

Sports participation and physical disabilities: Taking the hurdle?!

Eva A. Jaarsma

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Publication was supported by donations received from:

Center for Rehabilitation, UMCG

Research Institute SHARE

University of Groningen

University Medical Center Groningen

Design & lay-out by:

Freek Kilsdonk Grafische Onderneming

www.fkgo.nl

Printed by:

Gildeprint, Enschede

www.gildeprint.nl

ISBN: 978-90-367-7298-3

ISBN: 978-90-367-7297-6 (electronic version)

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rijksuniversiteit
 groningen

Sports participation and physical disabilities

Taking the hurdle?!

Proefschrift

ter verkrijging van de graad van doctor aan de
 Rijksuniversiteit Groningen
 op gezeg van de
 rector magnificus prof. dr. E. Sterken
 en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op

woensdag 29 oktober 2014 om 12.45 uur

door

Eva Annika Jaarsma

geboren op 23 maart 1983
 te Groningen

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Reinier Jaarsma

Laura Broekhuis

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Chapter 1

General Introduction

Sports participation in general

In the past decade people have become less physically active^[1]. Office jobs require employees to sit at a desk during the day, and after work many people like to watch television or use different types of social media. Sports are a less popular activity after work, either because people do not have the time to exercise or because they are not motivated to participate in sports after work^[2]. This physical inactivity could have negative consequences for a person's health, such as higher chances of cardiovascular diseases, obesity and type 2 diabetes mellitus^[3].

Generally, approximately two-thirds of the Dutch population participate in sports^[6]. But even though the majority of Dutch people are physically active, the percentage of people being overweight has increased over the years (2000: 44 %, 2010: 48%)^[7]. The Dutch national government is therefore investing in programs to increase sports participation in general and is cooperating with local authorities to provide easily accessible and safe sports facilities^[8].

Sports participation in people with physical disabilities

The sports participation of people with physical disabilities is lower compared to people without physical disabilities. In the United States, for example, 44% of people with physical disabilities participate in sports^[5]. In the Netherlands, people with physical disabilities show similar percentages for sports participation, namely 37%^[6]. The benefits of sports participation for people without physical disabilities are similar for people with physical disabilities. Besides health related benefits of sports such as reducing chances of heart disease, obesity, type 2 diabetes^[5,9], active people with physical disabilities also mentioned better balance and psychosocial benefits such as fun, social contacts, acceptance of the disability and improved self confidence^[2,10-12].

In 1944, Dr Ludwig Guttmann (neurologist of the Spinal Cord Injuries Centre at the Stoke Mandeville Hospital, United Kingdom) was one of the first to recognise these benefits and introduced sports in the rehabilitation program. He even stated that:

"If I ever did one good thing in my medical career it was to introduce sports into the rehabilitation of disabled people."^[13]

He developed rehabilitation sports into recreational and competitive sports by organising the first Stoke Mandeville Games in 1948, which would eventually evolve

into the Paralympic Games.

Today, sports are still part of the rehabilitation program, to familiarise patients with physical disabilities with different sports possibilities and increase their physical fitness and quality of life^[14,15]. The Paralympic Games of London in 2012 were more popular than ever with 2.7 million spectators to watch the Games, which exceeded the Paralympic Games of Beijing (2008) with 900.000 spectators. In total 4,237 athletes from 164 different countries competed in 20 sports compared to 3,951 athletes from 146 countries in Beijing^[16]. With more (international) interest in Paralympic sports than ever, one would expect that the sports participation of people with physical disabilities in general might also increase. But despite the presence of sports in the rehabilitation program and the growing attention for Paralympic sports, the majority of people with physical disabilities still are not physically active.

In order to try to increase sports participation of people with physical disabilities, it is important to understand what withholds them from participating and how they can be stimulated to become active in sports. It is also important to establish whether inactive and active people with physical disabilities experience different barriers and facilitators of sports participation.

Even though the United States and the Netherlands show similar percentages for sports participation in people with physical disabilities^[5,6], little information is known whether these percentages also represent percentages in other countries or continents. The functioning of a person with a physical disability depends on the environmental context he/she lives in^[17], which could indicate that influences such as the attitude of society and policies of the government could affect sports participation of people with physical disabilities^[18].

Aim and research questions

The overall aim of this thesis was to study which barriers and facilitators influence sports participation of people with different types of physical disabilities and whether inactive and active persons experience different barriers and facilitators of sports participation.

This thesis therefore aimed to answer the following research questions:

- Which barriers and facilitators of sports participation do people with physical disabilities experience?
- Do active participants experience different barriers and facilitators of sports than inactive participants? If so, what are these differences?

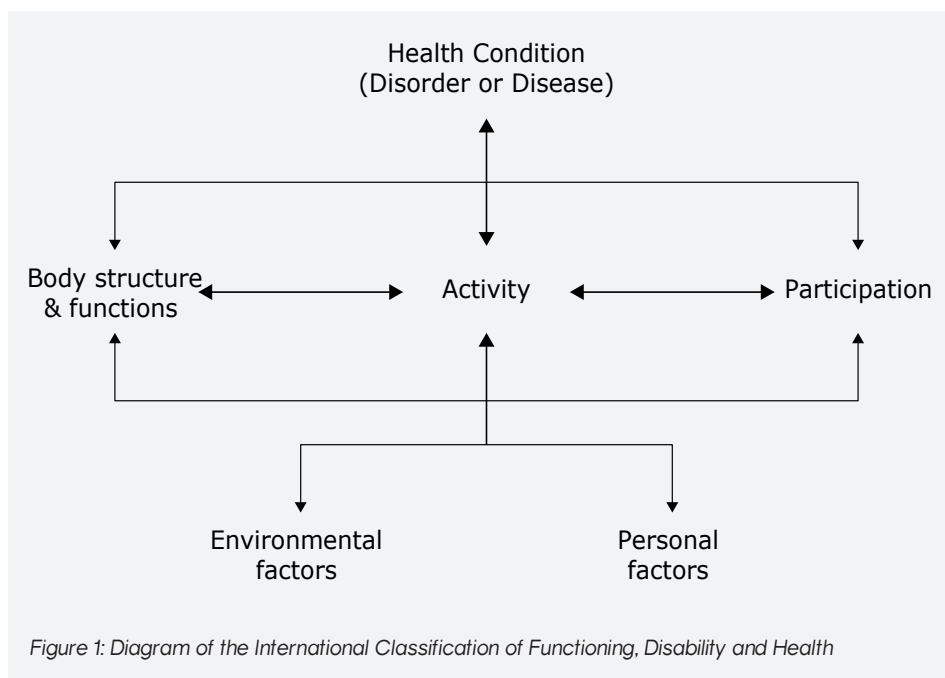
To also address the possible differences in barriers and facilitators of sports

participation within different countries, a third research question was added:

- What cross-cultural differences in barriers and facilitators of sports participation can be found worldwide?

Theoretical frameworks used in this thesis

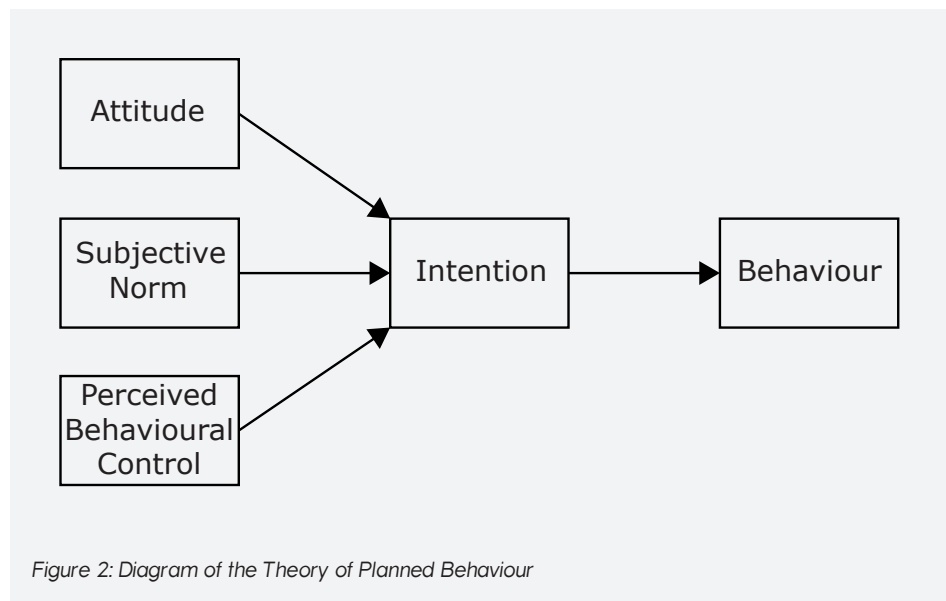
This thesis uses two theoretical frameworks to structure experienced barriers and facilitators of sports participation. The framework is the International Classification of Functioning, Disability and Health (ICF; Figure 1)^[17] of the World Health Organisation. The ICF model is a classification of health and health-related domains, which classifies health on both individual and population level.



The ICF model divides functioning into three components, namely body structure and functions, activities and participation. This thesis will focus on participation, as sports participation falls under this domain. As functioning is a complex interaction of an individual in a context, the ICF also acknowledges environmental and personal factors^[17].

The theory used in this thesis is the Theory of Planned Behaviour (TPB)^[19]. This theory assumes that behaviour (i.e. sports participation) is influenced by

intention, which in turn is influenced by attitude, subjective norm and/or perceived behavioural control. Attitude is the positive or negative outcome of behaviour, subjective norm refers to the social pressure regarding behaviour and perceived behavioural control is the belief that a person can control their own behaviour in certain situations^[19].



Outline of this thesis

The above mentioned research questions will be answered in the following chapters:

As a starting point a systematic review was performed to determine what is known about barriers and facilitators of sports participation for people with physical disabilities (Chapter 2).

Consequently, because the group of people with physical disabilities is very broad and diverse, barriers and facilitators of people from different disability groups will be investigated. As a first glance of what barriers and facilitators of sports participation can be expected, Dutch Paralympic athletes were questioned about the barriers and facilitators of sports participation they have experienced. Paralympic athletes are a specific group of people with physical disabilities, who probably have experienced barriers at the start of participation in sports. Despite these barriers they have also experienced facilitators, as they are obviously still participating in sports (Chapter 3).

Children with physical disabilities might experience different barriers and facilitators of sports participation, especially when they attend a special school. Since children with physical disabilities have to rely on their environment (i.e. family, friends and professionals at school), different perspectives on the child's sports participation will provide a more comprehensive insight in a complex phenomenon such as sports participation^[20]. This study therefore aimed to provide comprehensive information about the barriers and facilitators of sports participation of children with physical disabilities by triangulating data from children, their parents and their health care professionals (Chapter 4).

Little is known about possible barriers and facilitators of sports participation of people with visual impairments in the Netherlands. However, previous research reported that people with visual impairments have a poorer health status and higher rates of overweight and obesity compared to people without a visual impairment^[21,22]. Also, participation in daily activities of people with visual impairments is strongly related to sports participation^[23]. The aim of this study was to analyse barriers and facilitators of sports participation of people with visual impairments and compare differences in these factors between inactive and active participants. This study also aims to investigate differences in reasons to start and maintain participation in sports (Chapter 5). Experienced barriers and facilitators of sports participation from a different group of people with disabilities can help in providing new insight in developing strategies to increase sports participation.

From a rehabilitation medicine perspective, it is also important to gain knowledge about barriers and facilitators of sports of patients that were treated in our Rehabilitation Centre. A large group of people with physical disabilities will include both physically inactive and active persons, who might have experienced different barriers and facilitators of sports participation. A representation of the total population can also provide insight in differences in sports participation levels between diagnosis groups. Therefore the aim of this study was to analyse barriers and facilitators of sports participation of people with physical disabilities after rehabilitation and compare differences between inactive and active participants regarding these experienced barriers and facilitators (Chapter 6).

As functioning of a person with a physical disability depends on their environmental context^[17], sports participation can also be influenced by cultural differences in barriers and facilitators. Most studies on barriers and facilitators of sports are from Northern America or Europe, which is why it is unknown whether these results are also applicable to other continents. As only little research has been done at possible differences between countries, the aim of this study was to analyse cross-cultural differences in barriers and facilitators of sports participation of Paralympic athletes between countries and continents (Chapter 7).

Finally, this thesis concludes with discussing the results of the abovementioned studies and provides clinical recommendations and suggestions for future research (Chapter 8).

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Barriers to and facilitators of sports participation for people with physical disabilities: A systematic review

Eva A. Jaarsma, MSc; Pieter U. Dijkstra, PT, PhD; Jan H.B. Geertzen, MD, PhD; Rienk Dekker, MD, PhD.

Abstract

Purpose: Most people with physical disabilities do not participate in sports regularly, which could increase the chances of developing secondary health conditions. Therefore, knowledge about barriers to and facilitators of sports participation is needed. Barriers and facilitators for people with physical disabilities other than amputation or spinal cord injuries (SCI) are unknown. The aim of this study was to provide an overview of the literature focusing on barriers to and facilitators of sports participation for all people with various physical disabilities.

Methods: Four databases were searched using MeSH terms and free texts up to April 2012. The inclusion criteria were articles focusing on people with physical disabilities, sports and barriers and/or facilitators. The exclusion criteria were articles solely focusing on people with cognitive disabilities, sensory impairments or disabilities related to a recent organ transplant or similar condition.

Results: Fifty-two articles were included in this review, with twenty-seven focusing on people with SCI. Personal barriers were disability and health; environmental barriers were lack of facilities, transport and difficulties with accessibility. Personal facilitators were fun and health, and the environmental facilitator was social contacts.

Conclusion: Experiencing barriers to and facilitators of sports participation depends on age and type of disability and should be considered when advising people about sports. The extent of sports participation for people with physical disabilities also increases with the selection of the most appropriate sport.

Introduction

People with physical disabilities do not participate in sports as regularly as those without disabilities. For example, in the United States, nearly two-thirds of people with physical disabilities do not participate in sports, whereas just over one-third of people without disabilities do not participate in sports^[1]. Sports can be defined as 'an activity involving physical exertion with or without a 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'^[2]. During rehabilitation, sports are often made part of the treatment to familiarise people with physical disabilities with sports^[3]. However, only few people with disabilities decide to stay physically active after they have completed their rehabilitation^[3].

The physical benefits of sports have been frequently documented. Several studies noted the potential for sports to decrease the risk of secondary health conditions such as heart disease, diabetes type II and obesity, especially for individual program participants^[1,4]. It is therefore important to understand what prevents or stimulates people with physical disabilities to participate in sports. Insight into the barriers and facilitators in this respect can also help in providing opportunities to increase sports participation among people with physical disabilities.

Previous studies focusing on barriers to and facilitators of sports participation for people with physical disabilities have been very diverse in terms of study outcomes, data reporting (only barriers, only facilitators or both) and assessment methods^[5,9]. Most studies have also focused solely on people with amputation or SCI^[7,10-12] and do not provide information about barriers to and facilitators of sports participation for people with other disabilities. To structure the results of such studies, barriers and facilitators could be divided into personal and environmental factors in accordance with the International Classification of Functioning, Disability and Health (ICF)^[13]. Lack of motivation, lack of energy and sports history have been reported as personal barriers to sports participation. Environmental barriers that have been reported were transportation, accessibility to sports facilities and costs^[10,14-16]. Fun and health have been considered to be important personal facilitators^[7,15-17]. Because these studies have primarily focused on amputation or spinal cord injuries, it is unknown whether these barriers and facilitators are also experienced in other disability groups.

To date, no overview of studies focusing on barriers to and facilitators of sports participation for all people with various physical disabilities has been provided^[5].

The aim of this systematic review was therefore to provide an overview of such studies.

Methods

Search strategy

A search was performed in Medline, Embase, Cinahl and Sport Discus using a combination of MeSH terms and free text words (see Appendix 1 for the complete database search strategy). The main keywords for the search included 'people with disabilities', 'athletes', 'exercise', 'sports', 'physical activity', 'motivation' and 'attitude' in combination with 'barrier', 'obstacle', 'hurdle', 'constraint' and 'facilitator', 'motivate', 'encourage', 'benefit', 'advantage' and 'stimulate'. The search was performed up to April 2012.

Procedure

The inclusion and exclusion criteria used to screen the articles were similar for the titles, abstracts and full texts. First inclusion criterion was that the studies focused on people with physical disabilities or a certain type of physical disability. Second criterion was that studies focused on a sport(s), an athlete(s), exercise, physical activity, motor activity, sports participation or other general or specific sporting/ exercising activities. Last criterion was that studies contained words such as stimulation, barriers, facilitators, promotion or synonyms of these words. Studies written in English, Dutch or German were included.

Exclusion criteria were studies focusing solely on people with cognitive impairments without a concomitant physical disability, on people with hearing or visual impairments or on people with disabilities related to a recent organ transplant or similar condition, as this systematic review only focused on diagnoses frequently observed in rehabilitation medicine. Studies were also excluded if they focused on the biomechanical (kinetics, kinematics, dynamics, wheelchair propulsion) or physiological (energy expenditure, muscle strength, metabolism) aspects of physical disability, on surgical procedures, treatment modalities, orthopaedic examination, diagnostic methods or training programs. Reviews, comments, interviews, letters, posters, book chapters and books were also excluded.

For the full text stage, qualitative studies were excluded, as the focus of our systematic review was on studies with quantitative results.

Two reviewers (EJ, RD) independently assessed titles, abstracts and full texts, after which Cohen's kappa and absolute agreement for different stages were calculated. A pilot review was performed before every stage to determine whether the in- and exclusion criteria and instructions were clear for both reviewers. After every stage, a consensus meeting was held to agree on differences in assessment

between the two reviewers. In cases in which consensus was not met in any of the stages, a third reviewer (PD) made the final decision.

After the full text assessment, both reviewers used a checklist to identify relevant information to our research question from the included studies (see Appendix 2).

Data extraction

Data extracted from the included studies were number of participants, study design, assessment method, population characteristics, response rate, clinometric characteristics, theoretical framework and barriers and facilitators. Barriers to and facilitators of sports participation reported in the included studies were structured into personal and environmental factors according to the ICF model^[13]. Barriers and facilitators were also divided into two age groups, namely children and adolescents (mean age 0 - 20 years) and adults (mean age > 20 years), as children and adolescents may experience different barriers and facilitators than adults.

The mean age of the research population within a study was pooled if possible and necessary. The weighted mean age of all included studies was calculated by first multiplying the mean age by the number of participants for each study. Then, these values were added and divided by the total number of participants of all included studies.

Table 1: Study characteristics of the included studies

Author	Gender (M/F)	Age ^s	Disability	Sport	Rel	Val	Level	SM	RR (%)	Design	AT	Model	Barriers	Facilitators
Laihan et al., 1988 ^[6]	123 (./.)	[14-18]	-	Backpacking, (Winter) Camping, Canoeing, Cycling, Rafting	Y	Y	A	-	49	CS	Q	-	-	Past participation, Family participation, Social contacts
Fung, 1992 ^[9]	90 (45/45)	27/3	SCI	Athletics	Y	N	E	C	-	CS	Q	-	-	Energy, Fitness, Fun, Goals, Skills, Social contacts
Furst et al., 1993 ^[20]	22 (18/4)	36.5 [14-56]	SCI	Triathlon	N	N	CT	-	88	CS	Q	-	-	Competition, Fun, Health, Pre-injury sports participation, Social contacts
Kosel, 1993 ^[7]	241 (./.)	-	AMP, SCI, Sensory	-	N	N	E	-	-	CS	I	-	-	Competition, Fun, Health, Social contacts
Shifflett et al., 1994 ^[21]	203 (77/126)	26.6 (10.5)	Arthritis, Congenital Anomalies, Neuro, SCI	-	N	N	-	CL	41	CSc	Q	-	Accessibility, Disability, Energy, Health, Pain, Time	Health
Martin and Adams-Mushett, 1995 ^[22]	57 (30/27)	16.2 (1.3)	AMP, CP, Les Autres, SCI	Swimming	Y	Y	E	-	70	CS	Q	-	-	Competition, Self-identity, Social identity, Win and goal orientation
Hedrick and Broadbent, 1996 ^[23]	229 (151/78)	-	-	-	N	N	A	TP	-	CS	Q	-	-	Previous activity behaviour (college)
Potmesil and Snajdr, 1996 ^[24]	62 (43/19)	33.7	-	-	N	N	E	TP	-	CS	Q	-	-	Competition, Fun, Social contacts, Travel
Yarwasky and Furst, 1996 ^[25]	8 (7/1)	35.1	CP, SCI	Diving	N	N	A	-	-	CSc	Q	-	-	Fun, Self-confidence
Lockwood, 1997 ^[26]	493 (276/217)	-	-	-	N	N	A	TP	-	CS	I,Q	-	Disability, Possibilities, Support (staff), Time, Transport	-

Author	Gender (M/F)	Age ^s	Disability	Sport	Rel	Val	Level	SM	RR (%)	Design	AT	Model	Barriers	Facilitators
Wilhite et al., 1997 ^[21]	704 (333/371)	14.2 [11-21]	AMP, Brain, CP, MS, Musc, Neuro, SCI, Sensory	-	Y	Y	A	P	-	CS	Q	-	Disability, Time	Fun, Relaxation
Kinne et al., 1999 ^[28]	113 (47/66)	47 (1.4)	Brain, MS, Musc, Neuro, SCI	-	Y	N	A	CM	83	CS	Q	TTM	Accessibility, Costs, Disability, Fatigue, Information	Self-efficacy
Maher et al., 1999 ^[29]	19 (8/11)	47.4	Brain, MS, Neuro, SCI	-	N	N	A	-	-	nRCT	I, Q	-	-	-
Pensgaard et al., 1999 ^[30]	30 (23/7)	30.4 (9.4)	AMP, CP, SCI, Sensory	All winter sports	Y	Y	E	TP	74	CS	I, Q	-	Dependency of external factors, Management disability sport	Competition, Social contacts
Rimmer et al., 2000 ^[31]	50 (0/50)	[18-64]	-	-	Y	N	A	C	45	CS	I, Q	-	Costs, Energy, Possibilities, Transport	-
Szalda-Petree et al., 2000 ^[32]	119 (63/53)	43	Arthritis, AMP, Brain, CP, MS, Musc, Neuro, SCI	-	Y	Y	A	-	56	CS	Q	Influences on PA	Secondary conditions	-
Field and Oates, 2001 ^[33]	166 (./.)	10.0*	CF, Neuro	Aerobics, Archery, Athletics, (Ten-pin) Bowling, Cricket, Cycling, Fencing, Football, Karate, Netball, (Disabled) Skiing, Squash, Swimming, Tennis, Wheelchair sports, Weight-lifting	Y	Y	A	-	57	CS	Q	-	Possibilities, Information, Unequal time distribution between brothers/sisters and disabled child	-
Wu and Williams, 2001 ^[7]	143 (132/11)	33.3 [18-55]	SCI	Athletics, Wheelchair basketball, Wheelchair rugby, Wheelchair tennis	Y	N	CT	TP	-	CS	Q	-	-	Competition, Fitness, Fun, Health, Pre-injury sports participation, Social Contacts
Kalyvas and Reid, 2003 ^[34]	15 (11/4)	[9-12]	-	Volleyball	Y	N	A	IS	-	CSc	I, PM, Q	-	-	-

Author	Gender (M/F)	Age ^s	Disability	Sport	Rel	Val	Level	SM	RR (%)	Design	AT	Model	Barriers	Facilitators
Kosma et al., 2004 ^[35]	151 (34/117)	379 (8.8)	CP, MS, SCI	-	Y	N	A	-	50	CS	Q	TTM	-	Behavioural and cognitive processes, Self-efficacy
Latimer et al., 2004 ^[36]	124 (86/38)	434 (16.2)*	SCI	-	Y	Y	A	C	22	CS	Q	TPB	-	Perceived Behavioural Control (paraplegia)
Santiago and Coyle, 2004 ^[37]	170 (0/170)	468 (9.0)	Arthritis, Brain, Neuro, Ortho, Pain, SCI, Sensory	Cycling, Dancing, Gymnastics, Walking, Weight lifting	Y	Y	A	R	30	CS	Q	-	-	-
Tasiemski et al., 2004 ^[15]	678 (570/108)	44.5 (12.1)	SCI	-	Y	Y	MX	TP	56	CS	Q	-	Accessibility, Costs, Dependency of others, Dislike of 'traditional' disabled sports, Health, Information, Possibilities, Time, Transport	Competition, Fun, Health, Self-confidence, Social contacts, Strength, Travel, Weight control
Tsai and Lau, 2004 ^[38]	18 (12/6)	-	AMP, Neuro, SCI,	Wheelchair fencing	N	N	E	-	-	CS	Q	-	Information, Social acceptance, Support	Fitness, Self-actualization, Support
Bae et al., 2005 ^[39]	112 (75/37)	[10–80]	-	Baseball, Basketball, Football, Swimming, Table tennis, Volleyball	N	N	A	TP	-	CS	Q	-	Accessibility, Transport	Accessibility
Scelza et al., 2005 ^[14]	72 (50/22)	44.1 (13.0)	SCI	-	Y	Y	A	-	10	CS	I,Q	-	Boredom, Costs, Disability, Do not know how to exercise, Energy, Fractures, Health, Injury, Interest, Laziness, Motivation, Pain, Possibilities,	

Author	Gender (M/F)	Age ^s	Disability	Sport	Rel	Val	Level	SM	RR (%)	Design	AT	Model	Barriers	Facilitators
Martin, 2006 ^[40]	112 (63/49)	15.3 (1.6)	AMP, CP, Neuro, SCI	Athletics, Swimming	Y	Y	E	C	-	CS	Q	SCT, sport commitment model		Fun, Physical ability, Social Contacts, Sport commitment, Support
Ellis et al., 2007 ^[41]	223 (65/158)	45.4 (10.8)	AMP, Brain, CP, Lung, MS, Musc, Neuro, SCI, Sensory	-	Y	Y	A	-	-	CS	Q	TPB	Accessibility, Costs, Energy, Emotional Fatigue, Injury, Pain, Support, Time, Transport, Weather	Accessibility, Costs, Energy, Emotional functioning, Energy, Health, Strength, Social contacts, Support, Weight control
Kosma et al., 2007 ^[42]	143 (42/101)	46.0 (10.8)	AMP, Brain, CP, Lung, MS, Musc, Neuro, SCI, Sensory	-	Y	Y	A	-	71	CH	Q	TPB, TTM		Attitude, Intention, Perceived Behavioural Control
Perreault and Vallarand, 2007 ^[43]	72 (41/31)	30.1 (5.6)	-	Wheelchair basketball	Y	N	A	-	-	CS	Q	SDT	Motivation	Intrinsic motivation
Shihui et al., 2007 ^[8]	115 (64/51)	22.4	-	-	Y	Y	E	-	82	CS	Q	-	-	Body function and ability, Fun, Health, Skills, Social contacts
Heo et al., 2008 ^[44]	76 (47/29)	42 (14.1)	Dev Dis, Ortho, SCI	-	Y	N	MX	C	33	CS	Q	-	Structural constraints	Self-determination, Skills
Martin, 2008 ^[45]	79 (66/13)	31.4 (11.5)	AMP, CP, Les Autres, Neuro, Ortho, SCI	Wheelchair basketball	Y	Y	CT	C	-	CS	Q	SCT	Negative affect	Positive affect, Self-efficacy, Thought control
van der Ploeg et al., 2008 ^[46]	731 (369/362)	46 (14)	AMP, Arthritis, Brain, Neuro, Ortho, Pain, SCI	-	N	N	A	-	61	nRCT	PM, Q	PAD model	Costs, Energy, Health Possibilities, Transport	Attitude, Fitness, Health, Self-confidence, Self-efficacy, Social influence
Rimmer et al., 2008 ^[46]	83 (25/58)	54.2 (8.2)	Brain	-	Y	Y	A	C	-	CS	Q	-	Costs, Information, Transport	-
Spivock et al., 2008 ^[47]	205 (94/111)	41 (11.4)	Brain, Musc, Neuro, SCI, Sensory	-	N	N	A	P	35	CS	I, DB	EM	-	Presence of active living buoys
Swanson et al., 2008 ^[48]	193 (133/60)	19.8 (4.9)	-	Wheelchair basketball	Y	Y	CT	C	-	CS	Q	-	-	Goals, Self confidence, Social contacts

Author	Gender (M/F)	Age ^s	Disability	Sport	Rel	Val	Level	SM	RR (%)	Design	AT	Model	Barriers	Facilitators
Yoh et al., 2008 ^[48]	122 (57/65)	-	CP, SCI	-	N	N	A	C	61	CS	Q	-	Accessibility, Gender (female)	-
Kars et al., 2009 ^[10]	105 (71/31)	58.7 (12.6)*	AMP	Cycling, Fitness, Swimming, Walking	N	N	A	-	37	CS	Q	-	Absence of needs, Age, Assistive devices, Costs, Disability, Fear, Possibilities, Secondary conditions	Health, Medical advice, Need to participate, Self-confidence, Social contacts
Pittet et al., 2009 ^[50]	709 (354/355)	18.1*	-	-	N	N	A	RNS	90	CSc	Q	-	Disability, Injury, Physically demanding job, Preferring other activities, Time	-
Rimmer et al., 2009 ^[51]	92 (5/87)	58.8	-	-	Y	Y	A	-	-	RCT	PM, Q	-	-	-
Stroud et al., 2009 ^[52]	93 (18/75)	50 (10)	MS	-	Y	Y	A	-	22	CS	Q	-	Energy, Fatigue, Inconvenient training schedules, Places too far away, Possibilities,	Muscle tone, Personal accomplishment, Physical fitness, Strength
Beckerman et al., 2010 ^[53]	106 (40/66)	42.7 (9.6)	MS	Fitness, Gymnastics, Swimming	Y	Y	A	C	86	CS	Q	-	Activity too intense, Energy, Fatigue, Health, Motivation, Social constraints	Fitness, Strength
Molik et al., 2010 ^[54]	174 (./.)	26.1 (6.3)*	-	Boccia, Wheelchair basketball, Wheelchair rugby	Y	N	CT	-	-	CS	Q	-	-	Fun, Therapy
Shapiro and Martin, 2010 ^[55]	36 (27/9)	16 (2.8)	Brain, CP, Heart Condition, Hip Condition, Musc. Neuro,	Football, Wheelchair basketball	Y	Y	CT	TP	-	CS	Q	-	-	Endurance, Sport competence, Strength,
Brittain et al., 2011 ^[56]	248 (0/248)	48.9 (12.9)	Arthritis	-	N	N	A	C	-	CS	Q	-	Disability, Health	-

Author	Gender (M/F)	Age ^s	Disability	Sport	Rel	Val	Level	SM	RR (%)	Design	AT	Model	Barriers	Facilitators
Dlugonski et al., 2011 ^[57]	54 (9/45)	46.1 (9.9)	MS	-	Y	Y	A	C	60	CS	Q	SCT	-	Goal setting, Health, Positive overall, Social expectation for exercise
Knittle et al., 2011 ^[58]	271 (93/178)	60.5 (13.6)	Arthritis	-	Y	Y	A	-	16	CH	Q	-	-	Self-efficacy
Plow et al., 2011 ^[59]	335 (88/267)	53.0 (10.2)	MS	-	Y	N	A	Min	34	CS	Q	TTM	-	Cognitive process of change, Decision balance, Self-efficacy, Stage of change placement
Protic and Valkova, 2011 ^[60]	88 (83/5)	[15-60]	-	Sitting volleyball	N	N	CT	TP	60	CS	Q	-	-	Fitness, Fun, Health, Social contacts
Sæbu and Sorensen, 2011 ^[61]	327 (149/178)	24.2 (3.9)	CP, Musc, Neuro, SCI, Sensory	Boccia, Dancing, Equestrian, Fitness, Gymnastics, Swimming,	Y	Y	A	-	35	CS	Q	ICF, SDT	-	Exerciser schematic, Health, Intrinsic motivation, Possibilities
Suh et al., 2011 ^[62]	218 (21/197)	43.5 (10.0)	MS	-	Y	Y	A	C	71	CH	Q	SCT	-	Goals, Self-efficacy

* Pooled means and standard deviations

^s Mean age or (SD) or [range]

A = Amateur; AMP = Amputation; AT = Assessment Tool; Brain = CVA, Traumatic brain injuries, Cerebral injuries; C = Convenient Sample; CF = Cystic Fibrosis; CH = Cohort study; CI = Clustered Sample; CM = Community Sample; CP = Cerebral Palsy; CS = Cross-Sectional design without control group; CSC = Cross-Sectional design with control group; CT = competitive; DB = retrieving data from existing Database; DevDis = Developmental Disabilities; E = Elite; EM = Ecological Model; I = Interview; IS = Intact sample; Min = Minimum Sample for Data analysis; MS = Multiple Sclerosis; Musc = Muscular Dystrophy, Musculoskeletal disabilities; MX = mixed level (Elite and Amateur); N = No; Neuro = Other neurological disabilities such as polio, spina bifida and neuromuscular conditions; nRCT = non-Randomized Controlled Trial; Ortho = Orthopaedic injuries; P = Purposeful; PA = Physical Activity; PM = Physical Measurements; Q = Questionnaire; R = Random; RCT = Randomized Controlled Trial; Rel = Reliability; RNS = Representative National Sample; RR = Response Rate; SCI = Spinal Cord Injuries; SCT = Social Cognitive Theory; SDT = Self-Determination Theory; Sensory = Visual or hearing impairment; SM = Sampling Method; TP = Total Population; TPB = Theory of Planned Behaviour; TTM = Transfactual Model (including stages of change); Val = Validity; Y = Yes.

