Physical activity and characteristics of people with physical disabilities
- Investigation of the basis for inclusion in fitness centres

PhD thesis
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Preface

This thesis was completed at the Research Unit for Musculoskeletal Function and Physiotherapy at Department of Sport Science and Clinical Biomechanics, Faculty of Health Science at The University of Southern Denmark, Odense.
Main supervisor was Associate Professor Birgit Juul-Kristensen (University of Southern Denmark). Co-supervisors were Professor Jens Troelsen (University of Southern Denmark) and Assistant Professor Louise Fleng Sandal (University of Southern Denmark).

The thesis includes a register-based study determining the prevalence of adults with physical disabilities in Denmark, a review of the literature determining barriers to and facilitators of exercising in fitness centres comparing adults with and without physical disabilities, and an interview study of non-disabled users' perspectives of future inclusive fitness centres.
The interview study is directly related to the Danish campaign 'Fitness for alle – Fitness for mennesker med bevægelseshandicap' ['Fitness for all – fitness for people with physical disabilities'] with the purpose to establish three pilot inclusive fitness centres in Denmark.

The PhD project has been carried out in a joint venture between University College South Denmark and University of Southern Denmark with funding from Trygfonden. Further, a travelling scholarship was obtained from 'Christian og Ottilia Brorsons Rejselegat'.

Thesis at a glance

Overarching aim of the thesis	To investigate the basis for inclusion of AwPD in fitness centres		
Research questions	Who are the group of potential fitness centre participants with physical disabilities?	What are the barriers and facilitators for exercising in fitness centres for people with and without physical disabilities?	What do non-disabled fitness centre participants think of future inclusive fitness centres?
Study	**I**	**II**	**III**
Study Aim	To identify and describe the group of potential fitness participants with disabilities in Denmark in terms of prevalence and socio-demographic profile and finally to compare these characteristics with the general adult population in Denmark	To identify, synthesise and compare barriers to, and facilitators of, exercising in fitness centres among groups of adults with physical disabilities (AwPD) and adults without physical disabilities (AwoPD).	1) What is the ideal fitness space from the perceptions of AwoPD? 2) How might their dis/ableist attitudes negate inclusion in three future pilot inclusive fitness centres across Denmark?
Study design	A register-based cross-sectional study	A scoping review	An interview study
Material/ participants	606.857 AwPD from the DNPR	102 papers (26 concerning AwPD and 76 AwoPD)	18 AwoPD (≥18 years)
Methods	A descriptive cross-sectional study (cut-off day by December 31st, 2018) reporting data on prevalence and socio-demographic variables of AwPD covering nine diagnoses in Denmark.	Six databases and grey literature were searched. Identified barriers and facilitators were classified into six categories of contextual factors, according to a modified framework of Di Blasi et al, 2001.	Focus groups interviews from three different locations were conducted, transcribed, and subsequently coded and analysed according to Malterud's four-step method of systematic text condensation.
Conclusion	The prevalence of AwPD was equivalent to 13% of the Danish adult population. The group differed significant from the general adult population. The nine disability subgroups displayed large variation and thus have very different needs for accessibility and exercise. These differences must be taken into consideration when including AwPD in fitness centres.	The main focus differed between groups. For AwPD focus was on barriers of accessibility and for AwoPD it was on facilitators for exercising. The groups both valued skilled instructors, a comfortable fitness centre environment, the opportunity to exercise at the preferred type and level, and good social relationships, but the means of how to achieve this differ between groups.	AwoPD had several preferences regarding their ideal fitness centre, of most importance was a pleasant atmosphere and good social relations. They welcomed AwPD, but simultaneously predicted many challenges with inclusive fitness centres whereas social skills, ableism, ignorance, and preconceptions may hinder inclusion of AwPD.

DNPR = The Danish National Patient Register; AwPD = Adults with Physical Disability; AwoPD = Adults without Physical Disability.

List of papers

The thesis includes the following 3 papers (referred to by their roman numerals throughout the thesis):

I) **Nikolajsen H**, Larsen C.M, Holsgaard-Larsen A, Juul-Kristensen B and Hestbæk L. *Prevalence and socio-demographic profile of adults with physical disabilities in Denmark – a register-based cross-sectional study.* BMC Public Health. [under review]

II) **Nikolajsen H**, Sandal L.F, Juhl C.B, Troelsen J and Juul-Kristensen B. *Barriers to, and facilitators of exercising in fitness centres among adults with and without physical disabilities: A scoping review.* International Journal of Environmental Research and Public Health. 2021, 18,14: 7341. https://doi.org/10.3390/ijerph18147341.

III) **Nikolajsen H**, Richardson E.V, Sandal L.F., Juul-Kristensen B and Troelsen J. *Fitness for all – how do non-disabled people respond to inclusive fitness centres?* BMC Sports Science, Medicine and Rehabilitation. 2021, [in press]

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List of abbreviations

WHO	The World Health Organization
ICF	International Classification and Function model (ICF model)
CRPD	Convention on the Rights of Persons with Disabilities
ADA	Americans with Disabilities Act
AIMFREE	Accessibility Instruments Measuring Fitness and Recreation Environments
PWD	People With Disabilities
AwPD	Adults with physical disabilities
AwoPD	Adults without physical disabilities
ISCED	International Standard Classification of Education
DNPR	The Danish National Patient Register
GAP	General adult population
OA	Osteoarthritis
ABI	Acquired Brain Injury
RA	Rheumatoid Arthritis
MS	Multiple Sclerosis
SCI	Spinal Cord Injuries
CP	Cerebral Palsy
AMP	Amputations
MD	Muscular Dystrophy
POL	Poliomyelitis

1.0 Introduction

1.1 Physical activity, sedentary and disability (study 1)

Physical activity is a highly protective factor for both prevention and management of non-communicable diseases and reduces the risk of premature death (Warburton, 2006; World Health Organization, 2020). Therefore, lack of physical activity is a threat to public health, as this causes both morbidity and mortality in addition to being a major economic burden (Allender *et al.*, 2007; Ding *et al.*, 2016). Consequently, The World Health Organization (WHO) has launched the Global Action Plan on Physical Activity 2018-2030, aiming to reduce global inactivity by 10% in 2025 and 15% in 2030 and thereby to treat and prevent lifestyle diseases as well as improve mental health, quality of life and well-being (World Health Organization, 2018a, 2018b). Globally, 23% of the adult population does not meet the general recommendations of physical activity (World Health Organization, 2017) and the problem is worse in high-income countries (Guthold *et al.*, 2018)

Very recently, in November 2020, revised guidelines on physical activity were presented by WHO, constituting an update of the previous recommendations from 2010 (World Health Organization, 2020). The revised guidelines address physical activity recommendations for different adult subgroups in addition to a focus on sedentary behaviour, as seen in Figure 1.

Figure 1. Guidelines on Physical activity and sedentary behaviour

	Adults 18-64 years	**Adults ≥65 years Adults with chronic conditions* Adults with disability**
Physical activity		
Do regular physical activity	X	X
Do at least 150–300 minutes of moderate-intensity aerobic physical activity	X	X
Do muscle-strengthening activities at moderate or greater intensity on 2 or more days a week	X	X
Do multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity, on 3 or more days a week		X
May increase moderate-intensity aerobic physical activity to more than 300 minutes	X	X (when not contraindicated)
Sedentary behaviour		
Limit the amount of time spent being sedentary	X	X
Aim to do more than the recommended levels of moderate- to vigorous-intensity physical activity	X	X

*cancer survivors and those living with hypertension, type-2 diabetes and HIV.
The figure is based on information from WHO (World Health Organization, 2020)

For the first time, the new recommendations also address sedentary behaviour (defined as time spent sitting or lying with low energy expenditure, while awake, in the context of occupational, educational, home and community settings, and transportation). The overall advice is to reduce the time spent being sedentary (World Health Organization, 2020). The recommendations on physical activity are for all adults (except pregnant woman, where other recommendations are proposed), both people with and without disability should meet these recommendations where possible, when capable of and when it is not contraindicated (World Health Organization, 2020).

Being more physically active and minimizing sedentary behaviour, may also be of high importance for the increasing group of people with disabilities (PWD) (physical, mental, intellectual and sensory disability) (Chan and Zoellick, 2011), as this group is reported to be inactive in twice the proportion of people without disabilities (Carroll *et al.*, 2014; IFF Research, 2020). Furthermore, PWD report poorer health than people without disabilities (Elmose-Østerlund *et al.*, 2021; United Nations, Department of economic and social affairs, 2018), as they have more chronic diseases and conditions (Carroll *et al.*, 2014) which also occur earlier in life (Krahn *et al.*, 2015).
Inactivity and/or lack of physical activity is therefore a problem both for adults without disabilities and even more, for adults with disabilities. However, the new international recommendations will not in itself immediately lead to changes in physical activity levels among people with and without disabilities, as this requires dissemination and implementation. National and local initiatives must therefore be performed to achieve implementation, which may especially be important for PWD (World Health Organization, 2020).

In high-income countries there is a tendency towards a higher proportion of physical activity being performed through leisure-time activities (Strain *et al.*, 2020), which can be outside as well as inside, and can be unstructured (e.g. walking or running whenever it suits) or structured in relation to different sport clubs at specific times during the week.
Fitness centres thus constitute an obvious arena for performing physical activity as it can provide both structured and unstructured leisure-time activities. Further, it is not a competing sport, but focus on the social and personal benefits of participation rather than a strong focus on winning. Similarly, fitness centres appeal to a broad audience and is by some mentioned as 'the world's biggest sport' (Burgess, 2013). Moreover, participation does not require specific physical skills (like ball games), and it is suited for both the untrained and the professional user.

1.1.1 The group of people with disability

The group of PWD is diverse and may be divided into several subgroups which differ according to different ways of defining and grouping disability. In 2010 it was estimated that 15-20% of the world's population is living with some sort of disability, and that about 2-4% is suffering from 'severe disability' (about 190 million people). In the future the numbers will be larger due to the increased aging population also among PWD (Chan and Zoellick, 2011). In the US, adults with physical disability (AwPD) constitute the largest group of people with disability (compared with: vision, cognition, self-care, and independent living) (Courtney-Long *et al.*, 2015). AwPD have furthermore the highest rates of inactivity, obesity, diabetes, stroke, heart disease and cancer, compared with other disability groups (with hearing, vision, cognition, any disability limitation groups) and the non-disabled group (Carroll *et al.*, 2014). It is known, that cardiovascular disease, cancer and diabetes are three of the four major causes of death related to premature non-communicable diseases (seen in number of deaths in the 30–70 age group) (WHO, 2017). Thus, AwPD is a particularly high-risk group due to their high rate of inactivity, directly linked to their restrictions in movement, whether through compromised walking ability or wheelchair dependence. However, more information about the disabled group is needed. In the global disability action plan 2014-2021 from WHO (World Health Organization, 2015), data on standardized and internationally comparable methods have been requested to benchmark and monitor disability across the world. This includes e.g., prevalence studies of the disability groups. Further, WHO encourages disaggregation of these data by sex, age, income and occupation to uncover patterns, trends and general information about subgroups of people with disability (World Health Organization, 2015).

When looking at the recommendations for physical activity, it seems reasonable to believe that AwPD has the largest potential benefits of complying with these recommendations, due to their largest rates of risk factors for non-communicable diseases. Further, the greatest health improvements are seen when people who are the least active become more physically active (Warburton, 2006), and health benefits are actually achieved also at levels lower than those described in the international recommendations (Warburton and Bredin, 2017). In order to establish the optimum possibilities for AwPD to engage in physical activities and fitness centres, it is therefore crucial to uncover their specific characteristics (and needs) in comparison with adults without physical disabilities (AwoPD). Globally, information on prevalence and

socio-demographics seems to be limited, as described above, and even WHO has requested more general knowledge on disability groups, e.g., for international comparison.

Locally in Denmark, the group of AwPD is also sparsely described, with respect to specific subgroups' prevalence and characteristics. Based on small groups and not always representative of the general population of AwPD, the total prevalence of self-reported physical disability is estimated to be 26% of adults (16 and 64 years), of which 4.4% have congenital disability while the remaining 95.6% have acquired disability (Det Centrale Handicapråd [The Danish Disability Counsel], 2014). Other studies have estimated the prevalence based on a single diagnosis and reports only health information related to diagnosing, symptoms or e.g. multiple sclerosis (Magyari *et al.*, 2021) or cerebral palsy (Larsen *et al.*, 2021). Another study has based the prevalence on 199 different chronic conditions from a complete nationwide population sample where only the total prevalence is estimated by age-groups and gender (Hvidberg *et al.*, 2020) but lack further details. However, socio-demographic information is not included in these studies and is lacking across the group of AwPD.

To fill out some of this knowledge gap on prevalence and socio-demographic profile on AwPD, and to gain further knowledge on the group of AwPD when promoting physical activity in general and in fitness centres, systematic and comparable knowledge is needed. Denmark is an optimum study arena, due to the detailed registration of Danish citizens in several public registers, among others the National Patient Register, where detailed information on patient diagnoses and socio-demographics is registered. Furthermore, unique and always most recent information on the general Danish population, i.e., AwoPD, is available from Statistics Denmark (Statistics Denmark, 2021) for comparison.

Therefore, the aim of study 1 was *to identify and describe the group of potential fitness participants with disabilities in Denmark in terms of prevalence and socio-demographic profile and finally to compare these characteristics with the general adult population in Denmark.*

1.2 Participation in fitness centres (study 2)

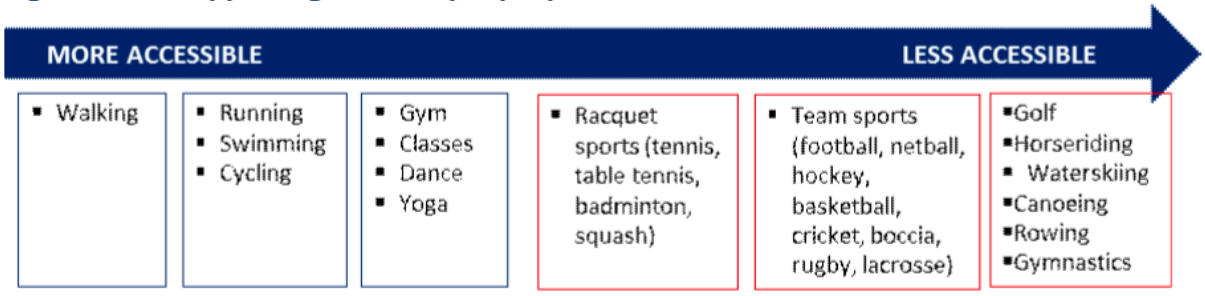
As described above, PWD are reported to have increased risk factors for non-communicable diseases (Carroll *et al.*, 2014; United Nations, Department of economic and social affairs, 2018; WHO, 2017) in addition to poorer health occurring earlier in life (Krahn *et al.*, 2015) while, at the same time, they are more inactive than AwoPD (Carroll *et al.*, 2014; IFF Research, 2020). Therefore, there is a need for this group to engage in more physical activity. But what are the

prerequisites (on the society level and on the specific level) for increasing the possibilities for performing physical activity generally, and specifically in fitness centres?

On the society level, Denmark ratified the United Nations Convention on the Rights of Persons with Disabilities (CRPD) (United Nations, Division for Social Policy and Development, 2006) in 2009. This means that Denmark is one out of 164 signatory nations (United Nations, Department of economic and social affairs, 2015), who is obligated to 'promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity' (CRPD, Article 1 – purpose). In the CRPD, Article 30 (about participation in cultural life) specifies that people with and without disabilities should have equal possibilities for participation i.e., in recreation, leisure or sport activities. Further, some argue that for PWD 'cultural life' such as sports play a far more important role in their lives as they often experience lower rates of employment and are thereby denied participation in the society in that regard (Singleton and Darcy, 2013).
In Denmark leisure time sporting activities are often segregated into 'traditional' sport (non-disabled) and parasport (disabled), and such activities do not provide many opportunities for inclusion of PWD together with AwoPD in the society. The goal of participation is to give PWD the choice to participate in leisure time activities as sport/fitness in the way they want to, and with whom they want to (Singleton and Darcy, 2013).

In general, PWD perceive activities which they can take part in themselves as more accessible, whereas activities involving others – with elements of competition, high demands of organisation and rules or safety concerns – are less obtainable and appealing, as illustrated in Figure 2 (English Federation of Disability Sport, 2014).

Figure 2. How appealing PWD perceive certain activities



Source: (English Federation of Disability Sport, 2014, p. 20)

Therefore, fitness centres are a relevant setting to facilitate physical activity, as it is more appealing to people with PWD and others who are less experienced with exercising. Moreover, it has gained in popularity since its conceptions in the USA in the early 1970s (Sassatelli, 2010). In Europe, membership rates of commercial fitness centres have grown 3.5% from 2017 to 2018, resulting in 9.4% of the population above 15 years of age being members, and with potential for further growth (Deloitte, 2019).

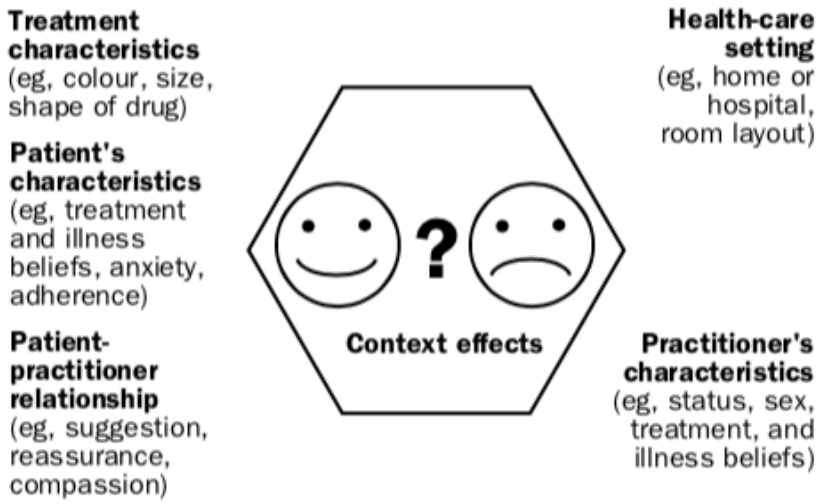
Fitness centres' popularity may be due to flexibility of offering activities of both unstructured (exercise when preferred, i.e., jogging or cycling in an indoor environment where bad weather is not a barrier) and structured types (participating in i.e., classes at a specific time and place). Thereby, it offers a variety of training facilities (individual and group activities), and the environment can be controlled physically by the interior design and guided psychologically and socially by the instructors and other users. Further, as it provides various exercising opportunities that can be adjusted to the individual user in relation to the preferred exercising type and level, it has the potential to be an arena where PWD can participate in physical activity.

1.2.1 Barriers of, and facilitators for fitness centre use for AwPD

Despite the potential of PWD for exercising in fitness centres, presence of PWD alongside AwoPD in fitness centres is lacking (Rimmer, 2005). Specific barriers for this may be many. Mainly, physical challenges like accessibility and building interior have been described as barriers (Calder *et al.*, 2018; Rimmer *et al.*, 2017), and a systematic review (Calder and Mulligan, 2014) identifies and describes seven instruments/checklists to assess accessibility and usability of fitness facilities for people with disabilities. Furthermore, a 20 year old study based on focus group interviews, reported general barriers and facilitators in relation to participation in physical activity in both indoor and outdoor settings (fitness centres, swimming pools, parks, and trails) (Rimmer, Riley, Wang, Rauworth, *et al.*, 2004). In this study, factors other than physical challenges were mentioned, such as cost/economic, knowledge and education of staff, perceptions and attitudes and policies/procedures etc. Although several guidelines (Kailes, 2008; North Carolina Office on Disability and Health and The Center for Universal Design, 2008; United states access board, 2003) and checklists with the most comprehensive one being AIMFREE (Lockett, 2011; Rimmer, Riley, Wang and Rauworth, 2004), have been developed to target accessibility challenges in fitness centres and their building interior, AwPD are still underrepresented in fitness centres more than 10 years after the United Nations Convention on the Rights of Persons with Disabilities (CRPD) were ratified.

There is, therefore, a lack of a comprehensive scientific summary of all context factors (not only the physical ones), that may influence participation in fitness centres for both AwPD and AwoPD. Such context factors have been described and outlined by Di Blasi et al. (Di Blasi *et al.*, 2001; Di Blasi and Kleijnen, 2003) Figure 3, and this framework has been used to understand context effects (effects of a given treatment, not directly caused by the treatment) on health outcomes in doctor-patient relationships.

Figure 3. The Di Blasi framework



Factors that determine context effects in doctor-patient relationships. Reprinted with permission (Di Blasi *et al.*, 2001)

The concept of context effects is multifactorial and should be interpreted broadly to include both physical, mental and social factors (Miller and Kaptchuk, 2008). The Di Blasi framework describes how five categories of context factors may influence health outcomes; These categories include; 'Healthcare setting', 'Patients characteristics', 'Treatment characteristics' 'Patient-practitioner relationship' and 'Practitioner characteristics'(Di Blasi *et al.*, 2001). The Di Blasi framework may also be used for describing the fitness centre environment, as it has similarities to the physical surroundings, the individual fitness user, the exercising characteristics, and the relation to the instructors/staff. Thereby this framework may group the different categories within barriers and facilitators for overview and for comparison between different fitness centre user groups.

To increase the possibility of participation in exercising in fitness centres for both AwoPD and AwPD an overview of context factors is requested to guide practice. Due to lack of scientific systematic compilation of barriers and facilitators for performing physical activity in a regular fitness centres jointly for AwPD and AwoPD, there is a knowledge gap on how to address the problem with lack of representation and participation in fitness centres especially for AwPD. Moreover, whether barriers and facilitators differ between the two groups is unknown, since comparison is rarely performed due to the frequent separation of sport into traditional sport (non-disabled persons) and parasport (disabled persons).

The aim of study 2 was therefore, *to identify, synthesise and compare barriers to, and facilitators of, exercising in fitness centres among groups of adults with physical disabilities (AwPD) and adults without physical disabilities (AwoPD).*

1.3 Inclusive fitness centres (study 3)

Fitness centres has roots in the bodybuilding culture, and has since developed into a broader, popular global movement within a more differentiated and individualized space where various techniques are used in order to form, sculpture, and transform the body (Andreasson and Johansson, 2014). The focus on body appearance is still an important part of the fitness culture and has come to be connected to health, beauty, youth, and a more androgynous relation to the body (Andreasson and Johansson, 2014). Fitness centres may therefore be percieved as an exclusive (non-inclusive) fitness space (Sassatelli, 2010), especially towards AwPD who rarely align with the bodyideals and, furthermore, experience accessibility problems in fitness centres (Richardson, 2017).

To try and change this, and to promote physical activity and health, 'inclusive fitness centres' has been proposed, but a clear definition is still lacking (some uses inclusive fitness in relation to homosexuality, transgender and gender nonconforming people). This thesis is specifically aimed at fitness centres where both AwPD and AwoPD can participate in fitness exercising on equal terms - a place where everybody can enter, participate as preferred, be in a pleasant atmosphere and leave again when preferred.

Initiatives to promote access and participation in physical activity in fitness centres has mainly been carried out in the USA and the UK. In the USA, The Inclusive Fitness Coalition (IFC) (Inclusive Fitness Coalition, n.d.) is working to promote access and participation in physical activity for AwPD, together with the education of Certified Inclusive Fitness Trainers (American College of Sports Medicine (ACSM), 2020). In the UK, the Inclusive Fitness

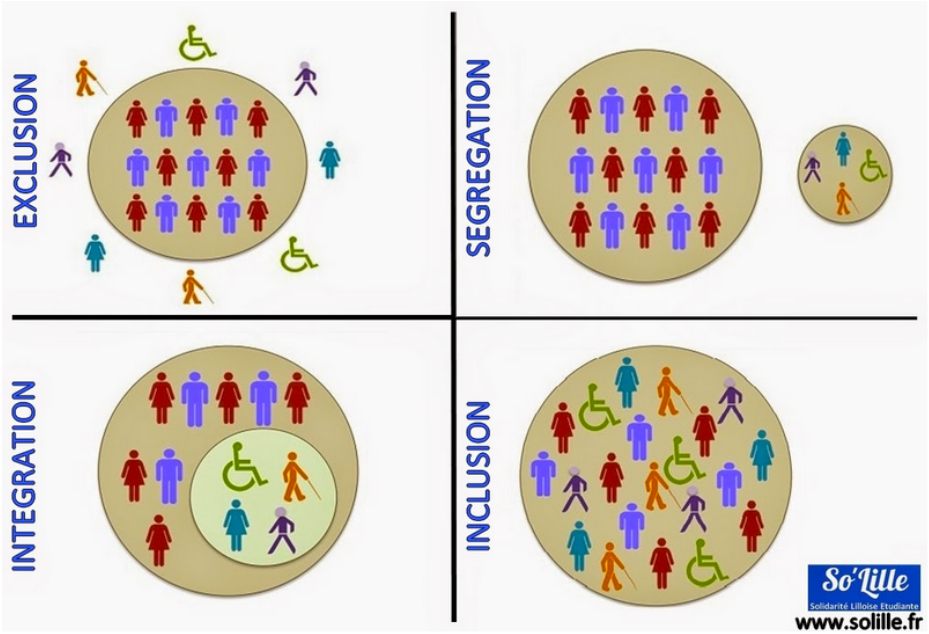
Initiative (IFI) started in 2001 to promote inclusive fitness centres and address inequality in physical activity (Activity Alliance, 2020). Among other things, IFI has developed 'the IFI Mark', a gym accreditation at three level (good, very good or excellent) to assess fitness centres in UK of their welcoming and accessible environments towards people with disabilities. However, equitable inclusion of both AwPD and AwoPD within the same fitness space is challenging as many barriers obstruct, and knowledge of how to create successful inclusion is still wanting. Impotantly, inclusive fitness centres in a Scandinavian context is still unexplored.

The key term in inclusive fitness centres is 'inclusive', and there are several definitions of inclusion depending on the context where it is used. The following general definition from Miller and Katz (2002) is applied in the broader perspective: *'Fully and respectfully involving all members, regardless of gender, religion, race, color, sexual orientation, national origin, age or physical ability in the activities and life of the organization.'* (Miller and Katz, 2002, p. 199). A more narrow definition relevant for this thesis is 'disability inclusion', which is *'making sure everybody has the same opportunities to participate in every aspect of life to the best of their abilities and desires'* (Centers of Disease Control and Prevention CDC, 2019). This definition aims to ensure an increased participation in socially expected life roles and activities – such as being a student, work colleague, friend, community member, etc., engaging in all parts of social activities in the community (Centers of Disease Control and Prevention CDC, 2019). For this thesis, the focus is on AwPD and obstacles to their participation in fitness centres as a part of leisure activities.

1.3.1 The concept of inclusion

The term inclusion has been used for many years, and it originates from inclusion of children with disabilities in the school system in 1994 described in The Salamanca Statement from UNESCO (Calderbank, 2009). However, the term is also used in areas where a minority group takes part in the society within a specific area. Inclusion is described as the desired form of environment as one of four categories within the educational system; exclusion, segregation, integration and inclusion (Hehir *et al.*, 2016), as illustrated by So'Lille seen in Figure 4. The model is meant to show different environments from the least inclusive to inclusion where both physical access and fully and respectful involvement of persons with disabilities (by some referred to as social inclusion (Cobigo *et al.*, 2012)) is perceived.

Figure 4. Illustrations of different types of educational environments



Four common educational environments for students with disabilities: exclusion, segregation and integration and inclusion. Source: (So'Lille - Solidarité Lilloise Etudiante, 2015)

The model from the educational environment may also be applicable in relation to sport and exercise settings, in the following examples related to fitness centres will be presented.

The concept of *exclusion* occurs when AwPD are directly or indirectly prevented from participation or simply denied access to an area (Hehir *et al.*, 2016). In relation to fitness centres exclusion may occur when participation is impossible due to inaccessible structural barriers in the building lay-out. This results in a situation where AwPD cannot physically enter the fitness centre or move around inside due to e.g. lack of space (Calder *et al.*, 2018; Dolbow and Figoni, 2015; Gross *et al.*, 2013; Riley *et al.*, 2008; Rimmer, 2005; Rimmer *et al.*, 2017).

To overcome the situation of inaccessible surroundings the concept of *segregation* may be used, where separate, specially designed environments established to counter a particular or various impairments (Hehir *et al.*, 2016). An example of segregation could be the fitness centre run by The Lakeshore Foundation in Alabama, USA (Lakeshore, 2020; Richardson and Motl, 2019), which is established solely for AwPD.

