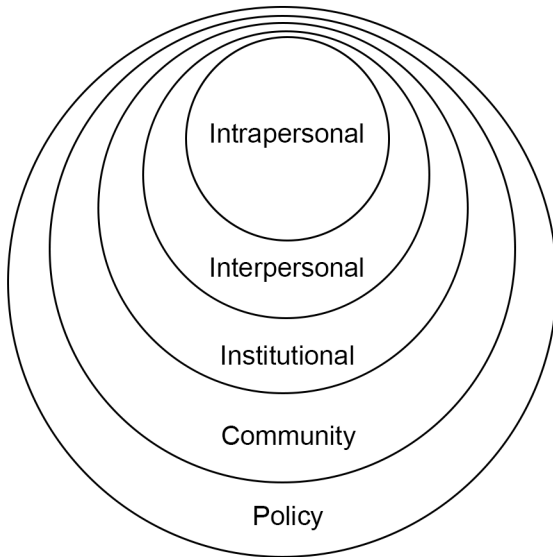
## Physical activity in physically disabled people

In 2011, 15% of the world's population, more than a billion people, were estimated to live with some form of disability<sup>19</sup>. In the Netherlands, 12% of the adult population suffers from a moderate or severe physical disability, of whom half (6% of the total adult population) has a moderate or severe disability of the locomotor system<sup>20</sup>. People may also suffer from impaired mobility as a result of chronic diseases. In total 9.6% of the Dutch adult population is estimated to live with a mobility impairment<sup>21</sup>. Throughout this thesis, people suffering from impaired mobility because of motor disability or chronic disease, are referred to as physically disabled people. Due to population ageing, the number of physically disabled people is rising<sup>22</sup>.

As in the general population, physical activity also benefits bio psychosocial health in physically disabled people<sup>23</sup>. In physically disabled people, physical activity prevents secondary conditions, and as such is a form of tertiary prevention<sup>24</sup>. Although physical activity may not reverse the underlying disability or disease, it can reduce consequences of the disability, for instance reduce pain, improve mental health, and improve HRQoL<sup>12,23,24</sup>. However, due to various barriers that physically disabled people experience, physical activity participation is considerably less in physically disabled people compared to the general population<sup>20,25,26</sup>.

## Stimulating physical activity in physically disabled people

Contrary to a long research history in the general population, priority for research on stimulating physical activity in physically disabled people was expressed only since the past three decades<sup>27,28</sup>. Research in this field started with describing barriers and facilitators (determinants) that physically disabled people experience to participate in physical activity<sup>29,30</sup>. A recent umbrella review, summarising earlier reviews, divided barriers and facilitators regarding physical activity participation in adults and children with physical disabilities into the five levels of the social ecological model (figure 2)<sup>29,31</sup>. Barriers and facilitators regarding sports participation in physically disabled adults were established and divided into personal and environmental determinants<sup>32</sup>. The intrapersonal level of the social ecological model describes personal determinants, where the interpersonal, institutional, community and policy level describe environmental determinants. Determinants on which healthcare and recreational sector can intervene are for instance psychological factors (personal determinant), facilities, social support, rehabilitation processes and costs (environmental determinants)<sup>29,32</sup>.



**Figure 2:** The social ecological model as described by McLeroy et al. (1988)<sup>31</sup>

The abovementioned umbrella review recommended that a shift should occur from describing barriers and facilitators towards designing and evaluating interventions to stimulate physical activity in physically disabled people<sup>29</sup>. More than 80 existing interventions to stimulate physical activity in this population were found in earlier research<sup>33,34</sup>. However, of these 80 interventions, only seven interventions were non disease specific, meaning that they targeted a heterogeneous population regarding disability. These seven interventions were exercise<sup>¶</sup> interventions, stimulating a specific mode of exercise, rather than participating in physical activity in general. To change physical activity behaviour on the long term, lifestyle physical activity interventions, that stimulate physical activity behaviour in general, are preferred above exercise interventions, since lifestyle physical activity interventions may be more acceptable to a larger population<sup>24</sup>.