Results

Study Characteristics

Study selection

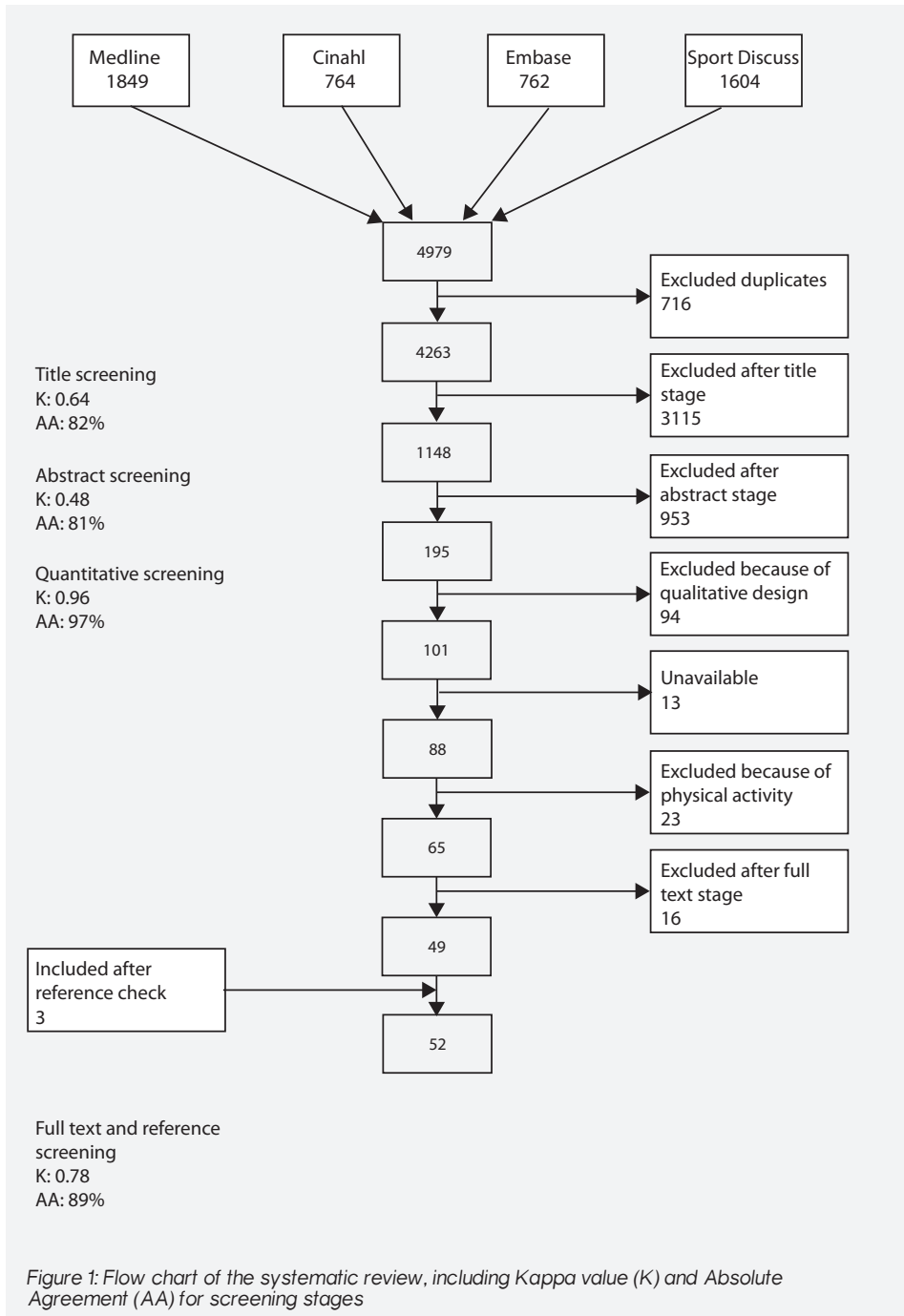
A total of 4979 articles were identified in the search, with 716 duplicates. After the evaluation of titles (kappa: 0.64; absolute agreement: 82%) and abstracts (kappa: 0.48; absolute agreement: 81%), 176 articles were included in the full text phase. After excluding qualitative studies, 82 quantitative studies were included for the full text phase. Thirteen articles were excluded because the full texts of the articles were unavailable, despite attempts to retrieve the studies from other libraries or by contacting the authors. An additional 23 articles were excluded because they did not meet our definition of sports^[2,63]. After assessing the full texts and checking the references of the included articles (kappa: 0.78; absolute agreement: 89%), 52 articles published between 1988 and 2011 were included in this study (Figure 1).

Characteristics of the study population

The weighted mean age of the studied population was 36.1, with ages ranging from 9 to 80 years. The minimum and maximum sample sizes were 8 and 709 participants, respectively. The response rate was reported in 30 studies (58%), with a minimum of 10% and a maximum of 88%. Thirty-eight studies (73%) reported the disability researched. Twenty-seven studies (52%) included people with SCI in their study population, but the majority of these studies included more than one disability group. Twenty-two studies (42%) reported the sport in which the research population participated. The most frequently researched sports were wheelchair basketball and swimming (both n=7). Thirty-five studies (67%) included either amateur-level or non-active participants in their study population. Nine studies (17%) reported age (SD), gender, types of disabilities and types of sports for their study population^[22,25,30,37,40,45,53,55,61]. All information about the included articles can be found in Table 1.

Assessment method

Forty-six studies (88%) were cross-sectional: five studies featured a control group of people without disabilities, three (6%) were cohort studies^[42,58,62], two (4%) were non-randomised control trials^[16,29] and one (2%) was a randomised control trial^[51]. All studies used either questionnaires or interviews (or both) to assess barriers and/or facilitators. Two studies performed physical measurements^[16,51], and one study also included data extracted from a large database^[47]. Thirty-five studies (67%) used either a reliable or valid instrument, with 25 studies (48%) using an instrument that



was both reliable and valid.

Theory

Fifteen studies (29%) used a theory or framework in their study. Social cognitive theory (SCT)^[40,45,57,62] and the transtheoretical model (TTM)^[28,35,42,59] were used in four studies (8%), and the theory of planned behaviour (TPB)^[36,41,42] was used in three studies (6%). Other theories and frameworks that were used only once or twice included self-determination theory (SDT)^[43,61], the ecological model (EM)^[47] and the international classification of disability, functioning and health (ICF)^[61].

Barriers and facilitators

Barriers

Personal factors

Children and adolescents

Children and adolescents with different types of disabilities mentioned each disability itself as a personal barrier^[27,50]. Other personal barriers were lack of time^[27,50,42] and unequal time distribution of the parents between the disabled child and their siblings^[33].

Adults

The disability itself was reported in several studies including adults with different types of disabilities^[10,14,21,28,56]. Health was a personal barrier for adults with physical disabilities^[14,15,21,53,56]. Lack of energy and fatigue was also reported as a personal barrier in studies including adults with different types of disabilities^[14,21,28,52,53].

Environmental factors

Children and adolescents

No studies reported environmental barriers to sports.

Adults

A lack of sports possibilities^[10,15,52] and difficulties with accessibility^[15,21,28] and transport^[15,46] were reported as barriers by adults with physical disabilities. A lack of information about sports was also experienced as a barrier by adults with physical disabilities^[15,28,46]. Costs were reported by adults with amputation, stroke or SCI^[10,14,15,46].

Facilitators

Personal factors

Children and adolescents

Fun was a frequently reported facilitator for children and adolescents^[22,27]. Children

and adolescents with different types of physical disabilities also experienced relaxation as a personal facilitator^[27].

Adults

Adults with physical disabilities experienced fun as a personal facilitator^[7,8,15,19,20,24,25,61].

Health^[7,10,15,20,21,57,61] and fitness^[7,19,52,53] were reported by adults with physical disabilities. Intrinsic motivation^[43,61] and self-efficacy^[28,45,58,59,62] were experienced as personal facilitators by adults with different types of physical disabilities. Goals or goal setting were reported by adults with multiple sclerosis (MS) or SCI^[57,62]. Pre-injury participation was reported by adults with an amputation or SCI^[7,10,20].

Environmental factors

Children and adolescents

The main environmental facilitator of sports among children with physical disabilities was social contacts^[40,48].

Adults

Social contacts was also the main environmental facilitator for adults with different types of disabilities^[7,8,10,15,19,20,24,30].

Discussion

The aim of this systematic review was to provide an overview of studies focusing on the barriers to and facilitators of sports participation for people with physical disabilities. Personal barriers included the disability itself and health, whereas lack of possibilities, difficulties with accessibility and transport were among the environmental barriers that were reported. Personal facilitators were factors such as fun, health and fitness, and the environmental facilitator was social contacts.

Barriers

Personal barriers such as the disability, health and lack of energy are directly related to a person's physical disability. Health was experienced both as a barrier when it restricted people from participation in sports, as well as a facilitator in terms of improving health through sports. Barriers to sports participation for people without physical disabilities differ from those for people with physical disabilities, as people without disabilities usually mention lack of time and motivation as the main barriers to sports participation^[64]. This study demonstrated environmental barriers such as lack of possibilities, lack of accessibility and transport are additional barriers specifically experienced by people with physical disabilities. Both personal and

environmental barriers are therefore very important to keep in mind when advising people with physical disabilities about participation in sports. Providing information about possible barriers prior to participation in sports makes a person more prepared for these barriers that need to be overcome and possibly also makes it easier to actually encounter and overcome these barriers.

The abovementioned barriers are also generally experienced by people with different types of disabilities. However, since only few studies provide barriers of a single disability, differences in barriers per disability group cannot be distinguished. Experienced barriers also appear to vary with age. Therefore, advice on sports participation should be tailor-made, and disability and age should also be considered in addition to other barriers and facilitators. By including all of these factors in the choice of sport, the chances of finding the most appropriate sport will increase, which could also increase a person's chances of not only becoming but also staying active in sports.

Facilitators

Facilitators should of course also be considered when advising people with physical disabilities about participation in sports. Facilitators such as fun, fitness and motivation are very much applicable to people with all types of disabilities. For people who have acquired a disability, pre-injury participation in sports has a large influence on post-injury participation, and the emphasis of the stimulation (whether advice or a programme) should be on the positive experiences gained through pre-injury participation.

Social contacts were reported by people with all types of disabilities and of different ages. Interaction with other athletes should therefore be introduced as soon as possible. Introducing people with physical disabilities to different team sports could therefore be of value, perhaps more so than introducing people with physical disabilities to individual sports. However, for people to also stay active, it is important that they are provided with sufficient information about the possibilities of participating in both team and individual sports. If team sports are not available in their communities, being able to participate independently in sports is also important. These results show that people with disabilities also consider the psychosocial factors of sports to be very important in addition to the health benefits thereof.

Methodological issues

A large majority of studies chose a cross-sectional design in determining barriers

to and facilitators of sports participation. A cross-sectional design allows for the provision of information about barriers to and facilitators of sports participation at a given time. This information about barriers and facilitators should then be used to develop sport stimulation programmes and determine the effectiveness of these programmes. Because only a few included articles used a longitudinal design for their research, little information can be provided about the effectiveness of programmes in stimulating sports participation and reducing barriers. Part of the successful bid for the 2012 Olympic and Paralympic Games in London was the legacy of the Olympic and Paralympic Games. One of the areas of priority was sports participation^[65]. Even though many initiatives such as National School Sports Week and International Paralympic Day have been in place since the bid was accepted in 2003^[65], a longitudinal study could provide insight into the successfulness and effectiveness of these initiatives and, with that, the legacy of the Olympic and Paralympic Games.

Few studies included in this review used a theory or framework to structure their results. Studies that did use theories chose different theories, namely SCT^[40,45,57,62] and the TTM^[28,35,42,59]. However, in these studies, the TTM was generally used to determine the activity level of the participants according to the stages of change and not necessarily to structure results. The use of theories in these studies is therefore mostly irrelevant as the theories were not used to determine barriers to and facilitators of sports participation.

Barriers to and facilitators of sports participation could often not be distinguished for each disability when studies included several types of disabilities, preventing a comparison with studies focusing on a single disability. For example, the study by Ellis et al. (2007) included adults with SCI, cerebral palsy, MS, muscle or joint disabilities, brain-related injuries, post-polio, amputation, spina bifida and sensory or lung disabilities. In the results, the authors provide many barriers to and facilitators of sports participation, but do not distinguish between disabilities. It can therefore not be concluded which barriers and facilitators are specifically experienced by which disability group. Future research should therefore consider reporting barriers and facilitators for groups of disabilities or for ambulant and non-ambulant persons. This division will make it easier to compare results with those of other (previous) studies.

There were also several studies that only reported that their research focused on disability and sports, but did not specify the investigated disability and/or the sport. In the study by Pittet et al. (2009), for instance, the only information provided was that they included adolescents with a chronic health condition and/or a physical disability, which were not specified into different types of diagnosis. These authors also mentioned the extent of sports activity exhibited by these adolescents but did

not mention the sports in which the adolescents participate. Again, by not including these characteristics of the research population, comparison with previous studies is very difficult.

Limitation of the current study

Cohen's kappa was relatively low for the title and abstract stage, namely 0.64 and 0.48, respectively. An explanation for these results could be that bias occurred between the two reviewers at these stages. This bias may have occurred if the reviewers differed in their assessment of the two stages, which would have led to differences in marginal distributions^[66]. A bias index (BI) can be calculated to determine whether the marginal distributions are equal (i.e., $BI = 0$)^[66]. An increase in BI will reduce the chance agreement, which will ultimately lead to a higher kappa^[66]. The BIs for the title and abstract stages in this study were 0.06 and 0.08, respectively. These small BIs will result in large chance agreements and might be the cause for the relatively low kappa. However, the percentage absolute agreement between the two observers was also included and showed relatively large agreement.

In this study, we chose to focus on barriers to and facilitators of sports participation^[2] and excluded articles that focused more on physical activity. Physical activity can be defined in many ways, from household chores to moderate intensive exercise^[67]. However, because sports are only a part of the broader definition of physical activity^[68], it could be interesting to also systematically review studies that focused on barriers to and facilitators of all types of physical activity.

This systematic review included barriers to and facilitators of sports participation in different countries and continents. Previous research hints that there might be cultural differences for barriers to and facilitators of sports participation among disabled athletes^[19,69]. Therefore, certain barriers or facilitators mentioned in the included studies might not be relevant for all countries or continents.

Conclusion

Even though barriers were predominantly environmental and facilitators were personal, the experienced barriers and facilitators depended on age and type of disability. When advising people about sports participation, not just the age and disability type should be considered, but also environmental and societal barriers. Finding the most appropriate sport could also increase the chances of people with physical disabilities to not only become active but also staying active.

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Appendix 1

	Medline	Embase	Cinahl	SportDiscus
#1	MeSH: Disabled Persons (Non Exp) OR Amputees	MeSH: Disabled person/exp	MeSH: Disabled(Non Exp) OR Amputees OR Athletes, Disabled	MeSH: Disabled(Non Exp) OR Amputees OR Athletes, Disabled
#2	Free text: physically handic* OR physical handic* OR ((motor OR locomotor) AND (handic* OR disab*)) OR physically disabled OR physical disab* OR physically impair* OR physical impairment* OR physically challenged OR amput*	Free text: disabled person OR (physically AND handic* OR physical AND handic* OR ((motor OR locomotor) AND (handic* OR disab*)) OR physically disabled OR physical disab*) OR physically impair* OR physically impairment* OR physically AND disab* OR physically AND impair* OR physical AND impairment* OR physically AND challenged OR amput*	Free text: physically handic* OR physical handic* OR ((motor OR locomotor) AND (handic* OR disab*)) OR physically disabled OR physical disab* OR physically impair* OR physical impairment* OR physically challenged OR amput*	Free text: physically handic* OR physical handic* OR ((motor OR locomotor) AND (handic* OR disab*)) OR physically disabled OR physical disab* OR physically impair* OR physical impairment* OR physically challenged OR amput*
#3	#1 OR #2	#1 OR #2	#1 OR #2	#1 OR #2
#4	MeSH: Exercise OR Physical Fitness OR Sports OR Motor Activity (Non Exp) OR Athletes	MeSH: 'exercise'/exp OR 'sport'/exp OR 'disabled sport'/exp OR 'fitness'/exp OR 'physical activity'/exp OR 'motor activity'/exp OR 'athlete'/exp	MeSH: Exercise OR Physical fitness OR Sports OR Sports, Disabled OR Physical activity OR Physical Education, Adapted OR Motor Activity	MeSH: Exercise OR Physical fitness OR Sports OR Sports, Disabled OR Physical activity OR Physical Education, Adapted OR Motor Activity
#5	Free text: exercise OR "physical fitness" OR sport OR sports OR motor activ* OR physical activ* OR athlete*	Free text: 'exercise' OR 'sport' OR 'disabled sport' OR 'fitness' OR 'physical activity' OR 'motor activity' OR 'athlete'	Free text: exercise OR "physical fitness" OR sport OR sports OR motor active* OR physical active* OR athlete*	Free text: exercise OR "physical fitness" OR sport OR sports OR motor active* OR physical active* OR athlete*
#6	#4 OR #5	#4 OR #5	#4 OR #5	#4 OR #5
#7	MeSH: Motivation OR Health Promotion OR Attitude	MeSH: 'motivation'/exp OR 'health promotion'/exp OR 'attitude'/de	MeSH: Motivation OR Health Promotion OR Attitude OR Attitude to Disability OR Personal Boundaries	MeSH: Motivation OR Health Promotion OR Attitude OR Attitude to Disability OR Personal Boundaries
#8	Free text: motivat* OR "health promotion" OR attitude OR barrier* OR hurdle* OR difficult* OR restrict* OR obstacle* OR restrain* OR impediment* OR disadvantage* OR limit* OR constrain* OR threshold OR facilitat* OR promot* OR benefit* OR advan* OR activate* OR activating OR improv* OR positive* OR arouse* OR encourage* OR challeng* OR participat*	Free text: 'motivati*' OR 'health promotion'/exp OR 'health promotion' OR 'attitude'/exp OR 'attitude' OR 'barrier*' OR 'hurdle*' OR 'difficult*' OR 'restrict*' OR 'obstacle*' OR 'impediment*' OR 'disadvantage*' OR 'limit*' OR 'constrain*' OR 'threshold' OR 'facilitat*' OR 'promot*' OR 'benefit*' OR 'advan*' OR 'activate*' OR 'activating' OR 'improv*' OR 'positive*' OR 'arous*' OR 'encourage*' OR 'challeng*' OR 'participat*'	Free text: motivat* OR "health promotion" OR attitude OR barrier* OR hurdle* OR difficult* OR restrict* OR obstacle* OR restrain* OR impediment* OR disadvantage* OR limit* OR constrain* OR threshold OR facilitat* OR promot* OR benefit* OR advan* OR activate* OR activating OR improv* OR positive* OR arouse* OR encourage* OR challeng* OR participat*	Free text: motivat* OR "health promotion" OR attitude OR barrier* OR hurdle* OR difficult* OR restrict* OR obstacle* OR restrain* OR impediment* OR disadvantage* OR limit* OR constrain* OR threshold OR facilitat* OR promot* OR benefit* OR advan* OR activate* OR activating OR improv* OR positive* OR arouse* OR encourage* OR challeng* OR participat*

#9	#7 OR #8	#7 OR #8	#7 OR #8	#7 OR #8
#10	#3 AND #6	#3 AND #6	#3 AND #6	#3 AND #6
#11	#3 AND #6 AND #9 Limit Humans	#3 AND #6 AND #9 Limit Humans	#3 AND #6 AND #9 Limit Humans	#3 AND #6 AND #9
#12	("Hearing Impaired Persons"[Mesh] OR "Deafness"[Mesh] OR "Mentally Disabled Persons"[Mesh] OR "Mentally Ill Persons"[Mesh] OR "Visually Impaired Persons"[Mesh] OR "Blindness"[Mesh] OR hearing impaired OR hearing impaired OR deaf OR mentally disabled OR mentally ill OR mentally retarded OR visually impaired OR visual impairment OR blindness)	'visual impairment'/exp OR 'visual impairment' OR 'hearing impairment'/exp OR 'hearing impairment' OR 'mental patient'/exp OR 'mental patient' OR 'mental disease'/exp OR 'mental disease'	(MH "Deafness+") OR (MH "Hearing Loss, Partial+") OR (MH "Blindness+") OR (MH "Mentally Disabled Persons") OR (MH "Mental Disorders+") OR (MH "Mental Retardation+")) or (hearing impaired OR hearing impaired OR deafness OR deaf OR mentally disabled OR mentally ill OR mentally retarded OR visually impaired OR visual impairment OR blindness	(MH "Deafness+") OR (MH "Hearing Loss, Partial+") OR (MH "Blindness+") OR (MH "Mentally Disabled Persons") OR (MH "Mental Disorders+") OR (MH "Mental Retardation+")) or (hearing impaired OR hearing impaired OR deafness OR deaf OR mentally disabled OR mentally ill OR mentally retarded OR visually impaired OR visual impairment OR blindness
#13	#3 AND #6 AND #9 NOT #12	#3 AND #6 AND #9 NOT #12	#3 AND #6 AND #9 NOT #12	#3 AND #6 AND #9 NOT #12
#14	#13 NOT (Editorial OR Letter OR Addresses OR Bibliography OR Biography OR Comment OR Interview OR News OR Newspaper Article OR Review)	#13 NOT review OR editorial OR letter	#13 NOT Commentary OR Editorial OR Interview OR Letter OR Review	#3 AND #6 AND #9 NOT #12 NOT Audiocassette, Book Review, CD-ROM, Computer disk or diskette, Jurisprudence, Microforms, Monograph or government document, Videocassette
#15	Limit All adults	Limit All Adults	Limit All Adults	

Appendix 2

Assessment of full text articles included in the systematic review

The full text of the included articles will be assessed for quality. The articles will be read by Rienk Dekker (RD) and Eva Jaarsma (EJ). The assesment procedure is based on the criteria below. All criteria will be scored with Yes or No; for criteria 5 the most applicable answer will be ticked.

Title article: Year of publication:

First author: Assessor: RD / EJ

First 3 answers have to be YES in order to continue the assessment.

- | | Yes | No |
|--|--------------------------|--------------------------|
| 1) Does the research investigate people with physical disabilities*? | <input type="checkbox"/> | <input type="checkbox"/> |
| 2) Does the research focus on sports** participation of people with physical disabilities? | <input type="checkbox"/> | <input type="checkbox"/> |
| 3) Are barriers and/or facilitators of sports** reported in the research? | <input type="checkbox"/> | <input type="checkbox"/> |
| 4) Is the number of participants ≥ 10 ? | <input type="checkbox"/> | <input type="checkbox"/> |
| 5) Which study design*** is used? (Please choose only one) | | |
| - Randomized control trial | <input type="checkbox"/> | |
| - Non randomized control trial | <input type="checkbox"/> | |
| - Cohort study | <input type="checkbox"/> | |
| - Cross-sectional with control group | <input type="checkbox"/> | |
| - Cross-sectional without control group | <input type="checkbox"/> | |
| - Other, please specify..... | <input type="checkbox"/> | |
| 6) What assessment method is used? | Yes | No |
| - Physical measurements (e.g. performance tests) | <input type="checkbox"/> | <input type="checkbox"/> |
| - Individual interview | <input type="checkbox"/> | <input type="checkbox"/> |
| - Focus groups | <input type="checkbox"/> | <input type="checkbox"/> |
| - Questionnaire/survey | <input type="checkbox"/> | <input type="checkbox"/> |
| - Other, please specify..... | <input type="checkbox"/> | <input type="checkbox"/> |
| 7) - Is the participation rate reported (either in percentages or absolute numbers)? | Yes | No |
| - Are drop outs reported? | <input type="checkbox"/> | <input type="checkbox"/> |
| - If so, are characteristics of drop outs mentioned (either in percentages or absolute numbers)? | <input type="checkbox"/> | <input type="checkbox"/> |
| - Do the participants represent the total target population? | <input type="checkbox"/> | <input type="checkbox"/> |
| 8) Are clinimetric characteristics of the instrument reported? | Yes | No |
| - Is the reliability of the instrument used for the assessment of the primary outcome reported? (Reliability: the degree to which the results obtained can be reproduced) | <input type="checkbox"/> | <input type="checkbox"/> |
| - Is the validity of the instrument used for the assessment of the primary outcome reported? (Validity: the extent to which an instrument measures what it is supposed to measure) | <input type="checkbox"/> | <input type="checkbox"/> |

		Yes	No
9)	- Is the number or percentage of males and females reported (or can be calculated)?	<input type="checkbox"/>	<input type="checkbox"/>
	- Is the number or percentage of different types of physical disabilities reported?	<input type="checkbox"/>	<input type="checkbox"/>
	- Is the number or percentage of different types of sports reported?	<input type="checkbox"/>	<input type="checkbox"/>
	- Is age reported and in an adequate way? (Adequate: mean age and standard deviation or median and interquartile range)	<input type="checkbox"/>	<input type="checkbox"/>
	- Is sampling method reported? (Convenient, random, total population, etc)	<input type="checkbox"/>	<input type="checkbox"/>
10)	- Is the study based on a theoretical framework?	<input type="checkbox"/>	<input type="checkbox"/>
	- If so, what framework is used?	<input type="checkbox"/>	<input type="checkbox"/>
		
	- Are the findings reported according to the theoretical framework?	<input type="checkbox"/>	<input type="checkbox"/>

*** People with physical disabilities:**

A physical disability is a permanent impairment in the human musculoskeletal system, as it appears in the field of Dutch Rehabilitation Medicine. Examples are: amputation, spinal cord injuries, cerebral palsy and stroke. Excluded will be: mental disabilities, visual and auditory impairments and organ patients (heart, lung, kidney, etc)

**** Sports:**

An activity involving physical exertion with or without a 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.

***** Different study designs:**

- Randomized control trial: an experimental comparison study with a treatment and control group, to which participants are randomly assigned.
- Non-randomized control trial: an experimental comparison study with a treatment and control group, without randomly assigning participants to groups.
- Cohort study: Data are obtained from groups who have been exposed, or not exposed, to the new technology or factor of interest (eg from databases). No allocation of exposure by the researcher.
- Cross-sectional (with or without control group): A study that examines the relationship between diseases (or other health-related characteristics) and other variables of interest as they exist in a defined population at one particular time (ie exposure and outcomes are both measured at the same time). Relationship can be examined with or without control group.

Barriers & Facilitators of sports in Dutch Paralympic Athletes: An explorative study

*Eva A. Jaarsma, MSc; Jan H.B. Geertzen, MD, PhD; Rinske de Jong, MSc;
Pieter U. Dijkstra, PT, PhD; Rienk Dekker, MD, PhD.*

Abstract

Purpose: The purpose of this study was to gain insight in barriers and facilitators of sports in Paralympic athletes.

Methods: An online questionnaire was distributed through the Netherlands Olympic Committee and National Sports Confederation to determine personal and environmental barriers and facilitators of sports participation. The ICF model and Theory of Planned Behaviour were used to respectively categorise the results in environmental and personal factors, and attitude, subjective norm and perceived behavioural control.

Results: Seventy-six Dutch Paralympic athletes completed the questionnaire (51% response rate). Barriers and facilitators experienced by ambulant and wheelchair athletes were compared. Most frequently mentioned personal barrier was dependency of others (22%), while most frequently mentioned environmental barrier was lack of sports facilities (30%). Wheelchair athletes mentioned more barriers (Median=3, interquartile range:0.5–6), than ambulant athletes (Median=1.0,interquartile range:0.0–3.0, $p=0.023$). One-third of the athletes did not experience any barriers. Most frequently mentioned personal facilitators to initiate sports participation were fun (78%), health (61%) and competition (53%). Most frequently mentioned environmental facilitator was social support (40%).

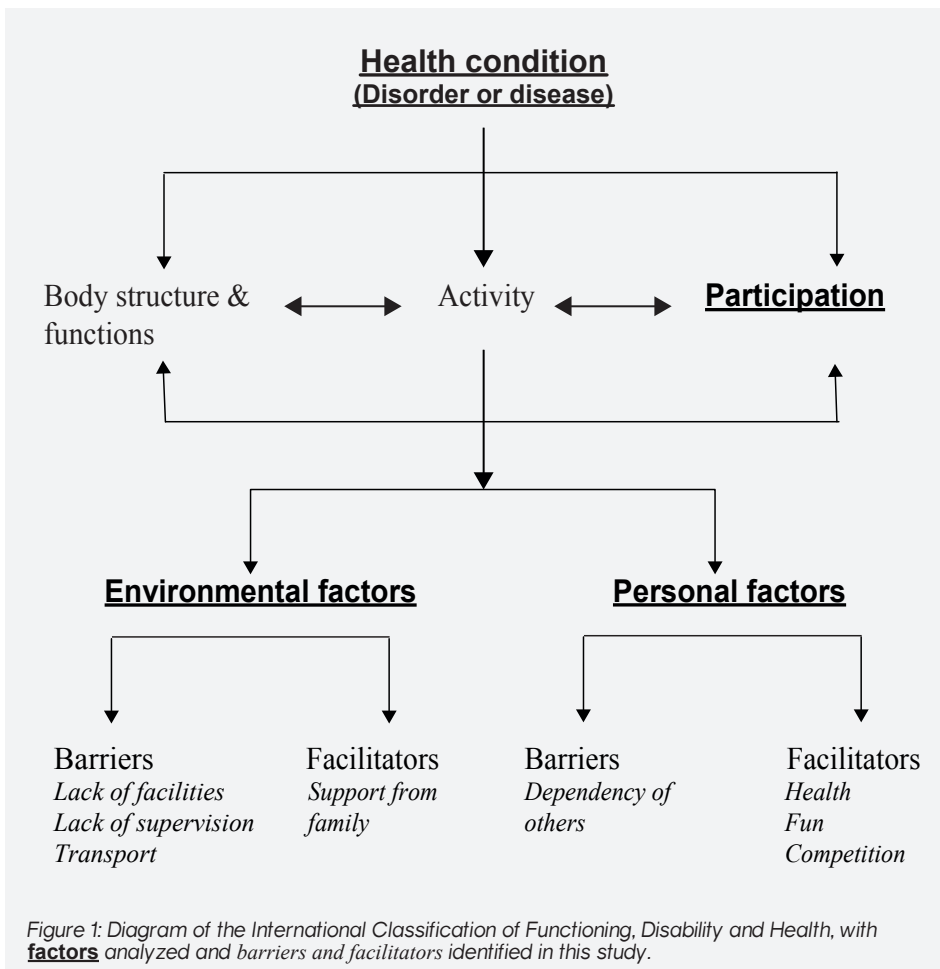
Conclusion: This study indicated that barriers of sport were mostly environmental, while facilitators were usually personal factors. Attitude and subjective norm were considered the most important components for intention to participation in sports. The facilitators outweighed the barriers and kept the athletes being active in sports.

Introduction

The importance of physical activity and sports for health benefits has been frequently documented and has for example shown reduction of chances of cardiovascular disease, obesity and type 2 diabetes mellitus^[1-4]. Unfortunately, 36% of able-bodied adults do not participate in sports. This percentage is even higher for people with a disability; 56%^[1]. During rehabilitation, sports are often part of the treatment, in order to familiarise people with physical disabilities with sports and to improve physical fitness and quality of life^[5,6]. However, only few people with physical disabilities stay physically active after they have completed their rehabilitation^[6]. Studies regarding barriers and facilitators of sports of able-bodied people showed that lack of time, lack of motivation and difficult access to facilities are among the most frequently mentioned barriers^[7]. People with physical disabilities experienced additional barriers to sports such as energy level, transportation, information access, qualification of supervision, and adjustment of facilities^[7-9]. Facilitators of sports for able-bodied people and people with physical disabilities seem to be very similar: both groups frequently mention enjoyment, motivation, health benefits and social aspects^[7,9-12]. In young adults with a disability personal factors such as motivation and health also appear to be more important facilitators in sports compared to environmental factors^[13]. Norwegian Paralympic and Olympic athletes also showed similar motivational factors and coping strategies. However, sport participation of Paralympic athletes was not only dependent on effort but also on external factors such as wheelchairs^[14]. Most previous studies focused on patients with spinal cord injuries or amputation^[9,11,15,16]. Furthermore, previous studies were not based on a framework or theory, which lead to a lack of coherence in their results. The frameworks used in this study to coherently identify barriers and facilitators in athletes were the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization^[17] and the Theory of Planned Behaviour (TPB) by Ajzen^[18].