The third concept, *integration,* is used in few facilities, with a specifically designed fitness space to accommodate AwPD within the mainstream facility for AwoPD. One such example is HI Fitness, a minor local Danish fitness centre with a room equipped with specially adapted fitness machines (HI Fitness, 2021). This model obviously provides AwPD with the opportunity to exercise but being physical present and able to participate still lack the social component for

AwPD to be fully and respectfully involved (Cobigo *et al.*, 2012). More serious, this type of physical environment may also lead to the feeling of being excluded or even displayed, and the setup shows limited success in recruitment of disabled fitness users (Focus group with disabled fitness users, 2018)

Promoting *inclusion* in fitness centres, to achieve the best possible environment for the requirements and preferences of AwPD, involves a process of systematic modification of structures and spaces as well as strategies to overcome barriers (Hehir *et al.*, 2016). An inclusive fitness centre would not only provide AwPD with physical access to the fitness centre on equal conditions as their non-disabled peers, but such fitness centres would also provide them with fully and respectfully involvement in a leisure activity. This could potentially increase the participation of AwPD in fitness centres and further increase their level of physical activity thereby provide the users the full benefit from exercising.

1.3.2 Dis/ableist attitudes influence on inclusion in fitness centres

In order to promote a truly inclusive fitness centre, it is important to gain insight in the perceptions of not only of the minority group of AwPD, whom we want to include, but also in the perceptions of the majority group of AwoPD. From the perspective of AwPD some very important barriers to address are those arising from AwoPD in terms of ableism and disablism towards AwPD in society in general (Campbell, 2009a). Definitions of ableism and disablism vary, and they both relate to different aspects of disability discrimination. Ableism relates to the discrimination in *favour* of non-disabled people and disablism relates to discrimination or prejudice *against* disabled people (Scope - the disability equality charity, 2021).

Ableism is described to be the most dominant disability narrative in Western societies (Tarvainen, 2019), and it refers to '*A network of beliefs, processes and practices that produces a particular kind of self and body (the corporeal standard), that is projected as the perfect, species-typical and therefore essential and fully human. Disability then is cast as a diminished state of being human.*' (Campbell, 2009b, p. 5). Thus, ableism is represented by AwoPD, and since there is a nearly unconscious acceptance of ableism in society, there seems to be a need to address this concept (Wolbring, 2008). Ableism is recognised as a regulator within sport and exercise settings leading to exclusion of AwPD (Brittain *et al.*, 2020), found to be present in fitness centres in the UK, consequently making AwPD feeling intimidated, unwelcome, excluded, and oppressed (Richardson *et al.*, 2017a).

In contrast, disablism is the typical perspective investigated, examining attitudes and barriers towards disabled people, refering to '*A set of assumptions (conscious or unconscious) and practices that promote the differential or unequal treatment of people because of actual or presumed disabilities*' (Campbell, 2009b, p. 4). Disablism can be divided into two different forms, indirect and direct psycho-emotional disablism (Reeve, 2014), both relevant in relation to fitness centres. Indirect psycho-emotional disablism relates to the structural barriers that exclude AwPD, e.g. inaccessible fitness centre entrances, unsuitable fitness equipment and lack of space for transferring around between the exercise equipment (Calder *et al.*, 2018; Rimmer *et al.*, 2017). Direct psycho-emotional disablism refers to the negative interactions that AwPD experience from others, e.g. looks, words or actions which can result in feelings of anger, otherness, lacking self-worth and feeling excluded (Reeve, 2012, 2014).

Therefore, physical accessibility in itself does not lead to inclusion (Hums *et al.*, 2016), as other inter-relational aspects need to be considered in order to understand how to achieve full and respectful involvement of AwPD.

In a single setting in the UK, aspects of both ableism and disablism have been reported as barriers for AwPD participation in fitness centres (Richardson *et al.*, 2017a, 2017b), but comparable investigations are so far lacking. Since AwPD furthermore point to AwoPD and their dis/ableist perspectives as a barrier, it would therefore seem important to investigate inclusion in fitness centres from the opposite perspective, from those who may hinder inclusion. This novel approach represents a knowledge gap, since investigating inclusion in fitness centres from the perspective of AwoPD regarding AwPD, has not been done before.

Since attempts at establishing inclusive fitness centres have thus far not been convincing, more initiatives must be launched, not only to foster an inclusive atmosphere in fitness centres (Richardson *et al.*, 2017a) but also to gather further understanding of the relations between AwPD and AwoPD. Establishing such inclusive fitness centres therefore requires knowledge about the current perceptions in the established fitness centre environment, i.e, among the AwoPD, which will be the majority group in inclusive fitness centres. Thus, to improve genuine inclusion in fitness centres, it is essential to identify the ableist and disablist attitudes of AwoPD.

Therefore, the aim of study 3 was, *to identify ableist barriers to inclusion, wherein we could anticipate the potential barriers, attitudes and perceptions that may hinder inclusion, and address these before members with and without disabilities use this exercise space.*

Thus, the aim was shaped by two key questions;

1) What is the ideal fitness space from the perception of non-disabled fitness users?
and
2) How might their dis/ableist attitudes negate inclusion in three future pilot inclusive fitness centres across Denmark?

2.0 Aims of the thesis

The overarching aim of this thesis was to investigate the basis for inclusion of adults with physical disabilities (AwPD) in fitness centres.
To work towards this overarching aim, three independent projects were designed, each applying a different methodology. Their specific aims are listed below.

Study 1:
To identify and describe the group of potential fitness participants with disabilities in Denmark in terms of prevalence and socio-demographic profile and finally to compare these characteristics with the general adult population in Denmark.

Study 2:
To identify, synthesise and compare barriers to, and facilitators of, exercising in fitness centres among groups of adults with physical disabilities (AwPD) and adults without physical disabilities (AwoPD).

Study 3:
To identify ableist barriers to inclusion, wherein we could anticipate the potential barriers, attitudes and perceptions that may hinder inclusion, and address these before members with and without disabilities use this exercise space.
The aim was shaped by two key questions:
1) What is the ideal fitness space from the perception of non-disabled fitness users?
and
2) How might their dis/ableist attitudes negate inclusion in three future pilot inclusive fitness centres across Denmark?

3.0 Scientific approach

The focal point of this PhD thesis is inclusion of AwPD in fitness centres. With this PhD thesis, I seek to shed light on a challenge in a practical setting by investigating this phenomenon from a research perspective and thereby produce knowledge which may be led back in the practical settings.

The phenomenon inclusion in fitness centres is complex as it originates from a practical setting and many different perspectives can be investigated in relation to this. My background in health science (physiotherapist, and MSc. in health science/cand.scient.san) and my 10+ years of teaching and performing research and experimental development activities (OECD/European Observatory on Health Systems and Policies, 2015) at a University college have formed my way of thinking. The strong focus is therefor on applied science directed towards a specific practical aim and knowledge from both human science (human culture and way of life), natural science (the body as a biological entity) and social science (human societies and communities) (Bjørnlund and Sjöberg, 2017), is used when relevant for the aim.

To capture the complex aim of this thesis, to investigate the basis for inclusion of AwPD in fitness centres, we need to draw on both extremes; natural science and human science. Nature is regarded as objective, but for us humans to understand the objective we also need to rely on human perceptions and subjective perspectives (Thisted, 2010a). This may seem a dualistic and conflicting battle about 'the truth', but it may also be regarded as complementary, and therefore better embracing the complexity of the aim. Dialectic constructivism is a practice-philosophical perspective that takes this viewpoint, where the interaction between objectivity and subjectivity comprises our world (Thisted, 2010a). Consequently, our world consists of both nature (object) and culture (subject), and science in practice may enable us to talk about the scientific realisation in practice (Thisted, 2010a). Dakwar et al. takes this one step further, arguing that their new approach within scientific theory 'Situational Dialectic Scientific Theory' (Dakwar *et al.*, 2017), is not static, but varies depending on time, location, interaction between theory and practice, and between parts and the whole (situational). Furthermore, all scientific theoretical approach has oppositions and is seen as a choice on a continuum (dialectic). So, this is not another new theory arguing for *the truth*, but rather an argument for achieving new knowledge and understanding by using different methods, perspectives and theories when looking at a complex phenomenon as inclusion of AwPD in fitness centres.

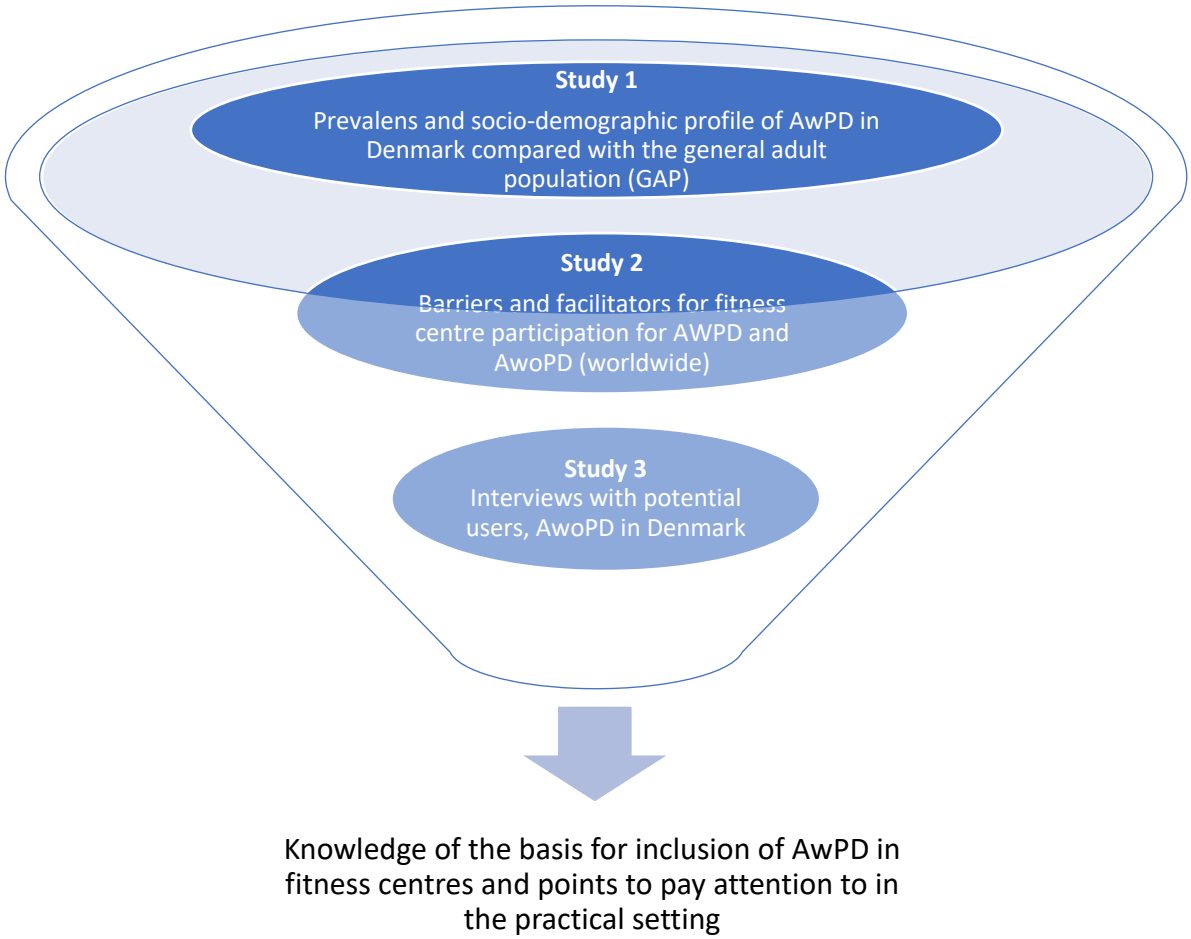
This perspective aligns with the term multimethod research, since it can be defined as 'bringing together numbers and narratives, description, hypothesis testing, hypothesis generation, and understanding of meaning and context to provide fuller discernment and greater transport-ability of the phenomenon under study' (Stange, 2006, p. 292). This underlines how the combined use of qualitative and quantitative methods should not be considered a battle between quantitative and qualitative research, but instead as beneficial in illuminating the phenomenon in a broader perspective, as exemplified in this PhD project encompassing three studies employing fundamentally different approaches.

The scientific rational for this 'multimethod PhD thesis' is also evident. The term multimethod specifically describes when different approaches or methods are used in parallel (or sequence) but are not integrated until inferences are being made (Johnson *et al.*, 2007) as is the case for this thesis. Somewhat similar, it designates as a thesis including both quantitative and qualitative studies (Malterud *et al.*, 2017).
The topic of this PhD project was inspired by the Fitness for all-campaign (Appendix p. 97), and this PhD-project with the overarching aim to investigate the basis for inclusion of AwPD, was designed. To investigate the phenomenon of inclusion in fitness centres, three research questions were designed with inspiration from the Fitness for all-campaign:

1) Who are the group of potential fitness participants with physical disabilities?
2) What are the barriers and facilitators for exercising in fitness centres for people with and without physical disabilities?
3) What do non-disabled fitness participants think of inclusive fitness centres?

These research questions were used in order to structure the PhD thesis. Accordingly, the thesis is build up through three steps (Figure 5): firstly, an investigation to establish the background by determining the prevalence and characteristics of the group of AwPD we aim to include in fitness centres. Secondly, an overview of barriers and facilitators for fitness centre participation for users, AwPD and AwoPD, in addition to a comparison of the two groups. This leads to the third study of perceptions regarding how to be or not to be a part of an inclusive fitness environment. Thus, developing an overall progression from broad-based knowledge about larger populations to narrow and in-depth knowledge of small, selected populations. (Please note, that this structure does not mirror the actual work-flow, as great parts of the work were performed concurrently due to the working relationship with the Fitness for all-campaign (Appendix p. 97).

Figure 5. The PhD-thesis and the three studies



The PhD-project comprises of three studies investigating prevalence, barriers/facilitators, and user perspectives.

Consequently, to fulfil the overarching aim of the thesis, based on the different research questions, the three studies draw on different scientific background and research traditions (Table 1), as different research methods are necessary in relation to the aims set up for this project (Malterud, 2017a):

Study 1: Aims to identifying the relevant group of AwPD based on ICD-10 diagnoses, and it is therefore related to natural science and the biomedical field, using methods within epidemiology which is based on a positivistic scientific theoretical approach. Further this is categorised as primary research, as this is an original study. The study in mainly descriptive, but involves analytical statistics in terms of p-values in order to test our hypothesis of differences in distribution of the different variables between the groups of AwPD and AwoPD.

Study 2: Aims to identify, synthesise, and compare barriers and facilitators for exercising between groups. The scoping review method (Peters *et al.*, 2017; Peters, Godfrey, McInerney, *et al.*, 2015), draws upon the positivistic scientific theoretical approach as it is based on the systematic review method in the top of the evidence hierarchy (Munn *et al.*, 2018; Tricco, 2016; Tricco *et al.*, 2018a). The scoping review is a type of secondary research, which aims to review the existing original literature of all types; quantitative, qualitative, mixed methods and grey literature (Peters, Marnie, *et al.*, 2020). Thus, as the literature synthesis rely on studies from both natural, social and human sciences, the study is drawn towards a qualitative/human scientific direction in relation to the data analysis. This leads to a more pragmatic worldview were the research is problem-centred and real-world practice oriented and research always occurs in a setting where the context is an important factor that needs to be considered (Creswell, 2014).

Study 3: Aims to identify ableist barriers to inclusion by describing non-disabled participants ideal fitness environment and how their ableist attitudes might negate inclusion. Involving the perspectives of individual persons, this part of the project is based on human science based on empirical interview data with an explorative approach to the field (Malterud, 2012a). The method chosen for this analysis, Systematic Text Condensation, have philosophical roots in hermeneutics (interpretation of lived experiences in the specific context) and phenomenology (lived experiences of the individuals and their 'lifeworld') whereas social constructivism (social phenomenon's and human interactions) is more related to the data analysis (Crabtree and Miller, 1999; Malterud, 2017b). Social constructivism is based on the assumption that individuals develops meanings of their experiences and with this approach it is important to study the specific context in which the people live, in order to understand the cultural setting, as the individuals subjective meanings are negotiated socially and historically (Creswell, 2014). An editing approach was used, where the researcher engages with the text naively without a template, and attempts to identify and separate one selves from preconceptions prior to reading the data (Crabtree and Miller, 1999). Researchers within social constructivism recognize that their own background influence the interpretation of data as it is influenced by their personal, cultural and historical experience etc. (Creswell, 2014). The very inductive approach used in this study ended with the use of a theoretical critical disability study lens on the data related directly to AwPD in the inclusive fitness centres.

Table 1. Overview of the scientific approach of the three studies

Overarching aim of the thesis	To investigate the basis for inclusion of AwPD in fitness centres		
Research question	Who are the group of potential fitness participants with physical disabilities?	What are the barriers and facilitators for exercising in fitness centres for people with and without physical disabilities?	What do non-disabled fitness participants think of inclusive fitness centres?
Study	**1**	**2**	**3**
Research type	Primary research	Secondary research/desk research	Primary research
Philosophical worldview	Natural science - Positivism	The method arises from natural science (positivism), but the included studies both draw on natural, social and human science. - Pragmatism	The method arises from human science with roots in hermeneutic and phenomenology - Social constructivism
Methodological approach	Quantitative	Quantitative	Qualitative
Research method/Study design	A register-based cross-sectional study	A scoping review	An interview study based on 3 focus groups
Material/ participants	606.857 AwPD based on ID-numbers	102 qual/quan/mixed/grey papers	18 AwoPD (≥18 years)
Data	Numbers	Numbers and text	Text
Name of the papers	Paper I: Prevalence and socio-demographic profile of adults with physical disabilities in Denmark – a register-based cross-sectional study	Paper II: Barriers to, and facilitators of exercising in fitness centres among adults with and without physical disabilities: A scoping review	Paper III: Fitness for all – How do non-disabled people respond to inclusive fitness centres?

The overarching aim, the three research questions and the scientific approaches of the three studies constituting the foundation of this thesis

4.0 Methods and results

This section comprises a presentation of the three studies in the PhD-project. Due to the fundamentally different methods employed in the studies, study 1, 2 and 3 will be presented one by one; first the method and, in immediate continuation hereof, the results.
The PhD-project was approved by the University of Southern Denmark, Research & Innovation Organisation (RIO) on behalf of The Danish Data Protection Agency, journal number 2015-57-0008.

4.1 Methods in study 1 - Register-based study

The first study was designed to establish more precise knowledge about the group of AwPD, as this group is the immediate target for the improvement of inclusion in fitness centres investigated. Existing knowledge about both identification of this group, as well as knowledge about socio-demographic variables of the group were limited as described in the introduction. The register study was designed to provide knowledge of the identified knowledge gap identified on p. 12 establishing the prevalence of AwPD in the Danish population, and to provide socio-demographic knowledge about the group as a whole. To the best of my knowledge this is the first study to combine ICD-10 diagnosis and socio-demographic variables, thus making it possible to compare across different diagnosis. Knowledge about AwPD in Denmark could support the foundation of the Fitness for all-campaign and a national approach was chosen to improve the generalisability.

This register-based, descriptive, cross-sectional study, was based on data from December 31st 2018, harvested from the Danish National Patient Register (DNPR) and Statistics Denmark. The study was approved by Statistics Denmark, prior to accessing data on their server. Due to data protection regulations, data was not reported if there were less than 10 individuals in a cell/variable. The STROBE guideline (Vandenbroucke, 2007) was used for reporting.

4.1.1 Population

The study population consisted of AwPD identified from The Danish National Patient Register (DNPR). AwPD were defined by the selection of nine subgroups with different diagnoses of physical disabilities, judged to be common and sizable groups that would benefit from some

level of physical activity and could be potential fitness centre users within the Fitness for all-campaign. The nine groups selected include: osteoarthritis (OA), rheumatoid arthritis (RA), acquired brain injuries (ABI), cerebral palsy (CP), multiple sclerosis (MS), spinal cord injuries (SCI), amputations (AMP), muscular dystrophy (MD) and poliomyelitis (POL).
The data set was created by Statistics Denmark, from the following inclusion criteria:
All persons within The Danish National Patient Register (DNPR) who, in the period from 1994 and onwards, were given one or several of selected ICD-10 Diagnosis Codes, related to the nine disability groups (see page 120-121 for further details). Additionally, the persons had to be adults (at least 18 years of age), alive and living in Denmark on December 31st 2018.

4.1.2 Data and variables

To describe the study population, the following variables were identified from four different registers from Statistics Denmark.

'Population in Denmark'-register:

- Sex (binominal data) was extracted and categorized into 'Male' or 'Female'.
- Age (ratio-interval data) was extracted by Dec. 31st 2018, and grouped into seven age categories; '18-24 years', '25-34 years', '35-44 years', '45-54 years', '55-64 years', '65-74 years' and '75 and older'.
- Geographical region in Denmark (nominal data) was based on the individual's home address by Dec. 31st 2018 and categorised into the five regions in Denmark; 'North Denmark', 'Central Denmark', 'Southern Denmark', 'Capital' and 'Zealand'.
- Civil status (nominal data) was extracted and categorized into 'Unmarried', 'Married or separated', 'Divorced' and 'Widow or widower'.
- Origin (nominal data) was categorized into 'Danish', 'Immigrants' or 'Descendants of immigrants'.

'Educational attainment'-register:

- Educational level (ordinal data) was operationalised as the highest completed education, categorized into 5 groups according to the International Standard Classification of Education (ISCED) (UNESCO Institute for Statistics, 2012): 'ISCED 0-2 Primary and lower secondary school', 'ISCED 3-4 Upper secondary school/vocational education',

'ISCED 5-6 Bachelor or equivalent level', 'ISCED 7-8 Master/doctoral level' and 'Unknown or missing'.

'The Danish Employment Classification Module':

- Occupational status (nominal data) was extracted and categorised into 'Affiliated to the labour marked', 'Education' 'Unemployed or welfare payment', 'Early retirement', 'Retirement', and 'Unknown or missing'.

'Disability/Handicap Services'-register:

- Functional level (ordinal) is a variable registered by the municipality as an overall functional level status for a person who receives disability services. Data is reported in the following five categories: 'No problems', 'Slight problems', 'Moderate problems', 'Severe problems' and 'Complete problems'.

All data sources were linked by use of the personal identification number (CPR-number), a unique identifier assigned to all Danish citizens since 1968 that encodes sex and date of birth. Consequently, it is possible to link data from one or more registers or from other sources with register-based information at an individual level. All linkage was performed anonymously within databases of Statistics Denmark.

Data on the general adult population (GAP) in Denmark, was collected from StatBank Denmark (Statistics Denmark, 2021). The database in StatBank Denmark is directly accessible, free of charge and data is only presented at an aggregate level. We extracted data of the GAP in Denmark who were 18 years or above, alive and living in Denmark by Jan 1st, 2019. All variables were collected from different statistical tables in StatBank Denmark and used for comparisons with the AwPD group:

- sex, age, geographical region in Denmark and origin (StatBank Denmark, 2020a),
- education level (only accessible for people between 15-69 years) (StatBank Denmark, 2020b)
- occupational status (StatBank Denmark, 2020c)
- civil status (StatBank Denmark, 2020d)

4.1.3 Analysis

The prevalence of the total group of AwPD as well as the prevalence of the nine disability subgroups, were reported as a proportion of the GAP living in Denmark on December 31st 2018. The distribution of the total disability group and the nine different subgroups are presented with the variables; sex, age and geographical region in Denmark, origin, education level, occupation and civil status, and compared with the GAP in Denmark.

A Pearson's chi-squared test was used to calculate whether there was a significant difference in distribution of the different variables between each of the disability subgroups compared with the GAP in Denmark. For each variable, we used data from the GAP and subtracted the disability subgroup from the total Danish population before calculating the p-value for differences between the groups. Finally, the distribution of functional level is reported for all nine disability subgroups and the total group.

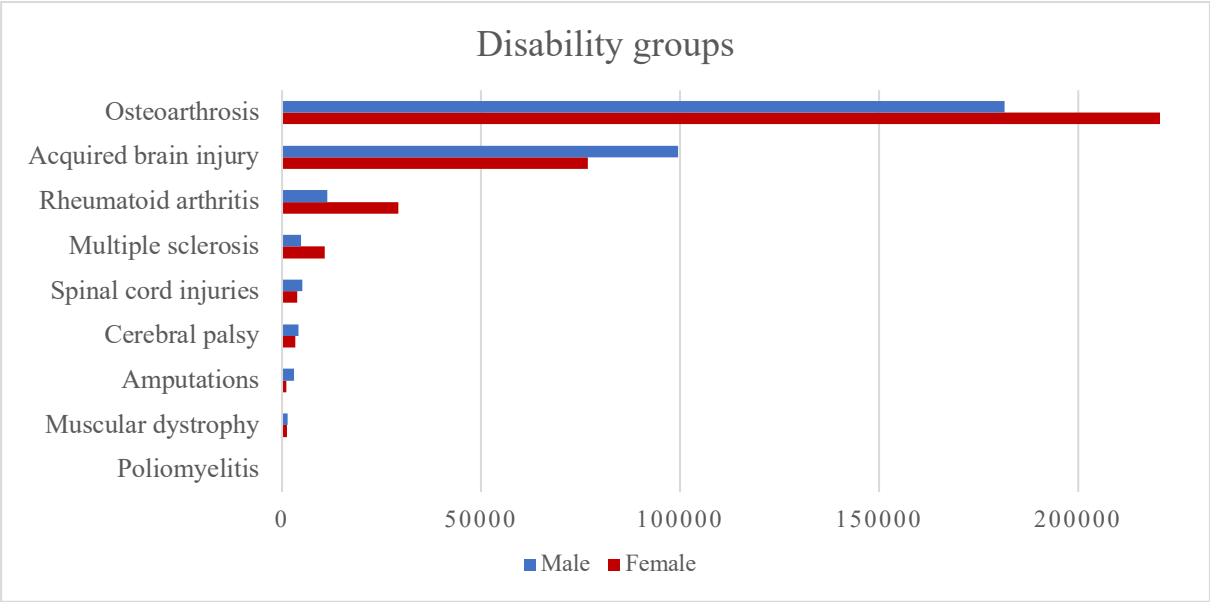
4.2 Results from study 1

This section is divided in three paragraphs: prevalence, socio-demographic variables and level of disability.

4.2.1 Prevalence

In total 606.857 persons were included in the nine disability subgroups, equivalent to 13% of the total adult population in Denmark (Figure 6). The largest group is osteoarthritis (OA) (69%), followed by acquired brain injury (ABI) (29%), rheumatoid arthritis (RA) (6.7%), multiple sclerosis (MS) (2.6%), spinal cord injuries (SPI) (1.5%), cerebral palsy (CP) (1.2%) amputations AMP (0.7%), muscular dystrophy (MD) (0.5%) and poliomyelitis (POL) (<0.1%). Almost 91% of the persons are only included in one disability group, nearly 9% are included in two groups, while <0.5% are included in 3 or more groups.

Figure 6. Distribution by gender of the nine disability subgroups, in total 606.867 persons



4.2.2 Socio-demographic variables

The socio-demographic variables consisted of; sex, age, geographical region, origin, education level, occupation and civil status and are described below.

In total we fund an overrepresentation of women in the disability group as compared with the GAP in Denmark (Table 2), but there were considerable sex-related differences within the nine different disability subgroups (subgroups not shown here, see page 98-99). Systemic diseases like Rheumatoid arthritis and Multiple sclerosis were considerably more frequent among women than men (72% vs. 28%, and 69% vs. 31%, respectively), whereas injury related disabilities were more common among men, e.g., A (73% vs. 27%), SCI (58% vs. 32% and acquired brain injury (56% for men vs. 44% for women). There were only minor sex differences in relation to osteoarthrosis, cerebral palsy, muscular dystrophy and poliomyelitis.

The age differences between subgroups reflect that some disabilities were diagnosed early in life, e.g., cerebral palsy, muscular dystrophy and some spinal cord injury, while others appear later in life. In the total disabled group, we found a higher percentage of both males and females above 75 years compared with the GAP in DK (Table 2), which is related to the two biggest subgroups osteoarthrosis and acquired brain injury experiencing the latest disease onset.

The distribution of subgroups between the Danish geographical regions generally follows the same pattern as the GAP. Only exceptions were amputations, which were more prevalent in region Southern Denmark and less prevalent in region Capital, as well as rheumatoid arthritis,

with a higher prevalence in region Zealand and, finally, osteoarthrosis which is less prevalent in the Capital region. The difference in the osteoarthrosis distribution may simply reflect a younger population in the capital (only 21.2% of the adult population is ≥65 year in region capital compared to 26% in the rest of Denmark).

Origin was classified as immigrants as well as descendants of immigrants (western and non-western countries were pooled in the analysis). Both groups had far fewer physical disabilities compared with the GAP (immigrants 6.3% vs. 12.3, and descendants of immigrants 0.4 vs. 1.7%). However, among descendants of immigrants, cerebral palsy was twice as common as in the general population (3.8% vs. 1.7%).