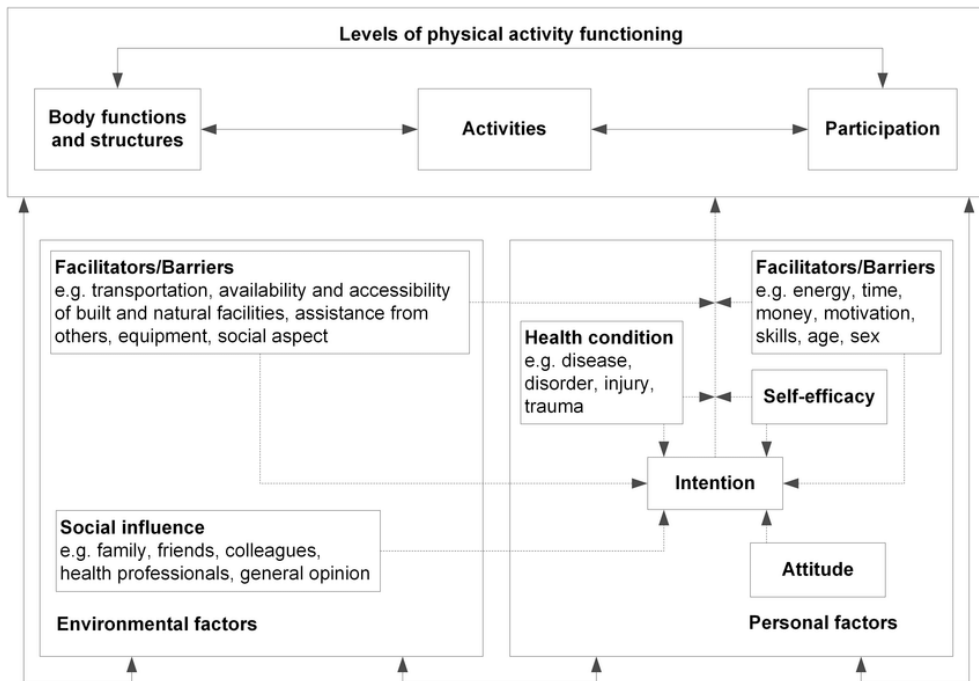
<sup>¶</sup> Throughout this thesis, exercise is defined as a subset of physical activity that is planned, structured, and repetitive, with the intent of improving or maintaining one or more facets of physical fitness or functioning<sup>111</sup>.

In The Netherlands several (lifestyle) physical activity interventions exist for physically disabled people. However, existing interventions reach their target population through rehabilitation centres<sup>35,36</sup>, primary health care professionals<sup>37,38</sup> or schools for special education<sup>39</sup>. But a substantial proportion of the target population is not reached. Throughout this thesis, physically disabled people who cannot be reached through rehabilitation, primary health care and special education, are referred to as hard-to-reach physically disabled people. The limited reach of existing interventions is suggested to explain the fact that physical activity participation did not increase, despite several existing interventions<sup>20</sup>. Stimulating physical activity in a community setting is preferred above for instance medical settings to include hard-to-reach physically disabled people, and to ensure continuity and applicability in daily practice<sup>33,40</sup>.

## **Theoretical frameworks used in this thesis**

### *PAD model*

The theory about physical activity behaviour in physically disabled people is summarised in the Physical Activity for people with a Disability (PAD) model (figure 3)<sup>41</sup>. This model integrates the International Classification of Function, Disability and Health (ICF) framework and the Attitude, Social influence and self-Efficacy (ASE) model. The PAD model describes both aspects of functioning and disability (ICF) and factors influencing physical activity behaviour (ASE)<sup>42,43</sup>. The PAD model explains how environmental- and personal factors, influence levels of physical activity functioning directly and indirectly by means of influencing intention. Levels of physical activity functioning can be subdivided into the level of body functions and structures, activities and participation. For example, social influence of peers (environmental factor) can improve a person's attitude towards physical activity (personal factor), which can improve intention (personal factor) to take the dog for a walk (participation). In order to take the dog for a walk, a person has to walk (activities), for which muscle strength of the legs (body functions and structures) is required.