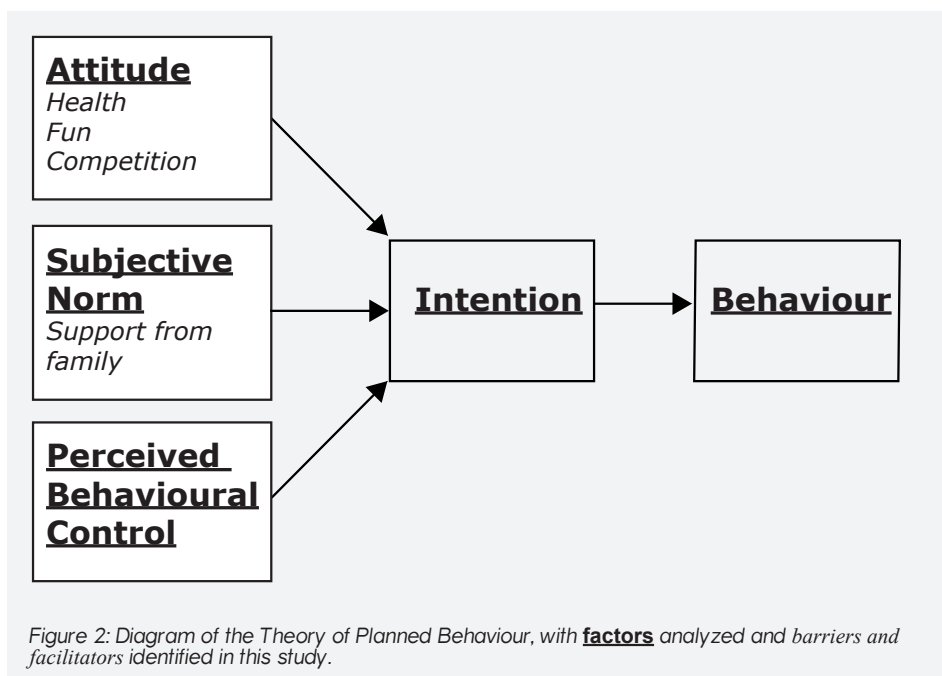
The ICF model (Figure 1) is a classification of health and health-related domains; body, personal and environmental perspectives. Focusing on the health domain from a personal perspective, the health condition can be divided into three parts: body structure and functions, activity, and participation^[17]. For this study we focused on the participation part of the model. Within participation, the ICF model distinguishes personal and environmental factors.

The Theory of Planned Behaviour (Figure 2) is an extension of the theory of reasoned action by Ajzen and Fishbein. The theory combines several components that determine intention or motivation, which in turn will lead to behaviour. These components are attitude, subjective norm and perceived behavioural control.



‘Attitude’ refers to positive or negative outcome expectancies of behaviour, ‘subjective norm’ to the social pressure regarding the behaviour and ‘perceived behavioural control’ to believe of control a person has over their own behaviour in certain situations^[18]. Both frameworks are often used in research in sports participation and can help in determining important factors related to sports participation in people with physical disabilities^[13,19-21].

Insight in barriers and facilitators can help developing strategies to reduce barriers and enhance facilitators in order to increase the number of people with physical disabilities to participate in sport, also at an elite level. A specific group of physical disabilities are Paralympic athletes, who will probably have experienced barriers at the start of participation in sports. Despite these barriers they will also have experienced facilitators, which stimulated them to start and maintain



participation in sports. Therefore we chose Paralympic athletes as our research population. We have included athletes with all physical disabilities classified according to the Paralympic Movement^[22]. This broader research population allows for more insight in barriers and facilitators of sport than studies focusing on only one group of disabilities. The aim of this study was to gain insight in the barriers and facilitators of sports participation for Dutch Paralympic athletes with a physical disability.

Methods

Subjects

Subjects for this study were all Dutch Paralympic athletes who had an official elite athlete status (A or B) provided by the Netherlands Olympic Committee and National Sports Confederation (NOC*NSF) on 1st November 2010.

Questionnaire

The questionnaire (44 questions) was partially based on a previously used

questionnaire^[23]. The questionnaire used in this study included questions about sports participation, disability, and barriers and facilitators. Questions concerning sports participation (barriers and facilitators) were divided in personal and environmental factors according to the ICF model. Questions about disability and sports were grouped according to attitude, subjective norm and perceived behavioural control, components of TPB. General questions about other characteristics were also included. The headlines and questions about barriers and facilitators of the questionnaire can be found in the appendix.

All 149 Dutch Paralympic athletes were contacted by email by NOC*NSF to fill in the questionnaire. A cover letter explained the purpose and methodology of the study and it ensured that all data would be processed anonymously. Participation was voluntary. Athletes were invited to click the link to proceed to the online questionnaire. Reminders were sent to the athletes two, four, and six weeks after the initial email. The study was approved by the Medical Ethical Committee of the Universal Medical Centre Groningen, the Netherlands (METc 2010.264).

Data collection and analysis

Information about age, gender, disability and sports of all 149 athletes was provided by NOC*NSF. Athletes who completed the questionnaire were divided into two groups: athletes using a wheelchair for activities of daily living and ambulant athletes.

A Mann-Whitney U test was used to analyse differences in the number of barriers and facilitators mentioned by wheelchair and ambulant athletes. To analyse differences between wheelchair and ambulant athletes a Chi-square test was used, and to analyze differences between initiation and maintenance of sports a McNemar test was used. The alpha level for statistical significance was set at 0.05 for all tests in this study.

Results

In total 76 Paralympic athletes completed the questionnaire (response rate: 51%). Mean (SD) age of the participating athletes was 30.5 (9.7) years and 60% were female (Table 1).

Table 1: Characteristics of the participated athletes and the total Dutch Paralympic population.

	Participants (n=76)		Total group (n=149)	
	m	SD	m	SD
Age	30.5	9.7	30.9	10
	%*	n	%*	n
Gender				
Male	40	30	46	68
Female	60	46	54	81
Disability				
Amputation	21	16	17	25
Spinal cord injuries	16	12	15	23
Cerebral palsy	16	12	17	26
Other neurological disabilities	9	7	11	17
Les Autres	34	26	34	53
Visual Impairment	4	3	3	5
Sport				
Alpine skiing	1	1	1	1
Athletics	15	11	11	17
Bench pressing	3	2	1	2
Archery	1	1	1	1
Equestrian	4	1	7	10
Judo	0	0	1	1
Rowing	1	1	3	5
Wheelchair basketball	11	8	11	17
Wheelchair tennis	9	7	10	15
Table tennis	7	5	6	9
Football 7 a side	7	5	12	18
Cycling	8	6	10	15
Sailing	7	5	4	6
Volleyball	12	9	10	15
Swimming	16	12	11	17
Education#				
Primary school	7	5		
Lower General Secondary Education (practical)	5	4		
Lower General Secondary Education (theoretical)	13	13		
High school degree	9	7		
Vocational education	25	19		
Applied sciences	28	21		
University degree	13	10		
Living arrangements#				
Independent, alone	24	18		
Independent, with spouse and/or children	45	34		
Independent, with contact persons	1	1		
Living at home	28	21		
Sheltered housing	3	2		
Monthly net household income#				
< € 913	15	11		
€ 913 < € 1304	20	15		
€ 1304 < € 1700	13	10		
€ 1700 < € 3000	30	23		
€ 3000 < € 3500	3	2		
> € 3500	16	12		
Rather not say	4	3		

* Percentages are column percentages, sum ≠ 100% because of rounding

Data unavailable from NOC*NSF

Barriers

Frequencies of variables of barriers to sports of all participants, the wheelchair and the ambulant athletes, are shown in Table 2. The most frequently experienced personal barrier to sports was 'being dependent of others to be able to exercise' (22%). Most frequently experienced environmental barrier was 'too little sports facilities in the neighbourhood' (30%). Overall wheelchair athletes experienced more barriers (Median = 3, interquartile range: 0.5 – 6), compared to ambulant athletes (Median = 1.0, interquartile range: 0.0 – 3.0; U = 936.5, z = 2.3, p = 0.023).

Significantly more wheelchair athletes mentioned 'too little sports facilities in the neighbourhood' (51%), and 'facilities not (sufficiently) adjusted' (30%) than ambulant athletes did respectively 10% and 3% (p < 0.01 - Fisher exact).

Personal factor 'being dependent of others to be able to exercise' and

Table 2: Barriers to sports experienced by all participants (Participants) wheelchair bound (Wheelchair) and ambulant (Ambulant) Paralympic athletes.

	Participants (n=76)		Wheelchair (n=37)		Ambulant (n=39)	
	n	%	n	%	n	%
Personal factors:						
Being dependent of others to be able to exercise	17	22	12	32	5	13
Not comfortable in the presence of other athletes	10	13	4	11	6	15
Fear of injuries	7	9	5	14	2	5
Too busy with other activities	5	7	2	5	3	8
Not being able to exercise because of physical disability	4	5	2	5	2	5
Other	9	12	3	8	6	15
Environmental factors:						
Too little sport facilities in the neighbourhood	23	30	19	51*	4	10*
No/not sufficiently qualified supervision	19	25	12	32	7	18
Transport	17	22	12	32	5	13
Materials are too expensive	14	18	9	24	5	13
Disabled athletes are not (fully) accepted	13	17	6	16	7	18
Facilities not (sufficiently) adjusted	12	16	11	30*	1	3*
Sports possibilities are unknown	12	16	8	22	4	10
Not enough fellow disabled athletes	10	13	5	14	5	13
Not enough materials available	7	9	4	11	3	8
Practice/Training is not (sufficiently) adapted	7	9	5	14	2	5
Not enough support from environment	6	8	3	8	3	8
Materials not (sufficiently) adjusted	5	7	4	11	1	3
No possibilities to exercise with peers	4	5	2	5	2	5
Sports activities are too expensive	2	3	1	3	1	3
Sports are too competitive	1	1	0	0	1	3
Other	8	11	3	8	5	13
No barriers	28	37	12	32	16	41

* Significant differences between wheelchair and ambulant athletes (p < 0.01).

environmental factor 'transport' were both more frequently experienced by wheelchair bound athletes (32%) compared to ambulant athletes (13%; $p = 0.055$ for both factors). Thirty-seven percent of the athletes did not experience any barriers to sports (57% ambulant, 43 % wheelchair).

Facilitators

Main personal factors for initiating / maintaining sports of Dutch Paralympic athletes were 'fun and relaxation' (78% / 82%), 'health and physical fitness' (61% / 76%) and 'competition and winning' (53% / 72%), as is shown in Table 3.

The personal factor 'health and physical fitness' was more frequently mentioned for maintaining sports (76%) than for initiating sports (61%) ($\chi^2 = 6.050$, $df\ 1$, $p = 0.012$), as was also the case for 'competition and winning' 72% and 53% respectively ($\chi^2 = 6.759$, $df\ 1$, $p = 0.009$). Wheelchair athletes mentioned 'health and fitness' for maintaining sports most frequently (89%) ($p = 0.015$, Fisher's exact test), compared

Table 3. Facilitators of initiating and maintaining sports for all Paralympic athletes (total), the wheelchair bound athletes (wheelchair) and the ambulant athletes (ambulant).

	Wheelchair initiate (n=37)		Ambulant initiate (n=39)		Wheelchair maintain (n=37)		Ambulant maintain (n=39)		Total initiate (n=76)		Total maintain (n=76)	
	n	%	n	%	n	%	n	%	n	%	n	%
Personal factors:												
Fun/relaxation	30	81	29	74	29	78	33	85	59	78	62	82
Health/physical fitness	24	65	22	56	33	89 ^S	25	64 ^S	46	61 [#]	58	76 [#]
Competition/winning	21	57	19	49	30	81	25	64	40	53 [#]	55	72 [#]
Social contacts	18	49	19	49	26	70	20	51	37	49	46	61
Loose energy	18	49	18	46	17	46	17	44	36	47	34	45
Strength	16	43	16	41	20	54	18	46	32	42	38	50
Acceptance disability*	6	16	9	23					15	20		
Self confidence	5	14	10	26	9	24	9	23	15	20	18	24
Learning new skills*	3	8	7	18					10	13		
Weight control	3	8	5	13	10	27	6	15	8	11	16	21
More independence	3	8	3	8	5	14	1	3	6	8	6	8
Dealing with disability and aid*	5	14	1	3					6	8		
Other	3	8	5	13	3	8	5	13	8	11	8	11
Environmental factors:												
Support from family, partner or children	14	38	16	41	15	41	16	41	30	40	31	41
Support from friends and colleagues	3	8	9	23	10	27	13	33	12	16	23	30
Medical indication	8	22	3	8	3	8	2	5	11	15	5	7
Other	30	81	29	74	1	3	2	5	5	7	3	4

* Only factors for initiating exercise.

Significant differences between initiate and maintain exercising ($p < 0.05$)

S Significant differences between wheelchair and ambulant athletes ($p < 0.05$)

to ambulant athletes (64%).

Main environmental factor for initiating / maintaining sports was 'support from family, partner or children' (40% / 41%).

Discussion

The aim of this study was to gain insight in the barriers and facilitators of sports in Dutch Paralympic athletes with a physical disability. Most experienced personal barrier was dependency of others, while most mentioned environmental barrier was too little sports facilities in the neighbourhood. The barrier too little sports facilities was significantly more mentioned by wheelchair athletes than by ambulant athletes. Over one-third of the athletes did not experience any barriers.

Main personal facilitators were fun, health and competition. Health and competition were significantly more mentioned for maintaining sports than for initiating sports. Wheelchair athletes mentioned health for maintaining sports significantly more than ambulant athletes. Most mentioned environmental facilitator was support from family.

ICF model

Personal factors

Barriers

The most frequently experienced personal barrier was dependency of others, which was more frequently mentioned by wheelchair athletes than by ambulant athletes. This finding is similar to that of previous research where athletes with spinal cord injuries expressed difficulties with personal assistance in order to access equipment or do the exercises^[9]. As wheelchair athletes often need help from professionals or family to participate in sports, this could feel as a burden on those people.

Facilitators

First frequently experienced personal facilitator by Paralympic athletes was health. Others also found that health is among the most important facilitators in participation in sports^[7,11-13]. In this study health was not only important as an initiating factor of sports but also for maintaining sports, especially for wheelchair athletes. In general a good health helps in preventing secondary conditions and in remaining independent^[9,24].

Fun was also a factor that was experienced as personal facilitator by most of

the Paralympic athletes in this study, which is in accordance with others studies^[7,11,13].

Competition or winning were also factors that were experienced as personal facilitators in this study, which is to be expected of (Paralympic) athletes in general but also of disabled athletes^[11,12,14]. This study showed that the athletes found this factor more important for maintaining than for initiating participation in sports. This finding may indicate that once athletes start winning matches, the focus of the sport will be more on competition and winning and becomes a more important reason to continue participating in sports.

Environmental factors

Barriers

Environmental barriers most frequently experienced by Dutch Paralympic athletes were lack of facilities in the neighbourhood, which agrees with previous research^[13]. Lack of facilities in the neighbourhood was especially a problem for wheelchair athletes, which may imply that wheelchair athletes have to look for facilities specifically for disabled sports and have difficulty integrating with able-bodied athletes. Sport facilities that also provide wheelchair sports are probably less available than facilities for able-bodied sports, especially in rural areas.

Lack of qualified supervision was another environmental barrier experienced by Paralympic athletes. This result is in contrast with previous research, where supervision was mentioned as a facilitator for sports participation and not as a barrier^[25,26]. This contradiction might have occurred because in this study we specifically asked for barriers at the start of participation in sport. Perhaps supervision changes from being a barrier to becoming a facilitator after athletes and supervisors are working more intensively, and performance becomes more important.

Transport was also frequently mentioned as environmental barrier to sports participation. Difficulties with transportation for athletes in this study concern lack of transportation, large expenses for taxi services to and from the sport facilities and difficulties with public transport because of the use of a wheelchair. These difficulties have been found often in research^[7,8,27].

An interesting result was that over one-third of the athletes did not experience any barriers of sports participation. This could indicate that though barriers of sports participation are present, these athletes do not perceive them as such. These athletes may focus only on the positive factors of sports. The athletes who did not perceive any barriers were more often men (57%) but no other characteristic were found for this group.

Facilitators

Most frequently experienced environmental facilitator was support from family. This result was also found in disabled swimmers^[25]. Support from family or partner can help in providing emotional, functional or economical support^[25]. It could be that athletes experience support from family as a positive influence, because their family can help to motivate them to continue participation in sports at difficult times. Family could also help in perceiving the right balance between sport and relaxation. All above mentioned results according to the ICF model can be found in Figure 1.

Theory of Planned Behaviour

The most frequently experienced facilitators are all personal factors, which are associated with their attitude towards sports. Athletes in this study chose to participate because they consider it to be good for their health, they believe it was fun and they have the ambition to win competitions. These factors can all be considered positive outcomes of sports. These positive factors lead to the intention of participating in sports and have also shown to be reasons to remain participating in sports (Figure 2). Subjective norm was also an important facilitator in sports in Dutch Paralympic athletes. The Paralympic athletes considered support from family, spouse and children to be the most important environmental facilitator for participating in sports. This could indicate that the athletes do not see the social pressure of family as a negative for their sports, but consider support from people around them to be a help in performing in their sport. Support from family is equally important at starting and at continuing their sport.

Factors for perceived behavioural control were not experienced by the Paralympic athletes. This could indicate that the athletes do not consider the control over their sports was of any influence in their sports participation. So despite the presence of barriers to sports, these experienced barriers were outweighed by the experienced facilitators and do not change the athletes' intention to participation in sports.

The study showed a response rate of over 50% and similar characteristics of the participants of age, gender, disability and sport for participants and the total Dutch Paralympic athletes' population. Based on these characteristics, generalisation to all Dutch elite level Paralympic athletes may be possible. Other characteristics, possibly limiting generalisation, of the total Dutch Paralympic athletes' population were not known.

This study was an explorative study, where we used a questionnaire that was

partly based on a previously used questionnaire. The psychometric properties of the used questionnaire are therefore unknown. Future research could focus on reliability and (construct) validity of the questionnaire for barriers and facilitators of sports for people with physical disabilities. Also, this study concentrated solely on Dutch Paralympic athletes. The Netherlands are a relatively small country with considerable achievements at previous Paralympic Games, with 22 medals in Beijing (2008) and 39 medals in London (2012)^[26]. The Netherlands also have an organization of disabled sport being integrated with able-bodied sports, which is not the case for all Paralympic countries. Consequently the Netherlands cannot be considered as a representative for all Paralympic countries based on previous Paralympic results and organisation. Further research at barriers and facilitators in different Paralympic countries would therefore be recommended, where previous successes at Paralympic Games and organisation of disabled sports are taken into consideration. Finally in order to compare these results with people with disabilities who do not actively participate in sports, future research should also focus on barriers and facilitators of sports and physical activity in people with physical disabilities in general.

Conclusion

These results of this study indicate that barriers of sports are mostly environmental, while facilitators are usually personal factors. Also, attitude and subjective norm are considered the most important components for intention to participation in sports. Therefore the facilitators outweigh the barriers and allow athletes to maintain their intention in sports participation. These findings provide insight in both barriers and facilitators of sports, because Paralympic athletes from all disability groups were included. This knowledge can help in providing advices for policy makers in sports and rehabilitation to reduce barriers and increase facilitators in order to improve sports participation.

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Appendix 1

Barriers and facilitators of sports in Dutch Paralympic athletes.

Research shows that only few people with a disability regularly participate in sports. We are from the Department of Rehabilitation Medicine, of the University Medical Centre Groningen, and are interested in why people with a disability participate in sports. This research is in collaboration with the Netherlands National Paralympic Committee. Results from the questionnaire can help us give insight in what you consider to be the most important barriers and facilitators. We would also like ask you a few questions about nutrition, mental training and how you combine work or education with elite sport.

There are no correct or incorrect answers to the questions. What counts is your opinion. Every question is asked with a specific reason, even if the question may not seem relevant to you personally.

The answers to the questions will be processed anonymously.

Completion of the questionnaire will take **only 10-15 minutes**.

Thank you in advance for your cooperation.

Barriers/facilitators of sports:

28) Did somebody encourage you to start participating in Paralympic sports?

- ☐ No → *Please go to question 32*
- ☐ Yes

29) Who encouraged you to start participating in Paralympic sports?

Multiple answers possible

- ☐ Medical specialist (rehabilitation specialist, surgeon, etc)
- ☐ Physiotherapist
- ☐ General Practitioner
- ☐ Sports & Exercise coordinator
- ☐ Cesar therapist
- ☐ Occupational therapist
- ☐ Family
- ☐ Parents/Caretaker
- ☐ Friends
- ☐ Partner
- ☐ Lecturer
- ☐ Other, namely.....

30) How did you discover sports possibilities for people with disabilities?

Multiple answers possible

- ☐ Local newspaper
- ☐ National newspaper
- ☐ Internet, website:
- ☐ Information from the county
- ☐ Information from the physiotherapist
- ☐ Information from the medical specialist/ rehabilitation centre
- ☐ (Local) interest groups for people with disabilities
- ☐ Family and friends
- ☐ Education
- ☐ Sports club

- ☐ Information centre for sports at the rehabilitation centre
- ☐ Fellow patients
- ☐ Other, namely.....

31) What were the reasons for start participating in sports?

Multiple answers possible

Personal factors:

- ☐ Increasing Health/physical fitness
- ☐ Having fun/relaxation
- ☐ Increasing Strength
- ☐ Increasing Social contacts
- ☐ Losing weight
- ☐ Increasing Self confidence
- ☐ Loosing energy
- ☐ Learning new skills
- ☐ Competition/winning
- ☐ Increasing independence
- ☐ Accepting disability
- ☐ Learning how to deal with disability/ wheelchair/aid
- ☐ Other, namely.....

Environmental factors:

- ☐ Support from family, partner or children
- ☐ Support from friends and colleagues
- ☐ Medical indication
- ☐ Other, namely.....

32) What were the facilitators for maintaining sports?

Multiple answers possible

Personal factors:

- ☐ Remaining health/physical fitness
- ☐ Remaining fun/relaxation
- ☐ Remaining strength
- ☐ Remaining social contacts
- ☐ Controlling weight
- ☐ Remaining self confidence
- ☐ Losing energy
- ☐ Competition/winning
- ☐ Independence of others
- ☐ Other, namely

Environmental factors:

- ☐ Support from family, partner or children
- ☐ Support from friends and colleagues
- ☐ Medical indication
- ☐ Other, namely

33) What barriers did you experience when you started participating in sports?

Multiple answers possible

- ☐ No barriers

Personal factors:

- ☐ Not being able to exercise because of disability
- ☐ Being (too) busy with other activities
- ☐ Not being comfortable in the presence of other athletes
- ☐ Having fear of injuries
- ☐ Being dependent of others to be able to exercise
- ☐ Other

Environmental factors:

- ☐ Sports possibilities are unknown
- ☐ Having little sports possibilities in the neighbourhood
- ☐ No/not sufficiently qualified supervision
- ☐ Facilities not (sufficiently) adjusted
- ☐ Transport
- ☐ Materials not (sufficiently) adjusted
- ☐ Lack of materials available
- ☐ Materials are too expensive
- ☐ Practice/Training is not (sufficiently) adapted
- ☐ Sports activities are too expensive
- ☐ Sports are too competitive
- ☐ Lack of possibilities to exercise with peers
- ☐ Disabled athletes are not (fully) accepted
- ☐ Lack of support from environment
- ☐ Lack of fellow disabled athletes
- ☐ Other, namely.....

34) On reflection, what do you consider the most important factors for initiating sports?

.....

.....

.....

35) On reflection, what do you consider the most important factors for maintaining sports?

.....

.....

.....

36) What aspects of your sports club/federation concerning possibilities for Paralympic athletes are adequate?

Please explain

.....

.....

.....

37) What aspects of your sports club/federation would you like to see improved, in order to increase sports possibilities for Paralympic athletes?

.....

.....

.....

38) In general, what aspects of your sports club/federation would you like to see improved, to make it easier for people with disabilities to start and continue participating in sports?

.....

39) In general, what changes should be made in your environment to reduce barriers to performing sports for people with disabilities?

.....

40) What improvements could be made in the organisation of Paralympic sports of your country to increase sports participation of people with disabilities?

.....

41) What do you consider the three largest barriers for initiating sports for people with disabilities?

- 1)
- 2)
- 3)

42) What do you consider the three largest barriers for maintaining sports for people with disabilities?

- 1)
- 2)
- 3)

43) What advice would you give other people with disabilities who would like to initiate sports?

.....

44) Research is necessary to increase medical care, now and in the future. Would you mind being approached again for participating in a research of the Rehabilitation Department of the University Medical Center of Groningen, the Netherlands?

- ☐ Yes
☐ No, please indicate name and (email) address below.

Name:.....

Address:.....

Email address:.....

Thank you for your time and cooperation.

Barriers and facilitators of sports in children with physical disabilities: A mixed method study

Eva A. Jaarsma, MSc; Pieter U. Dijkstra, PT, PhD; Jan H.B. Geertzen, MD, PhD; Rienk Dekker, MD, PhD.

Abstract

Purpose: This study explored barriers and facilitators of sports participation of children with physical disabilities from the perspective of the children, their parents and their health care professionals.

Method: Thirty children and 38 parents completed a questionnaire, and 17 professionals were interviewed in a semi-structured way. Data from the three groups were combined in a mixed method design, after which the results were triangulated.

Results: Mean age (SD) of the children was 14.1 (2.9) years old, 58% were boys. Sixty-seven percent of the children had cerebral palsy and 77% participated in sports after school. Most commonly practiced sports were swimming, cycling and football.

Children specifically experienced dependency on others as a barrier, parents did not have enough information about sports facilities, and professionals observed that the family's attitude had influence on the child's sports participation. Facilitators were health benefits, fun and social contacts.

Conclusion: Sports participation of children with physical disabilities is a complex phenomenon because children, their parents and professionals reported different barriers. Sports participation is more physically challenging for children with severe physical disabilities, as their daily activities already require much energy. However, the psychosocial benefits of sports are applicable to all children with physical disabilities.

Introduction

In the Netherlands in 2007, approximately 130,000 children (4%) between the ages of 6 and 19 years had a physical disability^[1,2]. These children often participate less in sports than children without physical disabilities^[3,4]. The benefits of sports have been documented frequently and generally include an increase in health and physical fitness and a decrease in secondary conditions, such as type 2 diabetes and obesity^[5,6]. These benefits are also very much applicable to children with physical disabilities^[7]. Besides health benefits, sports participation also promotes personal autonomy, community integration and life satisfaction of children with physical disability^[8].

Most research on sports participation of children with physical disabilities tends to focus either on children, their parents or health professionals working with children with physical disabilities or a combination of two of these groups. Barriers to sports participation mentioned by parents of children with physical disabilities were the physical, social and cognitive demands of sports^[9], transport^[9,10], lack of information^[9,11] or lack of equipment^[9], lack of time^[9,12], and costs^[9]. Health professionals mentioned the need for adaptive equipment, sufficient information on how to use equipment and instruction on how to successfully conduct sports classes, as requirements for sports participation^[13]. Facilitators mentioned by parents were fun^[12], social contacts^[9,12] and transport^[9]. A recent qualitative study on children with cerebral palsy showed that children participated in sports because they enjoyed it, felt capable or could do the activity with someone else^[14]. Pain and fatigue were barriers to sports participation^[14]. However, all these studies only focused on describing sports participation from only one perspective, which does not allow distinguishing differences in perspectives on sports participation of children with other physical disabilities.

To our knowledge, no study has combined the experiences of children, their parents and health professionals on the barriers and facilitators of sports in the same study. By combining perspectives from children, their parents and their health professionals into one study (i.e. triangulation), a more comprehensive insight into the complex phenomenon of sports participation can be provided than only one perspective could do^[15].

This study therefore aimed to provide comprehensive information about the barriers and facilitators of sports participation of children with physical disabilities by triangulating data from children, their parents and their health professionals.

Methods

Ethical approval

The study was approved by the Medical Ethical Committee of the University Medical Center Groningen (METc 2012/033).

Participants

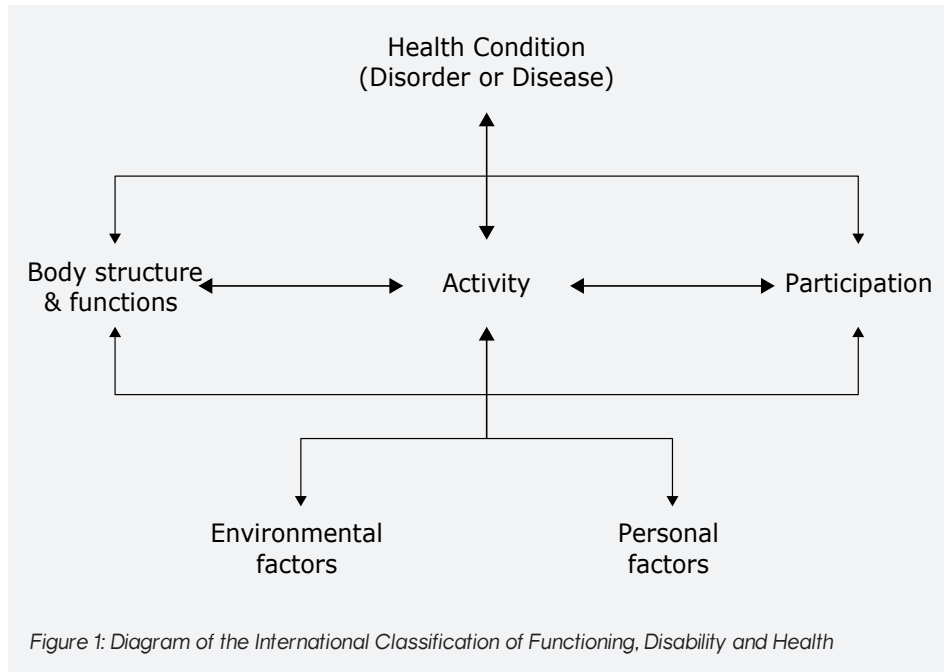
Between June and December 2012, children between 8 and 20 years old were invited to participate in this study. All children were registered at the Prince Johan Friso Mytylschool, Haren, the Netherlands, a special school for children with physical disabilities, some of whom also have mental disabilities. The age of 20 years old was chosen, because this is the maximum age for children to be able to attend this school. All children had diagnoses that are frequently treated at the University Medical Center Groningen. Children attended all levels of education offered at the school. Levels 1 and 2 were primary education with level 1 indicating the level for children with multiple disabilities and an IQ lower than 35, and level 2 being special primary education that sometimes provides extra individual attention to the children. Level 3 until 5 are secondary education. Where level 3 focuses on daytime activities (either work or activity related), level 4 focuses on vocational education and level 5 focuses on finishing a high school degree^[16].

During that same period, parents of these children and health professionals (i.e. occupational therapists, physical therapists, speech and language therapists and teachers) were also invited to participate in a questionnaire and an interview, respectively.

Quantitative section

Children and their parents were invited by mail to participate in the study by completing a children's and parents questionnaire, respectively (Appendix 1). The children's questionnaire consisted of 18 items. The parent questionnaire consisted of 23 items. Both questionnaires were adapted from a self-constructed questionnaire for Paralympic athletes published previously^[17], and contained items about sports participation, physical disabilities, and barriers and facilitators of sports participation. The items about barriers and facilitators of sports participation were divided into personal and environmental factors, according to the International Classification of Functioning, Disability and Health (ICF)^[18]. The ICF model (Figure 1) is a classification that divides health conditions into three parts: body structure and

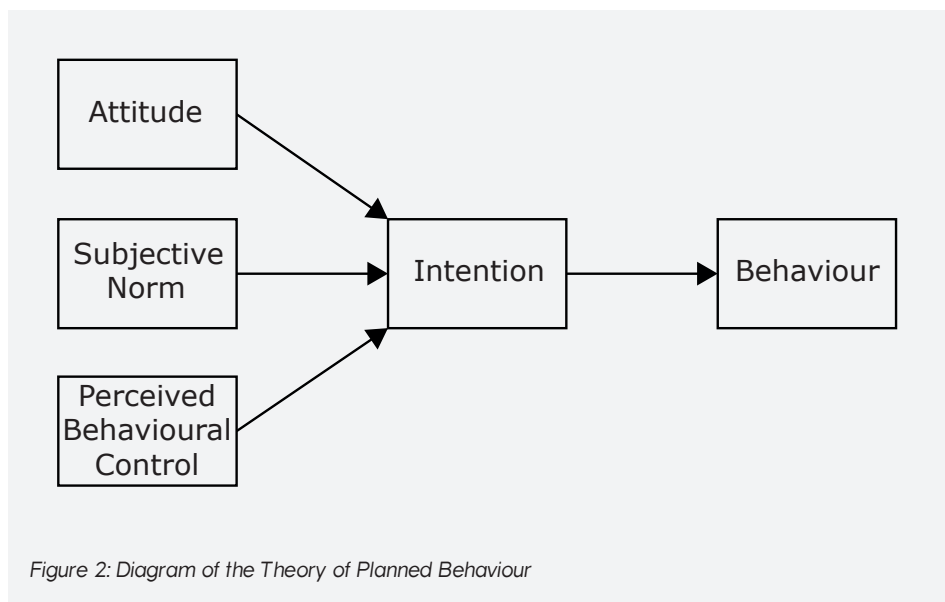
functions, activities and participation. Sports participation falls under the broader term participation. Within participation, the ICF model distinguishes personal and environmental factors.



Items about sports participation and disabilities were grouped according to components of the Theory of Planned Behaviour (TPB)^[19]. The TPB (Figure 2) combines the components attitude, subjective norm and perceived behavioural control that determine intention (motivation), which in turn leads to behaviour (i.e. sports participation). “Attitude” refers to positive or negative outcome expectancies of a person toward the behaviour. “Subjective norm” is the social pressure regarding the behaviour. “Perceived behavioural control” is the perceived control a person has over their own behaviour in certain situations^[19].

In the envelope sent to children and parents, a cover letter was included that explained the purpose and methodology of the study. The cover letter also explained that participation was voluntary and that all data would be processed anonymously. An informed consent was included for the children and parents to sign. Children and parents were invited to either complete the paper questionnaire included in the mail or to use the provided link to complete the questionnaire online. A reminder was sent two months after the initial mailing. Compensation of 10 euro was given as a token of appreciation for their participation after completing and

returning the questionnaire.