The educational level in all subgroups were lower than in the GAP but differed considerably among disability types. Diseases with possible affection of the cognitive functions and early on-set, i.e., cerebral palsy and spinal cord injury, also display the lowest educational levels.

The proportion of AwPD affiliated to the labour market is only half the proportion of the GAP (28.3% vs. 60.0%). The lowest proportion of persons affiliated to the labour market were found in cerebral palsy (16.4%) while amputation had the highest proportion (48.5%). Finally, the total disability group were twice as often on early retirement (10%) or retirement (53.8%) as the GAP (4.8% and 21.5%, respectively).

Civil status differs notably between the groups, as only half as many in the disabled group (14.9%) compared to the GAP (35.9%) were unmarried, and thus there were more people with disability in the remaining groups; married/separated, divorced or widow/widower. Again, there are differences between the subgroups; cerebral palsy is the group with fewest people being married (18.3%) while osteoarthrosis include the most (89.4%).

Table 2. Sociodemographic variables for the group of AwPD and the GAP

	Total[1] disability group AwPD N=606,857	Total[2] group in DK GAP N=4,645,697	p-value
Sex			
Male	285,391 (47.0)	2,294,081. (49.4)	≤0.001
Female	321,466 (53.0)	2,351,616 (50.6)	
Age			
Male			
18-	4633 (0.8)	271,039 (5.8)	
25-	10,761 (1.8)	379,277 (8.2)	
35-	16,803 (2.8)	354,771 (7.6)	
45-	37,377 (6.2)	408,131 (8.8)	≤0.001
55-	59,851 (9.9)	358,343 (7.7)	
65-	80,715 (13.3)	314,798 (6.8)	
75-	75,251 (12.4)	207,722 (4.5)	

Female			
18-	3632 (0.6)	259,452 (5.6)	
25-	8049 (1.3)	363,886 (7.8)	
35-	15,168 (2.5)	350,681 (7.5)	
45-	36,682 (6.0)	402,733 (8.7)	≤0.001
55-	61,963 (10.2)	361,321 (7.8)	
65-	87,363 (14.4)	333,726 (7.2)	
75-	108,609 (17.9)	279,817 (6.0)	
Geographical Region:			
North Denmark	64,222 (10.6)	476,109 (10.2)	
Central Denmark	137,692 (22.7)	1,048,402. (22.6)	
Southern Denmark	141,087 (23.2)	979,225 (21.1)	≤0.001
Capital	167,461 (27.6)	1,470,152. (31.6)	
Zealand	96,395 (15.9)	671,809 (14.5)	
Origin			
Danish	565,711 (93.2)	4,005,579. (86.2)	
Immigrants	38,422 (6.3)	562,347 (12.1)	≤0.001
Descendant of immigrants	2724 (0.4)	77,771 (1.7)	
Education level[3,4]			
ISCED 0-2	204,181 (33.6)	1,025,443 (25.5)	
ISCED 3-4	250,753 (41.3)	1,606,866. (39.9)	
ISCED 5-6	109,907 (18.1)	891,196 (22.1)	≤0.001
ISCED 7-8	30,418 (5.0)	435,718 (10.8)	
Unknown or missing	11,598 (1.9)	69,874 (1.7)	
Occupation			
affiliated to the labour market	171,879 (28.3)	2,786,698. (60.0)	
education	5881 (1.0)	202,840 (4.4)	
unemployed or welfare payment	34,424 (5.7)	278,150 (6.0)	≤0.001
early retirement	61,365 (10.1)	223,007 (4.8)	
retirement	326,765 (53.8)	999,083 (21.5)	
Unknown or missing	6543 (1.1)	155,919 (3.4)	
Civil status			
Unmarried	90,323 (14.9)	1,669,782 (35.9)	
Married or separated	320,687 (52.8)	2,141,704 (46.1)	
Divorced	98,226 (16.2)	545,085 (11.7)	≤0.001
Widow or widower	97,621 (16.1)	289,126 (6.2)	

[1] Adults alive and living in Denmark by Dec. 31st, 2018, who received one of the diagnoses listed in Appendix 1 (see page 101-103) between January 1994 and December 2018
[2] Adults alive and living in Denmark by Jan. 1st, 2019
[3] Educational level for GAP (from StatDenmark) only includes 15-69 year-old persons in total 4.029.097 and is therefore not directly comparable with the disabled group (18-110 years).
[4] ISCED levels: 0-2 Primary and lower secondary school, 3-4 Upper secondary school / vocational education, 5-6: Bachelor or equivalent level, 7-8: Master / doctoral level
AwPD=Adults with Physical Disabilities, GAP= General Adult Population

P-values for differences in distribution for each variable, between the total disability group and the rest of the population (GAP) were calculated and all distributions were statistically significant between the groups (see Table 2, right column). Further, p-values for differences were calculated for each variable category for each disability subgroup compared with the GAP.

Again, all distributions were significantly different, except for the age distribution among women with spinal cord injury compared with the GAP (p=0.341) and the distribution of geographical region within the muscular dystrophy group compared with the GAP (p=0.367), where no differences were found (not shown).

4.2.3 Level of disability

Level of disability was a new variable in the register (established January 2018) and therefore reporting rates are low 0.9% for the total disability group, and differed considerably between groups from 0.4% for the osteoarthrosis group up to 14.3% for the cerebral palsy group (Table 3). For the total disability group, the disability levels comprising most persons were 'moderate' and 'severe problems' (in total 75.9%), which was also the case for all disease subgroups.
Five of the disability subgroups had about 20% of the included persons categorised in the two groups with the lowest level of disability 'no problems' and 'slight problems' (amputation 25%, osteoarthrosis 21%, rheumatoid arthritis 18.8%, acquired brain injury 17.6% and multiple sclerosis 16.1%). This were in contrast with the remaining three categories where more than half of the persons are categorised into the two categories with the lowest functional levels, 'severe problems' or 'complete problems' (spinal cord injury 70%, cerebral plasy 67.1% and muscular dystrophy 57.8%). This indicates the difference in how affected the individuals are from a given diagnosis. Whereas osteoarthrosis, acquired brain injury, rheumatoid arthritis, multiple sclerosis and amputation also include individuals who are less affected, spinal cord injury, cerebral palsy or muscular dystrophy severely affects the level of disability.

Table 3. Level of disability in the total disability group and in the nine subgroups.

	AO n=1444	ABI n= 2457	RA n=149	MS n=1442	SCI n=797	CP n=1048	AMP n=44	MD n=152	In total AwPD N=5412
Reporting rate (%)	0.4	1.4	0.4	2.9	8.9	14.3	1.0	5.5	0.9
Level of disability(%)									
No problems	1.0	0.9	2.0	0.5	0.4	0.2	2.3	0.7	0.8
Slight problems	20.0	16.7	16.8	15.6	4.8	6.4	22.7	3.3	14.9
Moderate problems	49.3	45.8	53.7	48.2	24.8	26.3	34.1	38.2	42.4
Severe problems	25.4	31.8	24.2	27.1	45.2	45.9	38.6	46.7	33.5
Complete problems	4.2	4.8	3.4	8.6	24.8	21.2	2.3	11.2	8.5

OA=osteoarthritis, ABI=acquired Brain Injury, RA=rheumatoid arthritis, MS=multiple sclerosis, SCI=spinal cord injuries, CP=cerebral palsy, AMP=amputations, MD=muscular dystrophy, AWPD= adults with physical disability.

In summary, there were significant differences between the disability group and the GAP in Denmark. The disability group had an overrepresentation of woman, were older and more often of Danish origin, had lower educational level and fewer were affiliated to the labour market. Furthermore, a lower proportion in the disability group were unmarried and lived in region Capital compared to GAP. The nine subgroups displayed big variation on all variables, including the newly introduced variable 'level of disability', which should be used with cautious due to the low reporting rates.

This study describes background knowledge by uncovering patterns and trends on the socio-demographical variables of AwPD and of the subgroups. This knowledge should be taking into account when promoting physical activity for this group. Due to the marked difference between the subgroups, it is important to be aware of the different needs among these subgroups of AwPD, and one could question whether it is reasonable to treat this highly diverse group as one single group.

Fitness centres must be aware of the special, and varied, needs from the group of AwPD in order to provide an appropriate and attractive exercise space for this group as members/users. The level of disability, in particular, must be considered carefully in order to make fitness centres both accessible and usable for this group.

4.3 Methods in study 2 - Scoping review

The second study in the thesis was designed to remedy the scientific knowledge gap caused by the lack of a comprehensive summery as identified on p.16. Compiling knowledge of the barriers and facilitators for fitness centre users is an obvious prerequisite for making fitness centres an arena for increasing physical activity for a broader audience. A systematic approach, with high transparency and reproducibility due to a well described method was prioritised among the many types of reviews available (Grant and Booth, 2009). Because of the broad research question and the need for an overview (Munn *et al.*, 2018), a scoping review was chosen. Scoping reviews are particularly useful, when a body of literature has not yet been comprehensively reviewed (Peters *et al.*, 2017; Peters, Godfrey, Khalil, *et al.*, 2015), as this type of reviews can include all types of literature, both qualitative, quantitative, mixed method research as well as unpublished and grey literature (Peters, Godfrey, *et al.*, 2020). This aligns well with the aim as barriers and facilitators for fitness centre participation can be identified in all types of literature, and not only in the research literature.

A five-step protocol was used for conducting the scoping review, as previously described from the Joanna Briggs Institute (Khalil *et al.*, 2016; Peters *et al.*, 2017; Peters, Godfrey, Khalil, *et al.*, 2015; Peters, Godfrey, McInerney, *et al.*, 2015), based on the framework of Arksey and O'Malley (Arksey and O'Malley, 2005) and Levac (Levac *et al.*, 2010). An a priori protocol for this scoping review was made publicly available online, at the European Open Access Science Repository Zenodo.com on 5 September 2018, DOI: 10.5281/zenodo.1409587 (Nikolajsen *et al.*, 2018). The PRISMA Extension for Scoping Reviews (PRISMA-ScR) (Tricco *et al.*, 2018b) was used as guideline for reporting.

4.3.1 Step 1 - Identifying the research question

The research question to be explored in the scoping review was: Which contextual factors are perceived as barriers to, or facilitators of, fitness centre participation for adults with or without physical disabilities? Contextual factors were grouped a priori into six categories modified from the Di Blasi framework (Di Blasi *et al.*, 2001) (see Figure 3, p. 15), which is used to understand contextual effects in practitioner–patient interactions. In this review, the framework was slightly modified to suit the fitness centre setting, by adding an additional sixth category to include relations to other users. See Table 4 for further details.

Table 4. The six contextual categories and their descriptions

	Contextual categories	Descriptions
1	The fitness centre setting	The physical environment in the specific fitness centre/gym e.g., surrounding area, buildings, room arrangement and fitness equipment.
2	The fitness centre user characteristics	The 'personal factors' according to ICF (World Health Organization, 2001) combined with their physical ability, e.g., the bodily performance and the individual fitness participant's opinions and feelings.
3	The fitness instructor's/staff characteristics	The front personnel in the fitness centre and their qualifications, e.g., knowledge, education, appearance, communication skills and courtesy, etc.
4	The fitness centre user – instructor/management relationship	The direct or indirect interaction between the participant and the instructor/management with respect to personal relations, teaching, and prejudices when interacting as a representative of the specific fitness centre together with rules, policies, membership terms and conditions, artifacts, culture and the atmosphere of the place.
5	The fitness/exercise characteristics	The different type of fitness exercises and how they are performed, e.g., individual exercising, type of classes, planning, specific exercises etc.
6	Other relationships	The relationship or direct and indirect interactions with other people than the staff in the fitness centre, e.g., strangers, familiar faces, friends and family or personal assistants.

The modified version of the Di Blasi framework, based on (Di Blasi *et al.*, 2001)

4.3.2 Step 2 - Identifying relevant studies

To capture the core elements of the research question, we used the PCC mnemonic - Population, Concept and Context, as proposed by Peters et al. (Peters *et al.*, 2017) to determine the inclusion criteria.

- The Population were adults ≥18 years, with or without physical disabilities.
- The Concept incorporated the variety of contextual factors encouraging or hindering participation, e.g., transportation, usability, accessibility, motivation and affordability etc.
- The Context was limited to indoor fitness centre/gym/health club settings where people exercise voluntarily in their leisure time.

The exclusion criteria were people solely with cognitive disorders/mental illness (depression, psychiatric diagnosis, etc.), prescribed (non-voluntary) exercises as part of rehabilitation in the

health care sector, and worksite or university fitness centres without public access. Furthermore, some papers were excluded as having an unsuitable scope if the main focus was on e.g., drugs or nutrition/dietary supplements, orthorexia, bodybuilding, homosexuality, hygiene and bacteria levels, defibrillators etc.
We included literature published in English, Danish, Norwegian and Swedish. All types of records were included also the grey literature as proposed in the PRISMA-ScR (Tricco *et al.*, 2018b) and the JBI manual for scoping review (Peters *et al.*, 2017). No restriction regarding publication date was applied.

As recommended in The Joanna Briggs Institute Reviewers' Manual (Peters *et al.*, 2017), we utilised a three-step protocol for our search strategy when conducting relevant studies.
Firstly, we performed a cursory search to identify relevant search terms. Secondly, guided by a medical research librarian, a block strategy with two blocks ('adult' and 'fitness centre') using Boolean operators were used. Index terms were adjusted and tailored for each of the six databases; Medline (via PubMed), Scopus (via Elsevier), Cinahl and SPORTDiscus (via EBSCO), and PsycInfo and Embase (via Ovid). The initial search was performed on 15 October 2018, with an update undertaken on 19 May 2020.
Thirdly, we conducted a systematic search for 'grey literature' using relevant parts of the Canadian Agency for Drugs and Technologies in Health (CADTH) guideline (Canadian Agency for Drugs and Technologies in Health (CADTH), 2018), as proposed in the PRISMA-ScR (Tricco *et al.*, 2018b). Further citation searching and searches of key authors were performed in all parts of the 'grey literature' search.

4.3.3 Step 3 - Study selection

Title and abstract screening of all records were performed in Covidence independently by two researchers. Firstly, we excluded all obviously irrelevant records (personal fitness and inclusive fitness are terms within evolution biology and were mixed in our search when we used the term 'fitness') this was performed by a physiotherapy student (NKL) and the author. Subsequently, a title and abstract screening for eligibility was performed. Reviewer 1 (HN) screened all records, while reviewer 2 (LFS) and reviewer 3 (BJK) screened half of the records each. All references were screened independently by the reviewers and consensus was obtained, with any conflicts resolved by discussion. Hereafter, a full-text screening was performed independently by two reviewers as described above.

4.3.4 Step 4 - Charting the data (data extraction process)

Data extraction was performed independently by two persons using a customised Excel data extraction sheet (see page 156) containing the following categories:

- Author(s)
- Year of publication
- Title
- Origin (where the study was conducted)
- Type of publication (original research or grey, and what kind)
- Methodology/Methods
- Aim
- Population
- Context (type of indoor fitness centre)
- Concept (barriers and facilitators for fitness centre use within the 6 context categories):
    1. The setting
    2. Fitness centre user characteristics
    3. Fitness instructor/staff characteristics
    4. Fitness centre user – instructor/management relationship
    5. Fitness characteristics
    6. Other relationships

Barriers and facilitators were defined as everything that could hinder or facilitate exercising in fitness centres, and a common-sense approach was used in terms of categorising factors as a barrier or a facilitator, if not directly described in the text. We established a standard set of rules before extracting data from different study/data types and determining whether a statement was labelled as a barrier or a facilitator:

Quantitative data:

- Descriptive studies (e.g., questionnaires) – if more than 50% of the respondents stated something as a barrier or a facilitator
- Regression/correlation analysis – a significant result according to the definition in the paper
- Factor analysis – a significant result according to the definition in the paper

Qualitative data:

- Papers with a result section – barriers or facilitators described in the result section or conclusion
- 'Grey literature' without a result section – if barriers or facilitators were described in the text.

Results from the two groups, AwPD and AwoPD, were handled separately. Further, we used the modified Di Blasi framework with six categories to provide an overview of the identified barriers and facilitators. For each of the six categories, barriers and facilitators were grouped with headlines and sub-points and ordered in a pragmatic chronology, rather than indicating importance or data saturation.

4.3.5 Step 5 - Collating, summarising, and reporting the results

The result section consists of three parts:

1. A numerical summary of the included records to establish an overview in terms of publication year, origin, type and population.
2. A descriptive summary of the barriers and facilitators reported separately for the two groups, AwPD and AwoPD, within the modified De Blasi framework.
3. A comparative analysis of the similarities and dissimilarities concerning barriers and facilitators between the two groups.

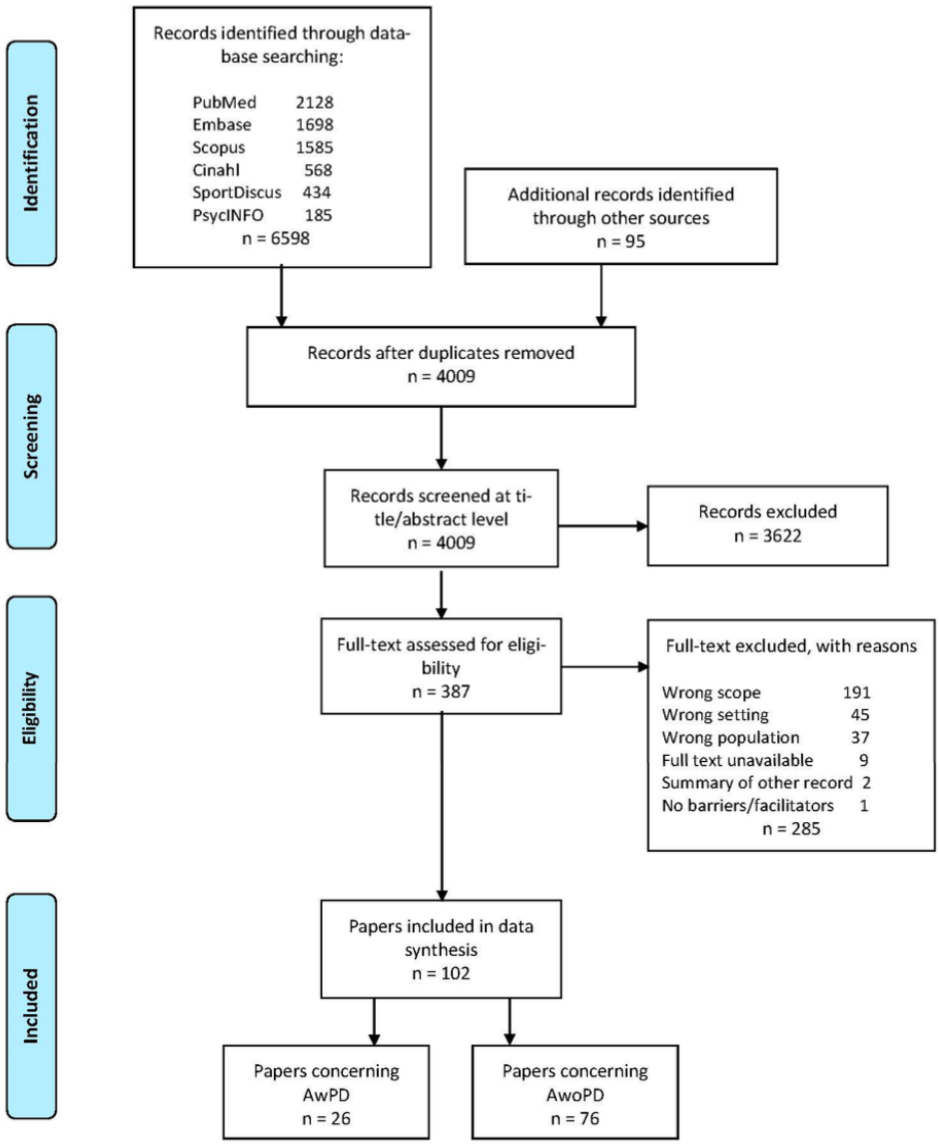
4.4 Results from study 2

This section is divided in three sections firstly a numerical summary, secondly a descriptive summary covering each of the groups AwPD and AwoPD and, finally, a comparative analysis of the groups.

4.4.1 Numerical summary

We included 102 papers in the review, the overview of the detailed process of study selection is shown in the PRISMA flowchart (Figure 7).

Figure 7. PRISMA-flowchart, overview of the study selection process

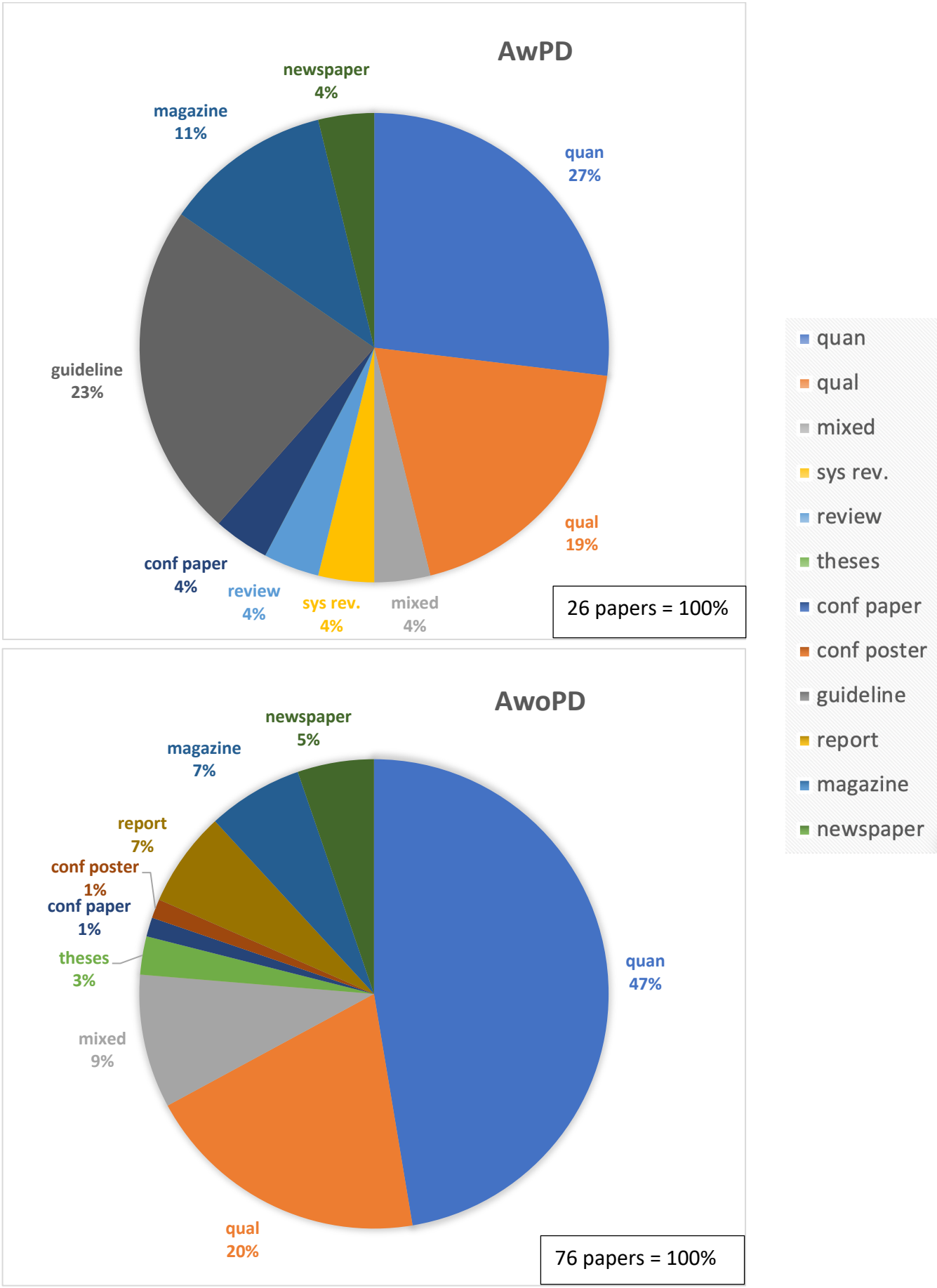


AwPD=adults with physical disabilities, AwoPD=adults without physical disabilities

All 102 papers were published between 1995 and 2020 and represented five continents (North America = 58, Europe = 36, Oceania = 5, Asia = 2 and South America = 1).

The papers were divided into scientific papers (original studies using quantitative, qualitative or mixed methods, systematic reviews, reviews/opinion papers and thesis) and 'grey literature' (conference papers, conference abstracts, reports and guidelines and articles from newspapers or magazines etc.). The distribution of the included papers is shown in Figure 8 (for a detailed overview of the 102 papers see page 129).

Figure 8. Overview of the 102 included papers according to type and group.



4.4.2 Descriptive summary

Adults with physical disabilities (AwPD) – barriers and facilitators

Only 26 papers concerned AwPD, of which almost 60% were categorised as scientific literature with the remaining being grey literature: guidelines, magazine and newspaper articles and a single conference paper. Only 6 papers actually gave voice to AwPD (Allen, 2001; Johnston *et al.*, 2015; Richardson *et al.*, 2017c, 2017b, 2017a; Rimmer, Riley, Wang, Rauworth, *et al.*, 2004), of those, one is a short newspaper article and three are from a single research group based on overlapping study populations.

The group of AwPD was very heterogenous regarding level of physical impairment, although this was sparsely described. Diagnoses were for instance cerebral palsy, spinal cord injury, post-polio syndrome, Parkinson's disease, injuries from accidents, fibromyalgia and back problems. The remaining 20 papers dealt with fitness facilities/equipment and managers perspective of their offers for people with disabilities or were guidelines on how to build or adjust existing fitness facilities to make them accessible and usable.

For AwPD in general, the focus of the papers was mainly on barriers that explained why AwPD rarely used fitness centres, revealing that most were due to accessibility issues and unsuitable equipment (20 out of 26 papers). The focus was on barriers, whether high costs, lack of skilled instructors, negative attitudes from staff and other users, in addition to facilities not being actively inclusive etc.. Most barriers were associated with being disabled. In contrast facilitators were often the opposite of the barriers, such as good accessibility, special trained staff, respectful communication, inclusive environment, tailored/adaptive fitness programmes and good social relationships. Consequently, positive aspects of fitness centre participation for AwPD related to the individual user with disabilities were lacking in the literature, e.g., motivation factors and advantages of physical exercise. In total, 14 different subgroups of barriers and 12 different subgroups of facilitators were identified (see page 130-134 for further details).

Adults without physical disabilities (AwoPD) – barriers and facilitators

Of the 76 papers identified on AwoPD, almost 80% were categorised as scientific literature. The group of AwoPD seemed more homogenous and were mostly subgrouped based on age, gender and membership status, such as being new users or long-time users.

For the AwoPD group, the papers mainly focused on facilitators (43 papers out of 76), and the primary focus was on personal motivation, exercise effects and exercise adherence. Other

facilitators were a pleasant fitness environment, comfortable atmosphere, good instructors, a variety of exercising possibilities and social relationships. Barriers were unattractive settings, dislike of the fitness culture, lack of knowledge, negative attitudes from instructors or staff, and the feeling of not fitting in.

In total 12 different subgroups of barriers and 13 subgroups of facilitators were identified (see page 136-141 for further details).

4.4.3 Comparative synthesis

An overview of the number of papers informing each of the six context categories for each of the groups AwPD and AwoPD is found in Figure 9, while a comprehensive list of all the subgrouped barriers and facilitators for the two groups is gathered in Table 5. In the following section differences and similarities between the AwPD and AwoPD will be presented with reference to Figure 9 and Table 5.