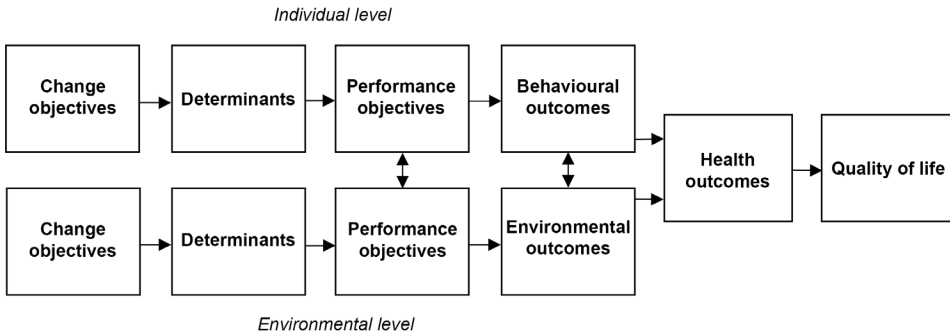


**Figure 3:** Physical Activity for people with a Disability (PAD) model<sup>41</sup>.

### Intervention Mapping

Intervention Mapping (IM) is a widely accepted method for designing theory-based health promoting interventions, consisting of six steps<sup>44</sup>. As a first step, a needs assessment must be conducted to investigate the health problem, identify the population at risk, and assess health status and quality of life at baseline. IM step 2 focusses on describing expected outcomes at behavioural (individual) and environmental level, and on specifying performance objectives on these outcomes (i.e. the desired change of these outcomes). Moreover, determinants for the behavioural and environmental outcomes will be selected. Change objectives will be described in a matrix, and are the cross product of the performance objectives and determinants (i.e. how a determinant should change in order to fulfil the performance objective). Behavioural and environmental outcomes, determinants and change objectives together form the logic model of change of IM (figure 4).





**Figure 4:** Logic model of change summarizing the first two steps of Intervention Mapping<sup>44</sup>. Arrows indicate causal relationships. The course of the intervention designing process is in the opposed direction, starting with quality of life (IM step 1).

In IM step 3, theory-based intervention methods will be selected from behavioural science models, for each of the change objectives. These theory-based intervention methods will be translated to practical applications, that together form the building blocks of the intervention. In IM step 4 the intervention programme will be designed by connecting and sequencing the different practical applications. Additionally, protocols, documents and materials for the execution of the intervention will be developed in step 4. Adopters and users of the intervention will be identified in IM step 5, and strategies for adoption, implementation and maintenance of the intervention will be identified. IM step 6 focusses on the development of an evaluation plan, which includes both evaluation of the implementation process and effectiveness of the intervention.

IM is an iterative process. After finishing the six steps, the intervention can be implemented in practice, and evaluated. Based on the evaluations, the intervention can be further developed, by following the steps of the IM process again<sup>44</sup>.

### RE-AIM framework

The RE-AIM framework can be used for evaluating the implementation process and the public health impact of health promotion interventions<sup>45</sup>. This framework describes Reach and Effects of the intervention at the level of the individual, Adoption and Implementation at the organisational level, and Maintenance of an intervention at both individual and organisational level.

## Aims of this thesis

This thesis aims to develop an intervention to stimulate physical activity in hard-to-reach physically disabled people, that can be applied in a community setting. Application of IM, resulted in the following study aims:

- To study HRQoL and its association with physical activity participation in physically disabled people.
- To investigate requirements of stakeholders (professionals and potential users) on an intervention to stimulate physical activity in hard-to-reach physically disabled people.
- To develop and implement an intervention to stimulate physical activity in hard-to-reach physically disabled people, in a community setting.
- To evaluate feasibility and short-term health effects of an intervention to stimulate physical activity in hard-to-reach physically disabled people.

## Outline of this thesis

The structure of this thesis is based on the steps of IM. As part of the needs assessment (IM step 1), HRQoL of physically disabled people was measured using the RAND-36. *Chapter 2* describes the reliability of the RAND-36 for the generic physically disabled (rehabilitation) population. *Chapter 3* describes reference values for health related quality of life of physically disabled people, and associations between physical activity and different components of health related quality of life. Behavioural and environmental outcomes, performance objectives, determinants and change objectives of the intervention (IM step 2), as well as intervention methods and practical applications (IM step 3) were determined among professionals and the target population. *Chapter 4* describes requirements of professionals working in the field of adapted physical activity on an intervention to stimulate physical activity in hard-to-reach physically disabled people. The PAD model and logic model of change of IM were integrated to describe both an intervention and the physical activity behaviour itself. *Chapter 5* describes the requirements of the target population on the intervention. *Chapter 6* describes the development and design of the final adapted intervention Activity Coach+ (IM step 4), and plans for adoption, implementation (IM step 5) and evaluation of Activity Coach+ (IM step 6). *Chapter 7* presents short term effects of Activity Coach+ on physical activity behaviour and bio-, psycho- and social health outcomes. *Chapter 8* discusses the findings of this thesis and provides recommendations for practical use and future research.