Qualitative section

The qualitative part of this study involved semi-structured interviews with teachers and health professionals about sports participation of children with physical disabilities attending their school. For the interviews, a pre-developed interview plan with open questions was used^[20]. The topics in the interview plan were based on the questionnaire used for the children and parents (Appendix 1). With this interview plan, the interviewer (EAJ) was able to interact with the participant and still have a relatively tight structure to ensure that all important information was obtained during the interview^[20]. This type of interviewing also allowed participants to reveal more information about experiences with sports participation, because they had room to shape the interview according to their experiences^[20]. At first the interviewer asked some general questions about the participant's background, occupation and participation in sports, to make them feel comfortable. During the interview participants were asked to describe their experiences with children's participation in sports both during and after school, observed barriers and facilitators of participation in sports and their role in stimulating the children's participation in sports. All participants were interviewed in a separate, quiet room at school. Prior to the interviews, informed consent was obtained.

Mixed methods design

This study used a mixed methods design, where qualitative and quantitative data were collected simultaneously. A mixed methods design combines two or more research methods (e.g., qualitative and quantitative methods) into one study, after which results are triangulated^[15]. Data from questionnaires completed by the children and their parents were combined with data extracted from the interviews with health care professionals. We considered the results from the children and their parents to be dyadic data.

Data collection and analysis

For the quantitative part of this study, chi-square tests were used to analyse differences in barriers and facilitators between active and inactive children, and a McNemar test was used to analyse differences between the children and their parents. A Mann Whitney U test was used to analyse differences in the number of experienced barriers and facilitators between active and inactive children. The alpha level for statistical significance was set at 0.05 for all tests in this study.

For the qualitative part of this study, all interviews were digitally recorded and were transcribed verbatim by the first author. To ensure anonymity of the participants, all information about the identity of the participant was excluded from the transcribed interviews and all participants were assigned identification numbers. Thematic analysis of the transcribed interviews was used to interpret the qualitative data. Thematic analysis is a flexible research tool for identifying, analyzing and reporting themes in qualitative data. It can organise and describe complex data in rich detail, such as the phenomenon of sports participation of children with physical disabilities^[21]. Thematic analysis can also be used with any theoretical frameworks, which in our study were the ICF and TPB^[21].

Transcribed interviews were read and re-read several times by the first author, to get familiarized with the data. While conducting the interviews, the first author already had noted initial thoughts about the analysis of the data. After the familiarisation with the data, two researchers (EAJ and RD) independently and systematically coded interesting features throughout all interviews, to ensure reliability of the interpretation of the data. The coding from both researchers was compared during a consensus meeting and the final coding resulting from this meeting was then used to combine codes into themes. These themes were codes that were shared by several health professionals or that contained possible explanations for sports participation. Finally, these themes were compared with the quantitative data from the children's and parents' questionnaires, and triangulated

to allow interpretation of both qualitative and quantitative data.

Results

In total, 127 children and parents were asked to participate in this study, of which 30 children and 38 parents completed the questionnaires. Twenty-six pairs of child and parent data were obtained. The mean age (SD) of the children was 14.1 (2.9) years old, 58% were boys. Sixty-seven percent of the children had cerebral palsy and 55% used assistive devices during activities of daily living (Table 1).

Almost all of the children participated in sports at school (96%, $n=29$), and the majority also participated in sports after school (77%, $n=20$). The most commonly practiced sports were swimming ($n = 9$), cycling ($n = 4$) and football (soccer) ($n = 4$).

Seventeen teachers and health professionals were interviewed about barriers and facilitators of sports participation of children with physical disabilities. Data saturation occurred after 14 interviews, after which an additional three health professionals were interviewed. No new themes occurred.

International Classification of Functioning, Disability and Health

Personal factors

Barriers

Disability

Disability was frequently mentioned as a barrier to sports participation by active children ($n=6$) and their parents ($n=7$), as well as by inactive children ($n=2$) and their parents ($n=3$; Table 2). Several teachers and health professionals mentioned the severity and the type of disability as a barrier to sports participation:

"Some children are so severely disabled that almost everything will be a disappointment, as they can hardly do anything." (Subject 5, teacher)

Fatigue

Teachers and health professionals also considered fatigue of the children as a result of long school days as a barrier:

"[Travelling to and from the school] takes a lot of time for some, there are some [children] who have to leave early in the morning, and come home late in the afternoon. And then they also have to do their homework." (Subject 4, teacher)

Table 1: Characteristics of the research population

	Children (n = 30)		Paired Children and Parents (n=26)				Parents (n = 38)	
	M	SD	Children		Parents		M	SD
			M	SD	M	SD		
Age child	14.3	2.7	14.1	2.9	14.4	2.8	14.8	2.7
	n	% ^a	n	% ^a	n	% ^a	n	% ^a
Gender (boy)	17	57	15	58	14	56	23	61
Disability child^b								
Cerebral Palsy	20	67	17	65	16	62	26	68
Spina Bifida	1	3	1	4	1	4	1	3
Other Neurological diagnoses	3	10	2	8	3	12	3	8
Visual Impairment	2	7	2	8	2	8	3	8
Mental Impairment*	2	7	2	8	8	31	13	33
Muscle Disease	1	3	1	4	1	4	1	3
Other	6	20	6	23	6	23	9	23
Level of education^c								
<u>Primary education:</u>								
Level 1	6	20	5	19	5	19	7	18
Level 2	5	17	5	19	5	19	8	21
<u>Secondary education:</u>								
Level 3	2	7	0	0	0	0	0	0
Level 4	8	27	7	27	8	31	12	32
Level 5	9	30	9	35	8	31	11	29
Assistive advices								
Use of assistive devices (Yes)	23	55	20	77	22	85	32	84
Wheelchair	13	43	12	46	16	62	26	68
Wheeled walker	8	27	4	15	5	19	8	21
Speech generating devices	1	3	1	4	2	8	4	11
Ankle Foot Orthoses	6	20	6	23	6	23	6	16
Orthopedic shoes	10	33	10	39	11	42	15	39
Adapted bicycle	12	40	12	46	16	62	23	61
Other	2	7	2	8	3	12	6	16
Sports participation child								
Sports at school (children)	29	97	25	96	26	100	36	92
Sports after school (children)	24	80	20	77	17	65	26	67

^a Percentages are column percentages^b Multiple answers were possible^c Level 1: IQ<35; Level 2: special primary education, sometimes with extra attention; Level 3: focus on daytime activities (work or activity related); Level 4: vocational education; Level 5: high school degree

* Significant differences between children and parent pairs: p= 0.03

Table 2: Barriers of sports mentioned by paired children and parents

	Children (n = 26)		Parents n = 26)	
	n	% ^a	n	% ^a
Barriers (of active children)[§]	n=20		n=17	
Disability	6	30	7	41
Lack of acceptance by others	5	25	2	12
Transportation	2	10	3	18
No peers	2	10	1	6
Costs	1	5	3	18
Dependency	4	17	-	-
Injuries	2	10	-	-
Too busy with other activities	1	5	-	-
Lack of information	-	-	2	12
No problems	8	40	7	41
Barriers (not active children)^b	n=6		n=9	
Transportation	3	50	5	56
Disability	2	33	3	33
Costs	1	17	2	22
No sports clubs in the neighborhood	1	17	7	78
Lack of sports facilities	2	33	-	-
No fitting sport	2	33	-	-
Injuries	1	17	-	-
Child does not like activity	-	-	2	22
Takes too much time	-	-	2	22
No buddy	-	-	1	11

^a Percentages are column percentages

^b Multiple answers were possible

"I think lots of children would like to play football, but they can't"...."It's physically impossible [because of fatigue caused by the disability]." (Subject 8, teacher)

Facilitators

Health

A frequently mentioned facilitator of sports participation by active children (n=12) and their parents (n=11) was improved health (Table 3). Health professionals mentioned change in position of the body for children in wheelchairs as a positive factor of participation in sports:

"When you're in a wheelchair all day, it is hard, especially with warm weather. So then it's good to be out [of the wheelchair]."...."And being in the same position the entire day is not healthy." (Subject 1, teacher)

Table 3: Facilitators of sports participation mentioned by active children and their parents

Facilitators ^b	Children (n = 20)		Parents (n = 17)	
	n	% ^a	n	% ^a
Health	12	60	11	65
Fun	11	55	14	82
Getting stronger	6	30	8	47
Losing weight	5	25	3	18
Social contacts	5	25	11	65
Support from family	5	25	11	65
Suggested by physician	3	15	5	29
Skills	1	5	4	24
Winning	1	5	-	-
Accepting the disability	-	-	4	24
Self confidence	-	-	9	53
Independence	-	-	2	12
Energy	-	-	1	6

^a Percentages are column percentages

^b Multiple answers were possible

Fun

Fun was mentioned as a facilitator by both active children (n=11) and their parents (n=14). The majority of the teachers and health professionals also mentioned fun as an important facilitator:

"Yes, yes, I always think it makes them happy. Those Physical Education classes are very important. Even though the children sometimes cannot do anything, it is still very important to race through a gym class with the wheelchair. Just to experience moving." (Subject 3, teacher)

Internal motivation

Many teachers and health professionals mentioned internal motivation of the child as a facilitator:

"They have to become interested by experiencing [sports] themselves" (Subject 9, Physical Education teacher)

"Well, it (i.e., sport participation) is part of internal motivation of the child, why children participate in sport, or not" (Subject 12, physical therapist)

Strength

Increasing physical strength was mentioned both by children (n=6) and their

parents (n=8). Health professionals did not mention physical strength as a possible facilitator.

Environmental factors

BARRIERS

Lack of sports facilities

A lack of sports facilities was mentioned as a barrier by inactive children (n=2). Teachers and health professionals also mentioned the lack of sports clubs for people with disabilities, particularly clubs with team sports, in the children's neighbourhood. Logistical problems with transportation were also noted as possible barriers:

"You (i.e. the child) have to travel far to play a match, a tournament. You cannot really play in a competition, because there are not enough teams." (Subject 13, teacher)

Transportation

Transportation was mentioned by inactive children (n=3) and their parents (n=5) as a barrier to sports participation. Health professionals also mentioned transportation as one of the organizational issues parents have to address:

"I also have several children who would love [to participate in sports], but the parents dread it for some reason. And if you ask them, it is usually transport issues." (Subject 16, physical therapist)

Dependency

Four active children with disabilities did not like to be dependent on others to be able to participate in sports. Health professionals frequently mentioned the attitude of the family (e.g., parents and siblings) of the child as an important role in the child's participation in sports:

"It very much depends on how things are arranged within a family...whether it (i.e., participation in sport) is easy to organise." (Subject 15, teacher and former occupational therapist)

Lack of acceptance

Active children mentioned not feeling accepted by others (n=5) as an environmental barrier. Two parents of active children also mentioned this barrier. Health professionals did not mention the fact that children did not feel accepted

by others as a possible barrier.

Lack of information

Lack of information about sports was mentioned as a barrier by two parents of active children. Health professionals also mentioned a lack of information as a barrier:

"Information, well, they will pay attention to that during the Physical Education classes, obviously. But I do not think that it is clear to everybody what possibilities there are." (Subject 4, teacher)

"At my previous job we had a nice overview of all disabled sports clubs in the area. I find it much harder to search in the rural areas, to find what possibilities there are and for which group of children." (Subject 11, physical therapist)

FACILITATORS

Social contacts

Active children (n=5) and their parents (n=11) mentioned social contacts as a facilitator of sports participation. Social contacts were also mentioned by health professionals:

"It is nice that they have the exercise, but it is mainly about atmosphere, the fun and social contacts." (Subject 8, teacher)

Support from family

Support from family was a facilitator mentioned by both active children and their parents (n=5; n=11).

Teachers and health professionals also mentioned the positive influence of the child's environment (e.g., influence from parents, teachers and friends) on the child's participation in sports:

"When you are participating in sports yourselves (i.e., as a parent), then your child will also participate easier. Yes, and then if you possibly have several children, then it's more natural to also start participating in sports." (Subject 14, teacher and former occupational therapist)

"It (i.e., participation in sports) was initiated by themselves (i.e., the children), there were a few students...who were very competitive and they encouraged the others as well." (Subject 4, teacher)

Information

Several health professionals mentioned information as a facilitator:

"I think you can find a lot of information on the internet, well certain things. When you type in disabled sports and Province Groningen, for instance, you will find a whole range of different information." (Subject 6, teacher)

"In general, they (i.e., parents) have a lot of information and they also exchange information amongst each other. And with the internet nowadays, you just google it and everything will appear." (Subject 10, teacher)

Sports activities during school hours

A possible facilitator only mentioned by health professionals was organising sports activities (i.e., activities other than the regular Physical Education classes) during school hours:

"We try to plan projects, if possible, during the breaks in between classes, as the children are already at school. Because after school it is very difficult to keep them here, because then you immediately have transport issues." (Subject 9, Physical Education teacher)

Organising sports during school hours could also help parents with their busy schedule:

"It is easier to arrange things (i.e., sports) during school hours, as children live all through the region. So it (i.e., sports) is something you cannot ask from parents to also take care of that after school." (Subject 15, teacher)

Discussion

Factors such as a child's health, information availability and the role of the family were mentioned as both barriers and facilitators of participation in sports. The data collected from children, parents and health professionals showed different perspectives on barriers and facilitators of participation in sports of children with physical disabilities.

International Classification of Functioning, Disability and Health

Personal factors

Barriers

Children, parents and health professionals all mentioned the disability and health conditions (e.g. fatigue) of the child as personal barriers, something that has been repeatedly reported in previous research^[22,23]. The severity or type of disability and fatigue after a long day at school might be reasons for children not to have enough energy left to also participate in sports in addition to their daily activities. Although the school offers many opportunities for its students to become familiar with and participate in sports, these activities are perhaps more applicable to children with less severe disabilities because sports are probably more physically challenging for children with more severe physical disabilities.

Facilitators

Health benefits and fun were mentioned as personal facilitators by children, parents and health professionals. Health was mentioned both as a barrier (see above) and a facilitator in terms of increasing health and/or physical fitness as a reason to participate in sports. Increasing physical strength was another health benefit that was mentioned by children and parents, and was also reported in previous research^[14]. Fun was frequently mentioned as a facilitator by children, their parents, and health professionals, as has been reported previously^[12,14,24]. Children with severe disabilities also described fun and health as facilitators, highlighting that the psychosocial factors for sports participation are applicable to all children with physical disabilities.

Environmental factors

Barriers

Children depend on their parents to be able to participate in sports, in terms of medical care, transportation and sometimes also supervision or guidance during the activity. Health professionals expressed that the attitude of the parents and siblings very much determines whether a child with a disability has an opportunity to participate in sports. Parents could experience their child's sports participation as an additional burden in addition to their daily obligations, such as work and taking care of their family, including a child with disabilities. The suggestion by several health professionals to organise sports activities at the school site could help by easing transportation problems. If sports clubs were situated at the school facilities and offered sports activities directly after school or in between classes, it would spare children from travelling. However, as mentioned above, the school should

carefully consider the physical challenges children with severe physical disabilities might face when sports are added to their daily activities. In addition to the above-mentioned barriers, the children, their parents and the health professionals had group-specific perceptions of barriers to the children's participation in sports. Children exclusively mentioned the dependency on others, whereas parents mention problems with transportation, information about sports possibilities and acceptance of their child with a physical disability, and health professionals observed that the attitude of the family was of large influence on participation in sports by children with physical disabilities.

Facilitators

In accordance with previous research, the children, their parents and the health professionals also mentioned social contacts and support from family as environmental facilitators^[9,12,14,26,27]. These facilitators were also mentioned by all of the children, regardless of the severity of their disabilities.

Theory of Planned Behaviour

Variables influencing sports participation found in this study were supported by the TPB. Facilitators such as health and fun positively influenced the attitude of the child. The internal motivation mentioned by health professionals could also positively influence the intention of children with physical disabilities to participate in sports. Children, parents and health professionals also mentioned factors associated with subjective norm to influence sports participation. Support from family, friends and school positively influenced the sports participation of a child with physical disabilities. However, children and parents also reported negative pressure on sports participation, as peers sometimes did not accept children with physical disabilities. Perceived behavioural control did not play a role in sports participation by the children in this study. So when advising and promoting sports participation for children with physical disabilities, the emphasis should be on attitude and subjective norm to ensure intention and eventually actual participation in sports. However, the TPB focuses on the positive components that eventually will lead to participation in sports, whereas not all children with physical disabilities were able to become physically active. This study showed that active and inactive children also experienced barriers to participation in sports and these barriers should also be considered when promoting participation in sports.

Mixed methods design

We used questionnaires for the children and parents based on a similar questionnaire on barriers and facilitators of sports participation of people with physical disabilities that was published previously^[17]. Children and parents both received a questionnaire with related questions, to provide dyadic data. Additionally, we wanted to explore how health professionals viewed sports participation by children with physical disabilities. In order to obtain a more complete picture of sports participation of children with physical disabilities, we decided to include different methods in a single study^[15]. We considered the data resulting from the interviews with the health professionals to be supplementary data that would not be obtained by another questionnaire and triangulated this with the data from the questionnaires^[15]. It is therefore that we decided that a qualitative approach via semi-structured interviews was the most appropriate research method for collecting data from health professionals. This mixed methods design revealed that children, parents and health professionals not necessarily have the same perspective on sports participation. Children and parents might report gaining physical strength as an important facilitator, whereas professionals consider other facilitators, such as internal motivation, as an important reason for children to be physically active. Children and parents also tend to look at the positive influence of family and friends, whereas health professionals observed that physical inactivity of parents and siblings has negative consequences for the sports participation of the children. This study has therefore indicated that sports participation of children with physical disabilities is indeed a complex phenomenon, and all perspectives should be considered when promoting sports participation.

Limitations

In this study, only 30 children and 38 parents out of a possible 127 children and parents completed the questionnaire. Most children included in this study were active both during and after school, whereas previous research showed that only 25% of children with physical disabilities in the Netherlands participate in sports after school at least once per week^[22]. Our findings could therefore be the result of selection bias. The percentages of active children were probably overestimated, as active children were probably more interested in participating in this study than inactive children. If, in the worst case, our sample included all of the active children in the school, only 19% (24/127) of the children of the school participated in sports after school.

Not all of the questionnaires completed by children and parents could be paired,

as both the children and their parents did not always complete questionnaires. Data from children and parents that were not paired could only be partly used in the results section. Future research should therefore thoroughly consider the approach for recruitment of subjects to obtain a greater number of (paired) responses.

Because of the small sample size some barriers and facilitators were only reported by 1 or 2 children and/or parents, which implies that interpretation of these results should be considered very carefully. However, because of the explorative and mixed method nature of this study, these results represent the perspectives of the children, parents and the health professionals on sports participation. Results in this study therefore cannot be generalized for children with physical disabilities, but do provide interesting suggestions that could be considered in future research.

Conclusion

This mixed methods study found that children, their parents and health professionals considered different factors influencing the participation in sports by children with physical disabilities. Perceived barriers seemed to differ by group, suggesting that sports participation is a complex phenomenon. Sports might be more physically challenging for children with severe physical disabilities, as their daily activities already take much energy. However, the psychosocial benefits of sports are applicable to children with all types and severities of physical disabilities and should be emphasized by rehabilitation professionals when advising children with physical disabilities about sports. Advice about sports participation should be considered very carefully and should be tailor made.

Declaration of interest

The authors report no conflicts of interest.

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Appendix 1

Sports participation of children of a special school: Questionnaire for students

Some children participate a lot in sports, while other children rather do other things. We know you have Physical Education (PE) classes at school, but we would also like to know that sports you do after school hours. We would like to know whether you participate in sports and why you like it so much. If you do not participate in sports, we would also like to know why you do not like sports. Your answers can help us seeing what you like and dislike the most about sports

There are no right or wrong answers; we just would like to know how you think about sports. We cannot see who gave what answer.

Completing the questionnaire will take about **15 minutes**.

General questions:

1) You are a:

- ☐ Boy
- ☐ Girl

2) Please write down your date of birth? dd/mm/yyyy

.....

3) You are in:

- ☐ Primary school
- ☐ Secondary school

4) Could you please tell us what kind of disability you have:

- ☐ I am missing a (part of my) arm or leg
- ☐ I have trouble with moving (spasticity)
- ☐ I cannot see that well
- ☐ I do not have that much strength in my arms and/or legs
- ☐ Other, namely

5) This disability started:

- ☐ When I was born
- ☐ (year)

6) Do you have assistive devices, which help you every day during school or playing outside?

- ☐ Yes
- ☐ No → Please go to question 8

7) What are those assistive devices that help you every day during school or playing outside?

- ☐ Prosthesis

- ☐ Wheelchair
- ☐ Walker, cane
- ☐ White cane
- ☐ Magnifying screen for the computer
- ☐ Speech generated devices
- ☐ Splint(s)
- ☐ Special shoes
- ☐ Adapted bicycle
- ☐ Other, namely.....

8) How do you (usually) go to school?

- ☐ With special transport
- ☐ By car, brought by parents
- ☐ By bicycle
- ☐ Walking

We would like to ask you a few questions about sports. With sports we mean playing tennis or football (soccer), but also biking (to school) or walking.

9) Do you participate in sports at school?

- ☐ Yes
- ☐ No → Please go to question 11

10) What sports do you do at school?

Multiple answers possible

- ☐ Fysiojudo
- ☐ Survival
- ☐ Gymnastics
- ☐ Swimming
- ☐ Zumba or similar
- ☐ Fitness
- ☐ Other, namely

11) Do you also participate in sports after school?

- ☐ Yes
- ☐ No → Please go to question 18

12) What sports do you do after school?

Multiple answers possible

- ☐ Athletics

- ☐ Basketball
- ☐ Zumba or similar
- ☐ Boccia
- ☐ Cycling
- ☐ Fitkids
- ☐ Golf
- ☐ Judo
- ☐ Rowing
- ☐ Wheelchair basketball
- ☐ Wheelchair hockey
- ☐ Table tennis
- ☐ Tennis
- ☐ Soccer
- ☐ Volleyball
- ☐ Walking
- ☐ Sailing
- ☐ Swimming
- ☐ Other, namely

13) Are you a member of a sports club?

- ☐ No
- ☐ Yes

14) How long are you playing this/these sport(s)?

..... years

15) Where did you get your information about these sports?

Multiple answers possible

- ☐ The doctor
- ☐ Someone from the rehabilitation center told me
- ☐ Someone from school told me
- ☐ Friends
- ☐ Parents of family
- ☐ There was a day at school, where you could try different sports
- ☐ Internet, facebook, other social media
- ☐ Other, namely

16) Why did you want to do this sport?

Multiple answers possible

- ☐ Because it is good for me

- ☐ Because I like sports
- ☐ Because I want to become stronger
- ☐ Because I can meet other children during sports
- ☐ Because I want to loose weight
- ☐ Because I like winning
- ☐ Because I want to improve my skills with my wheelchair or prosthesis
- ☐ Because my family also plays sports
- ☐ Because my friends also play sports
- ☐ Because the doctor told me it is good for me
- ☐ Other, namely

17) What are things you do not like about sports?

Multiple answers possible

- ☐ I like everything about sports
- ☐ I have trouble playing sports because of my disability
- ☐ I am (too) busy with other activities
- ☐ I am afraid I will fall and hurt myself
- ☐ I do not like it when other people have to help me with playing sports
- ☐ I have to travel far to get to a sports club
- ☐ There are no children of my age to play sports with
- ☐ Other people think I am strange because of my disability
- ☐ Playing sports is expensive
- ☐ Other, namely

Please go to the end of the questionnaire

18) Why do you not play sports?

Multiple answers possible

- ☐ I do not like sports
- ☐ I have trouble playing sports because of my disability
- ☐ I am afraid I will fall and hurt myself
- ☐ I do not like it when other people have to help me with playing sports
- ☐ I do not know which sports clubs I can go to
- ☐ There are (almost) no sports club close to my home
- ☐ I have to travel far to get to a sports club
- ☐ There are no children of my age to play sports with
- ☐ I cannot find a sport that I like
- ☐ I cannot find a sport I can play with my disability
- ☐ Other people think I an strange because of my disability
- ☐ Playing sports is too expensive
- ☐ Other, namely.....

**Could you please return the completed questionnaire to us in the return envelope?
Thank you for your answers to our questions!**

Barriers and facilitators of sports participation in people with visual impairments

Eva A. Jaarsma, MSc; Rienk Dekker, MD, PhD; Steven A. Koopmans MD, PhD; Pieter U. Dijkstra, PT, PhD; Jan H.B. Geertzen, MD, PhD.

Abstract

Purpose: To examine barriers and facilitators of sports participation in people with visual impairments.

Methods: Participants registered at Royal Visio, Bartiméus and the Eye Association were invited to complete a questionnaire (telephone or online).

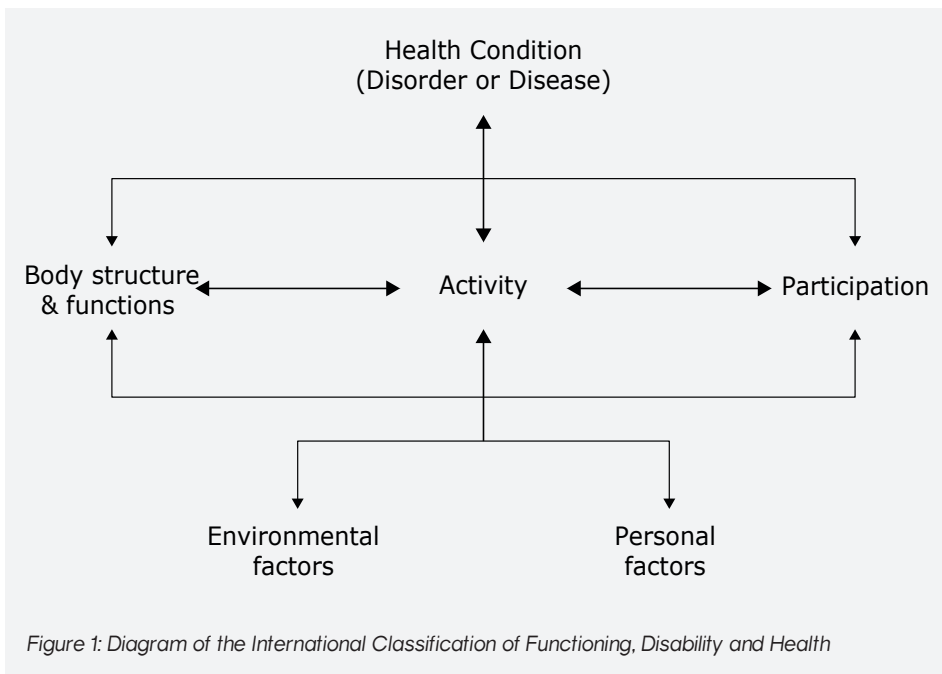
Results: Six hundred forty-eight of the invited participants (13%) completed the questionnaire, with 63% of the respondents reporting sports participation. Walking (43%), fitness (34%) and cycling (34%) were frequently mentioned sports. Costs, lack of peers/buddies and visual impairment were negatively associated with sports participation, whereas higher education and computer (software) use were positively associated. The most important personal barrier was visual impairment; transport was the most important environmental barrier. Active participants also mentioned dependence on others as a personal barrier. The most important personal facilitators were health, fun and social contacts; support from family was the most important environmental facilitator.

Conclusion: The emphasis in a sports program should be on the positive aspects of sports, such as fun, health and social contacts to improve sports participation in people with visual impairments.

Introduction

In 2005, nearly 300,000 people in the Netherlands (total population 16.3 million) had a visual impairment with 75% being 50 years or older^[1]. Because the incidence of visual impairments increases with age, the number of people with a visual impairment in the Netherlands will most likely increase to more than 354,000 between 2005 and 2020 because of the aging of the Dutch population^[1]. Research has demonstrated that people with visual impairments have a poorer health status and higher rates of overweight and obesity compared with people without a visual impairment^[2,3]. Within the group of aging people with visual impairments, both impairment-related and age-related restrictions will increase rapidly, such as difficulties in participating in daily activities^[4]. People with visual impairments need a 'livable' environment within their community with conditions such as palpable curb cuts, paths free from temporary obstructions and accessible public transport to be able to participate in daily activities^[5,6]. In the International Classification of Functioning, Health and Disability (ICF) of the World Health Organization (WHO), participation is one of the components that determines the health condition (together with body structure and functions and activities; Figure 1)^[7]. Within participation, the ICF model distinguishes personal and environmental factors. Participation in daily activities of people with visual impairments is strongly related to sports participation^[8]. On average, only one-third of people with physical or sensory disabilities regularly participate in sports, compared to two-thirds of people without physical disabilities^[11,12]. To increase sports participation in people with visual impairments, knowledge about what prevents and what enables sports participation is essential. We will therefore use the ICF model as our theoretical framework to examine which (personal and environmental) barriers and facilitators influence sports participation of people with visual impairments.

Research on sports participation among people *without* disabilities has demonstrated that lack of time, lack of motivation and difficulty accessing sports facilities are among the most common barriers to sports^[13]. In addition, barriers experienced by people *with* physical disabilities have been reported to be difficulties with energy level, transportation, information access, qualification of supervision, and adaptation of sports facilities^[13-17]. Frequent facilitators mentioned by people *with* and *without* physical disabilities are enjoyment, motivation, health benefits and social aspects^[13,15,18-20]. A previous study also indicated that facilitators such as health and competition or winning have become important for people with physical disabilities to maintain a physically active life style^[14]. Only a few studies have discussed barriers to sports such as accessibility of health clubs experienced specifically by people with visual impairments^[21].



More insight into possible barriers and facilitators can help us in developing strategies to reduce these barriers and enhance facilitators to ultimately increase the sports participation in people with visual impairment and thus increase their health status.

Therefore, in the current study, we wanted to determine factors that influence sports participation in people with visual impairments. We compared active and inactive participants with visual impairments in regards to their experienced barriers and facilitators of sports. We also investigated differences in starting and maintaining participation in sports of active participants. Finally, we determined which variables had a significant influence on participation in sports.

Methods

Participants

Participants in this study were people of 18 years or older with a visual impairment who were registered at Royal Dutch Visio, Bartiméus or the Eye Association in April 2012, these being the three largest centres of expertise for people with visual impairments in the Netherlands. These centres provide information and advice

for people with visual impairments^[22-24] but also provide rehabilitation^[24] or help with living arrangements, work or assistive devices needed for activities of daily living^[22,24].

Questionnaire

We used a self-constructed 30-item questionnaire (Appendix 1) that was adapted from a questionnaire for Paralympic athletes published elsewhere^[14]. Items were modified to make them relevant for people with visual impairments. Firstly, participants could classify their visual impairment as mild (visual acuity $\geq 20/70$), moderate (visual acuity $< 20/70$ and $\geq 20/200$), severe (visual acuity $< 20/200$ and $\geq 20/400$) or total blindness ($< 20/400$) according to the International Classification of Diseases of the World Health Organization^[7]. Participants could also classify their visual impairment as "other" if they could not classify their impairment in any of the above mentioned categories. Secondly, items in the original questionnaire about mental training and nutrition were excluded from this questionnaire. Finally, a definition for sports participation was set, namely 'an activity involving physical exertion with or without a game or competition element with a minimal duration of 30 minutes for at least two times a week where skills and physical endurance are either required or to be improved'^[25]. The items concerning barriers and facilitators of sports participation were divided into personal and environmental factors according to the ICF model.

Procedure

The three centres of expertise invited participants by email to participate in this study between April and September 2012. A cover letter in the email explained the purpose and methodology of the study. The letter ensured all data would be processed anonymously and participation was voluntary. Participants were invited to click the link to proceed to the online questionnaire. Participants who were registered at more than one centre of expertise were asked to complete the questionnaire only once. A reminder was sent six weeks after the initial email by the three abovementioned centres of expertise. The questionnaire was checked for compatibility and accessibility of computer software by a professional test team from the Eye Association prior to giving participants access to the questionnaire.

To enable people with visual impairment without an email address to also participate in the study, research assistants approached participants during an annual exhibition for people with visual impairments (April 2012) and invited them to participate in a telephone interview. Information about the telephone interview was

provided by research assistants and phone numbers of participants who agreed to participate in the study were collected at the annual exhibition. Participants were then contacted by the research assistants in the week after the annual exhibition. At the beginning of the interview, the purpose and structure of the questionnaire were explained again, and consent was obtained. All (ten) research assistants received training about conducting interviews via telephone before the start of the study.

The study was approved by the Medical Ethical Committee of University Medical Center Groningen (METc 2010.264).

Data collection and analysis

Information about the mean age and percentage of men and women of the population approached for the online questionnaire was provided by the three centers of expertise for people with visual impairments. Participants who completed the questionnaire were divided into active and inactive participants, based on whether they positively responded to our definition of sports. We used a Mann-Whitney U test to analyze differences in the number of barriers and facilitators experienced by active and inactive participants and a Chi square test to analyze differences between active and inactive participants. To analyze paired proportions between the initiation and maintenance of sports participation, we used a McNemar test. To determine which variables were associated with sports participation, we used a logistic regression (method enter), which included all variables that were related ($p \leq 0.1$) with sports participation. For the other tests, we set the alpha level for statistical significance at 0.05.

Results

We approached a total of 4,838 people to participate in this study, with 4,763 people being approached for participation in the online questionnaire and 75 people for the telephone interview. The mean age (SD) of the online questionnaire group was 50.2 (19.4) years, and 51% were female. A total of 1,348 people (28%) responded to the invitation, with 648 (13%) participants completing the questionnaire. The mean age of these participants was 49.1 (18) years, and 52% were female. There were no significant differences between the total population registered at Royal Visio, Bartiméus or the Eye Association and the participants for age or gender. Sixty-three percent ($n = 411$) of the study participants reported their participation in sports (Table 1).