Figure 9. Distribution of the numbers of papers within the six contextual categories

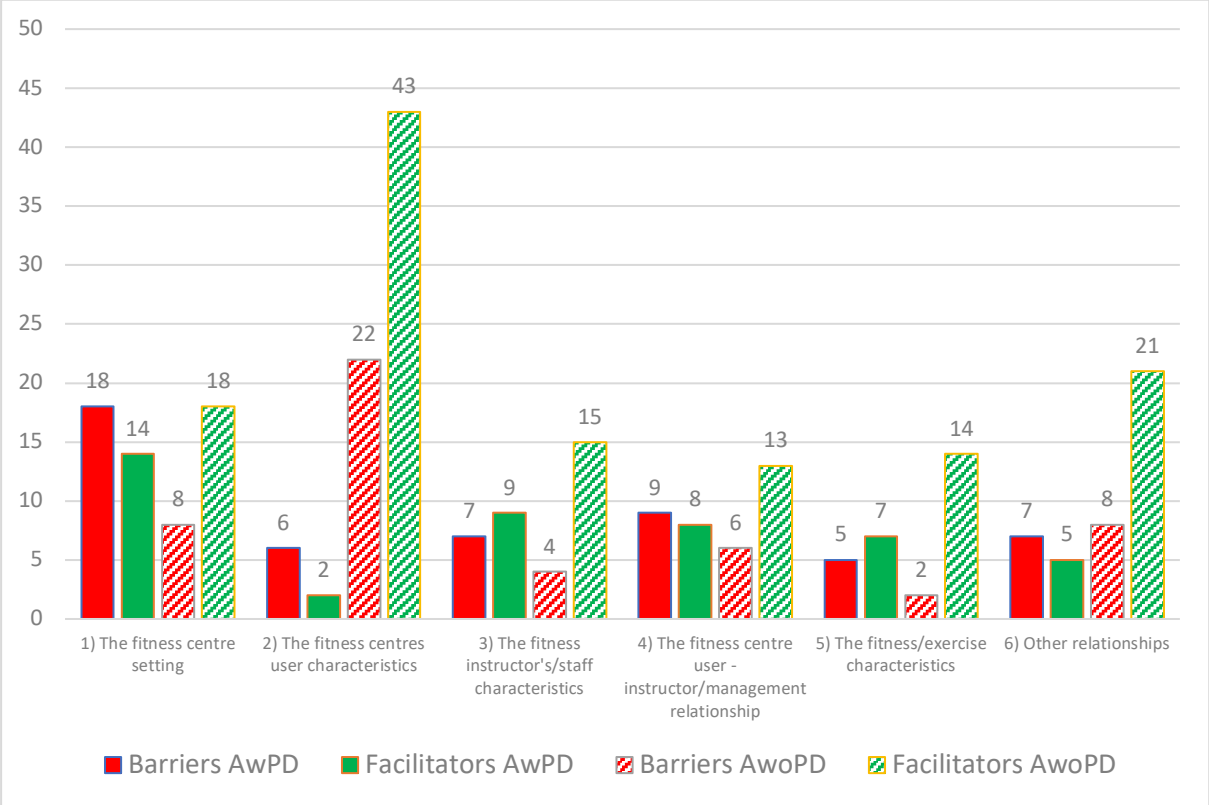


Table 5. Overview of the grouped barriers and facilitators for AwPD and AwoPD

Context Factor categories	Adults with physical disabilities (AwPD)		Adults without physical disabilities (AwoPD)	
	Barriers (Table 3)	**Facilitators** (Table 4)	**Barriers** (Table 5)	**Facilitators** (Table 6)
1. The fitness centre setting	• Poor transportation options (7) • Poor accessibility in the fitness centre and bathrooms/locker rooms (16) • Unsuitable fitness machines (11)	• Universal design/good accessibility (9) • Specialized fitness equipment (9) • Use of checklists to improve accessibility (3)	• Long transportation time/distance to the fitness centre (3) • Unattractive fitness facilities (6)	• Easy access (10) • Pleasant fitness environment (11)
2. The fitness user characteristics	• Lack of knowledge about accessible and available facilities (1) • High costs (2) • Negative feelings about fitness (5)	• Benefits from exercising (1) • Positive experiences related to fitness (2)	• Dislike of the fitness culture (7) • Lack of knowledge (7) • Individual priority (17)	• Health and body appearance (31) • Positive mind and feelings (22) • Feeling comfortable in the fitness centre (17) • Low costs (6)
3. The instructor/staff characteristics	• Lack of skilled instructors (7)	• Special trained staff (8) • Respectful communication (3)	• Lack of professional guidance (4)	• The ideal instructors (15)
4. The fitness centre user – instructor/management relationship	• Management not being actively inclusive (7) • Negative attitudes resulting in direct psycho-emotional disablism (6) • Unprofessional assistance (2)	• Correct guidance and assistance from instructors (1) • Inclusive and tolerant environment (4) • Membership/low costs (4)	• Negative staff attitudes (5) • Body ideals and physical performance (3)	• Comfortable atmosphere (5) • Soft values (8) • Memberships/discounts (5)
5. The fitness/exercise characteristics	• Lack of tailored classes/adaptive programs (5)	• Tailored exercise programmes to people with physical disability (7)	• Uninteresting/boring exercise (2)	• Fitness classes (9) • Individual focus/goal (6)
6. Other relationships	• Stigma from non-disabled members leading to direct psycho-emotional disablism (5) • Negotiations of body ideals, rights and power (1) • Lack of support from friends and family (5)	• The fitness centre as a social arena (5)	• Lack of social connections (2) • Lack of support from health authorities (1) • Not fitting in (7)	• Social connections (21)

The contents of each headline is described further in Tabel 3-6, page 130-141. Numbers in parenthesis refer to the number of papers informing each subcategory. For a graphical presentation see Figure 9.

The main focus of the papers differed between groups. For AwPD, the main focus was on the barriers, while for AwoPD, the focus was on facilitators (Figure 9 and Table 5)

According to the modified Di Blasi categories, the two groups differed especially on category 1) 'The fitness centre settings' and category 2) 'The fitness centre user characteristics'. Many papers focused on the setting, in terms of accessibility and usable fitness equipment for the AwPD group, whereas the setting for the AwoPD mainly focused on easy access/transportation and a nice environmental setting. For category 2 numerous papers focus on facilitators for exercising for the AwoPD, whereas only two papers investigated this category for AwPD (Richardson *et al.*, 2017b, 2017a) (Figure 9 and Table 5).

The remaining four categories are more aligned, with an overall request for competent instructors with good social skills, (category 3), an inclusive and welcoming environment (category 4), possibility of exercising at preferred type and level (category 5) and good social relations/connections (category 6). However, the different elements in how to achieve that differ between the groups. In category 3, both groups request good instructors, but AwPD wanted instructors who could adapt/adjust their exercise programs, whereas many AwoPD wanted a motivating instructor with a fit appearance. In category 4, AwPD focused on the fitness centre not being actively inclusive, in addition to negative staff attitudes with unprofessional assistance, and facilitators were therefore described as the opposite. AwoPD focused more on the negative attitudes and unachievable body ideals as barriers, while facilitators were a pleasant atmosphere combined with professional, motivating and fun instructors. In category 5, AwPD lacked tailored classes and programs, while AwoPD wanted exercising to be fun and motivating. In category 6, both groups agreed on the importance of social relations and found social relationships necessary. They characterised fitness centres as a place to meet new people, peers and even role models. AwPD mainly focused on the negative interactions, such as stigma or negotiation of body ideals, while AwoPD focused on limited social relationships or not fitting in as being their barriers.

In general, most of the barriers experienced by the AwPD group were associated with or related to their disability, and facilitators were factors that eliminate these barriers (e.g., unsuitable fitness machines vs. specialized fitness machines; poor accessibility vs. universal design/good accessibility; lack of skilled instructors vs. special trained staff, etc.). On the other hand, barriers and facilitatiors for the AwoPD are associated with them as individuals, e.g., their personal preferences, wishes and motivational factors. So, in that sense, many of the barriers/facilitators for the AwoPD may, potentially, be applicable also to AwPD, provided their individual

preferences will be prioritized before their disability. However, this aspect has not been investigated yet, and is challenged due to the limited accessibility for AwPD.
Further knowledge gaps were identified in relation to AwPD, as information about their actual experiences of exercising in fitness centres and especially facilitators for exercising are lacking. Knowledge on how interactions of AwPD and instructors/staff and other users can be optimised is also lacking.
For AwoPD more research is need on barriers and facilitators for exercising for the group of non-users, to attract new members. Although many studies investigate non-disabled users of fitness centres, overviews of the literature are lacking.

In summary, his study provides an overview of barriers and facilitators for exercising in fitness centres, and even though recommendations for practical settings is not a part of the scoping review method, it can still provide guidance for fitness centres in which context factors to pay attention to, in order to provide attractive fitness space for both AwPD and AwoPD. The identified knowledge gaps based on this scoping review should guide future research projects, particularly knowledge on how to increase the inclusion of AwPD in fitness centres is needed. The one-sided focus on physical barriers for AwPD may improve accessibility of fitness centres whereby segregation may be obtained, but it is far from enough to achieve inclusion (see Figure 4, page 18) as this requires equality and fully and respectfully involving of all members both AwPD and AwoPD.4.5 Methods study 3 - Focus group interviews

4.5 Methods in study 3 - Focus group interviews

The third study in the thesis was performed in order to investigate inclusion of AwPD in fitness centres in a concrete, practical setting. Thus, study 3 starts filling some of the knowledge gap identified in the scoping review, lack of actual experiences from AwPD exercising in fitness centres and lack of knowledge on how to include AwPD in fitness centres. Study 3 is directly linked to the Fitness for all-campaign (see appendix 1), aiming to establish three pilot inclusive fitness centres in Denmark. In relation to the Fitness for all-campaign I performed focus group interviews with both AwPD and AwoPD, separately, in the very beginning of the Fitness for all-campaign when they started planning the three new inclusive fitness centres. In this thesis only the interviews with AwoPD are included (data on AwPD will be presented in a future publication). Inclusion from the perspective of AwoPD is also identified as a knowledge gap (p. 20).

When wanting to promote inclusion between two groups AwPD and AwoPD, attention should be given to both groups. From the field of disability studies, concepts like ableism and disablism is found to be a barrier for inclusion seen from the perspective of AwPD and, therefore, investigating inclusion from the perspective of the largest and dominant group in fitness centres and may be at a part of the problem with lack of inclusion, AwoPD, is a new, highly relevant approach.

Consequently, study 3 sought to develop an in-depth, detailed data set of Danish non-disabled persons' perceptions of an inclusive fitness centre. The study was explorative with an editing approach. The analysis aimed for a descriptive level and was performed thematically with a cross-case approach. The method of Systematic Text Condensation (STC), a pragmatic method inspired by Giorgis psychologically phenomenological method (Malterud, 2017b) was employed, combined with the COREQ-checklist for interviews and focus groups (Tong *et al.*, 2007) and the SRQR-checklist (O'Brien *et al.*, 2014) for reporting qualitative research.

The project was approved by the University of Southern Denmark, Research & Innovation Organisation (RIO) on behalf of The Danish Data Protection Agency, journal number 2015-57-0008. Oral and written informed consent was obtained before the interviews and all names are pseudonyms. To prevent identification of participants, the locations of the fitness centres are not correlated to the interviews included in this thesis.

4.5.1 Sampling and participants

A focus group interview with AwoPD was conducted at each of the three locations selected for the Fitness for all-campaign (Appendix p. 97). The three locations are presented below as they appeared at the time of the interviews in March and April 2018:

Location 1: 'Gårslev Fitness – for alle'

This sports facility (Picture 1) is located in the village Gårslev, with about 1500 citizens, in Vejle municipality (about 116,000 citizens), and it function as the centre for local sports clubs and the local school. Except for a few outdoor fitness machines, the sports hall had no established fitness centre or exercising room before the Fitness for all-campaign. This sports facility is an independent association, named 'Foreningen Gårslevhallen', which constituted the formal anchor for the project. During the Fitness for all-campaign a new fitness club was established named 'Gårslev Fitness – for alle' ['Gårslev Fitness – for everyone'].

Picture 1. The sports facility before the establishment of the fitness centre in Gårslev.

Location 2: 'Gladsaxe Multifitness'

This empty building (Picture 2) is the physical surroundings of the future inclusive fitness centre to be established in Gladsaxe municipality (about 69,000 citizens), a suburb to Copenhagen. The municipality has been heavily engaged in the establishment of the fitness centre from the beginning, not only making the building available, but also by supporting the process of establishing the new fitness club Gladsaxe Multifitness. At the time of the interviews the executive committee had only just been established.

Picture 2. The empty building before the establishment of the fitness centre in Gladsaxe.

Location 3: 'Viking Atletik, Fitness'

This fitness centre is located in the outskirts of Rønne, a provincial town with approximately 13,000 citizens, in Bornholms municipality (an island with about 39,000 citizens). 'Viking Atletik' [Viking Athletics] is a large, well-established non-profit sports club with about 1800 members, primarily focussing on athletics, different forms of running/walking, cycling and fitness for people in Rønne and the greater municipality. The current fitness centre (Picture 3) is located in a few small buildings, but during the Fitness for all-campaign a new building will be built across the road.

Picture 3. The existing fitness centre in Rønne, a completely new fitness centre will be built

One employee/volunteer worker connected to each of the three future fitness centres acted as gatekeepers to participants and were responsible for recruiting participants for the focus groups. The gatekeepers were asked to compile a list of 10-12 'potential users of the future inclusive fitness centres' with information about gender, age and fitness centre-experience (classified into limited, former or current) and contact information to each of the potential participants for the focus group interviews.

The participants were recruited through a notice in the local fitness centre or through relevant groups on a social media platform supplemented with snowball recruitment. The author used the list from the gatekeepers to secure maximal variation of the included participants when contacting and double checking their information. The inclusion criteria for the participants defined as 'potential members of the future three inclusive fitness centres' were: adult (≥18 years) and user of the already established fitness centres or potential user of the future inclusive fitness centre. Participants were excluded if they had physical or cognitive disabilities, had severe visual or hearing disability, or were unable to speak and understand Danish.

4.5.2 Data collection

Data were collected using focus group interviews with aproxematly six participants at each location. Focus group interviews were used to gather new knowledge in areas not well researched, as they may bring forth spontaneous, dynamic dialogues between participants, since the participants have a higher degree of control over the discussions, and may be more willing to discuss things in-depth in a group rather than on one-on-one (Barbour, 2010). A semi-structured interview guide (see page 179) with open-ended questions was developed to ensure both width and depth in the interviews (Malterud, 2017c). To increase internal validity, two

pilot interviews were conducted, and only small adjustments were performed by adding extra cues to the interview guide.
The guide was developed with three overarching themes:

1) The physical surroundings and accessibility
2) Activities and usability
3) Atmosphere in the fitness centre

Broad, open-ended questions were composed for each of the themes, focusing on the participants' experiences and perceptions – both positive and negative.
The focus groups interviews were conducted by the author acting as moderator at the three different locations; in each case a meeting room was set up in relation to the future fitness centre, or at the city hall. No other people were present during the interviews.

4.5.3 Data analysis

The recorded interviews were transcribed in slightly modified verbatim mode as proposed by Malterud (Malterud, 2017b). That is, focusing on the content of the interviews and carefully making smaller adjustments from spoken language to written language, e.g. by erasing repetitions and empty words and adding punctuation. The thematic analysis was performed in four steps, following the Systematic Text Condensation (STC) method by Malterud (Malterud, 2012b):

1) Total impression – from chaos to themes
2) Identifying and sorting meaning units – from themes to codes
3) Condensation – from code to meaning
4) Synthesizing – from condensation to descriptions and concepts

The movement from themes in the interview guide through the analytical process of the four steps of STC ending with the structure of the results is outlined in Table 6. The author both conducted and recorded the interviews and performed the transcriptions. The Nvivo 12 software was used for the analysis. Four co-authors were involved in the analysis, focusing on the participant´s perceptions on fitness centres, the non-profit club format and the new inclusive concept. An initial coding process was performed by me and a co-author LFT to ensure structure and content of the analysis. I identified the preliminary analytical themes (step 1) and performed the coding (step 2) and the overall analysis was performed with 50 different meaning

units on a detailed level from the beginning, and subsequently grouped together in code groups and subgroups. Together with EVR we discussed the code groups and subgroups (step 3) and the analytical categories (step 4) have been discussed with JT. The results are presented in two parts, A) The ideal fitness centre – room for comfort and diversity and B) The ideal inclusive fitness centre – reflections on sharing a fitness space with AwPD.

Table 6. The analytical process from interview guide to results

Data collection	**Data analysis**			
Preparation: Themes in the interview guide	**Step 1:** Preliminary analytical themes	**Step 2** Decontextualization	**Step 3:** Code groups and subgroups	**Step 4:** Result categories
1. The physical surroundings and accessibility 2. Activities and usability 3. Atmosphere in the fitness centre	1. What is fitness? 2. Club community 3. Room for all 4. Manage oneself in the fitness centre 5. Membership/price 6. Physical surroundings 7. Volunteer staff 8. To feel comfortable	In total 50 different codes were used.	1. The physical surroundings 2. Running the club 3. Personal experiences and wishes 4. Inclusion	1. The ideal fitness centre: room for comfort and diversity a. Basic expectations for a non-profit club-based fitness centre b. User exercise knowledge and skills are required c. Rules and behaviour in fitness d. The atmosphere: fitting in with social relations 2. Ideal inclusive fitness centres: reflections on how to include people with disabilities a. The degree of disability b. Adaption of settings c. Social codex for inclusive centres d. Interaction with users with disabilities

4.6 Results from study 3

The results are based on interviews with a total duration of 5 hours and 10 minutes, with each interview lasting about 1.5 hours. Two of the contacts from the gatekeepers lists declined participation due to the selected date of the interview. Table 7 shows the 18 included participants in the three focus group interviews.

Table 7. Overview of the participants in the focus group interviews

	Numbers (Female/Male)	**Mean age** (years)	**Age range** (years)	**Fitness centre experience** (limited/former/current)
Interview 1	6 (3F/3M)	36	19-51	3/2/1
Interview 2	7 (5F/2M)	55	23-75	1/5/1
Interview 3	5 (1F/4M)	54	19-67	0/1/4
Total group	18 (9F/9M)	48.5	19-75	4/8/6

Focus group interviews; numbers of participants, gender, age and fitness centre experience. F=female, M=male

The results are divided into two subsections. Firstly, a description of the participants ideal non-profit fitness centre, and secondly a description of how the ideal inclusive fitness centre should be arranged and organised to embrace both fitness users with and without disabilities.

4.6.1 The ideal fitness centre - room for comfort and diversity

The participants had certain expectations for an ideal fitness centre. A location with easy access both by car, bicycle or public transportation was highlighted as very important – if it was not inconvenient, they would not use it. Also, long opening hours, and low prices – value for money was of importance. Participants mentioned or requested nice surroundings defined as a bright, welcoming and well-maintained, clean environment, making the exercise setting attractive and comfortable. Things that were perceived as unattractive were the smell of sweat or rubber, loud music and posters and electronic screens on the walls with 'protein-commercials' and examples of 'extremely fit' men and women. Susanne explained:

> *I think it is important with light, how it falls and the illumination. Colours on the walls and not in the linoleums-municipality-way, and no smelly rubber. […] so, when you go in you think 'this is a nice place to be'; I like to be here because something is calling for me.* (Interview 2)

The participants all agreed that basic user competence was required to exercise in a fitness centre, and stated that if potential users did not know how to exercise in a fitness centre, they were unlikely to ever enter or be a regular/permanent user. Therefore, in order to feel comfortable (especially newcomers), the participants strongly recommend an introduction session, e.g., one-on-one sessions or small group introduction. Also, regular users requested available guidancefrom instruction on how to use the fitness equipment or to compose/adjust exercise programs. But at the same time the dilemma for non-profit and voluntarily based instructors/staff was discussed. Marie-Louise told how it was taken care of in her non-profit fitness centre:

> *The volunteer staff have to be users of the fitness centre, because they are often there anyway and know exactly how all the machines work so they can assist others […] Being a volunteer is only something you do if you gain something out of it. It could be free instructor courses, fitness clothes, paid membership and a dinner once a year with all the other volunteer staff.* (Interview 2)

How to behave in the fitness centre was also of great importance for the participants, as this could result in potential conflicts, so etiquette and rules in the fitness centre were very important. Several examples were brought up about annoying behaviour such as insuitable use of equipment and mobile phones, inappropriate attire, failing to clean-up or forgetting to wipe off the fitness machines after use. Other issues regarding behaviour of other users were considered harder to regulate, with examples being: excessive huffing and puffing or loud groaning, loud talk or laughter and users playing loud music, together with more personal issues, such as users being very sweaty or smelly when exercising. In general, participants would prefer to confront other users in a polite or humoristic way if there were problems, but they found this approach hard to put into practice. Charlotte gave an example:

> *I get so annoyed if people sit on a machine or bench without exercising, then I say, 'So, do you use it as an armchair or what?'* (Interview 3)

The participants kept returning to talk about atmosphere or the 'right spirit' in the fitness centre as a key aspect, when deciding whether they would actually use the fitness centre. They stated the importance of feeling that they 'fit in'. Sylvester explicated:

> *Many times, when you come into such a fitness centre, you feel so overlooked because you have such a feeling that it is a crowded bunch and the users come in such super smart clothes and everything. So, it must be a place that is nice to be in and where you feel at home.* (Interview 1)

The feeling of belonging and fitting in was perceived possible and supported by e.g., greetings when seeing others, spotting peers of similar age, appearance and preferences for specific training types. In particular, participants discussed the intimidation of not being able to live up to super fit body norms with big muscles or skinny appearance, which made them feel uncomfortable, out of place and not welcome.

Social relationships were very important for the participants, not only did they enjoy meeting their friends, but they also described how small-talk could lead to a cup of coffee and, later, could become a new friendship. Generally, participants expressed the need for good social relationships for long-term commitment to exercise – it had to be comfortable and fun to be a part of the environment. Some preferred to exercise on their own, but the majority preferred training in smaller groups of 2-5 persons matched by age, fitness type and fitness level. Josefine gave an example:

> *If it is a club, then there should also be a common room where you can sit down and drink sodas and meet people and have the opportunity to talk. Otherwise, it's not a club.* (Interview 2)

4.6.2 Ideal inclusive fitness centres - reflections on how to include AwPD

All participants responded very positively on establishing new inclusive fitness centres for both disabled and non-disabled users but stated at the same time, that some people may choose another fitness centre because of the presence of AwPD. There was also a general feeling that the inclusion of AwPD should not happen at the expense of those who were already using the fitness centre. At the same time, participants had trouble imagining exactly who the disabled persons could be. Ib is straightforward:

> *You could be crude and say that when we say 'disability', we do not really mean the multi-disabled who need help with everything, right? It is the ones who - you can say - in many cases are self-sufficient, possibly supported by a carer.* (Interview 3)

The participants quickly address the requirements for disability-friendly adjustments such as lifts, extra space for wheelchairs and zones with special fitness machines suitable for both people with and without disability. Several of the participants stated the importance of sustaining the atmosphere of a volunteer fitness centre with no resemblance to hospitals, rehabilitation centres or other medicalised buildings. Charlotte reflected on the sense of belonging:

> *I may be naive, but I think we can easily make a disability-friendly centre where people can get around and where things are placed so it fits when sitting in a wheelchair, but still so that we others can be there without feeling like we're in a hospital room.* (Interview 3)

The participants valued diversity and that everyone should feel welcome, regardless of age, background or social class. But at the same time, participants thought it much easier to be tolerant and inclusive towards people with physical disabilities, in contrast to people with cognitive issues or mental disabilities who could make it difficult to follow the codex for 'normal' interpersonal behaviour.

Being a voluntarily based community, it is important to help each other and create a culture where all people take care of the place, clear up after oneself and help other members. But the participants did not want to be obligated to help or be delayed in their own exercises because of AwPD. Maya reflects:

> *I don't mind sharing the fitness centre with disabled people, but on the other hand I would be annoyed if I went to exercise and ended up behind a wheelchair user who takes forever to transfer between the fitness machines. It is not nice to say I know, but I would be annoyed.* (Interview 1)

Finally, several participants stated that they had some fear of interacting with AwPD because they were afraid of doing or saying something wrong or be misinterpreted. Participants were very engaged in how to do things right, be respectful and treat AwPD as everyone else; but participants felt that they lacked social competences in how to interact in practice because of their limited relations with AwPD in daily life.
They wanted everybody to feel comfortable but felt insecure on how to behave, so they would not unintentionally offend, disappoint, insult or snap at AwPD, resulting in triggering their feelings of decreased dignity and pride.

In summary, participants expressed opinions about the 'right' settings for non-profit club-based fitness centres and highlighted the atmosphere in the fitness centre as very important factor as it have to give room for comfort, inclusion, and diversity. Participants were positive towards the concept of inclusive fitness centres and expressed ideas and opinions about how the ideal inclusive fitness centres should be to include AwPD, but ableist perceptions were apparent throughout.
This knowledge is the very beginning of a dialog between AwoPD and AwPD who can inform the design of fully inclusive fitness centres. Not only can it be the first step of providing AwPD with a fitness center on equal terms with their non-disabled peers, but it may also educate AwoPD about disability and thereby reduce ableist prejudice.

5.0 Discussion

The prevalence of AwPD in Denmark is at least 13%, equivalent to about 600.000 persons. The total group of AwPD was found to be significantly different from the general adult population (GAP) on all sociodemographic variables (sex, age, geographical region in Denmark, origin, education level, occupation and civil status). The nine disability subgroups identified for the investigation further displayed large internal variation in demographic variables and levels of disability. Such differences must be taking into account when designing and adjusting fitness centres for AwPD, most particularly the level of disability.

Results from the scoping review, showed that barriers to and facilitators of exercising in fitness centres classified in six contextual categories differed between AwPD and AwoPD. Fundamentally, both groups request competent instructors, welcoming and inviting fitness environments, the possibility to exercise at preferred type and level, besides good social relationships, but the elements considered essential to achieve this differed. A pronounced bias in the available literature add to this uncertainty – while the AwPD relevant literature focus on inaccessibility issues and barriers related to disability, the AwoPD relevant literature focus on facilitators for exercising, such as motivation and exercising effects related to the individual personal preferences. All, six contextual categories (Table 4) must be taken into account when promoting inclusion in fitness centres.

During, the interviews, AwoPD expressed several opinions related to their ideal fitness centre, with the main component being a good atmosphere – it had to be inviting and welcoming. Overall, AwoPD was found to welcome AwPD, but at the same time they expected several challenges, partly in relation to inaccessible surroundings and unsuitable fitness machines, but also in relation to lack of social skills exacerbated by ableism, ignorance and unwarranted preconceptions.

5.1 Prevalence and characteristics of AwPD (study 1)

The prevalence of 13% of AwPD in the Danish population is difficult to compare with other studies as no international standard definition of AwPD exist, thus the prevalence varies according to the definitions used in the studies.

WHO defines disability as an umbrella term for impairments, activity limitations, and participation restrictions cf. the International Classification of Function (ICF) terminology(World Health Organization, 2001), and disability therefore refers to the negative

aspects of the interaction between individuals with a health condition/disease and personal and environmental factors (Chan and Zoellick, 2011), which aligns with the biopsychosocial disability model (World Health Organization, 2002).

WHO estimates (based on 2010 global population estimates) that about 15% of the worlds population lives with some sort of disability (physical, mental or sensory) and this number is reported to rise due to aging of the general population (Chan and Zoellick, 2011).

In contrast, our Danish data-set is an example of a medical model, where disability is defined by selected ICD-10 diagnoses (cf. WHO's International Statistical Classification of Diseases and Related Health Problems), which provides a more etiological framework for the reason for disability. This way of defining disability may underestimate the true prevalence, as other diagnoses rightfully could have been included as well. However, it may also include individuals who are at an early stage of a diagnosed disease, but not yet experiencing the associated disability to an extent where they would label themselves as disabled.

Compared to the WHO estimate of 15% disabled worldwide, our result of 13% with a physical disability may seem high. However, an American survey of non-institutionalised adults ≥18 years are in line with the results from our Danish data-set. The study estimates that 25% have some kind of disability, whereas disability related to mobility (defined as having serious difficulty in walking or climbing stairs) is reported to be 13,7% (Okoro *et al.*, 2018), which is very close to our results.

Another way of determining the prevalence of physical disability, opposed to the more objective measurements mentioned above, is the more subjective definition of disability, where the individual is asked about their self-image of disability. Thus, the SHILD-studies (Survey of Health, Impairment and Living Conditions in Denmark) from 2012 and 2016 provide such an example. Respondents were asked 'Do you have a long-lasting health problem or disability? (my translation of the Danish question: 'Har du et længerevarende helbredsproblem eller handicap?). These four-yearly reports show a prevalence of AwPD ranging from 25 to 27% of all 16-64 year old Danes (Bengtsson, 1997; Damgaard *et al.*, 2013; Amilon *et al.*, 2017; Kjær *et al.*, 2019), which is significantly higher than our results of 13%. Further, the SHILD Studies also found that the individuals own definition changes over time (Kjær *et al.*, 2019).

This underlines how difficult comparison of prevalence of physical disability is, as different studies use different definitions and methods.

The group of AwPD was found to differ significantly compared with the GAP. Several results are in line with previous knowledge. Our data showed a higher proportion of women in the

disability compared to the GAP, which is well known (Danish Health Authority, 2018) and can be explained by autoimmune diseases as rheumatoid arthritis and multiple being highly predominant among woman (Hvidberg *et al.*, 2020; Ortona *et al.*, 2016). The physical disability group was also older which probably was due to the two dominant groups osteoarthrosis and acquired brain injury (incl. apoplexies) having a disease onset later in life (high mean age). As expected, our data showed AwPD having lower educational levels and less affiliation to the labour market, which is commonly known for this group (Chan and Zoellick, 2011) and, as demonstrated previously, this pattern becomes more clear with increased severity of the disability (Johnsen *et al.*, 2018; Kjær *et al.*, 2019) as well as early onset (low mean age at disease onset) of the disability (Loprest and Maag, 2003), a trend which was also seen in our subgroups.