Table 1 Characteristics of all participants (Participants), physically active (Active) and physically inactive participants (Inactive)

	Participants (n=648)		Active (n=411)		Inactive (n=237)	
Age in years, mean (SD) [range]	49.1 (17.9) [18 - 92]		49.3 (16.9) [18 - 92]		48.7 (19.6) [18 - 92]	
	n	% ^a	n	% ^a	n	% ^a
Gender						
Female	339	52	219	53	120	51
Visual impairment^b						
Mild	64	10	38	9	26	11
Moderate	200	31	121	29	79	33
Severe	295	46	191	47	104	44
Blindness	61	9	39	10	22	9
Other visual impairments ^c	28	4	22	5	6	3
Education^c						
Lower education	207	32	109	27*	98	41*
Higher education	441	68	302	73*	139	59*
Living arrangements						
Independent, alone	178	28	120	29	58	25
Independent, with spouse and/or children	370	57	237	58	133	56
Living at home (with parents/guardian)	68	11	37	9	31	13
Sheltered housing	14	2	8	2	6	3
Other	18	3	9	2	9	4
Monthly net household income						
< € 913	72	11	41	10	31	13
€ 913 < € 1304	118	18	71	17	47	20
€ 1305 < € 1700	98	15	63	15	35	15
€ 1701 < € 3000	189	29	125	30	64	27
€ 3001 < € 3500	53	8	32	8	21	9
> € 3500	79	12	52	13	27	11
Rather not say	39	6	27	7	12	5
Assistive Devices						
Assistive device (Yes)	548	85	354	86	194	82
Loupe/Magnifying glass	346	53	220	54	126	53
Computer software	298	46	213	52*	85	36*
White cane	285	44	193	47	92	39
Magnifying screen for computer	203	31	123	30	80	34
Guide dog	89	14	65	16	24	10
Braille	93	14	64	16	29	12
Glasses, lenses	51	8	38	9	13	6
DAISY digital talking book	45	7	31	8	14	6
Other	79	12	56	14	23	10

^a Percentages are column percentages, sum ≠ 100% because of rounding; ^b No significant differences between mild and moderate impairment vs severe impairment and blindness between active and inactive participants; ^c Other visual impairments include tunnel vision and deaf blindness; ^d Lower education was defined as no education, primary school or Lower General Secondary Education; Higher education was defined as high school degree, vocational education, applied sciences, or University degree.

*Significant differences between active and inactive participants (p<0.001);

We found no significant differences between active and inactive participants in monthly net household income or in the level of visual impairment (i.e., mild and moderate impairment compared to severe impairment and blindness). Of the active participants, 73% had a higher education compared to 59% of inactive participants ($\chi^2 = 13.946$, $df = 1$, $p < 0.001$). Assistive devices for activities of daily living were used by 85% of the participants, of which a magnifying glass (62% active, 64% inactive), white cane (55% active, 47% inactive) and computer software (60% active, 44% inactive) were most frequently mentioned. Active participants used a computer and/or specialized computer software more often (60%) than inactive participants (44%; Table 1) ($\chi^2 = 14.206$, $df = 1$, $p < 0.001$), and more participants with a higher education (41%) used a computer and/or specialized computer software than participants with lower education (14%) ($\chi^2 = 12.391$, $df = 1$, $p < 0.001$).

Walking (43%), fitness (going to the gym) (34%) and (recreational) cycling (34%) were the most frequently mentioned sports by active participants (Table 2).

Barriers

Active participants reported dependence on others (28%) and visual impairment (14%) as personal barriers, whereas inactive participants mentioned visual impairment as a personal barrier (24%; Table 3) ($\chi^2 = 8.771$, $df = 1$, $p = 0.003$). Active participants mentioned transport (26%) and lack of possibilities in the neighbourhood (14%) as environmental barriers, whereas inactive participants mentioned lack of exercising with peers/buddies (24%), costs of sports activities (23%) and transport. Inactive participants mentioned exercising with peers/buddies (24%) ($\chi^2 = 45.490$, $df = 1$, $p < 0.001$) and costs of sports activities (23%) ($\chi^2 = 23.707$, $df = 1$, $p < 0.001$) more often as environmental barriers than active participants (6% and 9%, respectively). Active participants mentioned lack of (qualified) supervision (11%) more often as an environmental barrier than inactive participants (2%) ($\chi^2 = 15.950$, $df = 1$, $p < 0.001$).

Facilitators

The most frequently mentioned personal facilitators for initiating/maintaining participation in sports for active participants were health (85%/84%), fun (74%/75%) and social contacts (50%/52%; Table 4). The most frequently mentioned environmental facilitator for initiating/maintaining participation was support from family (31%/34%). Weight control was more often mentioned as a personal facilitator for maintaining sports participation (31%) than for initiating participation (27%) ($\chi^2 = 4.320$, $df = 1$, $p = 0.038$). Medical advice from rehabilitation professionals was more often mentioned as an environmental facilitator for initiating sports participation

(16%) than for maintaining participation (10%) ($\chi^2 = 17.361$, $df = 1$, $p < 0.001$).

Table 2: Sports mentioned by active participants

Sports ^a	Active (n=411)	
	n	%
Walking	176	43
Fitness	141	34
Cycling (recreational)	138	34
Swimming	78	19
Endurance training	55	13
Yoga	27	7
Running	26	4
Spinning	23	6
Cycling (competitive)	22	5
Athletics	19	5
Showdown	19	5
(Ice) Skating	17	4
Skiing	17	4
Dancing	14	3
Moving on Music	14	3
Rowing	14	3
Aerobics	13	3
Equestrian	13	3
Body pump	11	3
Tennis	11	3
Gymnastics	11	3
Football (soccer)	10	2
Aqua gym/Aqua jogging	9	2
Goal ball	9	2
Golf	8	2
Martial Arts	5	1
Diving	4	1
Sailing	4	1
Shooting	4	1
Squash	2	1
Table tennis	2	1
Judo	2	1
Climbing	1	0
Basketball	1	0
Other	63	15

^aParticipants could indicate multiple answers

Table 3: Experienced barriers to exercise in active (Active) and inactive (Inactive) participants

	Active (n=411)		Inactive (n=236) ^a	
	n	%	n	%
Personal factors^b:				
Being dependent of others to be able to exercise	116	28	-	-
Not being able to exercise because of visual impairment	59	14*	56	24*
Not comfortable in the presence of other people	51	12	-	-
Too busy with other activities	42	10	29	12
(Fear of) injuries	29	7	18	8
No motivation to exercise	-	-	38	16
Do not like exercise	-	-	29	12
Shame	-	-	11	5
Fatigue/ Energy consuming	-	-	10	4
Age	-	-	9	4
Other barriers	55	13	13	6
Environmental factors^b:				
Transport	106	26	52	22
Too little possibilities in the neighborhood	56	14	31	13
Sports possibilities are unknown	48	12	27	11
Facilities not (sufficiently) adjusted	43	11	-	-
No/not sufficiently qualified supervision	44	11**	5	2**
Sports activities are too expensive	38	9**	55	23**
Practice/Training is not (sufficiently) adapted	34	8	-	-
Not enough support from environment	25	6	-	-
Materials not (sufficiently) adjusted	25	6	-	-
No possibilities to exercise with peers/ buddy	23	6**	56	24**
Disabled athletes are not (fully) accepted	21	5	-	-
Materials are too expensive	18	4	-	-
Not enough fellow disabled athletes	13	3	-	-
Sports are too competitive	11	3	-	-
Not enough materials available	5	1	-	-
Other barriers	37	9	6	3
No barriers	112	17**	3	1**

^aMissing value; ^bParticipants could indicate multiple answers; *Significant differences between active and inactive participants (p = 0.003); **Significant differences between active and inactive participants (p < 0.001)

Logistic regression

Education, white cane, use of computer software, having a guide dog, disability (experienced as barrier), costs, lack of peers/buddies, age and gender were entered as predictors of sports participation in a logistic regression (Table 5). The significant factors predicting sports participation were education, disability

Table 4 Facilitators for initiating and maintaining participation in active participants

	Initiating Participation (n = 411)		Maintaining Participation (n = 411)	
	n	%	n	%
Personal factors^a:				
Health/physical fitness	349	85	344	84
Fun/relaxation	304	74	310	75
Social contacts	206	50	212	52
Strength	119	29	119	29
Weight control	110	27*	129	31*
Loose energy	98	24	90	22
Self confidence	71	17	67	16
Independence ^b	51	12	42	10
Learning new skills ^b	50	12		
Competition/winning	36	9	39	10
Accepting disability ^b	34	8		
Dealing with disability and assistive device ^b	23	6		
Other	28	7	38	9
Environmental factors^a:				
Support from family, partner or children	128	31	139	34
Support from friends and colleagues	85	21	96	23
Medical advice from a rehabilitation professional	65	16**	39	10**
Other	75	8	35	9

^aParticipants could indicate multiple answers; ^bOnly factors for initiating exercise; *Significant differences between initiating and maintaining participation ($p = 0.04$); **Significant differences between initiating and maintaining participation ($p < 0.001$)

(experienced as barrier), costs, lack of peers/buddies and computer software. Overall, the correct prediction of sports participation was 72%. Active participants experienced a lack of qualified supervision as a barrier more often than inactive participants. However, because only a small sample of inactive participants mentioned lack of qualified supervision as a barrier, this variable was excluded as a predictor in the logistic regression because of overfitting.

Discussion

Our aim was to gain insight into barriers and facilitators of sports experienced by people with a visual impairment. Active participants used a computer and/or specialized computer software, with more participants with a higher education using computer software. Inactive participants mentioned their disability, the costs and lack of exercising with peers or buddies as barriers to sports and/or exercise. The most mentioned facilitators were health, fun and social contacts. The positive

Table 5. Variables associated with sports participation that were included in the logistic regression

Variable	Coefficient	SE	p-value	OR	95% CI
Education*	.440	0.213	0.039	1.553	1.022-2.359
Disability (experienced as barrier)**	-0.561	0.258	0.030	0.571	0.344-0.947
Costs**	-1.326	0.285	<0.001	0.266	0.152-0.465
Peers/buddy**	-1.907	0.323	<0.001	0.149	0.079-0.280
Use of computer software**	0.635	0.212	0.003	1.888	1.245-2.862
White cane**	0.053	0.211	0.801	1.054	0.698-1.593
Guide dog**	0.412	0.300	0.170	1.510	0.838-2.719
Age**	0.005	0.006	0.368	1.005	0.994-1.016
Gender**	0.186	0.203	0.361	1.204	0.808-1.794
Constant	-0.642	0.587	0.274	0.526	

SE: Standard Error; OR: Odds Ratio; 95% CI: 95 % Confidence Intervals; * High education = 1, low education = 0; ** Quoted = 1, not quoted = 0

association with education and computer use could indicate that these people have learned to use more tools to cope with potential problems. People who have a high school, college or university degree may have had more experience in solving problems or tasks, which could also help them in finding solutions or alternatives for barriers to sports participation. As most participants completed the questionnaire online, it was expected that the use of a computer or computer software was a frequently used assistive device. However, the use of computers and/or computer software also turned out to be a positive factor for sports participation. The use of computers or computer software allows participants to gain more information about the possibilities of sports. The internet could also be a large source of information about the possibilities of sports for people with visual impairments.

Lack of qualified supervision was not included in the logistic regression as a variable, even though there was a significant difference between the active and inactive participants. It could be imagined that inactive participants do not consider lack of supervision as a barrier if they have never participated in sports before. They cannot know what the effect of poor supervision will be on their sports participation. Therefore, interpretation of this variable should be considered very carefully. Supervision was mentioned very few times (n= 5) by inactive participants, which could have led to overfitting in the regression analysis. When a sample is too small, the particular value of the variable in the model will be an overestimation, and the outcome cannot be generalized to the total population^[26]. With these considerations in mind, supervision was excluded as a variable for the logistic regression analysis. Other factors significantly related to sports participation will

be discussed below.

Barriers

Personal factors

Experiencing visual impairment as a barrier was mentioned as a personal barrier by active and inactive participants and was negatively associated with sports. Active participants also mentioned dependence on others to be able to exercise as personal barrier. Previous research in (Paralympic) athletes with spinal cord injuries also found dependence on others to be a personal barrier^[14,15]. These athletes mentioned that it can be felt as a burden that they need one or sometimes several people who help them to access the equipment or help with doing exercises^[15]. To gain independence and lessen the burden, it could be important to focus more on the abilities than the disabilities of the visual impairment, which could also increase the self-confidence of people with visual impairments.

Many inactive participants experienced their disability as a barrier to sports participation. However, previous data indicated that duration, level and cause of visual impairment does not influence sports participation^[8,27]. Participants might not experience the disability as a barrier but instead have difficulties coping with the disability. A study on motivations and strategies of sports in women with Multiple Sclerosis indicated that inactive participants displayed fewer strategies in overcoming disease-specific barriers to sports and adapting activity to overcome the barrier than active participants^[28]. Therefore, developing strategies should be facilitated to overcome barriers and stimulating sports participation in people with visual impairments.

The level of visual impairment in our population had no significant influence on participation in sports, which is consistent with a recent study using pedometers to establish sports participation in people with visual impairments^[29]. However, other research found that a higher level of impairment was associated with less participation in sports^[30,31]. Because the number of participants varied in these studies, further research is needed to provide more conclusive results on the influence of the level of visual impairment on sports participation.

Environmental factors

Transport is a frequently mentioned environmental barrier for both active and inactive participants. Previous research on sports in people with (physical) disabilities has also mentioned transport as a barrier^[16,32]. Inactive participants in the present study also mentioned the costs of participating in sports as an environmental barrier, which is consistent with previous research in people with physical disabilities^[16,33].

Costs for sports participation could be reduced by choosing a home-based sports program instead of membership of a sports club, which could also solve problems with transport.

The lack of peers or buddies for sports participation was another environmental barrier that was mentioned by inactive participants and was also negatively associated with sports participation. Therefore, it is recommended to develop social frameworks, by which a system of peers is organised for increasing participation in common activities such as walking, fitness and recreational cycling. Regular cycling clubs could also consider introducing tandem cycling within their club. Only a few team sports are eligible for people with visual impairments, making it hard to set up clubs and competitions for these sports. For example, goal ball is a sport designed especially for people with a visual impairment. Players have to roll a ball into the opposite goal while opposing players try to block the ball with their bodies^[34]. The Netherlands has only thirteen goal ball clubs, which are primarily located in the southern part of the country^[35]. These locations make it hard for people with visual impairments from other parts of the country to also participate in goal ball.

Facilitators

While lack of peers and buddies was perceived as an environmental barrier, acquiring social contacts was mentioned as an important personal facilitator for initiating and maintaining participation in sports. Additional important facilitators were health and fun. Previous research also indicated health, fun and social contacts as facilitators of sports for people with disabilities. Paralympic athletes mentioned health and fun for initiating and maintaining participation in sports^[14] to help in preventing secondary conditions such as cardiovascular disease, obesity and type 2 diabetes mellitus and maintaining physical fitness^[11,36,37]. Good health can also contribute to the maintenance of independence^[15,38]. Weight control was the only facilitator that was considered more important for maintaining participation than for initiating sports (see Table 4). Previous research on sports in women with Multiple Sclerosis also demonstrated weight control was an important motive to maintain physically active^[28]. Other than weight control, no differences were found regarding facilitators for initiating and maintaining participated in sports.

Support from family was the most important environmental facilitator for people with visual impairments to become and stay motivated in sports, which was consistent with previous research in (Paralympic) athletes^[14,39].

Limitations

The response rate in this study was 648 participants (13%), which also included people with visual impairments who were registered at more than one centre of expertise. It could therefore be reasonable to think that the actual response rate would be higher if information about double registration could have been provided by the centres of expertise. Many previous studies did not report response rates because they used convenient samples^[3,9,21,27]. Studies that have reported response rates have a large variety in rates. Research with questionnaires being part of a large population-based study usually displays high response rates between 66 and 83%^[40,41]. Cross-sectional research that only uses a questionnaire^[42] has a remarkably lower response rate (27%). Therefore, unfortunately, as in this study, a low response rate in cross-sectional research is common.

Almost two-third of the participants in this study participated in sports, according to our definition. Although there were no differences in mean age and percentages of men and women between the total approached population and the participants, it cannot be concluded whether these percentages for sports participation are representative for the total approached population. Moreover, previous research^[11] on other disability groups indicated a much lower percentage of sports participation of people with physical disabilities (44%). The high percentage in this study could be the result of selection bias. During the recruitment stage, we might not have explained clearly enough that we were recruiting both active and inactive participants in this study. Therefore, future research should be careful in choosing definitions of movement or sports to obtain a better representation of the total population. The high percentage of sports participants could have occurred because of the classification of visual impairment used in this study, i.e., visual acuity. Previous research has demonstrated that other measures of visual functioning such as (binocular) visual field could be a better predictor of mobility instead of visual acuity^[43-45]. Thus, it could be that active participants are over-represented in this study. Research has indicated that binocular visual field loss is associated with a lower participation in sports^[30]. Unfortunately, measures of visual field were not included in this study because the level of visual impairment was self-reported. Future research should carefully determine the classification of the visual impairment of participants to provide a representative group of participants.

It is possible that the number of active participants in this study is an overestimation. It is therefore likely that a higher percentage of participants were inactive than what was reported. For those people with visual impairments who do not (want to) participate in sports, it would be recommendable to at least try to improve their (physical) activity level. Future research might therefore also

consider focusing on barriers and facilitators of all types of physical activity, as inactive people with visual impairment might benefit from every improvement in (physical) activity.

Conclusions

Health professionals should try to decrease barriers, such as problems with transport, lack of information and lack of sports peers/buddies, prior to the start of sports programs. Both the personal and environmental barriers and facilitators should be considered in advising people with visual impairments about sports participation. The people's positive attitude toward sports participation and support from their family and friends is essential for successful participation in sports. The emphasis of a sports program should also be on the positive aspects of sports, such as fun, increasing health and social contacts, to improve sports participation in people with visual impairments.

Acknowledgements

The authors would like to thank Royal Visio (S. van der Steen), Bartiméus (M. Benning) and the Eye Association (R. van Vliet) for their support and help in distributing the questionnaire. The authors would also like to thank R. van der Vliet and T. van Weerdenburg for their advice and suggestions for the questionnaire and testing the compatibility of the online questionnaire. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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Appendix 1

Questionnaire on barriers and facilitators of sports

Research showed that only a small group of people with a visual impairment exercise regularly. We are from the Department of Rehabilitation Medicine of the University Medical Center Groningen, and are interested in what are reasons for people with a visual impairment to be physically active or not. Results from this questionnaire can help in providing insight in the most important barriers of exercise and what are decisive factors to engage in exercise.

This research is in collaboration with Disability Sports Netherlands, the National Paralympic Committee of the Netherlands and the Dutch Centre for people with visual impairments.

There are no correct or incorrect answers to these questions. What counts is your opinion. Every question is asked with a specific reason, even if the question may not seem relevant to you personally.

The answers to this questionnaire will be processed anonymously.

Completion of the questionnaire will take only 15 minutes.

Thank you in advance for your cooperation.

General questions:

1) Could you please fill in your initials:

.....

2) Sex:

- ☐ Male
- ☐ Female

3) Date of birth:

.....

4) Please indicate your current living arrangements:

- ☐ Independent, alone
- ☐ Independent, with spouse and/or children
- ☐ Living at home (with parents)
- ☐ Sheltered housing
- ☐ Other, namely.....

5) Please indicate the highest level of education you completed:

- ☐ None
- ☐ Primary school
- ☐ Lower General Secondary Education (practical)
- ☐ Lower General Secondary Education (theoretical)
- ☐ High school degree
- ☐ Vocational education
- ☐ Applied sciences
- ☐ University degree

6) Please indicate the net yearly income of your household:

- ☐ € 0 - € 913
- ☐ € 914 - € 1.303
- ☐ € 1.304 - € 1.700
- ☐ € 1.701 and € 3.000
- ☐ € 3.001 - € 3.500
- ☐ > € 3.500
- ☐ Rather not say

7) Please indicate

- ☐ Mild visual impairment
- ☐ Moderate visual impairment
- ☐ Severe visual impairment
- ☐ Blindness
- ☐ Other, namely.....

8) Please indicate the onset of your impairment:

Please indicate year

.....

9) Do you use any assistive devices for activities of daily living?

- ☐ No → *Please go to question 11*
- ☐ Yes

10) If yes, what type of assistive device?

Multiple answers possible

- ☐ Braille
- ☐ White cane
- ☐ Guide dog
- ☐ Loupe, magnifying glass
- ☐ Magnifying screen for the computer
- ☐ Computer software
- ☐ Other, namely.....

Sports

The next questions are about your participation in sports. We have defined sports as: moderate intensive physical activity, with or without a game element, where endurance and skills are needed or being improved. A minimum of two 30 minutes sessions or one 60 minute session of moderate intensity per week is required.

For example: You cycle or walk twice a week for at least 30 minutes at a moderate intensity.

Please be aware that mind sports such as chess or checkers are outside this definition of sports.

11) Are you participating in any sports at the moment?

- ☐ Yes → *Please go to question 15*
- ☐ No

12) Have you ever participated in any sports?

- ☐ Yes

- ☐ No → Please go to question 14

13) If yes, in what sport did you used to participate?

.....
.....

14) Why are you not or no longer participating in sports?

Multiple answers possible

- ☐ I do not like or do not feel like participating in sports
- ☐ I have an injury
- ☐ It takes up too much of my time
- ☐ Participating in sports is too expensive
- ☐ I do not have enough information about sports possibilities
- ☐ I do not have a sports buddy
- ☐ There are no sports facilities in the neighborhood
- ☐ I feel ashamed of my impairment
- ☐ Transport to and from the facilities is difficult
- ☐ Other, namely.....

Please proceed to question 29

15) What sport(s) are you participating in at the moment?

- ☐ Aerobics
- ☐ Aqua gym/Aqua jogging
- ☐ Archery
- ☐ Athletics
- ☐ Badminton
- ☐ Basketball
- ☐ Boccia
- ☐ Body pump
- ☐ Climbing
- ☐ Cycling (competitive)
- ☐ Cycling (recreational)
- ☐ Dancing
- ☐ Endurance training
- ☐ Equestrian
- ☐ Fitness
- ☐ Football
- ☐ Goal ball
- ☐ Gymnastics
- ☐ Handball
- ☐ Judo
- ☐ Martial Arts
- ☐ Rowing
- ☐ (Ice) Skating
- ☐ Shooting
- ☐ Show down
- ☐ Spinning
- ☐ Squashing
- ☐ Table tennis
- ☐ Tennis

- ☐ Walking
- ☐ Winter sports (skiing, cross country)
- ☐ Sailing
- ☐ Swimming
- ☐ Yoga
- ☐ Zumba or equivalent
- ☐ Other
namely.....

16) Are you a member of a sports club?

A fitness club is also considered a sports club

- ☐ Yes
- ☐ No → Please go to question 18

17) If so, what type of sports club are you a member of?

- ☐ An able-bodied sports club
- ☐ A sports club for disabled sports
- ☐ Fitness club

18) At what level are you participating in sports?

- ☐ Recreational level
- ☐ Competitive level
- ☐ Elite level (nationally and/or internationally)

19) How long have you been participating in sport(s)?

Concerning the sports you ticked at question 15

Sport	Year
1.
2.
3.

20) How many hours per week do you participate in sport(s)?

Concerning the sports you ticked at question 15

Sport	Hours per week
1.
2.
3.

21) Did you participate in any sport, before the onset of your visual impairment?

- ☐ Yes, namely.....
- ☐ No
- ☐ Not applicable

22) Did you participate in multiple sports, before participating in your current sport(s)?

- ☐ Yes, namely.....
- ☐ No
- ☐ Not applicable

Barriers and facilitators of sports

23) Did somebody encourage you to start participating in sports?

- ☐ No → Please go to question 25
- ☐ Yes

24) Who encouraged you to start participating in sports?

Multiple answers possible

- ☐ Medical specialist (rehabilitation specialist, surgeon, etc)
- ☐ Physiotherapist
- ☐ General Practitioner
- ☐ Sports & Exercise coordinator
- ☐ Cesar therapist
- ☐ Occupational therapist
- ☐ Family
- ☐ Parents/Caretaker
- ☐ Friends
- ☐ Partner
- ☐ Lecturer
- ☐ Other, namely.....

25) How did you discover sports possibilities for people with visual impairments?

Multiple answers possible

- ☐ Local newspaper
- ☐ National newspaper
- ☐ Internet, website:.....
- ☐ Information from the county
- ☐ Information from the physiotherapist
- ☐ Information from the medical specialist/ rehabilitation centre
- ☐ (Local) interest groups for people with disabilities
- ☐ Family and friends
- ☐ Education
- ☐ Sports club
- ☐ Information centre for sports at the rehabilitation centre
- ☐ Fellow patients
- ☐ Other, namely.....

26) What were reasons to start participating in sports?

Multiple answers possible

Personal factors:

- ☐ Increasing Health/physical fitness
- ☐ Having fun/relaxation
- ☐ Increasing Strength
- ☐ Increasing Social contacts
- ☐ Losing weight
- ☐ Increasing Self confidence
- ☐ Loosing energy
- ☐ Learning new skills
- ☐ Competition/winning
- ☐ Increasing independence
- ☐ Accepting disability
- ☐ Learning how to deal with disability/ wheelchair/assistive device
- ☐ Other, namely.....

Environmental factors:

- ☐ Support from family, partner or children
- ☐ Support from friends and colleagues
- ☐ Medical indication
- ☐ Other, namely.....

27) What were facilitators to maintain participating sports?

Multiple answers possible

Personal factors:

- ☐ Remaining health/physical fitness
- ☐ Remaining fun/relaxation
- ☐ Remaining strength
- ☐ Remaining social contacts
- ☐ Controlling weight
- ☐ Remaining self confidence
- ☐ Losing energy
- ☐ Competition/winning
- ☐ Independence of others
- ☐ Other, namely.....

Environmental factors:

- ☐ Support from family, partner or children
- ☐ Support from friends and colleagues
- ☐ Medical indication
- ☐ Other, namely.....

28) What barriers did you experience when you started participating in sports?

Multiple answers possible

- ☐ No barriers

Personal factors:

- ☐ Not being able to exercise because of disability
- ☐ Being (too) busy with other activities
- ☐ Not being comfortable in the presence of other athletes
- ☐ Having fear of injuries
- ☐ Being dependent of others to be able to exercise
- ☐ Other, namely.....

Environmental factors:

- ☐ Sports possibilities are unknown
- ☐ Having little sports possibilities in the neighborhood
- ☐ No/not sufficiently qualified supervision
- ☐ Facilities not (sufficiently) adjusted
- ☐ Transport
- ☐ Materials not (sufficiently) adjusted
- ☐ Lack of materials available
- ☐ Materials are too expensive
- ☐ Practice/Training is not (sufficiently) adapted
- ☐ Sports activities are too expensive
- ☐ Sports are too competitive
- ☐ Lack of possibilities to exercise with peers
- ☐ Disabled athletes are not (fully) accepted
- ☐ Lack of support from environment
- ☐ Lack of fellow disabled athletes
- ☐ Other, namely.....

29) What wishes do you have in terms of participating in sports for people with visual impairments?

Multiple answers possible

- ☐ Sports facilities that are better adjusted for disabled sports
- ☐ More possibilities to participate in sports with peers or with a sports buddy
- ☐ More possibilities to participate in sports with able-bodied persons
- ☐ More possibilities to participate in sports with other people with impairments
- ☐ Other,
namely.....

30) Research is necessary to increase medical care, now and in the future. Would you mind being approached again for participating in a research of the Rehabilitation Department of the University Medical Center of Groningen, the Netherlands?

- ☐ Yes
- ☐ No, please indicate name and (email) address below.
Name:
Address:
Email address:
Phone number:

Thank you for your time and cooperation

Sports participation of people after rehabilitation: Barriers and facilitators

*Eva A. Jaarsma, MSc; Rienk Dekker, MD, PhD; Jan H.B. Geertzen, MD, PhD;
Pieter U. Dijkstra, PT, PhD.*

Abstract

Purpose: To analyse barriers and facilitators of sports participation of people with physical disabilities after rehabilitation and compare differences between inactive and active participants regarding these experienced barriers and facilitators.

Methods: Participants were 1,223 adults (Mean age = 51.6 years, SD = 15.1) treated in the Rehabilitation Centre of the University Medical Center Groningen, who completed a questionnaire. The questionnaire consisted of the RAND-36 and a self-constructed part regarding barriers and facilitators.

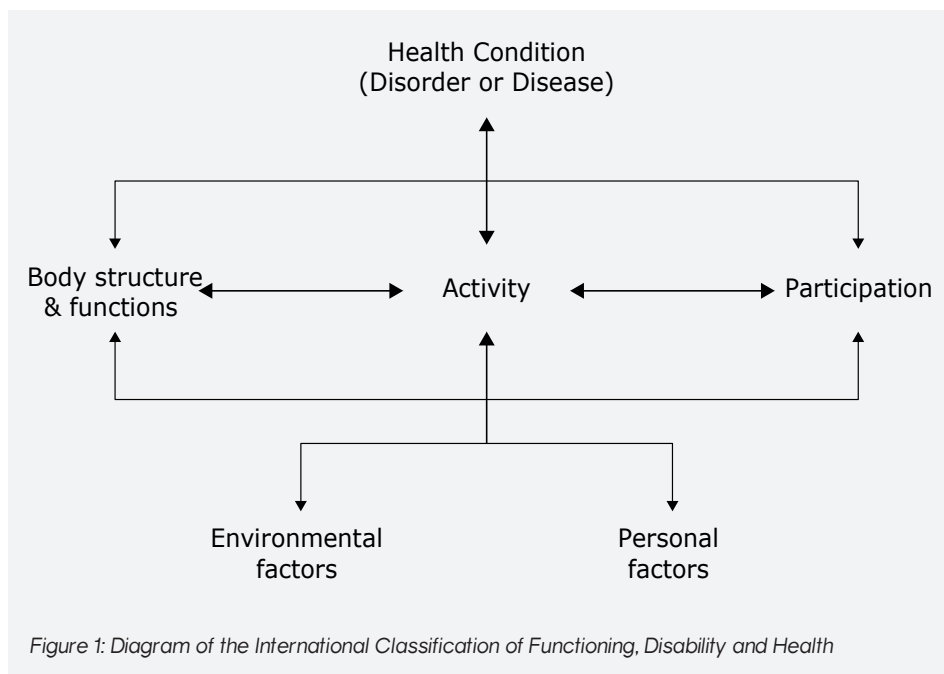
Results: A total of 58% of the participants was active in sports after their rehabilitation. Being younger and higher educated was positively associated with sports participation, whereas using assistive devices and experiencing environmental barriers were negatively associated. Facilitators of sports participation were health, fun and increasing physical strength, and advice from rehabilitation professionals.

Discussion: Rehabilitation professionals should emphasis health benefits and fun of sports participation for people with physical disabilities. They should repeatedly remind people with physical disabilities to stay/become active after completing their rehabilitation program. Rehabilitation professionals should provide information about strategies to reduce environmental barriers of sports participation which could help people using assistive devices to overcome these barriers.

Introduction

On average, only one-third of people with physical disabilities regularly participate in sports, compared to two-thirds of people without physical disabilities^[1,2]. Previous research demonstrated that not participating in sports could increase the risk of secondary health conditions such as heart disease, diabetes type II and obesity^[1,3]. Even though sports are often part of the rehabilitation program in the Netherlands, only few people with physical disabilities maintain active in sports after completing their rehabilitation program^[4]. To understand why the majority of people with physical disabilities do not participate in sports, it is important to know what prevents them from participating in sports and how they could be facilitated and motivated to become active in sports. A recent systematic review on barriers to and facilitators of sports participation demonstrated that people with physical disabilities often experienced barriers such as (disability related) health problems, lack of energy or fatigue that prevented them from participating in sports^[5]. Difficulties with sports accommodation, transport and costs were also reported as barriers to sports participation^[5]. Frequently reported facilitators of sports participation for people with and without physical disabilities were health, fun and social contacts^[5-14].

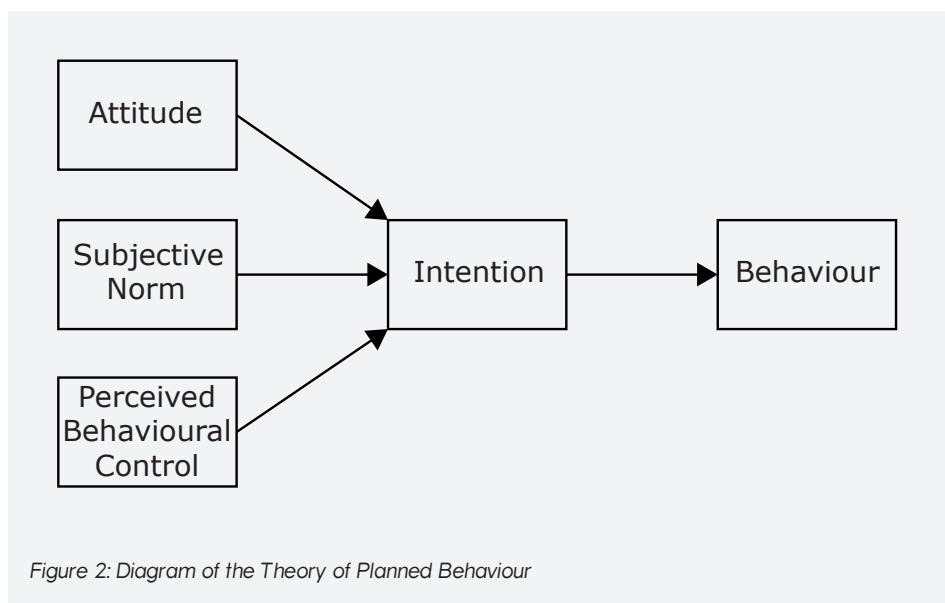
Several models or theories can be used to study why people with physical



disabilities decide to participate in sports or not. Two models that have been frequently used are the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization (WHO) and the Theory of Planned Behaviour (TPB). The ICF is a classification of health domains from body, personal and environmental perspectives. Focusing on the personal perspective, a health condition can be divided into three “Body structure and functions”, “Activity” and “Participation”^[18]. This study will focus on the “Participation” component of ICF which also includes sports participation^[18]. Sports participation falls under the component “Participation” of ICF which influences “Health Condition” together with “Body structure & functions” and “Activity” (Figure 1)^[9,12,15-17]. Regarding (sports) participation, the ICF distinguishes personal and environmental factors.