Of other results we found that the distribution in geographical regions generally followed the same pattern as for the GAP except for a tendency of fewer AwPD in the Capital Region, which we speculate may reflect the younger population there, or higher living expenses. However, such speculations need further investigations. Surprisingly, we found that the rate of being unmarried in the disabled group was only half that of the GAP. The reason for this is not known, and the only other study we found reported the opposite - in Canada, women with physical disability are married less often than women without disability (Savage and McConnell, 2016). We also found lower rates of immigrants and descendants of immigrants among AwPD compared to GAP, but without any comparable data.

The newly introduced, administrative variable 'level of disability', applied here, differed across the disability subgroups. It is a very rough screening of a persons' functional level that can be used across different diagnoses in Denmark, and has the advantage of being less time consuming compared to using the ICF classification as an alternative. As these data are from the very first year of reporting (the variable was introduced in the Disability/Handicap Services register from January 2018) there are no other data to compare with. The level of disability is scored in the municipalities, and since reporting is voluntary at the moment, reporting rates are very low. The reliability and validity of the variable is therefore unknown. It appears that this variable is scored by social workers in the municipality, primarily to aid in the assessment of allocation of social services (Hillerød Kommune [Hillerød Municipality], 2017), but we have not been able to locate a description of the individual categories in the classification applied. Hopefully, this variable will gain ground in the years to come, as it may potentially provide a valuable measurement of the disability/functional level within register-based research across

different diagnosis. As it stands, as it appears to allow differentiation of the degree to which individuals are affected across different diagnosis, but this requires a rigorist, uniformly applied set of definitions as well as more comprehensive, possibly mandatory reporting.

5.2 Barriers and Facilitators (study 2)

Comparing perceived barriers to, and facilitators of, exercising in fitness centres between AwPD and AwoPD is, to the best of my knowledge, a novel approach. This may be due to tradition, where disability research is rarely mixed with non-disabled groups unless being register-studies or surveys. In general, AwPD experience an extra layer of barriers directly related to their disability, whereas barriers experienced by AwoPD relate to them as individuals. However, our results suggest that such individually perceived barriers may be equally relevant for AwPD. Continued research along such lines are therefore highly recommended. In the following the focus will be on the AwPD.

A broad array of barriers and facilitators have been identified and synthesised in relation to fitness centre participation addressed by users (AwPD and AwoPD), the fitness industry (managers, instructors, staff) and, indeed, other stakeholders such as researchers and disability associations etc. One of the somewhat disturbing findings, was the simple lack of experiences from disabled fitness users – there really are very few active users reflected in the literature. This is supported by another resent scoping review by Sharon-David et al. (Sharon-David *et al.*, 2020) reviewing barriers to and facilitators of gym-based activities among AwPD. Due to limited data on this topic, they included papers with participants' exercise experiences in a broader range of leisure time and fitness settings than in our study (15 papers were included of which three are included in the present review). Both our review and the one by Sharon-David et al. (Sharon-David *et al.*, 2020), find a lack of perspectives from actual fitness users.

The three studies included in both reviews (Richardson *et al.*, 2017a, 2017c, 2017b) are investigating the perspective from disabled users in the transmission to become instructors, and it may therefore not be generalizable to a more untrained, new or 'average' fitness user. A caveat in these studies (Richardson *et al.*, 2017a, 2017b, 2017c) is that the group of disabled people investigated know each other in advance, which can make them stronger when entering at new fitness environment as part of a group. The three remaining papers with an actual user perspective included in our review (a total of six) were a newspaper article with a few comments from users (Allen, 2001), experiences from 21 users about dignity in fitness centres (Johnston *et al.*, 2015) and finally, an overview of barriers and facilitators from data based on both users

and managers/planners of fitness facilities/recreation areas (Rimmer, Riley, Wang, Rauworth, *et al.*, 2004). The other articles included in the review by Sharon-David did not meet our inclusion criteria, indicating a low probability of having overlooked relevant literature with user perspectives within our scope. So, actual experience, communicated by the physical disabled users participating in fitness centre exercising themselves, are almost non-existing in the scientific literature – a serious short-coming that needs to be addressed.

Our results for AwPD further showed a focus on barriers, in particular barriers related to the physical surroundings, which was to be expected due to the limited mobility of our target group were wheelchair users are included. Inaccessibility due to the physical surroundings was the most dominant barrier and described in multiple articles and guidelines as a widespread and constraining barrier for disabled users (Calder *et al.*, 2018; Dolbow and Figoni, 2015; Gross *et al.*, 2013; Riley *et al.*, 2008; Rimmer *et al.*, 2017; Rimmer, Riley, Wang, Rauworth, *et al.*, 2004; Sharon-David *et al.*, 2020).

Alternative, more comprehensive, concepts have been proposed as solutions to inaccessible surroundings and fitness equipment being unfit for purpose (Huges, 2010; Hums *et al.*, 2016; Hurley and Axelson, 2012; North Carolina Office on Disability and Health and The Center for Universal Design, 2008). The American concept 'Universal design' – defined as 'The design of products and environments to be usable by all people, to the greatest expect possible, without the need for adaptation or specialized design' – is based on seven principles with key concepts and definitions (Institute for Human Centered Design (IHSC), n.d.). Also available is the 'Inclusive Design' concept from the UK based on 5 principles to enable 'people to make effective and independent choices about how they use a development without experiencing undue effort or separation' (Commission for Architecture and the Built Environment (CABE), 2006). However, direct application of such ambitious concepts will not only take time but also rely on political action. Hopefully, the fact that universal design/inclusive design features in the UN Convention of the Rights of Persons with Disabilities (United Nations, 2008) may facilitate this process.

Many barriers related to AwPD were found to be related to usability; lack of knowledge by the users, lack of adaptive programs and lack of skilled instructors/staff who can assist when exercising in fitness centres. Two articles by Rolfe et al. (Rolfe *et al.*, 2009, 2012) underline that instructors/staff have a key role in that they may promote inclusiveness or exclude persons with disabilities instantly, depending on their abilities to adapt their instructions, particular when teaching classes. Exercising in fitness centres requires knowledge and skills, and new users typically lack these and will therefore have to rely on staff or instructors. On the other

hand, several papers point to the fact that assisting users with physical disability is a complex task which require special skills (Anderson *et al.*, 2017; Kailes, 2008; North Carolina Office on Disability and Health and The Center for Universal Design, 2008; Richardson *et al.*, 2017c, 2017a; Rimmer, Riley, Wang, Rauworth, *et al.*, 2004; Tolle *et al.*, 2018). In the 'real world' the education level of fitness instructors vary significantly, and it has been debated if fitness instructors suffers from a skills shortage and are generally 'under-educated' (Keyzer *et al.*, 2014) and, furthermore, that even educated trainers may not be qualified or happy about assisting persons with disabilities (Anderson *et al.*, 2017). In the USA, a certification as inclusive fitness trainer has already been introduced (American College of Sports Medicine (ACSM), 2020), while others argue that it requires actual, formal education as e.g. a physical therapist or similar (Malek *et al.*, 2002). Direct employment of disabled fitness instructors has also been proposed (Richardson *et al.*, 2017c).

Social relationships/connections are also very important as they can act as both a barrier and as a facilitator. Relations to both other user, instructors and staff is of importance together with social support (Johnston *et al.*, 2015; Rimmer, Riley, Wang, Rauworth, *et al.*, 2004; Sharon-David *et al.*, 2020; Wininger, 2002). These experiences may be crucial to new users, but they may also be an important factor for maintaining exercising and become a regular fitness user as reported for AwoPD (Evans *et al.*, 2019; Klein, 2002; Riseth *et al.*, 2019; Schmidt *et al.*, 2019; Whiteman-Sandland *et al.*, 2018). Negative attitudes are a key issue for disabled users (Richardson *et al.*, 2017b, 2017a; Rimmer, Riley, Wang, Rauworth, *et al.*, 2004; Sharon-David *et al.*, 2020) and should be eliminated, and the study by Richardson (Richardson *et al.*, 2017b) showed how disabled user crafted a collective story that they used to resist disablism in the gym.

5.3 Inclusion (study 3)

Participants in the interviews were uniformly focussed on the atmosphere in the fitness centres. AwoPD participants request representative diversity (Bernstein *et al.*, 2019) in the fitness centre environment including young, and old, male and female, with all sizes and shapes, simply because it makes themselves feel more comfortable. Also, they regard social relations as very important, and point to a welcoming atmosphere and good social relationships, a sentiment which is also picked up in other investigations (Ulseth, 2004; Unger and Johnson, 1995). Also the role of the volunteer instructors as role models is of importance, which is also found in another Danish study (Rasmussen *et al.*, 2018). Thus, all these factors should be regarded as

some of the key elements for non-profit inclusive fitness centres, thereby attracting engaged participants who will often choose this type of fitness centre rather than some of the many commercial fitness opportunities available. Further, the fact that participants argue specifically for their choice of exercising in non-profit club-based fitness centres instead of other commercial fitness centres, could indicate that they do, indeed, provide a more diverse setting, where the basis for inclusion of AwPD therefore has better opportunities.

All participants in our interviews were open to the idea of participating in activities with AwPD. This is more than responders in a survey from the UK showing that only 73% of AwoPD were open to the idea of taking part in sport and active recreation with disabled people (Johnson, 2019). Results from our interviews shows that AwoPD were not only welcoming AwPD, they also talked about the future inclusive fitness centres as being an integrated part of the community, where AwPD could share all the positive experiences, as they have experienced themselves. At the same time as they want to include AwPD, AwoPD nevertheless struggle with just how to fit in AwPD, debating, among other things, what time on the day they should exercise, as it probably did not need to be during the most crowded hours in the early evening. AwoPD also underlined the importance of the feeling of being in a fitness centre rather than in a hospital/rehabilitation setting. It would appear, therefore, that they actually talk about integration and not inclusion (cf. Figure 4, p. 18) when it comes to a practical level (Hehir *et al.*, 2016). So, one could ask whether they are genuinely interested or, perhaps, just being politically correct when wanting to engage people with disability, or if they only want it as long as they do not have to make any adjustments or changes themselves. This is supported by the fact that only one participant during the interviews mentions the possibility of learning something from AwPD, while the others only talk about why it would be beneficial for AwPD to participate in exercising in fitness centres. This is again an example of participants talking of integration and not actual inclusion as this would require full and respectful involvement of all members and equal relationships between AwPD and AwoPD (Miller and Katz, 2002, p. 199).

Another barrier for inclusion can be the language. During the interviews we found that AwoPD struggle with the dichotomous terminology them/us, they/we as well as with the Danish words for being ill, disabled, handicapped, healthy etc. This happened to the extent where the participants themselves commented that they found it hard to choose the right words to express themselves, without being value-laden, offensive or disparaging. The terminology is both related language (e.g., Danish versus English, in Denmark we still use the term handicap as an equivalent to disability in English), but it is also a question of ‘disability etiquette’, i.e., how to

express oneself correct without offending anyone. Some prefer person-first language (PFL) (people with disability rather than disabled persons) which originates from USA and signalling a person with a disability not that the person 'is' the disability (United Spinal Association, 2015). Others prefer identity-first language (IFL) (disabled person is preferred as the disability is a part of the person's identity) this is the common expression in England and other parts of Europe (Center for Disability Rights, Inc., 2018). Participants primarily used identity-first language, but were unsure if it was correct, and sometimes they even used expressions like 'us normal' versus 'the others/the handicapped' when referring to AwPD. This is an example of the participants striving to do the right thing and having the best intentions but being unsure about what is correct, and since only non-disabled people were present at the interviews they often chose to use the not so correct expressions in order to communicate their message clearly. It is my impression that they might have chosen differently if persons with disabilities had been present.

One view upon inclusion is a quote from Diane Richler, Past President, Inclusion International, stating that '*Inclusion is not a strategy to help people fit into the systems and structures which exist in our societies; it is about transforming those systems and structures to make it better for everyone. Inclusion is about creating a better world for everyone***.'** (National Center on Health, Physical Activity and Disability (NCHPAD), n.d.). Consequently, we have to pay attention to the systems and structures. From the interview sessions it appears that participantss struggle with how to fit AwPD into the structures of the already existing fitness centres, and by doing so they do the exact opposite of inclusion, where the structures should be transformed to fit AwPD. This is an example of the clear ableist perspective AwoPD demonstrates even though it is probably subconscious. Other examples include participants mentioning that <u>other</u> AwoPD may choose alternative fitness centres when AwPD are present, or stating that inclusion of AwPD should not happen at the expense of the users already using the fitness centre. The participants are clearly influenced by an ableist perspective whereas disablism is not really part of their perceptions. They quickly address indirect psycho-emotional barriers (structural barriers) immediately recognizing that it needs to be solved in the coming inclusive fitness centres in order to achieve inclusion. At the same time, they expect that professional persons such as architects and staff involved in the Fitness for all-campaign will take care of such issues. In contrast, direct psycho-emotional disablism (negative interactions with people), depending on the participants themselves and their actions, and was discussed more hypothetically as participants only very rarely interacted with AwPD in their daily lives. The participants all had good intentions and wanted it to be a success, but at the same time they

feared that they would unintendedly say or do something wrong. This indicate that some sort of guidance could be relevant, maybe simply by instructors and staff in the inclusive fitness centre providing good role models. Interactions between AwPD and AwoPD needs to be investigated further, a point which is already included in the Fitness for all-campaign when it reaches the time for evaluation of the campaign.

Schleien et al. (Schleien *et al.*, 2003) points to inclusion as a continuum with three layers of acceptance; firstly physical integration, secondly functional inclusion and, thirdly social inclusion. This can be considered a subdividing of inclusion in the formerly introduced figure of educational environments (Figure 4). Participants talk about physical integration as an obvious and important point for inclusion of AwPD – but, on the other hand, the fitness centre must not look like a hospital or rehabilitation setting as the result of the physical adjustments in lay-out or through the instalment of assistive technology. Functional inclusion is also a part of the challenges raised by the interview participants, such as 'Who should assist AwPD if needed?' Is that a task for the instructors/staff or themselves as users? They also mention that instructors need special education in order to guide in how to exercise in the fitness centre.

Social inclusion was debated quite a lot in our focus group interviews but it was largely focussed on how to respectfully interact at both a verbal and non-verbal level, reflecting that participants were not familiar with this type of situation. Basically, none of the participants thought they would gain anything from such the relations, and they only talked about how they should help or assist AwPD. Unfortunately, they do not see an opportunity for an equal relation between them and AwPD in, for example, a friendship. This indicate that full inclusion in fitness centres – including social inclusion – may still have some way to go. However, since inclusion within leisure time activities is often a good platform to facilitate new friendships, taking up such activities within the fitness centre frame seems like a good place to start a progression towards the highest level of acceptance and social inclusion.

Finally, it should be noted, that also commercial fitness centres are starting to see the benefits of inclusiveness as a way to growth, and in 2019 an e-book (International Health, Racquet & Sportsclub Association (IHRSA), 2019) became available from the International Health, Racquet & Sportsclub Association in USA, to facilitate the fitness centres and the industry to promote inclusive fitness.

5.4 Methodological considerations

The multimethod PhD-project (use of both quantitative and qualitative methods (Johnson *et al.*, 2007; Malterud *et al.*, 2017)) has its strength in the use of different methods chosen specifically

for the aim of each sub study, thereby creating data sets which are optimally suited for the specific aims (Frederiksen, 2020). Thus, this project provide a platform to investigate the basis for inclusion, and not least the possible challenges for inclusion of AwPD in fitness centres, through methodology derived from both the natural sciences and the human/social sciences to fully reflect the complex nature of this topic (Dakwar *et al.*, 2017). It is my hope that this approach will make the thesis more knowledgeable and nuanced, and relevant to a broader range of attention points for inclusion of AwPD in fitness centres.

Study 1 (Nikolajsen *et al.*, [under review]) had several strength. First, the study is an example of an objective way of measuring disability, based on the medical model of disability, which leads to a high reliability. Secondly, the study utilized the high-quality data available from the detailed Danish National Patient Registry (DNPR). This is further supported by the use of CPR-numbers, which makes it possible to follow our target group on an individual level.
Data on the general adult population (GAP) in Denmark, was collected from StatBank Denmark (Statistics Denmark, 2021), so we were able to compare the two groups. Due to time, resources, and economy restrictions in the research project it was not possible to obtain data on an individual level of the GAP as this group was estimated to comprise of more than 4 mil. people. Further, only data on the whole group was needed for comparison with the disability groups. This knowledge was obtained from Statbank Denmark since it was free of charge and covered our needs for a comparison. The data are quite detailed and could be a withdrawn from the database in a comparable way (except for education level which was only accessible for 15-69 year-old persons in the GAP, compared with AwPD having an age range from 18-110 years).
Aditionally, the study comply with the WHO Disability action plan 2014-2021 (World Health Organization, 2015) requesting definitions of disability and standardized methods for measuring disability and international comparable data, which is also considered a strength.
Limitations are that ICD-10 coding in DNPR only goes back to 1994, meaning we have missed persons if they have not been given the diagnosis at a hospital and/or have been admitted to the hospital without the specific ICD-10 diagnosis being registered as a primary or secondary diagnosis related to the admission.
The method for this study was deemed fully appropriate, but other designs available to address the research question; Who are the group of potential fitness participants with physical disabilities? As an example, an alternative method could be based on a questionnaire being send out to a group of AwPD randomly identified through the Danish National Patient Registry (DNPR). Such an approach might have provided a deeper insight, but from fewer respondents.

However, as we expected some challenges in obtaining a representative sample and feared the risk an insufficiently low response rate, this approach was dismissed.

Study 2 (Nikolajsen *et al.*, 2021) has several strengths, first of all the strictly followed five-step method for conduction scoping reviews (Peters *et al.*, 2017) combined with an a priori protocol for transparency, secondly, two researchers have independently performed all steps in the selection of the studies and data extraction process. We also consider the use of our modified Di Blasi framework (Di Blasi *et al.*, 2001) as a strength, as it worked well as a frame for all our identified contextual factors. Other frameworks or theories may also have been used, such as the social ecological model, a commonly used model when conducting reviews related to disability sports (Ginis *et al.*, 2016; Sharon-David *et al.*, 2020). The social ecological model is found in many variations and comprises three to five levels of personal, social and environmental factors. But it does not explicitly include influence from fitness professionals such as instructors, staff or managers, as the Di Blasi framework does.

We included all types of literature, which we consider a strength, but some of the studies available, e.g. those using factor analyses, were difficult to extract data from. The inclusion of grey literature as proposed in the guideline (Peters, Godfrey, *et al.*, 2020; Peters, Marnie, *et al.*, 2020), is a complex task and we have undoubtedly overlooked relevant information even though we conducted a systematic search using the CADTH guideline (Canadian Agency for Drugs and Technologies in Health (CADTH), 2018). The argument for including grey literature, was the aim of the study, as fitness centre users or disability organisations easily could have described barriers and facilitators for exercising in fitness centres in other types of literature than published research papers, particularly as this topic is closely related to a practical setting. We wanted to include this valuable information and within the AwPD 42% of the included papers (11 out of 26 papers) were grey and for AwoPD it was 21% (16 out of 76 papers). Valuable information would have been missed if we had not included grey literature especially for the group AwPD were guidelines would have been missed.

Limitations in this study relates to the selected databases and to the wording of the search terms (general, not diagnosis specific), but due to a high number of dublicates in the six searched databases, we do not consider this a major concern. Also, as stated in the a priori protocol, we did not screen references in all the included papers, only in the grey literature.

Due to our narrow scope of the study, literature on physical activity/general exercising and sports participation were excluded. Furthermore, studies of fitness centres placed outdoors, indoor fitness centres within the healthcare and rehabilitation sector, as well as worksite fitness

centres without public access was excluded. The effect of this choice is unknown, but it could be anticipated that other barriers and facilitators could be identified in these settings that were not of interest for the investigated type of fitness centre and their use as a part of leisure time activities.

Other review methods could have been chosen to answer the research question: What are the barriers and facilitators for exercising in fitness centres for people with and without physical disabilities?. Most obvious is a type of systematic review were both qualitative and quantitative studies are included, this type of review is currently under development and the names and methodology is inconsistent. Terms used for this type is e.g. Mixed research synthesis (Sandelowski *et al.*, 2006), Mixed studies review/Mixed methods review (Grant and Booth, 2009), Mixed research synthesis studies (Sandelowski *et al.*, 2012), Systematic mixed studies review (Hong *et al.*, 2017), or Mixed methods systematic reviews (Stern *et al.*, 2021). In 2017, Hong et al. concluded that the field is still young, with lack of consistency in terminology and a lack of guidance in which synthesis method to use (Hong *et al.*, 2017). In 2020 the first, and so far only, guideline for how to conduct mixed method systematic reviews was published (Lizarondo *et al.*, 2020, p. 8), and the described convergent integrated approach (qualitative and quantitative data are synthesized/combined together through data transformation) could have been used as an alternative to the scoping review method. Using this method might have been advantageous as quality assessment is a part of the method which, however, can be difficult if a large amount of literature is included. The method is therefore deemed more appropriate when having a narrow scope pursuing depth in knowledge.

Study 3 (Nikolajsen *et al.*, [in press]) has its strength in the selection of participants as we strove for maximal variation within gender, age and experience with fitness centre exercising. Using focus group interviews was considered an appropriate method and, in our opinion, it worked well, as the participants interacted, discussed and revealed contradictory opinions as described as criteria for success (Barbour, 2010; Kvale and Brinkmann, 2015; Malterud, 2012a). Some of the participants knew each other beforehand, and this actually lightened the atmosphere from the very beginning of the interviews.

One limitation may be defining an explorative and editing approach to the field, which is rather unexplored scientifically. As human science is depending on human understanding and therefore not neutral (Thisted, 2010b), this open and non-theoretical approach is almost impossible hence the researchers' position is very important to know (Malterud, 2017d). Thus, general and non-specific theoretical framework, such as the ICF model (World Health

Organization, 2001) and the modified Di Blasi framework (Di Blasi *et al.*, 2001), in combination with my personal experiences and preconceptions (Malterud, 2001), may have influenced the work. Thus, my personal background as a trained physiotherapist, with previous engagements in fitness centres and non-profit sports clubs may, undoubtedly, have influenced my perspective, despite conscious efforts to bracketing my preconceptions. Later in the process of the analysis, as themes emerged from the data, we introduced the theoretical concepts of ableism and disablism (direct and indirect) to be able to clearly present and discuss our findings. These methodical choices have led to a very inductive approach which was suitable for the project and also reflected the timeline of the PhD-project as the interview was mowed forward due to cooperation with the Fitness for all-campaign. A more deductive approach could have been used when designing the interview guide or later in the analytical process, as the theoretical frameworks could have been applied earlier in the process. However, the interview guide was designed to fit both AwoPD and AwPD in order to be able to compare their perceptions of inclusive fitness centres at a later stage. (The results from AwPD are not yet analysed but will be presented in a publication later on). Another limitation with the focus group study was the already defined 'Fitness for all'-campaign, where some choices were taken by the steering committee and the contact persons at each location, i.e. when the interviews should be conducted, the choice of the three locations and, to some extent, the participants in the interviews.

In terms of generalisability, the results from this study are expected to be applicable to other non-profit club-based fitness centres in Denmark. However, as seen within the three different locations included in this study, significant context variations occur within such establishments that must be taken into account. As the investigation have specifically targeted non-profit club-based fitness centres, it is important to point out that the application to commercial fitness centres should only be done with great caution.

5.5 The thesis

The PhD-project as a whole, aimed to investigate the basis for inclusion of AwPD in fitness centres. The three research questions therefore originated from a practical setting and, accordingly, the research performed during the PhD-project was designed to provide knowledge back to the practical setting and the Fitness for all-campaign. Based on the knowledge produced, the basis for inclusion is good. There is a considerable group AwPD to include, barriers and facilitators for fitness centre participation are identified and can now be

addressed, and the users of the future inclusive fitness centres welcome AwPD, although an embedded ableism perspective is found.

The three studies used different methods, and the generalisability therefore varies among the studies. The prevalence and characteristics of AwPD is representative and specific for the Danish population, and data is expected to be comparable with other similar countries. Thus, barriers and facilitators defined here are considered applicable to indoor fitness centres in western societies. Finally, the combined results from the interviews are only generalisable in relation to non-profit club-based fitness centres in Denmark.

The application of three fundamentally different methodologies is considered an advantage in relation to the aim of the thesis, securing the necessary breadth in the project. To compensate for the potential disadvantage of the inevitable broad spectrum to be covered within a single PhD project, I have worked with skilled researcher within each of the specialized fields.

As a consequence of the broad scope research programme, not all data collected have been included in this thesis, most notably the interview results concerning inclusion seen from the perspective of AwPD. The interview data were collected but are currently awaiting further analysis; however, the knowledge and insight gained from these interviews have undoubtedly made this PhD-thesis more nuanced. Currently, the three new inclusive fitness centres are opening (with some delay partly due to the covid-19 pandemic), and it will be interesting to see how many new members with physical disabilities the new pilot inclusive fitness centres can attract. Knowledge and experiences from the Fitness for all-campaign is yet to be investigated further.

It is my hope and belief that the knowledge produced in this thesis will be useful in order to provide inclusive fitness centres.

6.0 Conclusion

This thesis identifies and describes potential adult fitness users with physical disabilities for an inclusive fitness centre environment; the thesis further identifies, synthesise, and compare current knowledge on barriers to and facilitators of fitness centre participation and, in an interview-based study, explore how AwoPD perceive an ideal fitness centre environment as well as an inclusive fitness centre environment in a non-profit club-based setting.

The register-based study showed a prevalence of AwPD in Denmark of 13% (equivalent to more than 600.000 persons). Since this number is probably underestimated, there is a sizable potential in broad-scale inclusion of adults with disability into fitness centres – particularly so as the distribution of AwPD was found to be fairly even throughout the five regions in Denmark. Comparing the group of AwPD to the general adult population (GAP) in Denmark, the group of AwPD was found to deviate in a number of ways, which has to be taken into consideration when creating new inclusive fitness centres. The most significant deviations are the high proportion of women and people with lower education levels among the AwPD, both in relation to the GAP. Noteworthy, but somewhat expected, are also the findings that the proportion of AwPD associated with the labour market is only half the level of the GAP, while the proportion of AwPD on early retirement/retirement pension is twice that of the GAP. However, our investigation also registered considerable variation in these parameters within the nine disability subgroups which, combined with the fact that the level of disability varies dramatically across the nine disability groups, may be considered an important, complicating factor when attempting to improve inclusion of AwPD in fitness centres.

Results from the review demonstrated that the focus for the group of AwoPD were on facilitators of exercising in fitness centres, particularly those related to the fitness centre user, including different motivational aspects and exercising effects. Barriers are more related to dislike of the fitness centre culture, feeling unwelcome or having other priorities or 'excuses' for not exercising (lack of time, bad weather, high cost, pain/injury etc).

In contrast, the focus for the group of AwPD were on the barriers related to their disabilities, emphasizing the physical barriers associated with poor accessibility and unsuitable fitness machines. The lack of knowledge - apparent or real - among instructors and staff on disability friendly modified exercises is reported as an important element, leading to unprofessional assistance. The AwPD group also pointed to negative attitudes from other users, as well as instructors and staff, as a major deterrence. Facilitators are mainly described as the opposite of

barriers, however, actual experiences from AwPD about exercising in fitness centres remains virtually undescribed.

Generally, AwPD and AwoPD agree in their requests of skilled instructors, a comfortable and welcoming fitness centre environment, opportunity to exercise at the preferred type and level, and good social relationships with other users. However, the means put forward to achieve these requests differ considerable between the groups. Interestingly, we noted that the barriers and facilitators experienced by AwoPD on the individual level, may be equally applicable for AwPD.

The interview sessions, in particular, revealed that AwoPD are having several expectations and preferences for the inclusive fitness centres of the future. The participants pinpointed the importance of a good atmosphere – a place that made them feel welcome, gave them a feeling of belonging and having good social relations. When participants considered whether or not they felt they fitted in, they mirrored themselves in relation to other users and elements like body ideals, gender, age, exercise preferences were of importance.

At a general level, participants welcomed AwPD and wanted them to feel included in the fitness centre community although they did predict several challenges for the new inclusive fitness centres. Besides the obvious barriers that may hinder inclusion of AwPD in fitness centres, such as inaccessible surroundings and non-adaptive fitness machines, other barriers as social skills, ableism, ignorance and preconceptions are considered important as well.

In order to make a successful inclusion of AwPD in fitness centres, it is therefore of high importance not only to focus on location and advanced fitness equipment, but also to facilitate the development of a suitable atmosphere. The atmosphere the fitness centres should aim for is welcoming and inviting, with room for diversity and inclusion, and where all fitness centre participants feel comfortable and develops a sense of belonging. The key to achieve this may be positive verbal and non-verbal interactions between the fitness centre participant and both instructors/staff and other users. Important aspects are acknowledgment of each other by eye contact, small-talk and a positive attitude, together with a feeling of fitting in when mirroring oneself in the other users, instructors and staff, e.g., by seeing other users of similar age, appearance, and preferences for specific training types. Importantly, fitness centres are seen as a place to meet peers and possible build valuable social relations.

However, in order to improve our understanding of the conditions facilitate such relations, the perspective from AwPD on how to increase inclusion in fitness centres still needs to be investigated further.

7.0 Perspectives

Based on the new knowledge presented and discussed in this thesis, several perspectives and points to pay attention to have emerged. In the following, practical implications and research perspectives will be presented.

Practical perspectives

Based on the investigations from this PhD project, the following factors and attention points should be addressed when promoting and improving inclusion in fitness centres (listed according to the six contextual factors modified from the Di Blasi framework (Di Blasi *et al.*, 2001)):

1) The fitness centre setting
- Think in universal design - make it accessible and usable for everybody
- Use appropriate guidelines and checklists e.g. ADA guideline, AIMFREE or CHEC-M to improve accessibility
- Adaptable and wheelchair-friendly fitness machines
- Surroundings must be bright with windows, not to crowded, no smell of rubber or sweat and not be a place signalizing hospital or rehabilitation setting

2) The fitness centre user characteristics
- The general atmosphere/ambience is very important for all users, - it has to be welcoming, inviting and comfortable
- Users seek the feeling of fitting in – gender, age, exercise preferences and body appearance are all of importance when deciding whether or not they fit in
- Information, engagement, promotion and support from the group of people with disability and disability organisations is important to result in participation

3) The fitness centre instructors/staff characteristics
- The definitions of 'a good instructors', differ somewhat between people with and without disabilities – common to both groups is an inspiring, motivating and skilled instructor, who can adapt the exercises
- Education for instructors to guide and adapt exercises for people with disability
- Have instructors/staff with disabilities - let them be role models for the inclusion
- Be welcoming and have an equal dialog with all members – think 'we' not 'us /them'
- Have instructors/staff of different age, gender and types – it signals diversity and inclusion

4) The fitness centre user – Instructor/staff/management relationship
- Provide and support a welcoming and inclusive atmosphere/ambience

- Have explicit policies, rules and etiquettes etc. - and make sure they are obeyed
- Prioritize an inclusive space – do not be exclusive because of lack of knowledge
- Inclusion of people with disabilities can also attract new customers/consumers
- Provide value for money – costs and quality have to go hand in hand
- Make it free to bring a carer for persons with disabilities
- Support social environments as well – e.g. provide an area where people can meet before or after exercising
- Make sure displayed images include of all types of bodies – not only the super fit

5) The fitness/exercising characteristics
- Provide opportunities so people can exercise at preferred type and level
- Offer (mandatory) introduction classes to new users
- Offer classes solely for people with disabilities - as a gentle start
- Provide classes including both people with and without disabilities e.g. spinning classes
- Provide assistance to users with disabilities who might need a helping hand once in a while during exercising

6) Social relationships
- Avoid negative interactions, both verbal and non-verbal
- Acknowledge each other – meet and greet
- Be openminded and engage in the fitness community

Research perspectives:

The knowledge put forward based on the studies in this PhD thesis, is one step further in the process achieving inclusion of AwPD in fitness centres although much is jet to be done. Especially the perspective from the AwPD group needs to be investigated further, in order to successfully achieve the goal of inclusion fitness centres. The results from our comparable focus group interviews of AwPD will be analysed and presented in a future publication. This may add essential new knowledge to the field, as to our knowledge this is the first time perspectives on inclusion in fitness centres from both AwPD and AwoPD can be compared based on data from the same settings at the same time span.

Moreover, as a part of the Fitness for all-campaign (Appendix p. 97), an evaluation and information gathering are planed when the three fitness centres have been running for about half a year (expected to be in autumn/winter 2022). This future research will probably consist of interviews and observations and will undoubtedly add further knowledge on this important topic.

In view of our finding the following areas of research need further investigation:

AwPD:

- Expanding the voice of people with disabilities – what are their wishes and needs in relation to inclusion in fitness centres?
- What is of importance in the relation between users with disabilities and instructors/staff and how can interactions be optimised?
- How do AwPD experience exercising in inclusive fitness centres?
- What do AwPD gain from exercising in fitness centres?
- Can any health benefits, wellness aspects or functional mobility progress be measured in AwPD as a result of exercising in fitness centres?
- Experience gathered from the three pilot inclusive fitness centres in the Fitness for all-campaign.. (both knowledge from users with and without disability, instructors, staff and executive committee/management).

AwoPD:

- For AwoPD more knowledge is need on barriers and facilitators for exercising in fitness centres for the group of non-users, in order to attract new members to fitness centres.
- Many studies investigate non-disabled users in fitness centres, but reviews of the literature are lacking.

Summary

Physical activity and characteristics of people with physical disabilities
- Investigation of the basis for inclusion in fitness centres

Background: Physical activity is essential to prevent lifestyle diseases for all people and fitness centres is an obvious setting for exercising due to its popularity as the world's biggest 'sport'. Unfortunately, adults with physical disabilities (AwPD) are under-represented in fitness centres. To accommodate this, initiatives have been proposed in the UK and the USA, focusing on accessible environments, adaptive fitness equipment, staff training and strategies to enhance disabled people's fitness participation. Thus far, inclusion in fitness centres have not gained much attention in Denmark and the campaign 'Fitness for all' was initiated, which was the inspiration for the topic for this PhD-project.

Aim: The overall aim of the thesis was to investigate the basis for inclusion of adults with physical disabilities in fitness centres The project has led to three papers which aims to:

I. identify and describe the group of potential fitness participants with disabilities in Denmark in terms of socio-demographic variables.
II. identify, synthesise and compare barriers to, and facilitators of exercising in fitness centres for adults with (AwPD) and without physical disabilities (AwoPD).
III. The aim was shaped by two key questions: 1) What is the ideal fitness space from the perception of non-disabled fitness users? And 2) How might their dis/ableist attitudes negate inclusion in three future inclusive fitness centres across Denmark?

Methods: The studies employed three fundamentally different methods to match the research questions, the methods are as follows:

I. A cross-sectional, descriptive, register-based study, reporting data on prevalence and socio-demographic variables of AwPD in Denmark. Data was extracted from the Danish National Patient Register and Statistics Denmark by December 31st, 2018.
II. A scoping review, searching literature from MedLine, Embase, Scopus, Cinahl, SportDiscus and PsycINFO in addition to a grey literature search. Two researchers independently extracted data on barriers and facilitators for exercising in fitness centres on six categories of contextual factors modified, according to the Di Blasi framework. Barriers and facilitators were reported for both AwPD and AwoPD and compared.
III. A qualitative study with three focus group interviews involving 5-7 non-disabled participants (totally n=18) were performed. Both men and women were incluted, age ranged between 19-75 years, and fitness centre experience ranged from 0 to 20+ years. Data were transcribed and subsequently coded and analysed according to Malterud's four-step method of systematic text condensation.

Results:

I. A total of 606.857 adults with disabilities were identified, corresponding to 13% of the total adult population in Denmark. Characteristics of both the total group and each of the nine diagnostic subgroups differed significantly from the background population on all the measured variables (sex, age, geographical region, origin, educational level, occupation, and civil status).
II. In total, 4009 unique records were identified, and 102 papers included. Only one-quarter of the papers dealt with AwPD. Barriers and facilitators for fitness centre participation differed between AwPD and AwoPD, especially in the two categories 1) The fitness centre setting' and 2) The fitness centre user characteristics. Overall, similar results were found for the remaining four categories 3) The fitness instructor/staff characteristics, 4) The fitness centre user-instructor/management relationship, 5) The fitness/exercise characteristics, and 6) Other relationships.
III. The selected participants (AwoPD) had several preferences regarding their ideal fitness centre, but of most importance was welcoming and inviting atmosphere, and good social relations. The participants welcomed AwPD, but simultaneously predicted many challenges. Both social skills, ableism, ignorance and preconceptions are important barriers that may hinder inclusion in fitness centres.

Conclusion:

I. The nine disability groups displayed large variation which implies having very different needs for accessibility and exercise. These differences must be taken into consideration when attempting to improve inclusion of AwPD in fitness centres.
II. The main difference between AwPD and AwoPD, was that the focus on barriers (inaccessible settings) for AwPD while, for AwoPD the focus was on the facilitators (motivation and exercising effects). Both groups requested skilled instructors, a welcoming environment, to exercise at their preferred type and level and good social relationships. Actual experiences from fitness centre users with physical disabilities is lacking in the literature.
III. Successful establishment of future inclusive fitness centres relies further on knowledge from AwoPD, i.e. their attitudes and perceptions on what may hinder the inclusion of AwPD.

Contribution to the research field

There is a good basis for inclusion in fitness centres, as AwPD comprises of 13% of the Danish population. Many barriers for fitness centre participation are identified for AwPD which is often related to inaccessible settings. By solving these issues segregation can be achieved but this is not a guarantee for inclusion. The atmosphere in fitness centres is essential for inclusion, and it should be welcoming, inviting with room for diversity and making all fitness centre users feel comfortable with a sense of belonging. AwoPD welcomes AwPD in fitness centres but they also demonstrate an ableist perspective that may hinder inclusion. However, the perceptions of inclusion in fitness centres from the perspective AwPD needs to be investigated.

Dansk resumé (Danish summary)

Fysisk aktivitet og karakteristika for personer med fysisk handicap
- Undersøgelse af grundlaget for inklusion i fitness centre

Baggrund: Fysisk aktivitet er essentielt i forebyggelsen af livsstilssygdomme for alle mennesker og fitness centre er et åbenlyst sted for træning på grund af dets popularitet som verdens største 'sport'. Beklageligvis er voksne med fysisk handicap (VmFH) underrepræsenterede i fitnesscentrene. For at rette op på det, er der i Storbritannien og USA lavet initiativer der fokuserer på adgangsforhold, justerbart fitness udstyr, træning af personale og strategier til at fremme deltagelse for VmFH. Indtil nu har inklusion i fitness centre ikke opnået meget opmærksomhed i Danmark og kampagnen 'Fitness for alle' blev igangsat, hvilket var inspirationen for dette emne for dette PhD-projekt.

Formål: Det overordnede formål med denne afhandling er at undersøge grundlaget for inklusion i fitnesscentre i Danmark. Projektet har ledt til tre artikler med følgende formål:

I. At identificere og beskrive gruppen af potentielle fitness deltagere med fysisk handicap i Danmark i relation til socio-demografiske variabler.
II. At identificere, syntetisere og sammenligne barrier og facilitatorer for træning i fitnesscentre for voksne med (VmFH) og uden fysisk handicap (VuFH).
III. Formålet var formet af to nøglespørgsmål: 1) Hvad er det det ideelle trænings center set fra perspektivet af ikke-handicappede brugere? Og 2) Hvordan kan deres dis/ableist holdninger modvirke inklusion i tre fremtidige inklusive fitness centre i Danmark?

Metoder: De tre studier anvendte forskellige metoder for at matche tre fundamentalt forskellige forskningsspørgsmål, følgende metoder er anvendt:

I. Et deskriptivt registerbaseret tværsnitsstudie, som rapporterer prævalens og socio-demografiske variabler for VmFH i Danmark. Data er udtrukket fra Landspatientregisteret og Danmarks Statistik, med skæringspunkt d. 31/12-18.
II. Et scoping review, med litteratur fra MedLine, Embase, Scopus, Cinahl, SportDiscus and PsycINFO i tillæg til en søgning af grå litteratur. To forskere har uafhængigt af hinanden ekstraheret data på barrierer og facilitatorer for træning i fitnesscentre med baggrund i seks kategorier af kontekstfaktorer, modificeret efter et rammeværk af Di Blasi. Barrierer og facilitatorer er beskrevet både for VmFH og VuFH og sammenlignet.
III. Et kvalitativt studie med tre fokusgruppe interviews med hver 5-7 ikke-handicappede deltagere (totalt n=18) blev udført.. Både mænd og kvinder deltog, alderen var mellem 19-75 år, og erfaringer med fitnesscentre var mellem 0 og 20+ år. Data blev transskriberet og efterfølgende kodet og analyseret jævnfør Malterud's fire-trins metode systematisk tekst kondensering.

Resultater:

I. Totalt blev 606.857 voksne med fysisk handicap identificeret, svarende til 13% af den totale voksne population i Danmark. Karakteristika for både hele gruppen af voksne med fysisk handikap og hver af de ni diagnostiske undergrupper var signifikant forskellig fra baggrundspopulationen på alle de målte variabler (køn, alder, geografisk region, oprindelse, uddannelsesniveau, beskæftigelse og civil status).
II. Total blev 4009 unikke søgehits identificeret og 102 artikler blev inkluderet. Kun omkring en fjerdedel af artiklerne omhandlede VmFH. Barrierer og facilitatorer for fitnesscenter deltagelse var forskellig for VmFH og VuFH, specielt i de to kategorier 1) Omgivelserne og 2) Fitnesscenter brugernes karakteristika. Overordnet var resultaterne ens for de fire resterende kategorier 3) Fitnessinstruktører/personale karakteristika, 4) Fitnesscenter bruger – instruktør/management forholdet 5) Fitness træning karakteristika og 6) Andre relationer.
III. De udvalgte deltagere (VuFH) havde adskillige præferencer angående deres ideale fitnesscenter, men mest vigtigt var en imødekommende og inviterende atmosfære og gode sociale relationer. Deltagerene bød VmFH velkomne, men samtidig forudså de mange udfordringer. Både sociale kompetencer, ableism, ignorance og fordomme er vigtige barrierer som han hinder inklusion i fitness centre.

Konklusion:

I. De ni handicap-grupper viste store variationer, hvilket indikerer forskellige behov for adgangsforhold og træning. Disse forskelle må der tages højde for når man forsøger at forbedre inklusionen af VmFH i fitnesscentre .
II. Den største forskel på grupperne af VmFH og VuFH var et fokus på barrierer (utilgængelighed) for VmFH, mens for VuFH var fokus var på facilitatorerne (motivation og træningseffekter). Begge grupper efterspurgte dygtige instruktører, et imødekommende miljø, at kunne træne på deres foretrukne måde og niveau og gode sociale relationer. Oplevede erfaringer fra fitnesscenter brugere med fysisk handicap mangler i litteraturen.
III. Succesfuld etablering af fremtidige inklusive fitnesscentre afhænger yderligere af viden fra VuFH f.eks. kan deres holdninger og opfattelser forhindre inklusion af VmFH.

Bidrag til forskningsfeltet

Der er god basis for inklusion I fitness centre da voksne med fysisk handicap udgør 13% af populationen. Mange barrierer for fitnesscenter deltagelse er identificeret for VmFH og er ofte relateret til dårlig tilgængelighed. Ved at løse dette kan der opnås segregation, men det er ikke en garanti for inklusion. Atmosfæren i fitness centre er essentiel for inklusion og skal være imødekommende, inviterende med plads til diversitet og skal få alle fitness center brugerne til at føle sig tilpasse og med et tilhørsforhold. VuFH er imødekommende over for VmFH i fitness centret men de demonstrerer også et ableisme-perspektiv som kan hindre inklusion. Ydermere er der behov for at perspektiver på inklusion i fitness centre set fra VmFH undersøges.

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Appendices

The Fitness for all-campaign

Paper I:

Nikolajsen H, Larsen C.M, Holsgaard-Larsen A, Juul-Kristensen B and Hestbæk L. *Prevalence and socio-demographic profile of adults with physical disability in Denmark – a register-based cross-sectional study.* BMC Public Health. [under review]

Additional files:

Sup 1: Disability subgroups by ICD-10 codes

Paper II:

Nikolajsen H, Sandal L.F, Juhl C.B, Troelsen J and Juul-Kristensen B. *Barriers to, and facilitators of exercising in fitness centres among adults with and without physical disabilities: A scoping review*. International Journal of Environmental Research and Public Health. 2021, 18,14: 7341. https://doi.org/10.3390/ijerph18147341.

Additional files:

Sup 1: Search strings from the databases

Sup 2: Excel sheet used for extraction of data

Sup 3: Overview of the 100 included papers

Paper III:

Nikolajsen H, Richardson E.V, Sandal L.F, Juul-Kristensen B and Troelsen J. *Fitness for all – how do non-disabled people respond to inclusive fitness centres?* BMC Sports Science, Medicine and Rehabilitation. 2021, [in press]

Additional file:

Sup 1: English translation of the interview guide

The Fitness for all-campaign

In April 2017 the campaign 'Fitness for all – fitness for people with physical disabilities' was launched (Bevica, 2021). The Fitness for all-campaign aims to rethink, transform and adjust club-based non-profit fitness centres in new, innovative and inclusive ways, to secure equal access for people with and without physical disabilities.

The Fitness for all-campaign is limited to a particular type of fitness centres (in Danish: foreningsfitness centre) characterized by being non-commercial clubs based on volunteer work, which enables low membership cost (about €10-15 per month) but requires an association board and yearly general assemblies. These fitness centres are established as a part of 'Bevæg dig for livet – Fitness' (DGI & GymDanmark, 2021) a partnership between the national, non-elite sports association DGI (consisting of more than 6.400 local associations and clubs, with more than 1.6 million members ("About DGI", n.d.)) and GymDenmark (English name: Danish Gymnastics Federation) the biggest federation under DIF (English name: The National Olympic Committee & Sports Confederation of Denmark, (consisting of the 62 national sport federations based on 9.000 member clubs and 1,9 million individual members (DIF, n.d.)). In 2019 Denmark had 358 club-based non-profit fitness centres, equivalent to 25% of the fitness centres in Denmark (Rask, 2019).

After an application round in 2017, three club-based non-profit fitness centres were selected by the Fitness for all-campaign to be a part of the campaign and become pilot inclusive fitness centres (Figure 10).

Figure 10. Location of the three fitness centres in the Fitness for all-campaign

1) Gårslev Fitness – for alle, Vejle municipality (116,000 citizens)

2) Gladsaxe Multifitness, Gladsaxe municipality (69,000 citizens)

3) Viking Atletik, Fitness, Bornholms municipality (39,000 citizens)

The fitness for all-campaign

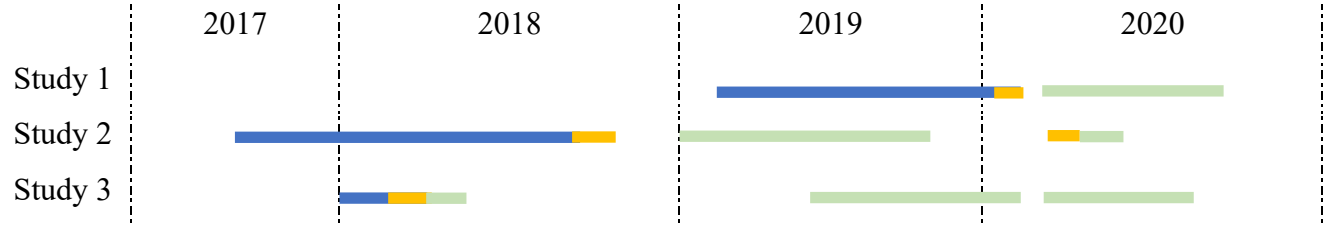
This campaign is the result of a partnership between; Bevica Fonden, Realdania, Lokale og Anlægsfonden, Danske Handicaporganisationer, Danmarks Idrætsforbund (DIF), Danske Gymnasktik- og Idrætsforeninger (DGI), Parasport Danmark og Bevæg dig for livet – Fitness, - a collaboration with disability organisations, national non-elite and elite sport organisations and funds within building and construction, together with the local fitness centers and Vejle, Gladsaxe and Bornholms municipalities. BARK Rådgivning is the secretary for the partnership and is doing the day-to-day running of the campaign. In total, the project has a budget of 12,7 mil. DDK, (€ 1,7M).

University of Southern Denmark, Centre for Adapted Physical Activity Participation Studies, is involved in the scientific part of the Fitness for all-campaign, this work is supported by Trygfonden. The work performed by University of Southern Denmark is divided in two parts. First, this PhD thesis is linked directly to the Fitness for all-campaign by the overlap between the focus group interviews in study 3 being equivalent to the baseline interview in the Fitness for all-campaign and indirectly as study 1 and 2 will provide a knowledge dissemination to the campaign. Secondly, University of Southern Denmark will also be responsible for the scientific evaluation of the Fitness for all-campaign (see Figure 11 for a timeline of the fitness for all-campaign and the PhD project). The campaign is expected to finish in the summer 2022.

The fitness for all-campaign

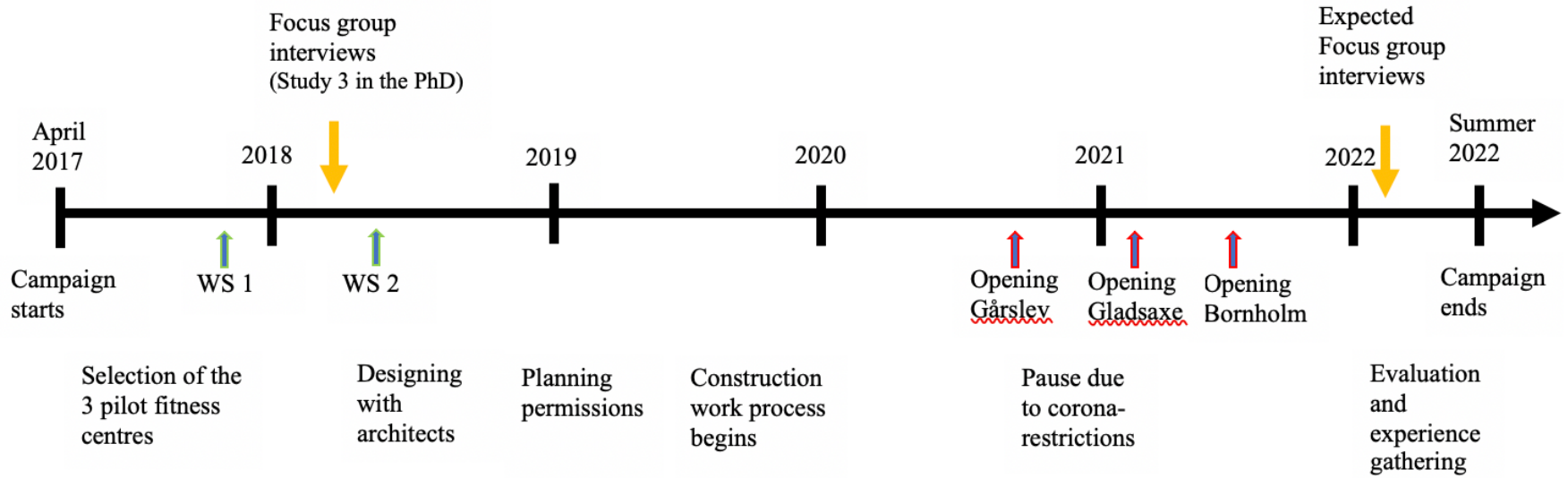
Figure 11. Timeline for the PhD project and the Fitness for all-campaign

Rough timeline for the 3 studies in the PhD project:



Colour codes: Preparation, Data collection, Analysis

Timeline for the Fitness for all-campaign:



Paper I

Nikolajsen H, Larsen C.M, Holsgaard-Larsen A, Juul-Kristensen B and Hestbæk L. *Prevalence and socio-demographic profile of adults with physical disability in Denmark – a register-based cross-sectional study.* BMC Public Health. [under review]

Additional files:

Sup 1: Disability subgroups by ICD-10 codes

Prevalence and socio-demographic profile of adults with physical disabilities in Denmark – a register-based cross-sectional study

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Abstract

Background: To facilitate physical activity by developing and tailoring exercise opportunities for people with physical disabilities, who are at risk of being physically inactive, knowledge about their general characteristics such as prevalence and demography are needed. The aim was I) to determine the prevalence of adults with physical disabilities, in total and divided into nine common diagnostic subgroups, in Denmark, and II) to describe their socio-demographic profile and finally, III) to compare their data with the general adult population (GAP) in Denmark.

Methods: This study is a descriptive, cross-sectional, register-based study, reporting general socio-demographic variables (sex, age, geographical region, origin, education level, occupation, civil status, and level of disability) of this group, extracted from the Danish National Patient Register and Statistics Denmark by December 31st, 2018. Further, data is compared with the GAP in Denmark, extracted from Statistics Denmark by Jan. 1st, 2019.

Results: In total 606.857 adults with physical disabilities were identified. Of the nine selected diagnostic groups, osteoarthritis (69,4%) was the largest group followed by acquired brain injury (29,0%), rheumatoid arthritis (6.7%), multiple sclerosis (2.6%), spinal cord injuries (1.5%), cerebral palsy (1.2%) amputations (0.7%), muscular dystrophy (0.5%) and poliomyelitis (<0.1%).

There were large variations between the nine disability groups in their socio-demographic profile. Compared with the GAP the total disabled group differed on all socio-demographic variables. The disabled group had; more women, were older, had almost the same geographical distribution, consisted of fewer immigrants, in addition to lower levels of education and occupation and a high prevalence of married persons.

Conclusion: This study described the group of adults with physical disabilities in Denmark distributed by nine disability groups, representing 13% of the adult Danish population. Large variations in the socio-demographic profile were observed between the nine disability subgroups, with significant differences on all variables compared with the GAP. This study uncovers patterns and trends on socio-demographic variables that are important at a society level e.g., when promoting physical activity for this very diverse group of people with physical disabilities.

(=331 words, max 350)

Keywords: physical disabilities, prevalence, demography, socio-demography, socio-economy, register-based study

1. Introduction

Physical inactivity poses a large threat to public health, causing both morbidity and mortality and lead to a major economic burden [1, 2]. Globally, 23% of the adult population does not meet the general recommendations of physical activity [3]. In their latest guideline, The World Health Organization (WHO) recommends a minimum of 150 minutes of moderate physical activity per week, 75 minutes of vigorous activity per week or an equivalent combination of moderate and vigorous activity for adults, and a reduction of sedentary behaviour [4]. Although this recommendation applies to adults both with and without physical disabilities, it is of even greater concern for people with disabilities as these are twice as likely to be physically inactive as people without disabilities [5, 6]. Furthermore, people with disabilities often experience more chronic diseases and conditions [5], which typically occurs at an earlier age than for people without physical disabilities [7].

When people with disabilities attempt to increase their physical activity level, they report several challenging barriers, e.g. inaccessible environments or intra- or interpersonal issues [6, 8, 9]. Fortunately, a positive effect of physical activity promotion interventions among adults with disabilities are seen [10], but much is yet to be done. Consequently, the WHO calls for more information about physical activity and people with disabilities. In their disability action plan 2014-2021, WHO requests international methods to compare disability across the world, e.g. prevalence studies, and encourage disaggregation of these data by sex, age, income and occupation to uncover patterns, trends and other information about subgroups of people with disabilities [11].

Therefore, the first step to facilitate physical activity by developing and tailoring exercise opportunities for people with disabilities, is to obtain group specific knowledge. The current study utilizes national population registers to identify and describe the group of people with disabilities in Denmark in terms of prevalence and socio-demographic variables. The specific objectives were therefore, firstly to determine the overall prevalence of adults with physical disabilities in Denmark, as well as the prevalence of nine selected common diagnostic subgroups (osteoarthritis, acquired brain injuries, rheumatoid arthritis, multiple sclerosis, spinal cord injuries, cerebral palsy, amputations, muscular dystrophy, poliomyelitis). Secondly, the aim was to describe the socio-demographic profiles (sex, age, geographical region, origin, education level, occupation, and civil status and level of disability) for the total group of adults with physical disabilities, as well as for the nine subgroups individually. Finally, these data on socio-demographic variables on adults with disabilities will be compared with the general adult population (GAP) in Denmark.

2. Methods

2.1 Design

This study is a descriptive, cross-sectional, register-based study, based on data available by December 31st 2018, from the Danish National Patient Register (DNPR) and Statistics Denmark. The STROBE guideline [16] for observational studies was used for reporting.

2.2 Population

The study population consists of adults with physical disabilities identified from The Danish National Patient Register (DNPR). Physical disabilities are in this study defined by nine selected and common groups of diagnoses anticipated to benefit from some level of physical activity: Osteoarthritis, Acquired brain injuries, Rheumatoid arthritis, Multiple sclerosis, Spinal cord injuries, Cerebral palsy, Amputations, Muscular dystrophy, and Poliomyelitis.

The data set is created by Statistics Denmark, from the following inclusion criteria: All persons from The Danish National Patient Register (DNPR), who in the period from 1994 and onwards, were given one or several of selected ICD-10 Diagnosis Codes, related to the nine disability groups (See appendix 1 for further details) during a hospital admission. The ICD-10 codes include both A and B diagnoses (the primary diagnosis and an optional secondary diagnosis from the hospital admission). Further, the persons had to be at least 18 years of age, alive and living in Denmark on December 31st, 2018.