The TPB by Ajzen combines the components Attitude, Subjective Norm and Perceived Behavioural Control to determine intention, which, in turn, leads to behaviour (Figure 2)^[19].

Attitude is a person’s positive or negative expectancy towards behaviour.



Subjective norm refers to the social pressure regarding behaviour. Perceived behavioural control is the belief that a person can control his or her own behaviour in certain situations^[19].

Most studies focusing on barriers and facilitators of sports participation of people with physical disabilities included either inactive or active participants^[13,20-24]. Focusing on one group does not allow direct comparison of differences in barriers

and facilitators between active and inactive participants. Knowledge on these differences could help rehabilitation professionals in providing a more thoroughly founded advice for sports participation depending on the activity level of the person with a physical disability.

Studies often also did not distinguish between physical disabilities, to determine whether differences exist in barriers and facilitators of sports between different physical disabilities^[9,12,25,26].

Therefore the aim of this study is to analyse which barriers and facilitators influence sports participation of people with different physical disabilities. We also compared inactive and active participants regarding their experienced barriers and facilitators of sports participation. Finally, we determined which variables were significantly associated with sports participation.

Methods

Participants

Participants in this study were all people with a physical disability of 18 years or older who had been treated in the Rehabilitation Centre of the University Medical Center Groningen, the Netherlands between 1st January 2009 and 31st December 2011. Excluded were patients with a diagnosis of orthopaedic origin (e.g. anterior cruciate ligament injury and total hip or knee replacement) and patients receiving cardiac or pulmonary rehabilitation. A total of 3169 (ex-) patients were invited to complete the questionnaire.

Questionnaire

The questionnaire (36 items) (Appendix 1) used in this study was a validated Dutch translation of the RAND 36-item Health Survey (RAND-36)^[27,28], combined with a self-constructed questionnaire on barriers and facilitators of Paralympic athletes, published elsewhere^[6]. The RAND-36 is a self-administered questionnaire containing 36 questions measuring health related quality of life^[28] of which the Dutch translation has shown an internal consistency between 0.71-0.92^[29]. The self-constructed questionnaire on barriers and facilitators was used, because no questionnaire is available specifically focusing on both barriers and facilitators of sports participation. Items from the questionnaire on barriers and facilitators in Paralympic athletes were modified to make them relevant for people with physical disabilities. Therefore items about mental training and nutrition in the original

Paralympic questionnaire were excluded. A definition for sports participation was included for this study, namely 'an activity involving physical exertion with or without a game or competition element with a minimal duration of 30 minutes for at least two times a week where skills and physical endurance are either required or to be improved'^[4,8,30]. To be able to compare sports participation of the participants, we only focused on sports. We excluded the broader term physical activity because it has various definitions, from household chores to moderate intensity activity^[31]. All items about barriers and facilitators were divided into personal and environmental factors according to the ICF. Items about physical disability and sports participation were grouped according to the components of the TPB. The complete methodology of the Paralympic questionnaire has been published elsewhere^[6].

Procedure

In the envelope sent to the subjects, a cover letter was included that explained the purpose and methodology of the study. The letter also ensured all data would be processed anonymously and participation was voluntary. An informed consent form was included for participants to sign. Subjects were invited to either complete the paper questionnaire included in the envelope or to use the provided link to complete the questionnaire online. Both paper and online versions of the questionnaire were included in this study, to also allow participants without a computer to participate in the study. The study was approved by the Medical Ethical Committee of the Universal Medical Centre Groningen, the Netherlands (METc 2012.450).

Data collection and analysis

The patients' names, addresses, disability, gender, date of birth and date of last treatment of the research population were retrieved from the database of the Rehabilitation Center of the University Medical Center Groningen, the Netherlands.

Participants who completed the questionnaire were divided into inactive (less than 2 x 30 minutes a week) and active (at least 2 x 30 minutes a week) participants, based on their answer on the sports question (Appendix 1, question 12). Chi square tests were used to analyse differences in barriers and facilitators as well as experienced environmental barriers between inactive and active participants. A Mann-Whitney U test was used to analyse differences between inactive and active participants in follow up time (i.e. time between last date of treatment and date of distribution of the questionnaire). A Bonferroni correction

was applied for post hoc tests. To determine which variables were associated with sports participation a binary logistic regression (method enter) was used, which included all variables associated with sports participation ($p \leq 0.1$). The alpha level for statistical significance was set at 0.05 for all other tests in this study, except post hoc tests.

Results

A total of 3,169 people were invited to participate in this study, with a mean age of 51.6 (SD = 15.1) years and 49% were male. A total of 1,223 participants (39%) completed the questionnaire. Mean age of the participants was 53.4 (14.5) years and 50% were male (Table 1). Participants were significantly older than non-participants $t(2465.207) = 5.125, p < 0.001$. There were no significant differences in gender between participants and non-participants. Participants and non-participants did not significantly differ in time between the date of last treatment and the date of receiving the questionnaire (1 March 2013) respectively median 27 months, interquartile range (IQR) 20 ; 37 and median 29 months, IQR 20 ; 39.

Fifty-eight percent of the participants participated in sports. The distribution of inactive and active participants differed between diagnosis groups ($\chi^2 = 31.807, df=1, p < 0.001$). More active participants were found for chronic pain (67%), brain injury (57%) and spinal cord injury (SCI) (55%), whereas more inactive participants were found for multiple sclerosis (MS) (60%) and amputation (57%). Living arrangements ($\chi^2 = 29.913, df=1, p < 0.001$) significantly differed between inactive and active participants; more active participants lived independently, either alone (64%) or with family (61%). More active participants also had a higher education ($\chi^2 = 17.424, df=1, p < 0.001$), and higher monthly net household income ($\chi^2 = 25.454, df=1, p < 0.001$) compared to inactive participants. Inactive participants used assistive devices more often than active participants ($\chi^2 = 63.081, df=1, p < 0.001$), especially wheelchairs ($\chi^2 = 20.454, df=1, p < 0.001; \alpha/4=0.0125$) and/or wheeled walkers ($\chi^2 = 57.709, df=1, p < 0.001; \alpha/4=0.0125$). Cycling (60%), walking (59%) and fitness (36%) were most frequently performed sports (Table 2).

Barriers

Inactive participants reported their disability (53%; $\chi^2 = 7.472, df=1, p=0.006$) and fatigue (42%, Table 3) ($\chi^2 = 8.719, df=1, p=0.003$) more often as personal barriers than active participants (45% and 33%, respectively). They also reported dependency of others (10%) more often than active participants (6%; $\chi^2 = 6.049, df=1, p=0.014$).

Active participants reported pain (7%) more often as personal barrier than inactive participants (2%) ($\chi^2= 14.269$, $df=1$, $p<0.001$). Inactive participants more often reported costs (12%) ($\chi^2= 4.989$, $df=1$, $p=0.02$) and the lack of a sports buddy (5%) ($\chi^2= 9.479$, $df=1$, $p=0.002$) as environmental barriers than active participants (8% and 2%, respectively). Overall, more inactive participants (44%) experienced at least one environmental barrier compared to active participants (30%; $\chi^2= 26.996$, $df=1$, $p < 0.001$).

Table 1: Characteristics of all participants and inactive and active participants separately.

	Total (n=1223)		Inactive (n=509)		Active (n=714)	
	M	SD	M	SD	M	SD
Age* (years)	53.4	14.5	55.8	14.7	51.6	14.0
	Median	IQR	Median	IQR	Median	IQR
Follow up (months)	27	[20-37]	27	[19-38]	27	[20-37]
	n	% [#]	n	% [#]	n	% [#]
Gender						
Men	609	50	264	52	345	49
Diagnosis group^{a,*}						
Amputation	49	4	28	5	21	3
Brain injury ^b	418	34	180	35	238	33
Chronic pain	334	27	112	22	222	31
Multiple sclerosis	73	6	44	9	29	4
Spinal cord injury	98	8	44	9	54	8
Other neurological disability ^c	99	8	49	10	50	7
Other ^d	152	12	52	10	100	14
Education*						
Lower education	796	65	366	72	430	60
Higher education	428	35	144	28	284	40
Living arrangements*						
Independent, alone	200	17	73	14	127	18
Independent, with spouse and/or children	817	67	317	63	500	71
Independent, with home care	115	10	72	14	43	6
Other ^e	81	7	43	9	38	5
Monthly net household income						
Lower income	445	36	226	44*	219	31*
Higher income	549	45	191	38*	358	50*
Rather not say	229	19	92	18	137	19
Assistive devices^f						
Use of assistive devices* (Yes)	477	39	265	52	212	3
-Prosthetics/Orthotics	35	3	14	3	21	3
-Wheelchair/Mobility scooter ^g	80	7	48	9*	32	5*
-Wheeled walker/ crutches/cane ^h	254	21	137	27*	117	16*
-Other ⁱ	92	8	44	9	48	7

*Percentages are column percentages, sum \neq 100%; ^aMultiple answers were possible; ^bThe Paralympic Movement uses the term 'disability group' instead of 'diagnosis group'; ^cBrain injury include brain injuries from vascular, traumatic or oncological origin and meningitis; ^dOther neurological diseases include Spina Bifida, Parkinson's Disease, Guillain-Barré Syndrome and Cauda Equina Syndrome; ^eOther diseases include disabilities such as tumours, fibromyalgia, arthritis, multi trauma and chronic fatigue syndrome; ^fOther living arrangements are living at home (with parents or a guardian), sheltered housing or elderly home; ^gBonferroni correction $\alpha/4 = 0.0125$; ^hOther assistive devices include devices such as a stair lift, white cane, toilet with handles or shower chair; ⁱ Significant differences between inactive and active participants ($p < 0.01$); SD = Standard Deviation, IQR = interquartile range

Table 2: Sports performed by active participants

Sports [§]	Total (n=714)	
	n	% [#]
Cycling	431	60.4
Walking	425	59.4
Fitness (including physio fitness)	256	35.9
Swimming	133	18.6
Endurance training	98	13.7
Running	29	4.1
Yoga	28	3.9
Zumba or equivalent	26	3.6
Gymnastics	20	2.8
Dancing	18	2.5
Spinning	16	2.2
Aqua gym or aqua jogging	15	2.1
Golf	13	1.8
Rowing	11	1.5
Football (Soccer)	10	1.4
(Ice) Skating	10	1.4
Tennis	9	1.3
Equestrian	8	1.1
Skiing	8	1.1
Sailing	7	1.0
Athletics	6	0.8
Basketball	5	0.7
Shooting	5	0.7
Martial arts	4	0.6
Body pump	4	0.6
Aerobics	3	0.4
Climbing	2	0.3
Judo	2	0.3
Table tennis	2	0.3
Other	109	15.3

Percentages are column percentages, sum ≠ 100%; § Multiple answers were possible

Facilitators

Health (88%), fun (63%) and increasing physical strength (50%) were most important personal facilitators of sports participation for active participants. Most important environmental facilitators for active participants were advice from rehabilitation professionals (39%) and support from family (30%, Table 4).

Table 3: Barriers of sports participation according to inactive and active participants

Barriers	Inactive (n=509)		Active (n=714)	
	n	% [#]	n	% [#]
Personal factors[§]				
Disability	268	53**	318	45**
Fatigue/ Lack of energy	213	42**	234	33**
Dependency of others	49	10*	42	6*
Injuries	49	10	76	11
Takes too much time/Too busy with other activities	49	10	61	9
Participant does not like sports	32	6	-	-
Uncomfortable among others	27	5	42	6
Ashamed of disability	22	4	-	-
Pain	11	2***	49	7***
Other	-	-	60	8
Environmental factors[§]				
Costs	62	12*	59	8*
No fitting sport	43	9	46	6
Lack of a sports buddy	24	5**	12	2**
Lack of information about sports facilities	19	4	30	4
Lack of sufficient transport facilities	19	4	19	3
Lack of sports facilities in the neighbourhood	18	4	33	5
Lack of acceptance of other people	17	3	13	2
Lack of (sufficient) supervision	15	3**	35	5**
Lack of support/help from environment	15	3	11	2
Courses are not (sufficiently) adjusted	10	2	22	3
Equipment is not (sufficiently) adjusted/available	10	2	9	1
Accommodation is not (sufficiently) adjusted	8	2	22	3
Lack of possibilities to sport with peers	4	1	13	2
Other	42	8	44	6
No barriers	-	-	136	19

[#]Percentages are column percentages; [§]Multiple answers were possible

*Significant differences between inactive and active participants (p < 0.05); **Significant differences between inactive and active participants (p < 0.01); ***Significant differences between inactive and active participants (p < 0.001)

Table 4: Facilitators of sports experienced by active participants

Facilitators	Active (n=714)	
	n	% [#]
Personal factors[§]		
Health	629	88
Fun	451	63
Getting stronger	355	50
Social contacts	249	35
Coping with disability	190	27
Loose weight	192	27
Increase self confidence	126	18
Acceptance disability	114	16
Release energy	93	13
Gain independence	99	14
Winning/Competition	47	7
Learning a new skill	32	5
Other	53	7
Environmental factors[§]		
Advice from rehabilitation professional	279	39
Support from family, spouse and/or children	217	30
Support from friends, colleagues and/or peers	105	15
Other	45	6

[#]Percentages are column percentages; [§]Multiple answers were possible

Multivariate analysis

Gender, age, education, living arrangements, use of assistive devices, diagnosis group, costs, dependency of others, disability (experienced as a barrier), experiencing environmental barriers, lack of energy, lack of a sports buddy, lack of supervision and pain were entered as predictors of sports participation in a logistic regression (Table 5). Dummy variables were created to enter the different diagnoses as categorical variables, with amputation as reference category. Younger age and higher education were positively associated with sports participation, whereas use of assistive devices and experiencing environmental barriers were negatively associated. Lack of supervision and pain were also positively associated with sports participation. Diagnoses did not have significant influence on the prediction of sports participation. The overall correct prediction of sports participation was 65%.

Table 5: Variables associated with sports participation that were included in the logistic regression

	Coefficient	SE	p-value	OR	95% CI
Characteristics					
Age (centered at 50 yrs)	-0.02	0.005	0.001	0.98	0.98 - 0.99
Education ^b	0.40	0.14	0.004	1.50	1.13 - 1.97
Gender ^b	-0.002	0.14	0.99	1.00	0.77 - 1.30
Living arrangements	0.03	0.08	0.72	1.03	0.88 - 1.21
Use of assistive devices ^b	-0.82	0.17	<0.001	0.44	0.32 - 0.61
Diagnosis group^{a, b}					
Amputation			0.23		
Brain injury	0.21	0.30	0.49	1.23	0.68 - 2.24
Chronic pain	-0.59	0.34	0.08	0.56	0.29 - 1.07
Multiple Sclerosis	-0.14	0.22	0.53	0.87	0.56 - 1.34
Spinal Cord Injury	-0.22	0.40	0.59	0.81	0.37 - 1.77
Other neurological disability	-0.37	0.27	0.11	0.69	0.43 - 1.09
Other	-0.29	0.30	0.33	0.75	0.42 - 1.33
Barriers^c					
Costs	0.06	0.24	0.80	1.06	0.66 - 1.71
Dependency of others	0.08	0.27	0.77	1.08	0.64 - 1.83
Disability (experienced as barrier)	-0.09	0.14	0.53	0.92	0.69 - 1.21
Experiencing environmental barriers	-0.66	0.17	<0.001	0.52	0.38 - 0.72
Fatigue/ Lack of energy	-0.20	0.14	0.14	0.82	0.62 - 1.07
Lack of sports buddy	-0.62	0.41	0.13	0.54	0.24 - 1.21
Lack of (sufficient) supervision	1.24	0.37	0.001	3.44	1.67 - 7.11
Pain (experienced as barrier)	1.40	0.41	0.001	4.06	1.83 - 9.03
Constant	0.95	0.33	0.003	2.60	

SE: Standard Error; OR: Odds Ratio; 95% CI: 95 % Confidence Intervals; ^aCategorical variables; ^bReference categories: gender: female; education: lower; use of assistive devices: no; diagnosis group: amputation; ^cQuoted = 1, non quoted = 0

Discussion

In total 58% of people after their rehabilitation were engaged in sports. Inactive and active participants differed in characteristics as well as experienced barriers. Active participants more often were people with chronic pain, brain injury or SCI, lived independently more frequently, and had higher education and income. They were also younger and more mobile, as the majority of active participants did not use any assistive devices. Inactive participants more often experienced their disability, dependency of others, lack of energy, costs and lack of a sports buddy as barriers to sports participation. Most frequently reported facilitators were health, fun and getting stronger, and advice from rehabilitation professionals.

International Classification of Functioning, Disability and Health

Personal and environmental factors

Multivariate analysis

The multivariate analysis showed that a younger age and higher education were positively associated with sports participation. Previous studies reported mixed results of the influence of age on sports participation of people with physical disabilities. Some studies did not report differences in age between inactive and active participants^[8,32,33]. However, other studies, including a study focusing on people with physical disabilities in an outpatient rehabilitation program reported that being younger was positively associated with sports participation^[23,34-36].

The positive association of education on sports participation could indicate that these people have more experience in coping with barriers. People with higher education (high school or more) might have learned more skills in terms of coping with problems, or are more ready to become active in sports, despite possible barriers. These results have also been shown in previous studies in people with physical disabilities including visual impairments and arthritis^[23,32,37] where active people reported less barriers.

Using assistive devices such as a wheelchair or crutches and experiencing (environmental) barriers to sports participation were negatively associated with sports participation. Previous research has demonstrated that athletes who use a wheelchair in daily living experience more barriers of sports participation than ambulant athletes^[6]. Sports facilities and equipment might not be sufficiently adapted or accessible for people with physical disabilities using assistive devices^[12,38-40]. However, having to use assistive devices is generally related to the disability of the patient. Perhaps the barrier is not necessarily the use of an assistive device, but refers to the underlying disability that necessitates the patient to use an assistive device.

Both “lack of supervision” and “pain” were significantly and positively related to sports participation. Both barriers were mentioned more often by active than by inactive participants. According to the results from the logistic regression this would imply that experiencing pain or lack of supervision increases the chances of participating in sports. These results are counter intuitive and may be caused by the question itself. Inactive participants might not consider lack of supervision or pain as barriers when they have never participated in sports before. Without prior experience of sports, inactive participants cannot know what the effect of poor supervision or pain will be on their sports participation. Therefore, these variables should be interpreted carefully.

The multivariate analysis did not demonstrate differences in diagnosis groups,

which makes younger age, higher education, not using assistive devices and not experiencing environmental barriers applicable for all diagnosis groups. Unfortunately, age and education are fixed and unchangeable. Increasing the patient's mobility and independency by using assistive devices when needed is already part of the rehabilitation program. Using an assistive device generally is related to the disability of the patient, and cannot be reduced because they are necessary for function in daily living.

Rehabilitation professionals, however, could inform patients about environmental barriers of sports participation that might encounter to help in providing strategies to overcome these barriers. Information about availability of (adjusted) transport, accessibility of sports clubs and/or equipment can help patients in decreasing possible environmental barriers. The final model correctly predicted 65% of sports participation for people with physical disabilities. Rehabilitation professionals should therefore also pay attention to individually experienced barriers of sports participation, to also cover the remaining 35% that could not be predicted in the model.

Facilitators

Health, fun and improving physical strength were facilitators that were also frequently reported in previous studies^[8-10,12-14,26,41]. Participants in our study reported similar facilitators of sports participation compared to other people with or without physical disabilities.

An interesting result in this study was advice from a rehabilitation professional as most frequently reported environmental facilitator, whereas previous research mostly frequently reported support from family as main environmental facilitator for sports participation^[11,12,42]. Perhaps rehabilitation professionals in our Rehabilitation Centre pay extra attention to sports participation. Rehabilitation professionals may also regularly remind their patients of the physical and psychosocial benefits of sports participation and advice patients to also stay active after they have completed their rehabilitation program. The advice also seems to be successful in the long run, as there were no differences between inactive and active participants in the follow up time between the last treatment date and the questionnaire. The beneficial effects of advice from rehabilitation professionals demonstrated the importance of continuing to provide appropriate advice about sports participation for people with physical disabilities. In 2011 our Rehabilitation Centre started a special sports office for patients with physical disabilities with consultant hours for advice about sports participation. This sports office may help increasing the percentage of active people with physical disabilities after their rehabilitation program even further, as the sports office was not available yet for the participants

of our study at the time of their rehabilitation program.

A total 58 % of participants were active in sports after their rehabilitation. Previous research reported percentages of sports participation ranging from 32% to 60% for people with physical disabilities^[8,32-34]. This shows that participants from our Rehabilitation Centre are among the most active people with physical disabilities and also show similar percentages of sports participation to people without physical disabilities^[1].

Theory of Planned Behaviour

The attitude of the person with the physical disability is very important for intention to participate in sports, as previous research has shown before^[6,17,37]. Active participants reported health, fun and improving physical strength as the most important facilitators for sports participation. Even though active participants also reported their disability as a barrier, this barrier did not outweigh the experienced facilitators and kept them motivated to remain active in sports. Providing information about health benefits and interesting activities could help in improving a more positive attitude of inactive people towards sports participation.

Subjective norm also seems important for successful participation in sports for people with physical disabilities. Besides support from family and friends, advice from rehabilitation professionals can also positively influence a person's intention to start participating in sports. An increased encouragement from family, friends or rehabilitation professionals towards sports participation (e.g. by providing information or serve as a sports buddy) could again help improving a person's intention to engage in sports.

Perceived behavioural control could negatively influence the intention of participating in sports of inactive participants, because they experience more environmental barriers and have more difficulty overcoming these barriers. Providing information about strategies to reduce environmental barriers of sports participation could help people with physical disabilities overcoming these barriers.

Strengths and weaknesses

We included both inactive and active participants from different diagnosis groups in the same study, which allowed us to directly compare experienced barriers and facilitators of sports participation of both inactive and active participants. Including different diagnosis groups also provided more insight about possible differences in barriers and facilitators of sports participation between diagnosis groups. The fact that no differences were found between diagnosis groups, allows rehabilitation

professionals to include general measures in a sports advice that are applicable to all diagnosis groups.

We decided to only include sports in this study and not the broader term physical activity. For inactive people with physical disabilities engaging in physical activity could also be beneficial in improving their physical and psychosocial well-being. Future research could therefore consider focusing on barriers and facilitators of physical activity for inactive persons with physical disabilities, as this group could benefit from any type of (physical) activity.

In this study we focused on determining personal and environmental factors of sports participation. We therefore divided all experienced barriers and facilitators into personal and environmental factors. According to the ICF model disability and pain should be placed under health condition and body functions, respectively. However, as we focused on personal and environmental factors, we categorised all barriers and facilitators including disability and pain under these components.

Conclusion

After rehabilitation 58% of people are engaged in sports. Younger age and higher education were positively associated with sports participation in people with physical disabilities, whereas using assistive devices and experiencing environmental barriers were negatively associated. Facilitators of sports participation were health, fun and increasing physical strength, and advice from rehabilitation professionals. Based on these results rehabilitation professionals should focus on health and psychosocial benefits of sports participation for people with physical disabilities. Rehabilitation professionals should provide information about strategies to overcome environmental barriers of sports participation that patients using assistive devices might encounter.

Acknowledgements

The authors would like to thank A. Dijkstra, Q. Kroese and M. Linders for their help with data entry of the collected data. The authors would also like to thank W. de Jong for retrieving relevant data of the research population from the database of the Rehabilitation Centre of the University Medical Center Groningen, the Netherlands.

Declaration of interest

The authors report no declarations of interest. The authors alone are responsible for the content and writing of this article.

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Appendix



Questionnaire

“Insight in the current health status of
people with a physical disability”

We are sending you this questionnaire because you have been treated in the Rehabilitation centre of the University Medical Center Groningen, the Netherlands. Since then you have completed your treatment and we would like to ask you some questions about your current health status. Based on the answers of this questionnaire we would like to gain insight in the health status of patients who have completed their rehabilitation program at least one year ago.

We would therefore like to ask you several questions about your health status and participation in daily activities, besides some general questions.

There are no correct or incorrect answers to the questions; we are merely interested in your opinion. Every question is asked with a specific purpose, even if questions do not seem relevant to your situation. We would therefore like to ask you to complete all questions of this questionnaire.

Answers to this questionnaire will be processed anonymously

Completion of the questionnaire will take only 15 minutes.

Thank you in advance for your cooperation.

General questions

1) Please state your initials:

.....

2) Sex:

- ☐ Male
- ☐ Female

3) Date of birth:

(dd/mm/yyyy)

.....

4) Please indicate your current living arrangements:

- ☐ Independent, alone
- ☐ Independent, alone with help (home care, family, friends, etc)
- ☐ Independent, with partner and/or children
- ☐ Living at home (with parents)
- ☐ Sheltered housing
- ☐ Other, namely

5) Please indicate the highest level of education you completed:

- ☐ None
- ☐ Primary school
- ☐ Lower General Secondary Education (practical)
- ☐ Lower General Secondary Education (theoretical)
- ☐ High school degree
- ☐ Vocational education

- ☐ Applied sciences
- ☐ University degree

6) Please indicate the net yearly income of your household:

- ☐ €0 - € 900
- ☐ € 901 - € 1.300
- ☐ € 1.301 - € 1.700
- ☐ € 1.701 - € 3.000
- ☐ € 3.001 - € 3.500
- ☐ > € 3.500
- ☐ Rather not say

7a) Please indicate your disability:

- ☐ Amputation
- ☐ Arthritis
- ☐ Brain injury
- ☐ Chronic Pain
- ☐ Multi trauma
- ☐ Multiple Sclerosis
- ☐ Spinal Cord Injury
- ☐ Other, namely

7b) Please indicate the onset of your disability:

Please indicate year

We would like to ask you some questions about your health in this questionnaire. For each question, please give the one answer that comes closest to the way you have been feeling.

8) In general, would you say your health is:

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor

9) **Compared to one year ago**, how would you rate your health in general **now**?

- ☐ Much better now than one year ago
- ☐ Somewhat better now than one year ago
- ☐ About the same
- ☐ Somewhat worse now than one year ago
- ☐ Much worse now than one year ago

The following items are about activities you might do during a typical day.

10a) Do you use any assistive devices for activities of daily living?

- ☐ No → **Please go to question 11**
- ☐ Yes

10b) If so, what assistive devices?

Multiple answers possible

- ☐ Prosthesis
- ☐ Wheelchair
- ☐ Wheeled walker, crutches, cane
- ☐ Guide dog
- ☐ Other, namely

11) Does your health now limit you in these activities? If so, how much?

	Yes, Limited a lot	Yes, Limited a little	No, Not limited at all
a) <i>Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) <i>Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) <i>Lifting or carrying groceries</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) <i>Climbing several flights of stairs</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) <i>Climbing one flight of stairs</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) <i>Bending, kneeling, or stooping</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) <i>Walking more than a mile</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) <i>Walking several blocks</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) <i>Walking one block</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) <i>Bathing or dressing yourself</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12) Do you participate in vigorous or moderate activities for at least 2 times 30 minutes a week?

- ☐ Yes
- ☐ No → Please go to question 19

13) What sports do you participate in for at least 2 times 30 minutes a week?

Multiple answers possible

- ☐ Aerobics
- ☐ Aqua gym/Aqua jogging
- ☐ Athletics
- ☐ Badminton
- ☐ Basketball
- ☐ Zumba or equivalent
- ☐ Body pump
- ☐ Endurance training
- ☐ Dancing
- ☐ Fitness
- ☐ Gymnastics
- ☐ Handball
- ☐ Archery
- ☐ Judo
- ☐ Climbing
- ☐ Equestrian
- ☐ Rowing
- ☐ (Ice) skating
- ☐ Shooting
- ☐ Spinning
- ☐ Squashing
- ☐ Table tennis
- ☐ Tennis
- ☐ Martial Arts
- ☐ Football/Soccer
- ☐ Cycling
- ☐ Winter sports
- ☐ Yoga
- ☐ Sailing
- ☐ Swimming
- ☐ Walking
- ☐ Other, namely.....

14) When did you start participating in these sports?

Concerning the activities you mentioned in question 13

Sport	Year
-------	------

- | | | |
|----|-------|-------|
| 1. | | |
| 2. | | |
| 3. | | |

15) How many hours a week do you participate in these sports?

Concerning the activities you mentioned in question 13

Sports	Hours a week
--------	--------------

1.
---------	-------

2.
---------	-------

3.
---------	-------

16) Did you participate in any sports, before the onset of your physical disability?

- ☐ Yes, namely
- ☐ No
- ☐ Not applicable

17) What barriers did you experience when you started participating in sports?

Multiple answers possible

- ☐ No barriers

Personal factors:

- ☐ Not being able to exercise because of disability
- ☐ Not having enough energy/feeling too tired to be able to exercise
- ☐ Being (too) busy with other activities
- ☐ Not being comfortable in the presence of other athletes
- ☐ Having fear of injuries
- ☐ Being dependent of others to be able to exercise
- ☐ Other, namely.....

Environmental factors:

- ☐ Sports possibilities are unknown
- ☐ Having little sports possibilities in the neighbourhood
- ☐ No/not sufficiently qualified supervision
- ☐ Facilities not (sufficiently) adjusted
- ☐ Transport
- ☐ Materials not (sufficiently) adjusted or available
- ☐ Practice/Training is not (sufficiently) adapted
- ☐ Sports activities are too expensive
- ☐ Lack of possibilities to exercise with peers
- ☐ Athletes with a disability are not (fully) accepted
- ☐ Lack of support from environment
- ☐ Lack of fellow athletes with a disability
- ☐ Could not find a fitting sport
- ☐ Other, namely.....

18) What were reasons to participate in sports?

Multiple answers possible

Personal factors:

- ☐ Increasing Health/physical fitness
- ☐ Having fun/relaxation
- ☐ Increasing Strength
- ☐ Social contacts
- ☐ Losing weight
- ☐ Increasing Self confidence
- ☐ Loosing energy
- ☐ Learning new skills
- ☐ Competition/winning
- ☐ Increasing independence
- ☐ Accepting disability
- ☐ Learning how to deal with disability/ wheelchair/assistive device
- ☐ Other, namely.....

Environmental factors:

- ☐ Support from family, partner or children
- ☐ Support from friends and colleagues
- ☐ Medical indication from a specialist or physical therapist
- ☐ Other, namely.....

If you have answered questions 13 until 18, please procede to question 20

19) Why are you not participating in sports (anymore)?

Multiple answers possible

Personal factors:

- ☐ Not being able to exercise because of disability
- ☐ I do not like participating in sports
- ☐ I do not have enough energy/ I am too fatigued to participate in sports
- ☐ I have an injury that prevents me from participating in sports
- ☐ Being (too) busy with other activities
- ☐ Not being comfortable in the presence of other athletes
- ☐ I am ashamed of my disability
- ☐ Being dependent of others to be able to exercise
- ☐ Other, namely.....

Environmental factors:

- ☐ Sports possibilities are unknown
- ☐ Having little sports possibilities in the neighbourhood
- ☐ No/not sufficiently qualified supervision
- ☐ Facilities not (sufficiently) adjusted
- ☐ Transport
- ☐ Materials not (sufficiently) adjusted or available
- ☐ Practice/Training is not (sufficiently) adapted
- ☐ Sports activities are too expensive
- ☐ Lack of possibilities to exercise with peers
- ☐ Disabled athletes are not (fully) accepted
- ☐ Lack of support from environment
- ☐ Lack of fellow athletes with a disability/ sports buddy
- ☐ Could not find a fitting sport
- ☐ Other, namely.....

20) During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health?**

Yes No

a) Cut down the <i>amount of time</i> you spent on work or other activities	<input type="radio"/>	<input type="radio"/>
b) <i>Accomplished less than you would like</i>	<input type="radio"/>	<input type="radio"/>
c) Were limited in the <i>kind</i> of work or other activities	<input type="radio"/>	<input type="radio"/>
d) Had <i>difficulty</i> performing the work or other activities (for example, it took extra effort)	<input type="radio"/>	<input type="radio"/>

21) During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

Yes No

a) Cut down the <i>amount of time</i> you spent on work or other activities	<input type="radio"/>	<input type="radio"/>
b) <i>Accomplished less than you would like</i>	<input type="radio"/>	<input type="radio"/>
c) Didn't do work or other activities as <i>carefully</i> as usual	<input type="radio"/>	<input type="radio"/>

22) During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

- ☐ Not at all
- ☐ Slightly
- ☐ Moderately
- ☐ Quite a bit
- ☐ Extremely

23) How much **bodily** pain have you had during the **past 4 weeks**?

- ☐ None
- ☐ Very mild
- ☐ Mild
- ☐ Moderate
- ☐ Severe
- ☐ Very severe

24) During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

- ☐ Not at all
- ☐ A little bit
- ☐ Moderately
- ☐ Quite a bit
- ☐ Extremely

These questions are about how you feel and how things have been with you *during the past 4 weeks*. For each question, please give the one answer that comes closest to the way you have been feeling.