2.3 Data acquisition

2.3.1 The Danish National Patient Register (DNPR)

We used The Danish National Patient Register (DNPR) [12] to identify our cases. DNPR contains information about diagnoses and performed operations since 1977 at all Danish Hospitals. This government-funded population-based registry is administered by the National Board of Health and they provide an updated copy of the register to Statistics Denmark for research linkage [13].

2.3.2 Statistics Denmark

We used Statistics Denmark to link our cases with our selected variables from different registers at Statistics Denmark. Statistics Denmark is a governmental institution that collects and maintains electronic records for a broad spectrum of statistical and scientific purposes, and it has a large data quantity at its disposal for its production of official statistics [13]. We used data from the following registers: Population in Denmark, Educational attainment, The Danish Employment Classification Module and Disability/Handicap Services.

All data sources were linked by use of the civil registration number (CPR-number), a unique identifier assigned to all Danish residents since 1968 that encodes sex and date of birth. In this way it is possible to link data from one or more registers or from other sources with register-based information at an individual level. All linkage was performed anonymously within Statistics Denmark.

To compare our cases, adults with disabilities, with the rest of the adult population in Denmark, we used StatBank Denmark (www.statbank.dk), hosted by Statistics Denmark. This database is directly accessible, free of charge, and a guiding principle is that individuals and companies cannot be identified, so data is presented at an aggregate level. All variables were categorized in the same way as our disability cohort. We extracted data of the total group of the GAP in Denmark who were 18 years or more, alive and living in Denmark by Jan. 1st, 2019, except for data on education level which includes 15-69-year-old persons (in total 4.029.097).

2.4 Variables

All socio-demographic variables for the disability groups were extracted from four different registers from Statistics Denmark.

'Population in Denmark'-register:

- Sex (binominal data).
- Age (ratio-interval data) was extracted by Dec. 31st 2018, and grouped into seven age categories; '18-24 years', '25-34 years', '35-44 years', '45-54 years', '55-64 years', '65-74 years' and '75 and older'.
- Geographical region in Denmark (nominal data) was based on the individual's home address by Dec. 31st, 2018, and categorised into the five regions in Denmark; 'North Denmark', 'Central Denmark', 'Southern Denmark', 'Capital' and 'Zealand'.
- Civil status (nominal data) was extracted and categorized into 'Unmarried', 'Married or separated', 'Divorced' and 'Widow or widower'.
- Origin (nominal data) was categorized into 'Danish', 'Immigrants' or 'Descendants of immigrants'.

'Educational attainment'-register:

- Educational level (ordinal data) was operationalised as the highest completed education and was categorized into 5 groups according to the International Standard Classification of Education (ISCED) [14]; 'ISCED 0-2 Primary and lower secondary school', 'ISCED 3-4 Upper secondary school/vocational education', 'ISCED 5-6 Bachelor or equivalent level', 'ISCED 7-8 Master/doctoral level' and 'Unknown or missing'.

'Employment Classification Module':

- Occupational status (nominal data) was extracted and categorised into 'Affiliated to the labour marked', 'Education' 'Unemployed or welfare payment', 'Early retirement', 'Retirement', and 'Unknown or missing'.

'Disability/Handicap Services'-register:

- Functional level (ordinal) is a variable registered by the municipality as an overall functional level status for a person who receives disability services. Data is reported in the following five categories: 'No problems', 'Slight problems', 'Moderate problems', 'Severe problems' and 'Complete problems'.

2.5 Analysis

In general, analyses are descriptive and statistical tests were only performed for comparison with the GAP.

The prevalence rates of people in the nine disability groups, combined and for each group, were reported as proportions of adult citizens living in Denmark by December 31st,2018.

The distribution of sex, age, geographical region in Denmark, origin, education level, occupation and civil status within the nine disability groups as well as for the whole group was estimated as proportions. Further, all variables were compared with the respective numbers from the GAP in Denmark. Due to data protection issues, data were not reported if there are less than 10 individuals in a cell.

A Pearson's chi-squared test was used to calculate p-values for differences in distribution of the different variables between the disability groups and the GAP in Denmark. We subtracted the disability subgroup from the total Danish population before calculating the p-value.

Missing or unknown data was not included in the analysis. Significance level was set at 0.05 and all analyses were performed with Stata 16.1 [15].

Finally, a table of the distribution of functional level was reported for all nine disability subgroups and for the total group.

2.6 Ethics

The project was approved by the University of Southern Denmark, Research & Innovation Organisation (RIO) on behalf of The Danish Data Protection Agency, journal number 2015-57-0008.

3. Results

3.1 Prevalence

In total, 606.857 persons were included in the nine disability subgroups, equivalent to 13% of the total adult population in Denmark. The largest group were Osteoarthritis (67,4%), followed by Acquired brain injury (29,0%), Rheumatoid arthritis (6.7%), Multiple Sclerosis (2.6%), Spinal cord injuries (1.5%), Cerebral palsy (1.2%), Amputations (0.7%), Muscular dystrophy (0.5%), and Poliomyelitis (<0.1%) (Figure 1). Almost 91% of the persons were only included in one disability subgroup, nearly 9% were included in two subgroups, while <0.5% were included in three or more subgroups.

3.2 Socio-demographic variables

The sociodemographic variables (sex, age, geographical region, and origin) are shown in Table 1a for all groups, except for the group with poliomyelitis since several cells included less than ten individuals.

In total, there were more women in the disabled group than in the GAP, but there were large sex-differences among the different disability groups. Rheumatoid arthritis and multiple sclerosis were considerably more frequent among women than among men (72% vs. 28%; 69% vs. 31%, respectively). In contrast, injury related disabilities were more common among men, with 73% of the amputees and 58% of the people with spinal cord injuries being men. Also, acquired brain injuries, which in some cases were related to trauma, were more frequent among men (56% for men vs. 44% for women). There were only minor sex differences in relation to osteoarthritis, cerebral palsy, muscular dystrophy and poliomyelitis. The difference in sex-distribution between disabled persons and the GAP was statistically significant for all subgroups ($p \leq 0.001$).

Age differed within the nine disability groups, with cerebral palsy having the biggest proportion of young people and acquired brain injury having the oldest.

For the total disabled group, there was a higher percentage of both males and females above 75 years compared with the GAP in Denmark. This was related to the two biggest subgroups, osteoarthritis and acquired brain injuries (incl. apoplexia) which both usually appear later in life. The difference in age-distribution between disabled (men and women separately) and the GAP were statistically significant for all subgroups ($p \leq 0.001$), except for women with spinal cord injuries ($p = 0.341$).

The distribution of the selected diagnostic subgroups across the Danish geographical regions generally followed the same pattern as for the GAP, except for amputations which were much more prevalent in the region of Southern Denmark and less prevalent in the Capital region. Rheumatoid arthritis was more prevalent in the region of Zealand, while osteoarthritis was less prevalent in the Capital region (21.2% versus 26% for region Capital and the rest of Denmark, respectively (not shown in the table)). The differences in geographical distribution between the disabled and the GAP were statistically significant for all subgroups ($p \leq 0.001$), apart from the muscular dystrophy group where no differences were seen ($p = 0.367$).

Immigrants (both from western and non-western countries) as well as descendants of emigrants were only half as likely to have a physical disability compared with the GAP, but among descendants of immigrants, cerebral palsy was twice as common as in the GAP. The differences in distribution of origin between the disabled and the GAP were statistically significant for all subgroups ($p \leq 0.001$).

3.3 Socio-economic variables

The socio-economic variables (education level, occupation, and civil status) are shown in Table 1b for all groups, except for the group with poliomyelitis due to the reasons stated above.

The educational level for all the subgroups was lower than for the GAP but differed considerably among disability types. Diseases with possible affection of the cognitive functions, i.e., cerebral palsy and spinal cord injuries, were associated with very low educational levels, whereas the level for people with multiple sclerosis was similar to that of the GAP. The difference in distribution of educational level between the disabled groups and the GAP were statistically significant ($p \leq 0.001$) for all subgroups.

Only about half as many people with disabilities were affiliated to the labour market (28.3%) as in the GAP (60.0%); cerebral palsy had the lowest percentage of persons affiliated to the labour market (16.4%) and amputations had the highest (48.5%). Twice as many in the disability group compared with the GAP were on early retirement (10% versus 4.8%, respectively) or retirement (54.8% versus 21.5%, respectively). The differences in occupation-distribution between the disabled groups and the GAP were statistically significant for all subgroups ($p \leq 0.001$).

Civil status also differed notably between the groups with only 14.9% of the disabled persons being unmarried compared with 35.9% for the GAP, and thus there were more people with disabilities in the remaining groups; married/separated, divorced or widow/widower among disabled persons than among the GAP. Again, there were large differences between the subgroups; cerebral palsy was the group with fewest people being married (18.3%) and osteoarthritis with the most (89.4%). Again, the

differences in civil status-distribution between the disabled groups and the GAP were statistically significant for all subgroups ($p \leq 0.001$).

3.4 Level of disability

Level of disability was a new variable in the register and only very few persons were registered during this first year of reporting. The reporting rate was only 0.9% for the total disability group and differed considerably between groups, corresponding to 0.4% for the Osteoarthritis group and 14.3% for the Cerebral palsy group (Table 2).

Five of the disability subgroups had about 1/5 of the included persons categorised in the two categories with the best functional level: 'no problems' and 'slight problems' (amputation 25%, osteoarthritis 21%, rheumatoid arthritis 18.8%, acquired brain injury 17.6% and multiple sclerosis 16.1%). This was in contrast with the remaining three subgroups where more than half of the persons were categorised into the two categories with the lowest functional levels, 'severe problems' and 'complete problems' (spinal cord injuries 70%, cerebral palsy 67.1% and muscular dystrophy 57.8%). For the total disability group, the categories including most persons were 'moderate' and 'severe' problems (75.9% combined).

4. Discussion

This is to our knowledge, the first study to determine the prevalence of persons with physical disabilities in Denmark in combination with socio-demographic and socio-economic variables, by means of register-based data including a comparison with a reference population, the GAP in Denmark.

4.1 Prevalence

In total, 606.857 persons were included in the nine physical disability subgroups, equivalent to 13% of the total adult population in Denmark. As there were no international standard definition of the total group of people with disabilities, the prevalence varied according to the definition. WHO's definition of disability is as an umbrella term of a complex phenomenon [17], covering impairments, activity limitations, and participation restrictions cf. the International Classification of Function (ICF) terminology [18]. It is based on a biopsychosocial disability model, where disability reflects the interaction between the individual with a health condition/diagnosis, combined with personal and environmental factors according to the ICF terminology [17].

Our present data is an example of a medical model, where disability is strictly related to a somatic diagnosis and may thus underestimate the true prevalence, as other diagnoses could have been included as well. Our prevalence of physical disability (13%) is relatively high compared to the 20-year-old estimate from WHO, reporting that about 15% of the world's population >15 years is living with some sort of disability, but this percentage includes both mental and physical disability, and furthermore, they report future growing numbers due to general aging of the population. However, the present prevalence of 13% is in line with results from an American survey (based on six specific disability type questions), estimating that 25% of non-institutionalised adults ≥18 years have some kind of disability, and disability related to mobility (having serious difficulty in walking or climbing

stairs) was the most frequent condition with a prevalence of 13.7% [20]. In comparison, studies using self-reported data may overestimate prevalence rates compared with the present methodology using register-based data. One example is the SHILD-studies (Survey of Health, Impairment and Living Conditions in Denmark) that reports self-reported prevalence rates of physical disabilities/long lasting health conditions ranging from 25 to 27% of 16-64 year old Danish people [21–24].

4.2 Socio-demographic variables

Our study shows a higher percentage of women with disabilities, which is in line with Danish data from previous studies [25]. Furthermore, as commonly known, autoimmune diseases such as rheumatoid arthritis and multiple sclerosis are highly predominant among women [26, 27], but interestingly, diseases which can be traumatically induced, such as amputations, acquired brain injuries and spinal cord injuries were more common among men. Data from Danish hospital records show that men are more often involved in traffic accidents, work related accidents and violence than women [28].

Data on the age distribution reflects, not surprisingly, that the prevalence of osteoarthrosis and acquired brain injury (e.g. apoplexia) increases with age, while the other subgroups represent other pathological patterns with earlier disease debut and often earlier mortality, e.g. cerebral palsy, muscular dystrophy and some spinal cord injuries. Furthermore, osteoarthritis was found to be less prevalent in the Capital region than in the other regions, probably reflecting a younger population in region Capital (21.2% in region Capital compared with 26% in the rest of Denmark, numbers not shown).

An interesting finding was the very high rate of cerebral palsy among descendants of immigrants, which is in line with data of immigrants from Sweden [29] and Great Britain [30]. Consanguinity is suggested as a relevant factor influencing the prevalence of Cerebral palsy, as high rates are reported among Turkish and Pakistani immigrants [30, 31], two of the biggest groups of immigrants in Denmark.

4.3 Socio-economic variables

People with disabilities are known to have lower educational levels and less affiliation to the labour market [19], and this pattern becomes more clear with increased severity of the disability [24, 32], as well as with early onset of the disability [33]. Our results also reflect this but are unique as they can be compared across diagnostic groups. Data showed that disability subgroups with early onset and/or cognitive affection were associated with lower educational level, less affiliation with the labour market and higher probability of disability pension or early retirement. In contrast, the group with multiple sclerosis had an education level almost similar to that of the GAP. This probably reflects that multiple sclerosis usually has its first occurrence round the age of 30 [34, 35], where most people have completed their education and are of working age. This is also the case for osteoarthritis, but contrary to multiple sclerosis, this may also be related to the level of physical work load and is therefore more prevalent among blue collar workers [36].

Civil status revealed that more people in the disability groups were married or had been married compared with the GAP. Civil status of people with disabilities is an area with little knowledge but

the present results are in line with a study of Canadian women [37]. However, our results do not give information about whether people cohabit without being married.

4.4 Level of disability

Registration of disability level by the municipalities was introduced Jan 1st, 2018, consequently, our data represented the first year of registration. Further, reporting was voluntary for the municipalities as reflected in the very low reporting rates. Thus, data were very sparse, and reliability and validity unknown. Nevertheless, for discussion purposes, they may be used to give a preliminary indication about the burden of the various diseases. The overall level of disability was registered by social workers in the municipalities and intended to aid in the assessment of allocation of health and social services. Hopefully, this variable will gain ground in the coming years, as it can be an important measure, e.g. to describe the degree of disability across diagnoses.

4.5 Strengths and limitations

Study strengths include the use of the National Danish Patient register which collects data continuously through digitalized workflows and provides highly valid data of about 5.8 million people. Further, the linking of information using a personal identifier, the civil registration numbers (CPR-number), to demographic data stored by Statistics Denmark provides very complete and non-biased information [38], which also makes it possible to compare with the Danish GAP. This ensures a large dataset and avoids attrition bias, as usually present in survey data, e.g. the SHILD studies with self-reported responses from a random sample of about 30.000 adults between 18-64 years of age [24].

Another strength is that the present results are based on a medical model of measuring disability, which makes them easily replicable, and thus similar studies may be performed internationally for comparison. It is, however, a limitation that we use ICD-10 diagnoses which only dates back to 1994 in the Danish National Patient Register, meaning there may be persons diagnosed with disabilities before 1994, that we have missed. However, all patients admitted to the hospital between 1994-2018 with one of the selected ICD-10 codes as a primary or secondary diagnosis have been included in this study, thus we anticipate very low numbers of missing cases. Furthermore, prevalence overestimation is a risk, as individuals can be given a specific ICD-10 code 'obs.pro', if a patient is under observation for a specific diagnosis, this may increase the false positive numbers and especially the cerebral palsy and spinal cord groups are in risk of this overrepresentation.

Information on the GAP is as described not collected at an individual level but collected at aggregated level from Statistics Denmark. Fortunately, we were able to collect information with a cut-point that only differed one day from the rest of our data. However, one limitation in this respect is that educational data from the GAP could only be limited to 15-69-year-old persons and data on educational level are therefore not directly comparable with the disability group. Therefore, due to the inclusion of 15-18-year old persons in the GAP, including a large group who is still enrolled in education, the reported differences in education are likely to be even more pronounced than reported here.

4.6 Implications

Our results add to the existing knowledge about people with physical disabilities on a populational level as all adults in Denmark form the basis of this study.
People with physical disabilities are often treated as a homogeneous group but should be regarded as a heterogeneous group as subgroups differ significantly, both in relation to the physical impact of their disability and to socio-demographic and socio-economic characteristics, e.g. education, affiliation to the labour market and thus income.
It is clear from our results, that socio-demographic factors should be considered when promoting physical activity for people with disabilities. Socio-economic factors (mainly education, income, and occupation) are known to influence level of and possibilities for doing physical activity among non-disabled persons and may therefore also be relevant for persons with disabilities. Socio-economic factors may influence physical activity in work-life, as well as in housework and leisure time, and high socio-economic status is generally related to high leisure time physical activity [39]. Further, high income increase the use of structured leisure time activities as memberships of fitness centres etc. can be costly, where on the other hand, unemployed people have more time for leisure-time activities [40]. Marital status can indicate whether people live in a household with other people which can be beneficial in terms of social and physical support as well as motivation related to physical activity.

5. Conclusion

This study described the group of adults with physical disabilities in Denmark. We identified nine disability subgroups based on ICD-10 diagnoses, in total 606.857 persons, from the National Danish Patient Register. The total group represents 13% of the adult Danish population, and the most prevalent disorder was osteoarthritis, affecting 69% of all people with physically disabilities. The nine disability subgroups displayed large variations in their socio-demographic profiles, and when compared to the GAP in Denmark, they showed significant differences. The total disabled group had more women, were older, had almost the same geographical distribution, and consisted of fewer immigrants, in addition to lower levels of education and occupation and a high prevalence of married persons, compared with the GAP. The study uncovered patterns and trends about socio-demographic and socio-economic information about subgroups of people with disabilities as requested by WHO. This new knowledge is further important to take into considerations when promoting physical activity, for this very diverse group of people with physical disabilities.

(4077 words)

List of abbreviations

CPR-number: Civil registration number
DNPR: Danish National Patient Register
GAP: General Adult Population
ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th rev.
ICF: International Classification of Function

ISCED: International Standard Classification of Education
SHILD studies: Survey of Health, Impairment and Living conditions in Denmark
WHO: World Health Organization

Declarations:

Ethics approval and consent to participate:
This project was approved by the University of Southern Denmark, Research & Innovation Organisation on behalf of The Danish Data Protection Agency, journal number 2015-57-0008. All data were accessed through the server at Statistics Denmark.

Consent for publication: Not applicable

Availability of data and materials: The data that support the findings of this study are available from Statistics Denmark but restrictions apply to the availability of these data, which were used under license for the current register-based study and so are not publicly available.

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Authors' contributions:
HN and BJK conceived the study idea. HN, BJK, LH, CML and AHL all contributed to the designing the study. HN performed the data analysis in corporation with the data manager. All authors contributed substantially to the interpretation of the work. HN and LH drafted the manuscript. All authors contributed to critical revision of the paper and have approved the final manuscript.

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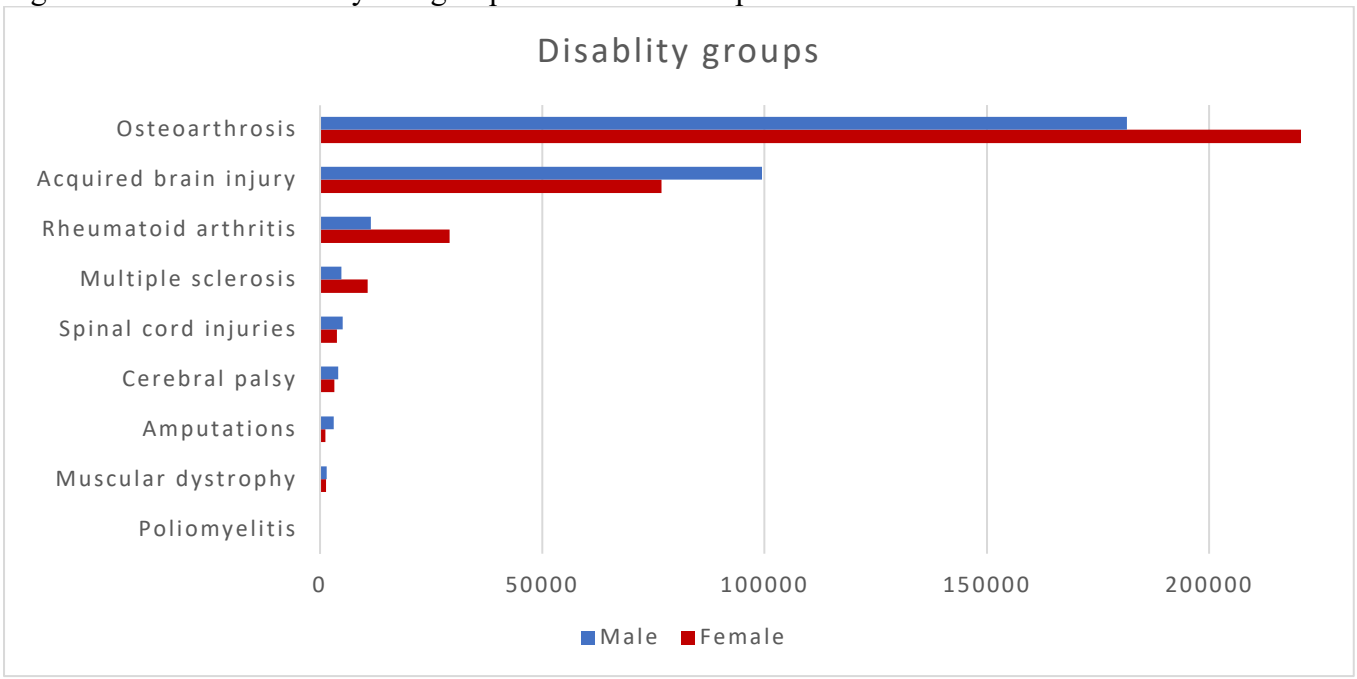
Figure, Table and Appendix:

Figure 1. The nine disability[1] subgroups in total 606.857 persons. Data were extracted from The Danish National Patient Register.



[1] Proportion of adults alive and living in Denmark by Dec. 31st, 2018, who received one of the diagnoses listed in Appendix 1 between January 1994 and December 2018

Table 1a. Distribution of demographic variables (sex, age geographical region and origin) in the eight disability[1] sub groups, the total disability group and the general Danish adult population. Reported as proportions. Distributions written in bold were significant ($p < 0.001$) when comparing difference in distributions between each of the demographical variables of each of the disability subgroups, and the total disability group compared with the GAP[2] in Denmark (each disability group is subtracted from the total group of adults in Denmark before comparison).

	Osteoarthritis	Acquired brain injury	Rheumatoid arthritis	Multiple sclerosis	Spinal cord injuries	Cerebral palsy	Amputation	Muscular dystrophy	Total disability group[1]	Total GAP in DK[2]
	n=409,202	n= 176,276	n=40,590	n=15,496	n=8,922	n=7,336	n=4,191	n=2,751	N=606,857	N=4,645,697
Sex										
Male	**44.3**	**56.4**	**28.1**	**30.6**	**57.6**	**55.5**	**72.9**	**53.2**	**47.0**	49.4
Female	**55.7**	**43.6**	**71.9**	**69.4**	**42.4**	**44.5**	**27.1**	**46.8**	**53.0**	50.6
Age										
Male										
18-	**0.1**	**1.4**	**0.3**	**0.4**	**6.2**	**15.4**	**2.6**	**7.4**	**0.8**	5.8
25-	**0.7**	**3.0**	**0.9**	**2.2**	**8.5**	**16.9**	**7.9**	**10.8**	**1.8**	8.2
35-	**2.0**	**3.4**	**1.7**	**5.1**	**8.2**	**8.4**	**11.4**	**8.3**	**2.8**	7.6
45-	**5.9**	**5.7**	**3.8**	**7.8**	**10.3**	**5.3**	**16.6**	**9.9**	**6.2**	8.8
55-	**10.1**	**9.7**	**5.8**	**7.7**	**10.1**	**4.9**	**15.9**	**8.2**	**9.9**	7.7
65-	**13.5**	**15.4**	**8.1**	**5.5**	**9.1**	**3.1**	**11.8**	**5.6**	**13.3**	6.8
75-	**12.1**	**17.8**	**7.5**	**1.9**	**5.2**	**1.5**	**6.7**	**3.1**	**12.4**	4.5
Female										
18-	**0.1**	**0.9**	**0.7**	**0.9**	4.6	**11.1**	**1.5**	**4.5**	**0.6**	5.6
25-	**0.6**	**1.5**	**2.6**	**5.4**	6.5	**12.4**	**3.1**	**6.9**	**1.3**	7.8
35-	**1.7**	**2.0**	**5.3**	**12.0**	6.1	**6.6**	**3.8**	**7.8**	**2.5**	7.5
45-	**5.8**	**3.9**	**9.9**	**18.2**	6.9	**5.2**	**5.0**	**9.6**	**6.0**	8.7
55-	**11.1**	**6.4**	**14.8**	**17.1**	6.9	**4.8**	**6.2**	**8.8**	**10.2**	7.8
65-	**16.4**	**10.3**	**19.0**	**11.5**	6.4	**2.6**	**4.4**	**5.8**	**14.4**	7.2
75-	**19.9**	**18.7**	**19.6**	**4.3**	5.0	**1.8**	**3.1**	**3.5**	**17.9**	6.0
Geographical Region:										
North Denmark	**10.8**	**10.0**	**9.5**	**9.0**	**9.3**	**10.0**	**12.8**	9.9	**10.6**	10.2
Central Denmark	**23.5**	**20.8**	**19.5**	**22.0**	**23.3**	**19.5**	**20.1**	22.7	**22.7**	22.6
Southern Denmark	**23.6**	**22.9**	**21.6**	**22.4**	**20.6**	**23.3**	**31.2**	20.6	**23.2**	21.1
Capital	**26.7**	**29.4**	**30.3**	**30.7**	**30.2**	**29.9**	**20.5**	31.1	**27.6**	31.6
Zealand	**15.3**	**16.8**	**19.1**	**15.8**	**16.6**	**17.3**	**15.4**	15.8	**15.9**	14.5
Origin										
Danish	**93.2**	**93.8**	**93.0**	**94.1**	**91.0**	**91.6**	**90.2**	**92.4**	**93.2**	86.2
Immigrants	**6.5**	**5.6**	**6.6**	**4.8**	**7.1**	**4.6**	**8.9**	**5.6**	**6.3**	12.1
Descendant of immigrants	**0.3**	**0.6**	**0.4**	**1.1**	**1.9**	**3.8**	**0.9**	**1.9**	**0.4**	1.7

[1] Proportion of adults alive and living in Denmark by Dec. 31st, 2018, who received one of the diagnoses listed in Appendix 1 between January 1994 and December 2018.
[2] General adult population (GAP) alive and living in Denmark by Jan. 1st, 2019

Table 1b. Distribution of socio-economic variables (education level, occupation and civil status) in the eight disability[1] sub groups, the total disability group and the general Danish adult population. Distributions written in bold were significant ($p < 0.001$) when comparing difference in distributions between each of the demographical variables of each of the disability subgroups, and the total disability group compared with the GAP[2] in Denmark (each disability group is subtracted from the total group of adults in Denmark before comparison).