25) How much of the time during the **past 4 weeks** . . .

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Did you feel full of pep?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Have you been a very nervous person?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Have you felt so down in the dumps that nothing could cheer you up?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Have you felt calm and peaceful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Did you have a lot of energy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) Have you felt downhearted and blue?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) Did you feel worn out?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) Have you been a happy person?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) Did you feel tired?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26) During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

- ☐ All of the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ A little of the time
- ☐ None of the time

27) How TRUE or FALSE is each of the following statements for you.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a) I seem to get sick a little easier than other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I am as healthy as anybody I know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) I expect my health to get worse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) My health is excellent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

28) Are there any final remarks you would like to add?

.....

.....

.....

.....

Thank you for your time and cooperation

Chapter 7

Cross cultural differences of sports participation of paralympic athletes

*Eva A. Jaarsma, MSc; Pieter U. Dijkstra, PT PhD; Jan H.B. Geertzen, MD PhD;
Rienk Dekker, MD PhD.*

Abstract

Purpose: To analyse cross-cultural differences in barriers and facilitators of sports participation of Paralympic athletes between countries and continents.

Method: Participants were policy makers and athletes from 10 selected National Paralympic Committees, representing developing and developed countries from all continents. Policy makers were interviewed via a semi-structured interview and athletes completed a self-constructed questionnaire.

Results: Lack of awareness in the society and sports facilities were main barriers, whereas athletes as ambassadors, information distribution and support from the environment were facilitators of sports participation. The response rate of quantitative data was too low to perform statistical analyses.

Conclusion: Barriers and facilitators such as awareness and the influence of the social environment seem to be universal issues for National Paralympic Committees, regardless of the country or continent. Results should be considered carefully, as data could not be triangulated. The International Paralympic Committee should improve future Paralympic research, by establishing a direct interaction between researchers and athletes and have both researchers and athletes gain from the research. They should also reduce the amount of research projects during Paralympic Games, to get acquainted with supervising Paralympic research and improve the quality of these projects.

Introduction

According to the International Classification of Functioning, Disability and Health, the functioning and disability of a person depends on the environmental context he/she lives in^[1]. Cultures in Europe and North America generally aim for independence and autonomy of a person with a physical disability, whereas group-oriented and interdependent cultures will not stigmatise dependency on others and merely take help from family for granted^[2,3]. Unfortunately this dependency on others could result in lower social participation of people with physical disabilities^[3]. Since social participation is also related to sports participation^[4], this dependency might also lead to lower sports participation.

In general, sports participation of people with physical disabilities has increased in the last decades in all continents, but not necessarily everywhere at the same pace^[5]. The (positive or negative) attitude of society towards a person with a physical disability and previous involvement of a country in a war influence the development of Paralympic sport within a country^[6]. Socio-economic factors such as a large country size, a large population and a high Gross Domestic Product increase Paralympic performance^[6].

Besides environmental, historical or socio-economic factors, sports participation of people with physical disabilities can also be influenced by the experienced barriers and facilitators. Previous research reported barriers such as lack of sports facilities, problems with accessibility, transport, lack of information and costs^[7-10]. Frequently reported facilitators were health, fun and social contacts^[9,11-19]. However, since these results were from studies in Europe or North America, it is unknown whether these barriers and facilitators are also applicable to other continents and cultures. In order to be able to develop strategies to increase sports participation worldwide it is important to gain insight in possible cross-cultural differences of Paralympic sports participation. Unfortunately, only few studies have focused on differences in barriers and facilitators of sports between different countries, continents or cultures^[3,11]. These (scarce) studies have shown that facilitators of sports participation were similar for British, Northern American and Japanese spinal cord injury athletes^[11]. Fitness and fun were most important facilitators, whereas releasing energy and achievement were less important^[11]. A comparison of sports participation of people with physical disabilities between Northern America and Turkey showed that Northern American participants described more active lives, which mostly were affected by government policies and individual characteristics^[3]. As these comparisons only indicate the possibility of differences between countries, the aim of this study is to analyse cross-cultural differences in barriers and facilitators of sports participation of Paralympic athletes between

countries and continents.

Methods

Ethical approval

This study was approved by the Medical Ethical Committee of the University Medical Center Groningen (METc 2010.264) and the International Paralympic Committee (2012-03-19, Research Agreement).

Participants

Participants in this study were Presidents and Secretary-Generals (hereafter called policy makers) from 10 selected National Paralympic Committees (NPCs) and athletes of these NPCs, participating in the Paralympic Games of London, 2012. The NPCs were chosen to ensure all continents were represented in this study. The selected NPCs in this study also represented NPCs from developing and developed countries. NPCs from developing countries were still trying to expand and improve their Paralympic organisation, whereas NPCs from developed countries more often had a long history in and extensive organisation of Paralympic sport. The selected NPCs were: Australia, Brazil, Canada, Hong Kong, Ireland, Kenya, Malaysia, New Zealand, United Kingdom and South Africa.

Qualitative methods

The qualitative part of this study was a semi-structured interview conducted with policy makers of 10 NPCs between December 2011 and September 2012. All 10 policy makers were sent an invitation letter with information about the project and after providing their consent, an appointment was made for the interview. Policy makers were either interviewed face-to-face during the General Assembly of the International Paralympic Committee (IPC) in December 2011 (Beijing) or via Skype or telephone in the weeks after the General Assembly leading up to the Paralympic Games. Prior to the interviews an interview plan was constructed with questions about the organisation of the NPC and structure of Paralympic sports with the NPC. The interview plan also included questions about barriers and facilitators of both grass root level (i.e. lowest, elementary form of sports that anyone can perform) and elite level of Paralympic sports according to the policy makers. The questions about barriers and facilitators included topics such as initiatives to

increase sports participation, future plans for Paralympic sports within the NPC and communication between NPC and (elite) athletes. Interviews had a maximum duration of 60 minutes and were audio taped.

Quantitative methods

The quantitative part of this study was a self-constructed online questionnaire. The questionnaire contained items about sports participation, disabilities, and barriers and facilitators of sports participation and was used in a previous study with Dutch Paralympic athletes^[12]. All 981 adult Paralympic athletes (excluding athletes with a Intellectual Disability) of the 10 selected NPCs that were participating in the Paralympic Games in London^[20] were invited to participate in this study. A cover letter with information and purpose of the study was displayed on the research page of the website of the IPC. The cover letter also explained that participation was voluntary and that all data would be processed anonymously. Interested athletes could click the link to be redirected to the online questionnaire and after providing their consent (i.e. question 1 of the questionnaire) they were able to complete the questionnaire. The questionnaire was provided in English, Portuguese and Malay. The cover letter was also sent to policy makers of the 10 NPCs so they could further distribute the information about the questionnaire to their athletes. The average duration to complete the questionnaire was 15 minutes. The questionnaire was available to the athletes from July 15th 2012 until October 1st 2012.

Mixed methods design

This study used a mixed methods design. Data extracted from the interviews with the policy makers were combined with data from questionnaires completed by the athletes, i.e. data triangulation^[21].

Data analysis

For the qualitative part of this study, the audio taped interviews were transcribed verbatim, followed by an interpretative, thematic analysis of the interviews focusing on barriers and facilitators of participation in sports. The transcribed interviews were read several times by the interviewer to get a general idea of the information presented in the interviews. Relevant segments of interviews were coded and the final coding was then used to combine codes shared by policy makers into themes.

Results

In this result section we will report data from the qualitative research of the interviews with policy makers. We will report results on the organisation of Paralympic sports and barriers and facilitators of Paralympic sports reported by the policy makers. Secondly the quantitative data will be reported resulting from the athletes' questionnaire.

Qualitative results

Organisation of Paralympic sports

All policy makers explained that an NPC generally has two main tasks: bringing the team to the Paralympic Games (or other big events) and improving sports participation of people with physical disabilities. Within the NPCs there was a distinction between developed and developing countries. NPCs from developed countries were usually more mature, with an extensive organisation that focused on bringing the team to the Paralympic Games. In developed countries the NPC was responsible for the elite athletes and National Federations or Governing Boards were concerned with sports participation at grass root or regional level. The NPCs collaborated with the National Federations, but both were separate organisations. This collaboration implied that National Federations were responsible for contact with schools and rehabilitation centres to find new talent, whereas developing NPCs had to find new talent themselves.

"As an NPC our responsibility is to take the team to the Games" "However, with regards to the development of the sports" "we will work with the government and the national governing bodies of sport and disability sport organisations" "to help them to facilitate the development. We do not develop athletes, that is the responsibility of the disability sports organisations." (Subject 3)

NPCs from developing countries were still expanding and improving their organisation and focused more on sports participation in general to be able to compose a Paralympic team of elite athletes. Policy makers from developing countries explained that their NPCs were usually responsible for all levels of Paralympic sport:

"There are participants [in our NPC] from the grass roots all the way up to the national, and after that the elite level." (Subject 8)

"We are coordinating all Paralympic Movement activities, [but] we also have to do

the development of all the sports." (Subject 7)

Most NPCs from developed countries had (partly) integrated with the Olympic Committees, sometimes also in terms of National Federations. In such cases sports associations were responsible for both the Olympic sport and the Paralympic equivalent. Developing countries tried to work together with their Olympic Committees towards the Games (e.g. in terms of arranging accommodation) but usually operated completely separate from each other.

Barriers and facilitators of Paralympic sport

Barriers

Awareness

Lack of awareness of Paralympic sports in their countries was frequently mentioned. Policy makers from developing countries explained that lack of awareness is present in many areas of Paralympic sport:

"[The main barrier to sports participation] is awareness. Awareness in education, awareness in the rights for people with disabilities, awareness in: hey, there is a lot we can do." (Subject 4)

But policy makers from developed countries also mentioned the lack of awareness or understanding of sports for people with disabilities as a barrier:

"One of the barriers is the lack of understanding and confidence [of coaches and teachers] when a person with a disability wished to participate in a new environment."..."We need to educate and mentor them (i.e. coaches and teachers) how to adapt their own sports knowledge to the impairment."..."Some disabled children are not getting the opportunity [to participate in sports], to decide whether they enjoy it (i.e. sports) or not, because their participation is: I will blow the whistle to start, because I am in a wheelchair, but that is not participating." (Subject 3)

"I would say the awareness of Paralympic Sport on a whole, is a challenge for us."..."Our awareness levels (i.e. within their country), if they could be higher, that could help us get better media coverage and therefore get more awareness and therefore get more people to participate." (Subject 5)

Facilities

Providing facilities or equipment and the costs that come with participating in sports was a barrier for NPCs from developing countries, especially for people participating at grass root level. Sports facilities in NPCs from developing countries

are only available in large cities of their country:

"You find that (i.e. sports facilities) maybe in a big city, like the capital city we have the facilities and the equipment and therefore at the grass root level we find that the opportunity is there, the talent but the opportunity is lacking because of lack of equipment and facilities." (Subject 8)

Policy makers from developed countries also reported problems with facilities, but they have more specific problems such as their budget that cannot meet the needs for facilities or equipment:

"Last year our budget could only fulfil half of the need [for equipment] that is out there. So obviously equipment is a challenge." (Subject 5)

Facilitators

Role models

Paralympic elite athletes were often seen as ambassadors of their Paralympic sports and policy makers consider them as important role models for awareness of Paralympic sports, especially in NPCs from developing countries:

"You (i.e. the athletes) have to attend [the Paralympic Talent Day] and you have to do a certain bit of promotion work,"..." Paralympic athletes are unique, they take their obligation, generating awareness and now there's an interest and support for young kids with disabilities." (Subject 2)

Paralympic athletes do not only act as role models for future athletes, but also as ambassadors for their sport towards companies or possible sponsors:

"We have created what we call an ambassador program, where we ask our athletes to do public relations engagements. We try to get our athletes to do this all the time." (Subject 5)

"So, it's about using that success (i.e. of previous Paralympic Games) then to recruit sponsors."..."So it (i.e. our focus) is not shifted from the athletes but it has extended into going out commercially, developing more awareness that would give us more income to drive programs for all." (Subject 2)

In NPCs from developing countries both the Paralympic athletes and the NPC still have to establish the role of Paralympic athletes as ambassadors of Paralympic sport:

"We have the same philosophy as you [i.e. developed countries] do."..."And we have now just started with athletes advising their own peer group. Former athletes talking to current athletes, former athletes talking to would-be-athletes. But it is in an initial stage, currently." (Subject 4)

Information

Even though not all NPCs are directly concerned with mainstream sports participation, several NPCs from developed countries provide information about Paralympic sports and local sports possibilities:

"We just created a web portal, where wherever you live you can click on your town and a list will come up on clubs or programs that are accessible and available to you." (Subject 5)

"We have a generic web portal, with information about local sports club." (Subject 3)

"We do a lot with social media and have a popular YouTube channel" (Subject 6)

Support from the social environment

A positive attitude and support from the society is needed to provide opportunities for persons with physical disabilities to be able to participate in sports:

"The sport key pathology [is] to actually provide the environments, the support for disabled athletes, within their sport and creating pathways within their own sports. To support the disabled athlete." (Subject 1)

The role of family can be ambiguous, as they can play an important role in whether a person with a physical disability has the opportunity to participate in sports:

"Of course family and friends have to support them, for them (i.e. people with physical disabilities) to start playing sports." (Subject 3)

Especially in NPCs from developing countries the parents might not be aware of the benefits of sports yet:

"Parents want to focus more on education than on sports. When a child want to engage in a sport, the parents would really feel that their child should focus all on education rather than doing sports. Most parents are still not aware that sport today is just about having fun. It has a lot of benefits. Parents can also contribute to lack of participation and becoming a barrier." (Subject 8)

Quantitative results

In total, 14 athletes (1%) from 3 NPCs completed the questionnaire (see Table 1). These athletes participated in 10 different sports and represented all disability groups. Unfortunately this response rate was too low to perform statistical analyses.

Table 1: Characteristics of responding athletes

	Total (n=14)	Australia (n=3)	Ireland (n=10)	South Africa (n=1)
	M (SD)	M (SD)	M (SD)	M
Age	40.79 (11.96)	34.33 (20.03)	44.20 (8.12)	26
	n	n	n	n
Gender				
Male	8	2	5	1
Disability group				
Amputee	2	1	-	1
Cerebral Palsy	3	2	1	-
Visual Impairment	2	-	2	-
Spinal Cord Injuries	4	-	4	-
Les Autres	3	-	3	-
Sports				
Athletics	3	-	3	-
Boccia	1	-	1	-
Cycling	2	1	1	-
Equestrian	1	-	1	-
Rowing	2	-	2	-
Sailing	2	1	1	-
Swimming	1	1	-	-
Table tennis	1	-	1	-
Wheelchair basketball	1	-	-	1
Wheelchair rugby	1	-	1	-

Discussion

The results from the interviews gave us an indication of what barriers and facilitators of sports were experienced within different NPCs, worldwide. Environment seems to be play an important role in sports participation and can influence it in a positive and a negative way. Differences between developing and developed countries seem to lie in the organisation of the Paralympic sport. Previous research supported that policies of governments in developing countries often prevent people with physical disabilities from being physically active^[3]. This study demonstrated that not just policies, but also rights for people with physical disabilities and general awareness of Paralympic sports in the society have to improve in developing countries. NPCs from these countries also focused more on sports participation of Paralympic athletes from all levels of Paralympic sport, whereas NPCs from developed countries focused only on elite athletes and delegated responsibilities for lower sports levels to National Federations.

Main barriers of sports participation mentioned by policy makers were lack of awareness of the society and problems with facilities. Even though several policy makers mentioned that the awareness is growing, there is still a need for improvement. The majority of the policy makers of NPCs from developed countries have made it an important goal within their NPC to improve this awareness, and for instance try to include Paralympic athletes to improve this awareness among future athletes and possible sponsors. It is therefore not surprising that the role of Paralympic athletes as ambassadors of their sport was also mentioned as one of the facilitators of sports participation. Results from successful Paralympic athletes could influence the participation within their sport, but a well targeted policy with for example media attention and sports programs is needed to structurally improve sports participation^[22]. However, for NPCs from developing countries both athletes and policy makers are still searching how athletes can fulfil their role as ambassadors for Paralympic sport within their NPC.

Problems with sports facilities or equipment have previously been reported as barriers of sports participation, such as problems with accessibility, lack of sports facilities in the neighbourhood and high costs^[7,8,16,23].

The positive influence from the social environment on sports participation is consistent with previous research^[16,24]. People who have support from family, friends or school are twice as likely to become physically active than people with lack of support^[25]. However, these results seem mostly applicable to developed NPCs, as policy makers of NPCs from developing countries expressed concerns about the negative attitude of parents towards sports participation of the person with a physical disability.

Unfortunately, these results are only a slight indication of possible barriers and facilitators of sports within different NPCs as the quantitative part of this study could not be fully executed. Our questionnaire had a very low response rate and therefore data resulting from this questionnaire could not be analysed. The respondents predominantly resulted from personal contacts of the authors with policy makers. At the end of the interview, policy makers were asked for their help in distributing the link to the questionnaire. Several policy makers agreed to contribute in the distribution by sending the link to their delegates. The promotion of the questionnaire by the IPC unfortunately contributed only marginally to the response of the athletes.

The lack of quantitative data makes it impossible to triangulate results from policy makers and athletes.

Suggestions for improvement of Paralympic research

Because of the low response rate, we feel compelled to provide several suggestions for improving Paralympic research, especially questionnaire research. The Sport Science Committee is responsible for making research a prominent feature on the agenda of the IPC^[26]. In order to do so the Sports Science Committee “actively seeks interaction with the scientific community by formulating research questions relevant to the Paralympic Movement, and activates strategies to come to solutions”^[27].

Unfortunately, Paralympic research is still very much developing and needs to become a general component of the Paralympic Movement. We also experienced a lack of awareness of research within the Paralympic Movement during this study. In our opinion, many coaches, policy makers and athletes do not recognise the importance and added value of Paralympic Research yet. The IPC should increase awareness of Paralympic research within the Paralympic Movement, for instance by adopting the following suggestions.

In the current set up of Paralympic research, the IPC is responsible for the distribution and promotion of the research to the athletes. They have distributed the links to the questionnaire, addressed the research on their website, in the magazine ‘the Paralympian’ and across their delegates. When consulting fellow researchers, who also made an attempt to perform research with Paralympic athletes, about the response to their questionnaires, they expressed similar problems or had no response at all. This problem might have occurred because of the research tool, as lower response rates to online questionnaires are not uncommon^[28]. However, low response rates could also have occurred because of the way the IPC promoted the research. The Sport Science Committee states

that they: “actively seek interaction with the scientific community by formulating research questions relevant to the Paralympic Movement, and activate strategies to come to solutions”^[27]. However, during the Paralympic Games the IPC acted as an intermediate between researchers and athletes concerning the distribution of questionnaires. Previous research has shown that response rates can have a decrease of 20% when researchers cannot send invitations directly to participants and do not have face-to-face interaction^[28]. The IPC could consider enabling a more direct interaction between researchers and athletes in order to promote scientific research, for example by providing direct contact between researchers and athletes during a certain time frame (e.g. several weeks or months prior or after the Paralympic Games). The IPC could organise meetings where researchers will be able to explain their research to the athletes and athletes will be able to ask questions and may feel more involved in the research^[28]. Researchers will also be able to explain why it is important that athletes participate in this research, which could help improve the response rate in Paralympic research. Of course, researchers are very much aware that the main priority of Paralympic athletes during the Paralympic Games is giving their best Paralympic performance. Unfortunately, this is also why tension may occur between researchers and athletes, as they have different goals during the Paralympic Games. It is therefore important to aim that both athletes and researchers gain from research that is conducted during the Paralympic Games. Research should focus on improving the Paralympic Movement as well as improving elite performance or general sports participation of (future) athletes.

The IPC could also pay more attention to promote research possibilities during other large Paralympic events such as Parapan American Games or the World Championships.

When research projects are divided over several Paralympic events it is possible to have fewer research projects per event. This also puts fewer loads on the athletes in terms of participation in Paralympic research. A more even distribution of research across Paralympic events might also help in the organisation of Paralympic research. The Sports Science Committee could decide to approve fewer research projects, to give the IPC time to find better possibilities in supervising scientific research. When these few research projects result in good quality research, then they could build from that and gradually expand.

A more practical suggestion for Paralympic research could be change in logistics and promotion of questionnaire research during the Paralympic Games. Prior to the Paralympic Games, the IPC distributed a research document containing all information about the Paralympic projects (6 on site and 9 questionnaire studies). Unfortunately this document provided a lot of information about the

projects without categorisation according to disability or NPC. The set up of this document made it time consuming for athletes to find a relevant project, which could result in athletes losing their interest in participating in research. The use of a scrolling down menu, in which athletes can select their disability, NPC or sport, could be an improvement. After submitting this information, relevant projects will pop up, after which the athletes can immediately see projects that are applicable to them. The scroll down menu will also be less time consuming and could make it easier for athletes to participate in sports.

Conclusion

Barriers and facilitators such as awareness and the influence of the (social) environment seem to be universal issues that NPCs deal with, and do not seem to differ within countries, continents or cultures. However, these results should be considered very carefully as lack of quantitative data prevented triangulation. In order to prevent similar disappointing outcomes in the future, the IPC should improve future Paralympic research. The IPC could improve awareness of research within the Paralympic Movement, by concentrating on creating a direct interaction between researchers and athletes and aim that both the athletes and the researchers gain from the research. The IPC could also decide to reduce the amount of projects during Paralympic Games, to find better possibilities of supervising scientific research and improve the quality of these research projects.

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Chapter 8

General Discussion

The aim of this thesis was to establish which barriers and facilitators influenced sports participation of people with physical disabilities, whether inactive and active people experienced different barriers and facilitators, and whether there were cross-cultural differences in barriers and facilitators of sports participation.

Main findings

The first research question on barriers and facilitators of sports participation was addressed in *chapters 2 through 7*. An overview of the different barriers and facilitators reported in these chapters is provided in Table 1. Most reported barriers were related to the disability itself, health status (e.g. high risk for cardiovascular diseases and overweight) and lack of energy as well as lack of transport, lack of sports facilities and lack of accessibility. Most reported facilitators were fun, health status and fitness, along with social contacts and support from family or friends.

The second research question about differences between inactive and active participants was addressed in *chapters 5 and 6*. Sports participation was positively associated with higher education, younger age and computer use. Costs, lack of sports buddies, their disability, the use of assistive devices and experiencing environmental barriers were negatively associated with sports participation. Active participants also mentioned dependency on others as a barrier. Inactive participants more often reported the disability itself and fatigue as well as costs and lack of a sports buddy as barriers.

The third research question about cross-cultural differences was addressed in *chapter 7*. Barriers and facilitators such as awareness of Paralympic sport in the society and the influence of the (social) environment seem to be general issues that National Paralympic Committees (NPCs) deal with, and do not seem to differ between countries or continents. Developing NPCs experienced barriers because of negative attitude towards people with a physical disability and the limited organisation of (elite) Paralympic sport. Developed NPCs usually had a more extensive organisation of Paralympic sports and could focus solely on taking their athletes to the Paralympic Games. National Federations (in developed NPCs) generally focused on mainstream sports participation and experienced barriers such as transport, lack of accessibility and lack of education of Paralympic sports.

Table 1: Overview of reported barriers and facilitators throughout the chapters of the thesis.

Chapter:	2	3	4	5	6	7
Barriers						
<u>Personal</u>						
Disability	x		x	x	x	
Health status	x		x	x	x	
Lack of energy	x		x	x	x	
Dependency of others		x	x	x		
Use of assistive devices				x	x	
Lack of time	x					
<u>Environmental</u>						
Lack of transport	x	x	x	x	x	x
Lack of sports possibilities	x	x	x	x	x	x
Costs	x			x	x	x
Lack of accessibility	x	x	x	x		
Lack of information	x		x	x		
Lack of a sports buddy			x	x	x	
Lack of supervision		x		x		
Attitude of family	x		x			
Experiencing environmental barriers					x	
Lack of Awareness						x
Facilitators						
<u>Personal</u>						
Fun	x	x	x	x	x	x
Health status	x	x	x	x	x	x
Fitness	x	x	x	x	x	x
Motivation	x		x			x
Pre-injury participation	x	x			x	
Winning		x				
Use of assistive devices				x		
Age	x			x	x	
Education				x	x	
Relaxation	x					
Goal setting	x					
Self efficacy	x					
<u>Environmental</u>						
Social contacts	x	x	x	x	x	
Support from family or friends		x	x	x	x	
Advice from rehabilitation professionals				x	x	

Theoretical considerations

The International Classification of Functioning, Disability and Health (ICF; Figure 1)^[1] and the Theory of Planned Behaviour (TPB)^[2] will be used in this general discussion to provide overview of the results and serve as a basis for the general discussion.

International Classification of Functioning, Disability and Health

Personal factors

Barriers

Personal barriers were mostly disability related and were reported both by inactive and active participants. Dutch Paralympic athletes were the only group investigated in this thesis that did not feel hindered in sports participation by their disability. As Dutch Paralympic athletes have made it their job to push their body to the limit in sports, this could explain why this group of people would not consider their disability as a barrier to sports participation. However, the recreational athlete (i.e. people with visual impairments, adults and children with physical disabilities) did consider the disability to be a barrier, regardless of type of disability or age. The use of assistive devices was considered both a barrier and a facilitator. Inactive patients reported use of assistive devices as a barrier, which was also reported in a previous research on sports participation of women with Multiple Sclerosis^[3]. Perhaps the barrier is not necessarily the use of an assistive device, but refers to the underlying disability that necessitates the patient to use an assistive device. This finding could indicate that inactive people might see fewer strategies or alternatives for activities to be able to cope with their disability in sport^[3].

Facilitators

Most personal facilitators such as fun, health status, intrinsic motivation and fitness reported in this thesis were also mentioned by people without physical disabilities^[4]. Active people with visual impairments reported the use of assistive device (i.e. computer) as a facilitator of sports participation, in contrast to inactive patients. This finding suggests a more profound construct, namely that people with visual impairments might use the computer as a strategy to cope with their disability and overcoming barriers.

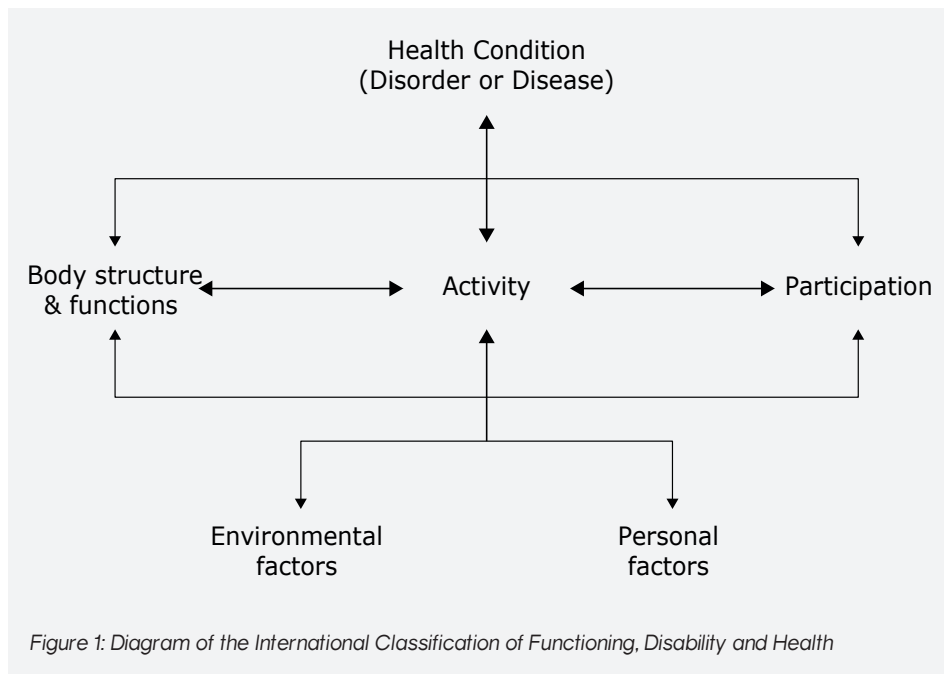
Environmental factors

Barriers

Many of the environmental barriers were related to infrastructure of sports, such as lack of transport, lack of sports facilities and lack of accessibility. Inactive participants experienced more environmental barriers than active participants. In fact, together with the use of assistive devices, environmental barriers were the main negative influence on sports participation of patients who had been treated for their disability.

Facilitators

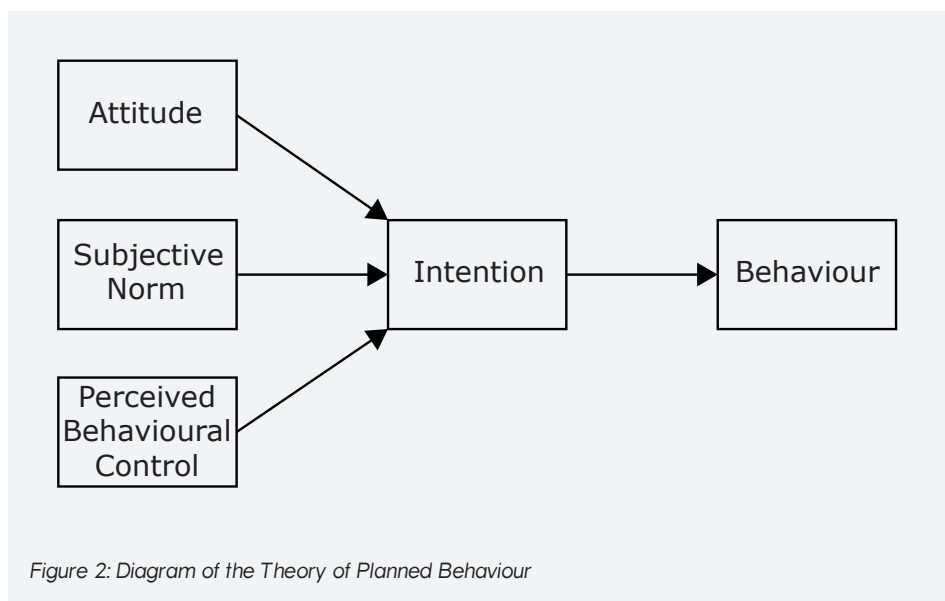
Environmental facilitators were very much focused on support from others, whether family and friends, or rehabilitation professionals. Support from family was equally important for recreational athletes and Paralympic athletes. Patients who had been treated for their disability more often reported advice from rehabilitation professionals as a facilitator than support from their family. Several studies have acknowledged the importance of support from family, friends or rehabilitation professionals on sports participation^[5-7]. However, active participants ranked support from family and friends higher than inactive participants^[7].



Theory of Planned Behaviour

Figure 2 shows the different components of the Theory of Planned Behaviour^[2]. The attitude of a person seems to be important for the intention to participate in sports. Positive attitudes towards sports participation could be established by focusing on personal facilitators, such as fun, health status and fitness, and intrinsic motivation. Disability and fatigue could result in negative attitudes towards sports participation. It is therefore important that people focus on the physical and psychosocial benefits in order to actually start participating in sports.

Support from family, friends and rehabilitation professionals, and social contacts play an important role in the subjective norm of the behaviour. People generally experience support from others as a positive influence on sports participation. However, inactive family members could influence sports participation in a negative way and make it more difficult for potentially active people to start participating in sports.



The perceived behavioural control of sports was only observed in patients who had been treated for their disability, as experiencing environmental barriers was negatively associated with sports participation. This finding indicated that inactive participants not only experienced more environmental barriers but also had more difficulty overcoming these barriers.

Clinical implications

Differences between people with and without physical disabilities

Even though this thesis included a broad population, results in experienced barriers and facilitators of sports participation seem very similar for people with different physical disabilities (Table 1). Results also show several similarities with barriers and facilitators of sport participation of people *without* disabilities^[4]. Negative associations with sports participation of people *without* disabilities were variables such as lack of time, age and health status, with lack of time as a main barrier. People *with* physical disabilities, however, more often reported health status as their main barrier to sports participation.

Education level, fun, health status, intrinsic motivation, self-efficacy, past exercise experience, social contacts and support from others (i.e. family, friends or health professionals) were positive associations of sports participation^[4]. Main differences in facilitators were that support from health professionals was a more important facilitator for people *with* physical disabilities, compared to people *without* physical disabilities^[4]. These findings suggest that most people *with* and *without* physical disabilities experience similar barriers and facilitators of sports participation and differences lie in the “disability specific” barriers. There are fewer sports possibilities for people *with* disabilities in their direct environment, so people *with* physical disabilities have to travel further to be able to participate in their sport. Lack of a sports buddy also seems to be a disability specific barrier. Because people *with* and *without* disabilities generally experience similar barriers and facilitators of sports, sports stimulation programs can also be addressed in a similar way.

(Un) changeable factors

Even though many barriers and facilitators of sports participation were identified in this thesis, not all factors can be changed through a sports stimulation program. For example, a younger age and higher education are positively associated with sports participation, but cannot be changed during a program. The disability and use of assistive devices are also unchangeable. Sport stimulation programs should therefore focus on factors that can be changed, such as the attitude (i.e. internal motivation) of the person with a physical disability and subjective norm (i.e. environmental barriers).

The person with a physical disability

The first focus during the rehabilitation program is to regain the mobility and independence of a person with a physical disability. Sports participation might only become interesting at the end of or after completing the program, as the person might not consider sports as a vital part of their rehabilitation program. However, in order to make sure the person is aware of the physical and psychosocial benefits of sports, rehabilitation professionals play an important role in increasing this awareness. But most of all, the person with a physical disability has to be motivated to participate in sports. The person needs to have a positive attitude towards sports participation, and needs to be willing to take the hurdle of becoming physically active.

Rehabilitation professionals

Rehabilitation professionals should focus on the facilitators that were reported in this thesis, to motivate and stimulate the patient to participate in sports. A person with a physical disability needs to think in terms of abilities instead of disabilities, and input from rehabilitation professionals can help with that. This input should consist of providing coping strategies to improve a person's attitude towards the disability, improve the use of an assistive device or help to perform sports activities in an alternative way^[8]. Besides providing strategies to cope with barriers, rehabilitation professionals should also prepare people with physical disabilities for possible environmental barriers. Rehabilitation professionals could for example provide information about possibilities of different sports, contact information of (adjusted) sports clubs and transport opportunities to get to sports facilities. Lately, several Dutch rehabilitation centres have started special sports offices for people with physical disabilities with consultant hours for advice about sports participation^[9]. These sports offices are good examples of rehabilitation professionals helping people with physical disabilities to make the transition from sports participation in a rehabilitation setting to staying physically active after completing their rehabilitation program.

Municipalities

Besides the person with the physical disability and the rehabilitation professional, the local authorities play an important role in increasing sports participation. In 2015, municipalities in the Netherlands will gain more power and responsibilities (i.e. decentralisation) on local issues^[10] and therefore have to restructure their

policy and budget in the upcoming year. The Dutch government has been investing in programs to increase sports participation of Dutch inhabitants^[11]. In 2015, municipalities should continue to prioritise sports participation, and the results of this thesis could act as a basis for it.

Firstly, municipalities should increase the infrastructure of sports participation. Both active and inactive participants in this thesis have addressed the need to improve transport, sports possibilities in the neighbourhood and accessibility of facilities. Previous research addressed the issue of accessibility and found that not only the accessibility of the facilities itself should be improved, but also space between equipment for wheelchair access is limited^[12].

Secondly, municipalities should collaborate and interact with other authorities such as health insurance agencies to improve sports participation. Health insurance agencies hardly ever cover the purchase of assistive devices, which means that people with physical disabilities have to turn to municipalities for funding of assistive devices^[13]. Unfortunately, funding is only provided for sports wheelchairs and does not include other sports devices such as sports prostheses or sit-skis. Part of the reasons why these assistive devices are not routinely covered could be because of the high costs. However, since only a select group of people will consider purchasing this type of device, municipalities should consider collaborating with authorities such as health insurance companies, and facilities for Prosthetics and Orthotics to also provide similar funding for people who need assistive devices other than sports wheelchairs.

Thirdly, municipalities should help in improving understanding and knowledge of sport participation of people with physical disabilities. During one of the interviews about cross-cultural differences (Chapter 7) a policy maker stated:

"One of the barriers is the lack of understanding and confidence [of coaches and teachers] when a person with a disability wished to participate in a new environment."

It is important to adapt sports knowledge of coaches and teachers to also make it relevant for people with disabilities. For example, physical education teachers at a mainstream school might not know how to modify their lessons to also include children with disabilities. Municipalities should provide extra education or courses to hand physical education teachers extra tools to address this issue. Besides education, municipalities should also play an important role in stimulating and promoting (further) integration of sports. In 2001, the Dutch national federations started to integrate Olympic and Paralympic sports (where possible), but unfortunately this integration has not reached every local sports club yet^[14].

Sports clubs that have started with the integration of sports within their club, have experienced problems with knowledge of supervising people with disabilities or lack of knowledge about how to reach possible new athletes (with a disability)^[14]. Municipalities should help sports clubs in providing more tools and knowledge to also include people with a disability in their sports clubs. Municipalities should also help in increasing awareness of sports possibilities for people with disabilities as these sports clubs. This improvement in integration will not only increase the amount of sports possibilities, but could help people with physical disabilities finding more sports buddies.

Finally, besides all these abovementioned key actors, the direct environment (i.e. family, friends and sports buddies) should also support people with a physical disability and stimulate them to become physically active.

Future research

This thesis included cross sectional studies, which only provided information about barriers and facilitators on a specific moment. Future research should therefore also include longitudinal studies. Longitudinal studies that address sports participation at regular intervals (e.g. repeating the questionnaire in Chapter 6), could help to determine changes in barriers and facilitators over time.

The effectiveness of a rehabilitation program regarding sports participation should also be analysed in longitudinal studies. In the last few years, the internet and social media are more and more incorporated in our daily lives. A form of “eHealth” can also be used in the rehabilitation program, for example by using the internet as a tool for an intervention to motivate people with physical disabilities to participate in sports. Participants can receive instructions and information about sports participation via a website or app during their rehabilitation program that could continue after people with physical disabilities have completed their rehabilitation program. The progress of the sports participation can be monitored in a personal profile on a website or app that is also accessible for the rehabilitation professionals. Follow up meetings can occur via email or Skype. A pilot of an internet intervention on sports stimulation for people with Multiple Sclerosis suggests that this type of intervention is successful in promoting sports participation^[15].

As explained in Chapter 7, the study focusing on cross-cultural differences in barriers and facilitators of sports could not be completed, due to an extremely low response rate (1%). Even though the International Paralympic Committee (IPC) distributed the links of the questionnaires to their delegates and used various ways of communication to their delegates, the response was extremely low. Fellow

researchers, also conducting questionnaire research at the Paralympic Games, reported similar or worse problems with their research: a low response rate or no response at all. During the Paralympic Games the IPC acted as an intermediate between researchers and athletes concerning the distribution of questionnaires. Previous research has shown that response rates can have a maximum decrease of 20% when researchers cannot send invitations directly to participants^[16]. The IPC should consider enabling a more direct interaction between researchers and athletes in order to promote scientific research during a certain time frame (e.g. several weeks or months prior or after the Paralympic Games). The IPC should organise meetings where researchers will be able to explain their research to the athletes and athletes will be able to ask questions and may feel more involved in research^[16].

A suggestion for the IPC is also to pay more attention to promoting research possibilities during other large Paralympic events such as Parapan American Games or World Championships. A more even distribution of research across different Paralympic events might also help in the organisation of Paralympic research. The Sports Science Committee could decide to approve fewer research projects, to give the IPC time to find better possibilities in supervising scientific research.

Strengths and limitations of the thesis

One of the strengths of this thesis is the broad research population. Results from this broad population provide insight in mutual barriers and facilitators that were experienced by people with different types of physical disabilities.

A reviewer commented on this broad population in one of the papers:

"Once you begin to write about barriers and facilitators, I would consider further subgroups in order to make this data meaningful."

We disagree with the reviewer that the data has to be divided into subgroups in order to become meaningful. Table 1 has demonstrated that the majority of the barriers and facilitators was reported by people with different types of physical disabilities and could be stated as generic barriers and facilitators of sports. The rehabilitation professionals could therefore provide people with physical disabilities with information about transport and sports possibilities and strategies to overcome these generic barriers, regardless of their physical disability.

A second strength of this thesis is the focus on inactive participants as well as (elite and recreational) athletes, which allows direct comparison of experienced

barriers between inactive and active participants. With this knowledge, rehabilitation professionals are able to adjust the sports stimulation program according to the level of sports participation of people with physical disabilities. In case a patient is not active (yet), rehabilitation professionals will have to concentrate more on coping with environmental barriers. The focus of the sports stimulation program for active patients could be more on facilitators such as fun, to ensure the patient will also remain physically active in the long run.

A limitation of this thesis was the use of a self-constructed questionnaire. Even though validated questionnaires including either barriers or facilitators of sports were present^[17,18], no questionnaire specifically focused on both barriers and facilitators of sports participation. Consequently, the questionnaire used in this thesis had to be developed and was based on previous questionnaires^[17,18].

The response rates in chapters 4, 5 and 7 were relatively low (19%, 13% and 1%, respectively), even after several (financial) incentives and reminders. Unfortunately, low response rates (< 40%) in cross-sectional research are not uncommon^[19-21]. In chapter 4 children, who were registered at the Prince Johan Friso Mytylschool in Haren in the Netherlands, and their parents were invited to complete a questionnaire about sports participation. This special school for children is the only special school in the Province of Groningen (approximately 600.000 inhabitants). These children (and their parents) therefore often receive invitations to participate in research focusing on children with physical disabilities. The group of this school might have experienced 'research saturation', which decreased response rate. In chapter 5 the three centres of expertise distributed the questionnaire among people with visual impairments and promoted the research as a 'sports research'. It is therefore possible that people with visual impairments who were not physically active at the time of the invitation were less likely to complete the questionnaire. The questionnaire sent to patients who had been treated for their disability was therefore promoted as a 'research on current health status', to prevent this possible selection bias.

This thesis used a cross-sectional design, which analysed experienced barriers and facilitators of sports participation at a certain moment in time. The associations and implications resulting from this cross-sectional research have not been investigated in longitudinal research.

Conclusion

People with different physical disabilities experience several generic, but also specific barriers and facilitators of sports participation. Both generic and specific

barriers and facilitators should be included in sport stimulation programs to increase sports participation of people with physical disabilities.

In order to do so, the following considerations should be kept in mind:

- Persons with a physical disability should have a positive attitude towards sports participation and have to be (internally) motivated to become active
- Rehabilitation professionals should emphasise health and psychosocial benefits of sports participation
- Rehabilitation professionals should provide information about strategies to overcome barriers and about local sports possibilities
- Municipalities should improve the infrastructure such as transport and sports facilities, and collaborate with other health care authorities regarding funding
- Municipalities should also improve disability sports knowledge, to fully integrate sports participation of people with and without physical disabilities

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Summary

On average, only one-third of people with physical disabilities regularly participate in sports, compared to two-thirds of people without physical disabilities. Benefits of sports participation for people with physical disabilities have been frequently documented and include physical benefits such as reducing chances of heart disease, obesity, type 2 diabetes and improving balance. But sports participation also provides psychosocial benefits such as fun, social contacts, acceptance of the disability and increased self confidence.

As sports are often part of the rehabilitation program in the Netherlands and Paralympic Games being more popular than ever, one would expect that the sports participation of people with physical disabilities in general might also increase. But despite the presence of sports in the rehabilitation program and the growing attention for Paralympic sports, the majority of people with physical disabilities are still not physically active.

In order to try to increase sports participation for people with physical disabilities, it is important to understand what withholds them from sports and how they can be stimulated to become active in sports. It is also important to establish whether active and inactive people with physical disabilities experience different barriers and facilitators of sports participation.

This thesis therefore aims to answer to following research questions:

- Which barriers and facilitators of sports participation do people with physical disabilities experience?
- Do active participants experience different barriers and facilitators of sports than inactive participants? If so, what are these differences?

To also address the possible differences in barriers and facilitators of sports participation within different countries, a third research question was added:

- What cross-cultural differences in barriers and facilitators of sports participation can be found worldwide?

As a starting point for this thesis, a systematic review was performed to determine what is known in the literature about barriers and facilitators of sports participation for people with physical disabilities (*Chapter 2*). This systematic review demonstrated that barriers were predominantly environmental factors such as lack of facilities, lack of transport and difficulties with accessibility, whereas facilitators were mostly personal factors such as fun and health. Barriers and facilitators also depended on age and type of disability, which should be taken into consideration when advising people with physical disabilities about sports participation.

Because of the broad population of people with physical disabilities, barriers and facilitators of people from different disability groups were investigated. As

a first glance, Dutch Paralympic athletes were questioned, a specific group of people with physical disabilities who probably have experienced both barriers and facilitators of sports participation (*Chapter 3*). Barriers of sports participation included dependency of other and lack of sports facilities, with wheelchair athletes experiencing more barriers than ambulant athletes. Interestingly, also one-third of the athletes did not experience any barriers. Facilitators were fun, health, competition and social support. Attitude and subjective norm of the athletes were important components for intention of sports participation.

Most research on sports participation of children with physical disabilities tends to focus either on children, their parents or health professionals working with children with physical disabilities or a combination of two of these groups. This study (*Chapter 4*) therefore included perspectives from children, their parents and their health care professionals on sports participation. In this mixed method study all participants mentioned that barriers were related to the child's disability or logistics of sports participation (e.g. lack of transportation or lack of sports possibilities). Children exclusively mentioned the dependency on others, whereas parents mentioned problems with transportation, information about sports possibilities and acceptance of their child with a physical disability. Health care professionals observed that the attitude of the family was of large influence on participation in sports by children with physical disabilities. It was concluded that sports participation of children with physical disabilities is a complex phenomenon, and all perspectives should be considered when promoting sports participation.

Little is known about barriers and facilitators of sports participation of people with visual impairments in the Netherlands. Insight in experienced barriers and facilitators of these people could help in developing strategies to increase sports participation of people with visual impairments (*Chapter 5*). Besides determining factors influencing sports participation, this study also compared experienced barriers and facilitators of physically active and inactive participants with visual impairments. Frequently mentioned barriers were costs, lack of a sports buddy and the visual impairment, which were all negatively associated with sports participation. Active participants also mentioned dependence on others as a barrier. Important facilitators were health, fun, social contacts and support from family. Higher education and computer (software) use were positively associated with sports participation. Experienced barriers and facilitators of sports of people with visual impairments did not differ from other those of people with other disabilities, and can be regarded as general, universal barriers and facilitators of sports.

From a rehabilitation medicine perspective, it was important to gain knowledge about barriers and facilitators of sports participation of both physically inactive and active patients that had been treated in the Rehabilitation Centre Beatrixoord

Haren, the Netherlands (*Chapter 6*). The large group of people with physical disabilities allowed comparison of differences between physically inactive and active persons, and between people from different diagnosis groups. Being younger and higher educated were positively associated with sports participation, whereas using assistive devices and experiencing environmental barriers were negatively associated. Facilitators of sports participation were health, fun and increasing physical strength, and advice from rehabilitation professionals. This study did not demonstrate differences in barriers and facilitators between diagnosis groups, which makes the results applicable for all diagnosis groups. Rehabilitation professionals should therefore focus on health related and psychosocial benefits of sports participation for people with physical disabilities and provide information about strategies to overcome barriers of sports participation.

The functioning of a person with a physical disability depends on the environmental context he/she lives in, which could also indicate that sports participation is culturally influenced (*Chapter 7*). Since most studies on barriers and facilitators of sports participation are from Northern America or Europe, it is unknown whether these results are also applicable for other continents. Policy makers of 10 selected National Paralympic Committee reported lack of awareness in their culture and lack of sports facilities as possible barriers, whereas the role of athletes as ambassadors, information distribution and education, and support from the environment were facilitators of sports participation. Unfortunately, these results should be considered very carefully as the response rate of the questionnaire sent to athletes of corresponding National Paralympic Committees was extremely low. Consequently, qualitative and quantitative data could not be triangulated. In order to prevent similar disappointing outcomes in the future, the International Paralympic Committee should consider improving future Paralympic research by establishing a more direct interaction between researchers and athletes, allowing researchers to explain the importance of their research and athletes to become more involved in Paralympic research. The IPC could also decide reducing the amount of research projects during Paralympic Games, to find better possibilities for supervising Paralympic research and improve the quality of these projects.

The results and clinical implications of the abovementioned studies are reflected upon in the general discussion (*Chapter 8*). In order to increase sports participation, the person with the physical disability needs to be motivated to become physically active. Rehabilitation professionals should focus on physical and psychosocial benefits to motivate people with physical disabilities, for instance by providing coping strategies to overcome barriers. They should also provide information about possibilities of disability sports. Municipalities could also help in

increasing sports participation by improving infrastructure of sports participation, collaborating with other authorities to provide funding. Municipalities could also improve education and knowledge on disability sport, to fully integrate sports participation of people with and without physical disabilities.

Samenvatting

Gemiddeld doet ongeveer een derde van de mensen met een lichamelijke beperking regelmatig aan sport, terwijl ongeveer tweederde van de mensen zonder lichamelijke beperking aan sport doet. Sportdeelname voor mensen met een lichamelijke beperking heeft vele gezondheidsvoordelen, waaronder een verminderende kans op hart- en vaatziekten, obesitas, diabetes type 2 en het verbeteren van de balans. Daarnaast geeft sporten ook psychosociale voordelen als plezier, sociale contacten, acceptatie van de beperking en het vergroten van het zelfvertrouwen.

Aangezien het beoefenen van sport vaak een onderdeel van het revalidatieprogramma is en de Paralympische Spelen populairder zijn dan ooit, zou men verwachten dat de sportdeelname van mensen met een lichamelijke beperking ook zou moeten toenemen. Echter ondanks dat sport een onderdeel van de revalidatie is en er steeds meer interesse is voor Paralympische sport, besluit de meerderheid van de mensen met een lichamelijke beperking nog steeds om niet te gaan sporten.

Om sportdeelname onder mensen met een lichamelijke beperking te verhogen, is het belangrijk te achterhalen wat hen tegenhoudt om te gaan sporten en hoe deze groep gestimuleerd kan worden om wel te gaan sporten. Daarnaast is het ook belangrijk om de verschillen tussen niet-actieve en actieve mensen met een lichamelijke beperking vast te stellen ten aanzien van belemmeringen en stimulansen van sport.

Voor dit proefschrift zijn daarom de volgende onderzoeksvragen opgesteld:

- Welke belemmeringen en stimulansen van sport worden ervaren door mensen met een lichamelijke beperking?
- Ervaren actieve mensen andere belemmeringen en stimulansen dan niet-actieve mensen? Zo ja, in welk opzicht?

Om ook eventuele verschillen in het ervaren van belemmeringen en stimulansen van sport tussen verschillende landen en continenten vast te stellen, is een derde onderzoeksvraag toegevoegd:

- Welke culturele verschillen ten aanzien van belemmeringen en stimulansen van sportdeelname kunnen wereldwijd gevonden worden?

Als eerste is een systematisch literatuuronderzoek uitgevoerd, om vast te stellen wat er al bekend is in de literatuur over belemmeringen en stimulansen van sportdeelname van mensen met een lichamelijke beperking (*Hoofdstuk 2*). Dit systematische literatuuronderzoek toonde aan dat belemmeringen voornamelijk omgevingsfactoren waren zoals gebrek aan sportfaciliteiten, problemen met transport en verminderde toegankelijkheid. Stimulansen waren vooral persoonlijke

factoren als plezier en gezondheid. Daarnaast waren belemmeringen en stimulansen ook afhankelijk van leeftijd en type lichamelijke beperking, factoren die meegenomen zouden moeten worden in een sportadvies voor mensen met een lichamelijke beperking.

Vanwege de brede populatie van mensen met een lichamelijke beperking, is ervoor gekozen belemmeringen en stimulansen van sport bij verschillende diagnosegroepen te onderzoeken. Als eerste zijn Nederlandse Paralympische atleten gevraagd naar hun ervaringen met sport (*Hoofdstuk 3*). Deze specifieke groep mensen met een lichamelijke beperking is gekozen, omdat zij zeer waarschijnlijk zowel belemmeringen als stimulansen van sport hebben ervaren. Belemmeringen van sport waren onder andere afhankelijkheid van anderen en gebrek aan sportfaciliteiten. Daarbij ervoeren atleten in een rolstoel meer belemmeringen dan ambulante atleten. Verrassend genoeg ervoeren ook een derde van de atleten helemaal geen belemmeringen. Stimulansen waren plezier, gezondheid, willen winnen en steun van familie en vrienden. De attitude van de persoon en de steun vanuit de omgeving waren belangrijke componenten voor de intentie tot sportdeelname.

De meeste onderzoeken naar sportdeelname bij kinderen met een lichamelijke richt zich meestal of op kinderen, of op hun ouders, of op hun hulpverleners of een combinatie van twee van deze groepen. In dit hoofdstuk zijn daarom de perspectieven gecombineerd van zowel kinderen, ouders als hulpverleners op het gebied van sportdeelname (*Hoofdstuk 4*). Resultaten van deze “mixed-method” studie toonden dat alle groepen belemmeringen noemden die gerelateerd waren aan de beperking van het kind of de logistieke voorwaarden van sporten (bijvoorbeeld problemen met transport of gebrek aan sportfaciliteiten). Daarnaast waren er ook verschillen in belemmeringen tussen de groepen. Zo noemden kinderen specifiek de afhankelijkheid van anderen als belemmering. Ouders ervoeren vooral problemen met transport, informatie over sportmogelijkheden en de acceptatie van de beperking van hun kind. Hulpverleners zagen dat de houding van de familie ten opzichte van sport bepalend was voor de sportdeelname van het kind zelf. Deze studie heeft daarom laten zien dat sportdeelname van kinderen met een lichamelijke beperking een complex fenomeen is, en dat alle perspectieven meegenomen zouden moeten worden bij het stimuleren van sportdeelname.

Er is maar weinig onderzoek gedaan naar belemmeringen en stimulansen van sport bij mensen met een visuele beperking in Nederland. Inzicht in welke belemmeringen en stimulansen deze groep mensen ervaren kan helpen bij het ontwikkelen van strategieën om sportdeelname bij mensen met een visuele beperking te verhogen (*Hoofdstuk 5*). Naast het bepalen wat de factoren die van invloed zijn op sportdeelname, zijn in deze studie ook belemmeringen en stimulansen

tussen actieve en niet-actieve deelnemers vergeleken. Belemmeringen als kosten, geen sportmaatje hebben en de visuele beperking, waren allemaal factoren die een negatieve associatie hadden met sportdeelname. Ook afhankelijkheid van andere mensen werd door actieve mensen vaker als belemmering genoemd. Stimulansen waren gezondheid, plezier, sociale contacten en steun van familie. Een hogere opleiding en het gebruik van computer software hadden een positieve associatie met sport. Ervaren belemmeringen en stimulansen van mensen met een visuele beperking waren vergelijkbaar met mensen met andere beperkingen, en kunnen daarmee gezien worden als algemene belemmeringen en stimulansen van sport.

Vanuit de Revalidatiegeneeskunde was het belangrijk om inzicht te krijgen over belemmeringen en stimulansen van sport van zowel actieve als inactieve patiënten die behandeld waren in het Centrum voor Revalidatie, Locatie Beatrixoord (*Hoofdstuk 6*). Een grote groep mensen met verschillende lichamelijke beperkingen maakt dat er niet alleen gekeken kan worden naar verschillen tussen actieve en niet actieve mensen, maar ook tussen verschillende diagnosegroepen. Jonger en hoger opgeleid zijn hadden een positieve associatie met sportdeelname, terwijl gebruik van hulpmiddelen en het ervaren van omgevingsfactoren negatief waren geassocieerd met sportdeelname. Stimulansen waren gezondheid, plezier, fysiek sterker worden en een sportadvies van het revalidatieteam. Omdat deze studie geen verschillen tussen de diagnosegroepen liet zien, kan gezegd worden dat de resultaten voor alle diagnosegroepen van toepassing zijn. Leden van het revalidatieteam zouden zich daarom moeten richten op gezondheids- en psychosociale voordelen van sport voor mensen met een lichamelijke beperking en voldoende informatie over strategieën moeten bieden om belemmeringen te overwinnen.

Het functioneren van een persoon met een lichamelijke beperking hangt af van de omgeving waarin hij of zij leeft. Sportdeelname zou daarom ook afhankelijk van de omgeving of de cultuur kunnen zijn (*Hoofdstuk 7*). Aangezien de meeste studies over belemmeringen en stimulansen van sport in Noord Amerika of Europa uitgevoerd zijn, is het niet duidelijk of deze resultaten ook van toepassing zijn op andere continenten. Beleidsmakers van 10 selecteerde Nationale Paralympische Comit  s gaven aan dat de mensen in hun land vaak niet bewust was van Paralympische sport en dat er een gebrek aan sportfaciliteiten was. De rol van de atleten als ambassadeur van hun sport, de informatieverstrekking en steun vanuit familie en vrienden waren volgens hen stimulansen voor sportdeelname. Helaas konden de resultaten van de beleidsmakers niet vergeleken worden met de resultaten van de atleten, omdat de respons van de atleten daarvoor te laag was. Om vergelijkbare teleurstellende resultaten in de toekomst te voorkomen,

zou het Internationale Paralympische Comité kunnen proberen het Paralympisch onderzoek te verbeteren door een directere interactie tussen onderzoekers en atleten tot stand te brengen. Onderzoekers zouden het belang van het onderzoek kunnen uitleggen aan de atleten, waardoor atleten meer betrokken zouden worden in Paralympisch onderzoek. Het Internationale Paralympische Comité zou er voor kunnen kiezen om het aantal onderzoeksprojecten tijdens de Paralympische Spelen te verminderen, om betere mogelijkheden te vinden voor het begeleiden van Paralympisch onderzoek en daarmee de kwaliteit van de onderzoeken te verbeteren.

De resultaten van alle hoofdstukken en de klinische implicaties worden besproken in de algemene discussie (*Hoofdstuk 8*). Om sportdeelname te kunnen vergroten moet de persoon met een lichamelijke beperking in ieder geval gemotiveerd zijn om te gaan sporten. Daarnaast zou het revalidatieteam zich moeten richten op gezondheids- en psychosociale voordelen van sport die mensen met een lichamelijke beperking kunnen stimuleren om te gaan sporten. Zij kunnen bijvoorbeeld strategieën aanreiken om belemmeringen te overwinnen. Ook kunnen zij informatie geven over hoe en waar mensen met een lichamelijke beperking kunnen sporten. Gemeentes kunnen ook een belangrijke rol spelen in het vergroten van de sportdeelname door de infrastructuur van sport te verbeteren en door samen te werken met andere instanties als zorgverzekeraars om vergoedingen te realiseren. Als laatste kunnen gemeentes proberen de kennis van gehandicaptensport te verbeteren, zodat sportdeelname van mensen met en zonder een lichamelijke beperking geïntegreerd kan worden.

About the author

About the author

Eva Annika Jaarsma was born on March 23th, 1983 in Groningen, the Netherlands. She completed her high school degree in 2001. In 2007 she received her Bachelor's Degree in Human Movement Sciences at the University of Groningen, the Netherlands, with a thesis titled: "Lateral trunk sway of unilateral transfemoral amputees." Her Master's thesis titled: "Using trans-tibial prosthetic simulators as a research methodology in prosthetic walking" resulted in a Master's Degree in 2009. Part of the Master's research was conducted at the Department of Prosthetics and Orthotics of the University of Salford (United Kingdom).

During university she was a student representative and co organiser the annual Symposium of the Faculty of Human Movement Sciences. She was also a lecturer for the course 'Anatomy in vivo' at the Medical Faculty of the University of Groningen.

From 2010 until 2014 she worked at the Department of Rehabilitation Medicine of the University Medical Center Groningen as a researcher, resulting in this thesis.

Over de auteur

Eva Annika Jaarsma werd geboren op 23 maart 1983 te Groningen. Ze behaalde haar VWO diploma aan het Maartens College te Haren in 2001. In 2007 rondde zij haar Bachelor's Degree af bij de opleiding Bewegingswetenschappen aan de Rijksuniversiteit Groningen, met het Bachelor afstudeerproject: "Lateral trunk sway of unilateral transfemoral amputees." Aansluitend behaalde zij in 2009 haar Master's Degree voor Bewegingswetenschappen met het afstudeerproject: "Using trans-tibial prosthetic simulators as a research methodology in prosthetic walking". Een gedeelte van dit afstudeerproject voerde zij uit aan de Department of Prosthetics and Orthotics van de University of Salford (United Kingdom).

Tijdens haar studie is zij actief geweest in de Jaarvertegenwoordiging en in de Symposiumcommissie van de studievereniging Studiosi Mobilae. Ook heeft zij meerdere jaren als docent de cursus 'Anatomie in vivo' verzorgd voor eerstejaars Geneeskunde studenten van de Faculteit Medische Wetenschappen van de Rijksuniversiteit Groningen.

Van 2010 tot 2014 is zij verbonden geweest aan de afdeling Revalidatiegeneeskunde van het Universitair Medisch Centrum Groningen als onderzoeker, dat geresulteerd heeft in dit proefschrift.

Dankwoord

Aangezien ik dit proefschrift niet had kunnen voltooien zonder de nodige hulp, wil ik een aantal mensen bedanken voor hun bijdrage.

Echter, voordat ik mensen specifiek ga bedanken, wil ik als eerste alle deelnemers bedanken voor hun medewerking aan de verschillende onderzoeken, want zonder hen was dit proefschrift er niet geweest.

Beste prof. dr. J.H.B. Geertzen, beste Jan, dank je wel voor het altijd behouden van het overzicht over de verschillende projecten. Het opstellen van een tijdsplan aan het begin van een project is nu vanzelfsprekend. Je 'no nonsense' mentaliteit ten opzichte van bepaalde beslissingen was erg verfrissend en duidelijk. Daarnaast heb ik je snelle feedback en directe opmerkingen over positieve én negatieve reacties op artikelen altijd erg kunnen waarderen.

Beste prof. dr. P.U. Dijkstra, beste Pieter, dank voor al je geduld gedurende de analysefase van de verschillende projecten. Ik denk vanaf nu in nullen en enen. Ook zal er tijdens het schrijven steeds een stemmetje in mijn achterhoofd roepen: "Korte zinnen! Wat staat hier nu eigenlijk? Voegt deze zin echt iets toe?" Daarnaast wil ik je ook bedanken voor je oprechte interesse, en je nooit aflatende humor.

Beste dr. R. Dekker, beste Rienk, als dagelijks begeleider spraken wij elkaar regelmatig over de verschillende projecten. Al vanaf onze eerste afspraak bij NOC*NSF ("Zorg jij voor de koffie? Met melk graag") bleek een gedeelde interesse voor gehandicaptensport. "Wat is wijsheid?" kwam regelmatig terug wanneer een project anders verliep dan gedacht. Ik wil je bedanken voor je enthousiasme voor mijn onderzoek en het geven van de juiste stimulans wanneer dat even nodig was.

Ook wil ik de volgende mensen bedanken voor hun mede- en samenwerking bij verschillende projecten:

Rita van Driel en Rinske de Jong van NOC*NSF, voor jullie samenwerking bij de onderzoeken bij Nederlandse en Internationale Paralympische atleten.

Rinske, dank voor je input bij het opzetten van de vragenlijst voor de Nederlandse Paralympische atleten en de vele informatie over ontwikkelingen binnen de Paralympische sport.

Rita, ik wil jou bedanken voor al je inzet en input tijdens beide Paralympische projecten en de vele goede suggesties tijdens de voorbereidende en schrijffase.

Sanny van der Steen van Koninklijke Visio, Marianne Benning van Bartiméus en Rob van Vliet van de Ooglijn voor hun samenwerking bij het onderzoek over sportdeelname bij mensen met een visuele beperking en het verspreiden van de vragenlijsten onder jullie leden.

Dr. Steven Koopmans voor zijn input tijdens de schrijffase van het artikel bij het onderzoek naar sportdeelname bij mensen met een visuele beperking.

Dr. Kiek de Blécourt voor haar kennis in de voorbereidende fase en feedback

in de schrijffase van het onderzoek naar sportdeelname bij kinderen van de Mytyschool.

Beste huidige (Daan, Dymphy, Edwin, Katja, Sietke en Sietske) en oud collega's (Carolin, Jaap, Jesse, Lauren, Lex, Lonneke, Marieke, Marlies, Mike, Sharon en Sobhan): de vele lunches, koffie/thee pauzes mét of zonder taart en etentjes hebben mijn promotie tot een erg leuke tijd gemaakt. Ook de brainstormsessies en het afvuren van opmerkingen tijdens "Samen Lezen" hebben me geholpen als ik even niet meer wist hoe ik nu verder moest met mijn artikelen. Jullie zullen nu alleen wel een eigen 'Bijbel' moeten aanschaffen voor alle statistiek vragen!

Zowel mijn gemengde tennisteam als de dames van Dames 2 hebben ervoor gezorgd dat de onvermijdelijke promotie frustraties dankzij een potje tennis ineens een stuk minder erg werden. Dank voor de vele gezellige competitiedagen met (foute) grappen, fanatiek tennis op zijn tijd en de o zo belangrijke evaluaties achteraf.

Ook moet ik natuurlijk de meiden van JC Tigre bedanken. Al ruim 10 jaar hebben we lief en leed gedeeld. Ondanks pieken en dalen zijn we nog steeds een jaarclub en ben ik er van overtuigd dat er nog vele jaren met clubweekenden en sinterkerstdiners zullen volgen.

Mijn paranimfen Laura en Reinier, dank jullie wel dat jullie hier vandaag aan mijn zijde willen staan. Lau, na al die jaren moeten we nog steeds onze eerste ruzie plannen. Ik vind het bijzonder dat het nooit uitmaakt hoe lang we elkaar niet hebben gesproken. Als we elkaar dan weer zien, gaan we eigenlijk altijd verder waar gebleven waren. Lieve Rein, mijn grote broer, altijd let je op mij en dat is vandaag niet anders. Ik vind het extra bijzonder dat je vandaag naast me staat en ben trots dat ik me "je kleine zusje" mag noemen. Kleine zusjes worden groot!

Last but not least wil ik mijn familie bedanken voor hun steun en toeverlaat. Lieve Rein, Rubi en kleine Marc, ondanks dat jullie misschien op enige afstand wonen, wil ik jullie bedanken voor jullie belangstelling voor mijn promotie. Lieve Heit en Mem, dank jullie wel dat jullie me altijd gemotiveerd hebben. Niet alleen tijdens mijn promotie maar ook daarvoor hebben jullie mij altijd geholpen en gesteund om de juiste keuzes te maken. Jullie trots van de afgelopen jaren en ook vandaag, doet me veel.

Het proefschrift is dan nu echt af. Ik kan dan ook niets anders meer zeggen dan: "Niks meer aan doen!"

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