	Osteoarthritis	Acquired brain injury	Rheumatoid arthritis	Multiple sclerosis	Spinal cord injuries	Cerebral palsy	Amputation	Muscular dystrophy	Total disability group[1]	Total GAP in DK[2]
	n=409,202	n= 176,276	n=40,590	n=15,496	n=8,922	n=7,336	n=4,191	n=2,751	N=606,857	N=4,645,697
Education level[3,4]										
ISCED 0-2	**33.0**	**36.7**	**33.9**	**23.4**	**45.2**	**66.2**	**31.2**	**35.7**	**33.6**	25.5
ISCED 3-4	**41.8**	**40.6**	**39.6**	**43.1**	**31.8**	**18.5**	**47.8**	**37.9**	**41.3**	39.9
ISCED 5-6	**18.7**	**15.4**	**19.6**	**23.6**	**14.5**	**7.7**	**14.7**	**17.7**	**18.1**	22.1
ISCED 7-8	**4.6**	**5.1**	**5.4**	**9.0**	**5.7**	**3.4**	**4.5**	**7.5**	**5.0**	10.8
Unknown or missing	**1.8**	**2.2**	**1.5**	**0.8**	**2.8**	**4.2**	**1.8**	**1.3**	**1.9**	1.7
Occupation										
affiliated to the labour market	**28.8**	**21.8**	**28.3**	**35.5**	**18.5**	**16.4**	**48.5**	**30.2**	**28.3**	60.0
education	**0.3**	**1.5**	**1.1**	**1.3**	**4.6**	**10.4**	**3.1**	**7.3**	**1.0**	4.4
unemployed or welfare payment	**5.0**	**5.6**	**6.7**	**11.1**	**8.6**	**8.5**	**9.6**	**11.3**	**5.7**	6.0
early retirement	**7.8**	**11.1**	**11.7**	**29.2**	**42.5**	**53.9**	**13.3**	**32.9**	**10.1**	4.8
retirement	**57.2**	**58.8**	**50.9**	**21.4**	**24.2**	**8.4**	**23.2**	**16.3**	**53.8**	21.5
Unknown or missing	**0.9**	**1.2**	**1.2**	**1.4**	**1.5**	**2.4**	**2.2**	**1.9**	**1.1**	3.4
Civil status										
Unmarried	**10.6**	**18.2**	**14.7**	**24.8**	**49.8**	**81.7**	**29.3**	**48.1**	**14.9**	35.9
Married or separated	**56.3**	**46.3**	**52.3**	**52.0**	**31.5**	**11.2**	**49.0**	**36.6**	**52.8**	46.1
Divorced	**16.1**	**17.2**	**16.7**	**17.6**	**13.2**	**5.1**	**16.4**	**11.6**	**16.2**	11.7
Widow or widower	**17.0**	**18.3**	**16.3**	**5.7**	**5.5**	**1.9**	**5.3**	**3.8**	**16.1**	6.2

[1] Adults alive and living in Denmark by Dec. 31st, 2018, who received one of the diagnoses listed in Appendix 1 between January 1994 and December 2018

[2] General adult population (GAP) alive and living in Denmark by Jan. 1st, 2019

[3] Data on education level for Total GAP in DK (from StatDenmark) only includes 15-69 year-old persons in total 4.029.097 and is therefore not directly comparable to the disabled group.

[4] ISCED levels: 0-2 Primary and lower secondary school, 3-4 Upper secondary school / vocational education, 5-6: Bachelor or equivalent level, 7-8: Master / doctoral level

Table 2. Level of disability by the eight disability[1] subgroups and the total disability group.

	Osteoarthritis	Acquired brain injury	Rheumatoid arthritis	Multiple sclerosis	Spinal cord injuries	Cerebral palsy	Amputations	Muscular dystrophy	Total Disability group
	n=1444	n= 2457	n=149	n=1442	n=797	n=1048	n=44	n=152	N=5412
Reporting rate	0.4	1.4	0.4	2.9	8.9	14.3	1.0	5.5	0.9
Level of disability									
No problems	1.0	0.9	2.0	0.5	0.4	0.2	2.3	0.7	0.8
Slight problems	20.0	16.7	16.8	15.6	4.8	6.4	22.7	3.3	14.9
Moderate problems	49.3	45.8	53.7	48.2	24.8	26.3	34.1	38.2	42.4
Severe problems	25.4	31.8	24.2	27.1	45.2	45.9	38.6	46.7	33.5
Complete problems	4.2	4.8	3.4	8.6	24.8	21.2	2.3	11.2	8.5

[1] Adults alive and living in Denmark by Dec. 31st, 2018, who received one of the diagnoses listed in Appendix 1 between January 1994 and December 2018

Appendix 1

Disability sub groups by ICD-10 codes. * indicates all sub codes are included

Disability group	ICD-10 codes	Codename in the Danish SKS/ICD-10 system https://medinfo.dk/sks/brows.php	ICD-10 codes	English codes https://icd.who.int/browse10/2016/en - /I61.0
Osteoarthritis	DM16*	Slidgigt i hofte	M16*	Coxarthrosis [arthrosis of hip]
	DM17*	Slidgigt i knæ	M17*	Gonarthrosis [arthrosis of knee]
	DM19*	Andre former for slidgigt	M19*	Other arthrosis
Acquired brain injury	DI61*	Hjerneblødning	I61*	Intracerebral haemorrhage
	DI63*	Hjerneinfarkt	I63*	Cerebral infarction
	DI64*	Slagtilfælde uden oplysning om blødning eller infarkt	I64*	Stroke, not specified as haemorrhage or infarction
	DI691	Senfølge efter tidligere hjerneblødning	I69.1	Sequelae of intracerebral haemorrhage
	DI693	Senfølge efter tidligere hjerneinfarkt	I69.3	Sequelae of cerebral infarction
	DI694	Hjerneblødning	I69.4	Sequelae of stroke, not specified as haemorrhage or infarction
	DS020*	Fractura thecae cranii	S02.0*	Fracture of vault of skull
	DS021*	Fractura baseos cranii	S02.1*	Fracture of base of skull
	DS027*	Fractura multiplex cranii eet ossis faciei	S02.7*	Multiple fractures involving skull and facial bones
	DS028*	Kraniebrud og brud af ansigtets knogler, andre former	S02.8*	Fractures of other skull and facial bones
	DS029*	Kraniebrud og brud af ansigtets knogler uden specifikation	S02.9*	S02.9 Fracture of skull and facial bones, part unspecified
	DS061	Oedema cerebri traumaticum	S06.1	S06.1 Traumatic cerebral oedema
	DS062*	Laesio traumatica cerebri duffusa	S06.2*	S06.2 Diffuse brain injury
	DS063*	Laesio traumatica cerebri focalis	S06.3*	Focal brain injury
	DS064*	Haemorrhagia epiduralis traumatica	S06.4*	S06.4 Epidural haemorrhage
	DS065*	Haemorrhagia subduralis traumatica	S06.5*	S06.5 Traumatic subdural haemorrhage
	DS066	Haemorrhagia subarachnoidalis traumatica	S06.6	S06.6 Traumatic subarachnoid haemorrhage
	DS067	Laesio traumatica intracranialis m protraheret coma	S06.7	Intracranial injury with prolonged coma
	DS068*	Interkranielle læsioner, andre	S06.8*	S06.8 Other intracranial injuries
	DS069	Interkranielle læsioner uden specification	S06.9	Intracranial injury, unspecified
	DS070	Conquassatio faciei	S07.0	Crushing injury of face
	DS071	Conquassatio cranii	S07.1	S07.1 Crushing injury of skull
	DS079	Laesio traumatica multiplex capitis	S07.9	S07.9 Crushing injury of head, part unspecified
	DT020	Frakturer både på hoved og hals	T02.0	T02.0 Fractures involving head with neck
	DT040	Conquassatio både hoved og hals	T04.0	Crushing injuries involving head with neck
	DT060	Læsion af hjerne hjernenerver med spin el. nerver på hals	T06.0	T06.0 Injuries of brain and cranial nerves with injuries of nerves and spinal cord at neck level
Rheumatoid arthritis	DM05*	Seropositiv leddegigt	M05*	Seropositive rheumatoid arthritis
	DM06*	Andre former for leddegigt	M06*	Other rheumatoid arthritis
Multiple sclerosis	DG35*	Dissemineret sklerose	G35*	Multiple sclerosis
Spinal cord injuries	DG82*	Paraplegi og tetraplegi	G82*	Paraplegia and tetraplegia

	DM471C	Spondylose i halshvirvelsøjlen med myelopati og tetraplegi	M47.1	Other spondylosis with myelopathy (Danish subcategory: 'Cervical spondylosis with myelopathy and tetraplegia')
	DT144C	Traumatisk paraplegi UNS	T14.4	Injury of nerve(s) of unspecified body region (Danish subcategory: 'Traumatic paraplegia, unspecified')
	DT144D	Traumatisk tetraplegi UNS		
	DG114	Arvelig spastisk paraplegi	G11.4	Hereditary spastic paraplegia
	DQ05*	Spina bifida	Q05*	Spina bifida
	DQ760	Spina bifida occulta	Q76.0	Spina bifida occulta
Cerebral palsy	DG80*	Cerebral parese	G80*	Cerebral palsy
Amputations	DS48*	Traumatisk amputation af skulder og overarm	S48*	Traumatic amputation of shoulder and upper arm
	DS58*	Traumatisk amputation af albue og underarm	S58*	Traumatic amputation of forearm
	DS68	Traumatisk amputation af håndled og hånd	S68	Traumatic amputation of wrist and hand
	DS684	Traumatisk amputation af hånd	S68.4	Traumatic amputation of hand at wrist level
	DS688	Traumatisk amputation af anden del af håndled eller hånd	S68.8	Traumatic amputation of other parts of wrist and hand
	DS689	Traumatisk amputation af håndled eller hånd UNS	S68.9	Traumatic amputation of wrist and hand, level unspecified
	DS78*	Traumatisk amputation af hofte og lår	S78*	Traumatic amputation of hip and thigh
	DS88*	Traumatisk amputation i knæregion eller underben	S88*	Traumatic amputation of lower leg
	DS98	Traumatisk amputation af ankel og fod	S98	Traumatic amputation of ankle and foot
	DS983	Traumatisk amputation af anden del af fod	S98.3	Traumatic amputation of other parts of foot
	DS984	Traumatisk amputation af fod UNS	S98.4	Traumatic amputation of foot, level unspecified
	DT05*	Traumatisk amputation af flere legemsdele	T05*	Traumatic amputations involving multiple body regions
	DT116	Traumatisk amputation på arm UNS	T11.6	Traumatic amputation of upper limb, level unspecified
	DT136	Traumatisk amputation på ben UNS	T13.6	Traumatic amputation of lower limb, level unspecified
	DT926	Følgetilstand efter knusningslæsion eller traumatisk amputation på overekstremitet	T92.6	Sequelae of crushing injury and traumatic amputation of upper limb
	DT936	Følgetilstand efter knusningslæsion eller traumatisk amputation på underekstremitet	T93.6	Sequelae of crushing injury and traumatic amputation of lower limb
Muscular dystrophy	DG71*	Primære muskelsygdomme	G71*	Primary disorders of muscles
Poliomyelitis	DA80*	Akut polio	A80*	Acute poliomyelitis
	DB91	Følger efter polio	B91	Sequelae of poliomyelitis
	DG14	Postpoliosyndrom	G14	Postpolio syndrome

Paper II

Nikolajsen H, Sandal L.F, Juhl C.B, Troelsen J and Juul-Kristensen B. *Barriers to, and facilitators of exercising in fitness centres among adults with and without physical disabilities: A scoping review*. International Journal of Environmental Research and Public Health. 2021, 18,14: 7341. https://doi.org/10.3390/ijerph18147341.

Additional files:

Sup 1: Search strings from the databases
Sup 2: Excel sheet used for extraction of data
Sup 3: Overview of the 100 included papers

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Review

Barriers to, and Facilitators of, Exercising in Fitness Centres among Adults with and without Physical Disabilities: A Scoping Review

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Abstract: Fitness centres are an obvious arena for performing physical activity for the general population but representation of adults with physical disabilities (AwPD) is lacking. To increase possibilities for AwPD to exercise in fitness centres together with adults without physical disabilities (AwoPD), the aim of this study was to identify, synthesise, and compare barriers to, and facilitators of, exercising in fitness centres for each group. A scoping review was conducted and data extraction of the barriers and facilitators was performed independently by two researchers on six categories of contextual factors based on the framework of Di Blasi: (1) The fitness centre setting; (2) The fitness centre user characteristics; (3) The fitness instructor/staff characteristics; (4) The fitness centre user–instructor/management relationship; and (5) The fitness/exercise characteristics. An extra category, (6) Other relationships, was added. The PRISMA Extension for Scoping Reviews was used for reporting. Of the 102 included papers, only 26 (25%) of the papers were on AwPD, which focused mainly on physical barriers (category 1: inaccessible settings). In contrast, the remaining 76 papers involving AwoPD focused primarily on facilitators (category 2: motivational factors and exercising effects). In categories 3–6, the two groups had similar results, as both groups preferred skilled instructors, a welcoming and comfortable fitness centre environment, an ability to exercise at their preferred type and level, and good social connections. Since most data were based on AwoPD, more studies on actual experiences from AwPD are needed, to reveal the facilitators/motivational factors for fitness centre use.

Keywords: fitness centre; gym; disabilities; contextual factors; accessibility; personal factors; fitness instructors; social connections; scoping review

1. Background

Globally, 27% of the adult population does not meet the general recommendations for engaging in physical activity [1], which poses a threat to public health, and constitutes a significant risk for developing non-communicable diseases [2]. However, a Danish survey revealed that 71% of those reporting to be physically inactive stated that they would like to be more physically active [3], which indicates the potential for increasing physical activity levels among the inactive population.

Physical activity can contribute to the prevention of a broad spectrum of diseases [4,5], and the World Health Organisation (WHO) recommends adults perform at least 150 min of moderately intense physical activity every week, or a minimum of 75 min of vigorously intense activity each week distributed across three weekdays, or an equivalent combination of moderate and vigorous activity [6,7]. This recommendation holds true for both adults with and without physical disabilities [8]. Fulfilling these recommendations would seem more beneficial for people with disabilities, as they are less physically active and, as a consequence, experience more diseases at an earlier age [9,10]. However, this group experiences a long list of both socially and environmental barriers [11,12], which makes it even harder to fulfil the WHO recommendations.

Physical activity is often performed through leisure-time activities in high-income countries [13] and exercising in fitness centres may, therefore, be a means of increasing physical activity in the general population. Fitness centres have gained in popularity since their inception in the USA in the early 1970s [14], and today are considered the world's biggest 'sport' [15]. The USA is the leading market with a penetration rate of 20.8% in 2018 [16]. In Europe, membership rates of commercial fitness centres have grown 3.8% from 2018 to 2019, resulting in 9.7% of the people above 15 years being members, and with potential for further growth [17]. Their popularity may be due to the variety of exercising opportunities that can be adjusted to the individual user according to their preferences, e.g., flexible hours with structured or unstructured activities performed in groups or individually, and a variety of exercising possibilities that suit the beginner, the advanced, and the professional user [14,18,19]. This aligns very well with the preferred choices of physical activity by people with disabilities, as they generally prefer activities that they can take part in alone, with low demand for organisation and rules [20].

Generally, research within fitness centre settings has either focused on cultural or sociological aspects [21], or on the more extreme aspects of fitness centre environments, such as bodybuilding [22], orthorexia [23], performance-enhancing factors, such as doping [24], or nutrition/dietary supplements [25]. Research on the largest or most frequent group of people training in fitness centres is needed, especially regarding daily experience of fitness training as a way of increasing physical activity among the general population. Knowledge about people with disabilities and their experience (positive and negative) with fitness centres is also sparse, and it is anticipated that one of the reasons is that fitness centre accessibility for this group is limited [26]. From a societal point of view, this lack of knowledge is problematic because people with disabilities (physical as well as mental) constitute a growing group of more than a billion people or about 15% of the world's population, and with the prolonged life expectancy of this group, continued growth is expected [27].

Frequently cited reasons for not being as physically active as one would like are lack of time, energy, and motivation [28]. For people with physical disabilities, barriers such as negative attitudes from other people and inadequate policies and standards, besides the inaccessible surroundings, have been reported [27]. To increase the possibility of participation in exercising in fitness centres for both AwoPD and AwPD, more information is needed on the barriers and facilitators in order to increase the levels of physical activity and thereby reduce the risk of lifestyle diseases.

There is a knowledge gap in the scientific systematic compilation of the barriers to and facilitators (not only the physical ones) of performing physical activity in fitness centres for AwPD. Further, since AwoPD is the dominant group in regular fitness centres, it is also important to know the experiences associated with these barriers and facilitators for AwoPD, so that AwPD and AwoPD can perform physical activity together in the fitness centres. Moreover, the WHO calls for safe, accessible, affordable, and appropriate spaces to be physically active in the Global Action Plan on Physical Activity 2018–2030 [29], and stresses special attention be paid to vulnerable groups; i.e., people with disabilities and chronic diseases.

Therefore, the aim of this study was to identify, synthesise, and compare the barriers to, and facilitators of, exercising in fitness centres among groups of adults with physical disabilities (AwPD) and adults without physical disabilities (AwoPD).

2. Methods

2.1. Methodological Design

To provide an overview of the barriers and facilitators associated with exercising in fitness centres among adults with and without physical disabilities, a scoping review was conducted. Scoping reviews are fruitful when a body of literature has not previously been comprehensively reviewed, is heterogeneous in nature [30], or implies different indications [31].

A five-step protocol was used for conducting the scoping review, as previously recommended [30,32–34], based on the framework of Arksey and O'Malley [35] and Levac [36]. An a priori protocol for this scoping review was made publicly available online, at the European Open Access Science Repository Zenodo.com on 5 September 2018 (doi:10.5281/zenodo.1409587) (accessed on 02 October 2018) [37]. Furthermore, the PRISMA Extension for Scoping Reviews (PRISMA-ScR) [38] was used as a guideline for reporting.

2.2. Step 1—Identifying the Research Question

The research question to be explored was: Which contextual factors are perceived as barriers to, and facilitators of, fitness centre participation amongst adults with or without physical disabilities? Contextual factors were grouped a priori into categories based on the Di Blasi framework [39], previously used to describe context effects in practitioner–patient interactions. Di Blasi and colleagues proposed five categories to describe the context surrounding any health care situation that may influence the effect of interactions. This includes the practitioner–patient interaction in relation to the practitioner's acting, talking, and behaving, which may positively or negatively influence the effect of the treatment. Consequently, the framework is used as a model for categorising the barriers and facilitators. In this review, adjusting the category labels and adding an extra category ('Other relationships') were performed to target the fitness centre setting. Therefore, the six categories were (1) The fitness centre setting; (2) The fitness centre user characteristics; (3) The fitness instructor/staff characteristics; (4) The fitness centre user–instructor/management relationship; (5) The fitness/exercise characteristics; and (6) Other relationships (Table 1).

Table 1. A modified version of the Di Blasi framework of contextual factors. The six categories were used to categorise the barriers to, and facilitators of, exercising in fitness centres in this review.

	Context Factor Categories	Description
1	The Fitness Centre Setting	The physical environment in the specific fitness centre/gym, e.g., surrounding area, buildings, room arrangement, and fitness equipment.
2	The Fitness Centre User Characteristics	The 'personal factors' according to ICF [40] combined with their physical ability, e.g., bodily performance and the individual participant's opinions and feelings.
3	The Fitness Instructor's/Staff Characteristics	The front-line personnel in the fitness centre and their qualifications, e.g., knowledge, education, appearance, communication skills, and courtesy, etc.
4	The Fitness Centre User—Instructor/Management Relationship	The direct or indirect interaction between the participant and the instructor/management who represent the fitness centre as a whole with respect to personal relations, teaching, and prejudices when interacting as a representative of the specific fitness centre, together with the rules, policies, membership terms and conditions, artefacts, culture, and the atmosphere of the place.
5	The Fitness/Exercise Characteristics	The different types of fitness exercises and how they are performed, e.g., individual exercising, types of classes, planning, specific exercises, etc.
6	Other Relationships	The relationship or direct and indirect interactions with other people than the staff in the fitness centre, e.g., strangers, familiar faces, friends and family, or personal assistants.

2.3. Step 2—Identifying Relevant Studies

To capture the core elements of the research question, we used the Population, Concept and Context (PCC) mnemonic, as previously recommended [33], to determine the inclusion criteria. The included 'Population' comprised adults above 18 years of age (a common age restriction in fitness centres), with or without physical disabilities. The 'Concept' incorporated the variety of contextual factors encouraging or hindering participation (e.g., transportation, usability, accessibility, motivation, and affordability), and the 'Context' was limited to indoor fitness centre/gym/health club settings where people exercise voluntarily in their leisure time. The exclusion criteria were people with cognitive disorders/mental illness (depression, psychiatric diagnosis, etc.), participation in prescribed (non-voluntary) exercise types that were done as part of rehabilitation in the healthcare sector, and exercising in worksite fitness centres where the public did not have access. Furthermore, because the primary focus was on the most common fitness centre user, rather than niche groups, a few records that focused on the experience of LGBTIQ+ or cultural or religious populations were excluded. Moreover, records were also excluded if the main focus of the record was on performance and intake of drugs or nutrition/dietary supplements, investigating different aspects of extreme behaviour, such as orthorexia, bodybuilding, and weightlifting, or focusing solely on body image, weight loss/obesity, hygiene and bacteria levels, or defibrillators and heart attacks in fitness centres. We included records published in English, Danish, Norwegian, and Swedish.

All types of scientific records involving both quantitative and qualitative designs were included for original studies and reviews. 'Grey literature', such as theses, conference proceedings, research reports, government reports, policy statements, fact sheets, and articles from newspapers and magazines, etc., were included, as proposed in the PRISMA-ScR [38]. Furthermore, no restriction on publication date was applied.

Search Strategy

We utilised a three-step protocol, as previously mentioned [33]. Firstly, we performed a cursory search using google.com, including Google Scholar, duckduckgo.com, and the electronic databases Medline and Cinahl, to identify the relevant search terms.

Secondly, guided by a medical research librarian, a block strategy using Boolean operators was constructed (see Supplementary S1). Index terms were adjusted and tailored for each of the six databases (Medline (via PubMed), Scopus (via Elsevier), Cinahl and SPORTDiscus (via EBSCO), and PsycInfo and Embase (via Ovid)). The initial search was performed on 15 October 2018, with an update undertaken on 19 May 2020.

Thirdly, we conducted a systematic search for the 'grey literature' using relevant parts of the Canadian Agency for Drugs and Technologies in Health (CADTH) guidelines [41], as proposed in the PRISMA-ScR [38]. Librarians with field expertise at The Danish Disability Sport Information Centre and Marselisborg Centre, Aarhus University Hospital, were contacted for references and advice for further search strategies. Finally, google.com, including Google Scholar and the University Library database, 'Summon', at the University of Southern Denmark, were used to search for additional relevant literature. Further citation searching and searches of key authors were performed in all parts of the 'grey literature' search.

2.4. Step 3—Study Selection

All records were imported from Endnote X9 to Covidence (https://www.covidence.org, accessed on 21 May 2021), an online systematic review platform, and checked for duplicates.

Title and abstract screening of all records were performed independently by two people (a physiotherapy student (N.K.L.) and the first author (H.N.)), to exclude all obvious irrelevant records (e.g., animal trials). Subsequently, a title and abstract screening for eligibility were performed. Reviewer 1 (H.N.) screened all records, while Reviewer 2 (L.F.S.) and Reviewer 3 (B.J.K.) screened half of the records each. All references were

screened independently by the reviewers and consensus was achieved, with any conflicts resolved by discussion.

Thereafter, a full-text screening was performed independently by two reviewers using the same method as described above. During the screening process, two consensus meetings reinforced a common understanding of the inclusion and exclusion criteria. A flowchart of the process is presented in the Results section (Figure 1).

2.5. Step 4—Charting the Data (Data Extraction Process)

Data extraction was performed using a customised Excel data extraction sheet (see Supplementary S2), containing the following categories: General characteristics—author(s), year of publication, origin (where the study was conducted), type of publication, aim/purpose, and methodology/methods; Population—characteristics and numbers; grouping of Concept (the contextual factors) into the six categories (Table 1) [39]; and Context—the type of indoor fitness centre. Data extraction was performed independently by two reviewers and conflicts were resolved by discussion.

Barriers and facilitators were defined as everything that could hinder or enable exercising in fitness centres, and if not directly described in the text, a common-sense approach was used for categorising a factor as either a barrier or a facilitator. We established a standard set of rules before extracting data from the included papers, which consisted of a variety of study types, to determine when a factor could be labelled as a barrier or a facilitator:

Quantitative data:

- Descriptive studies (e.g., questionnaires)—if more than 50% of the respondents stated the factor as a barrier or a facilitator;
- Regression/correlation analysis—a significant result according to the definition in the paper;
- Factor analysis—a significant result according to the definition in the paper.
- Qualitative data:
- Papers with a results section—barriers or facilitators described in the results or conclusion sections;
- 'Grey literature' without a results section—if barriers or facilitators were described in the text.

Under each of the six categories (Table 1), barriers and facilitators were grouped with headlines and sub-points and ordered in a pragmatic chronology, rather than indicating importance or data saturation. Results from the two groups, AwPD and AwoPD, were kept separately.

2.6. Step 5 Collating, Summarising, and Reporting the Results

The Results section consists of three parts: Firstly, a numerical summary of the number of included records (Figure 1), to establish an overview of the general characteristics, such as publication year, origin, type, and population included (Table 2, and Supplementary Table S3). Secondly, a descriptive summary of the barriers and facilitators grouped in categories is presented, and reported separately for the two groups, AwPD (Tables 3 and 4) and AwoPD (Tables 5 and 6). Thirdly, a comparative analysis of the similarities and differences concerning the barriers and facilitators for the groups is presented (Table 7).

3. Results

3.1. Numerical Summary

We identified 6598 records through the six scientific databases, and 95 records through other sources in our search for unpublished and 'grey literature'. After removal of duplicates, 4009 unique records were identified (Figure 1).

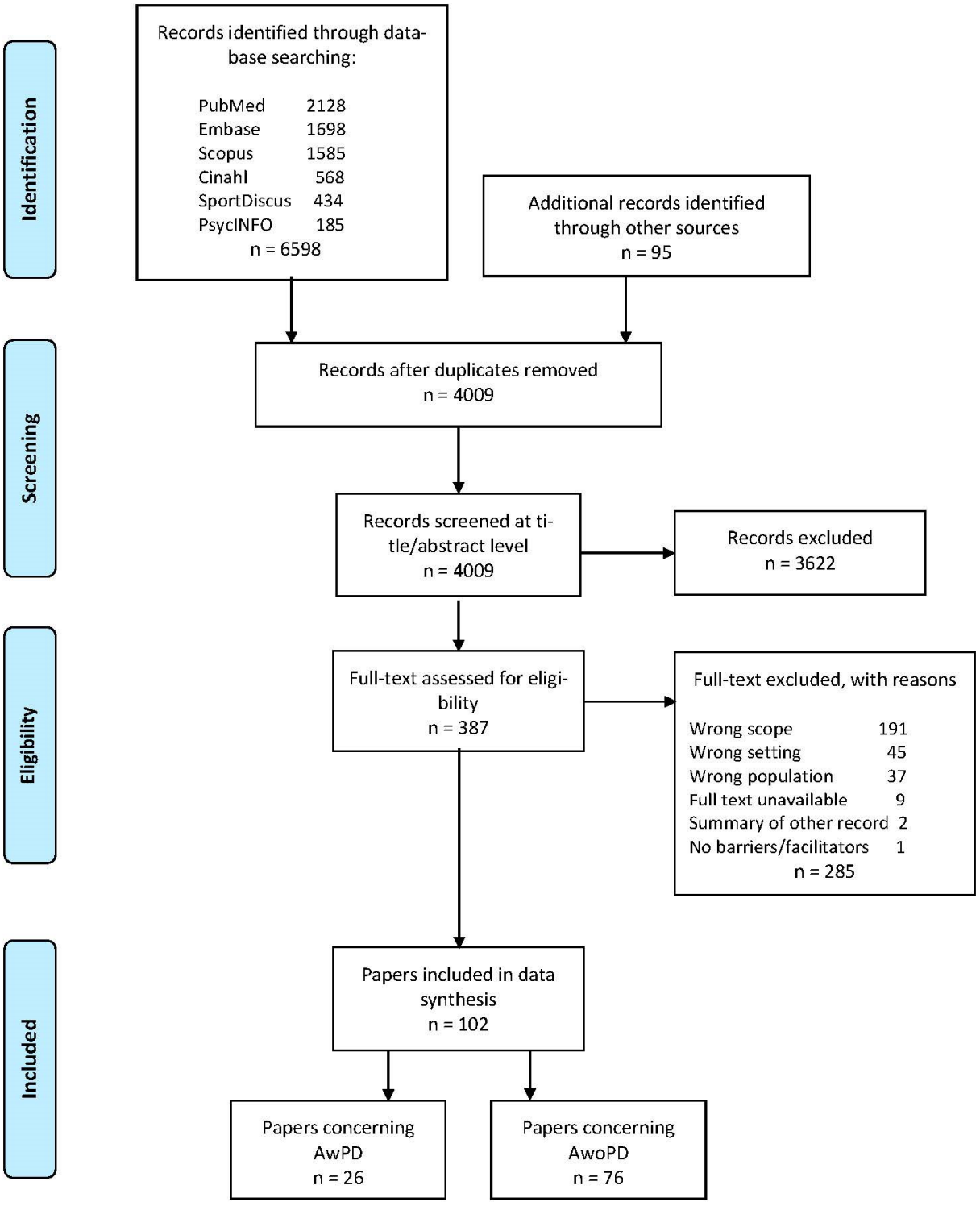

Figure 1. Study selection process illustrated in a PRISMA flowchart. AwPD = adults with physical disabilities; AwoPD = adults without physical disabilities.

Of those, a total of 102 papers were included in the scoping review (Supplementary Table S3, alphabetic list by first author). All papers were published between 1995 and 2020 and were from five continents (North America = 58; Europe = 36; Oceania = 5; Asia = 2; and South America = 1). Of the 102 papers, about 75% were scientific papers of original studies using quantitative, qualitative, or mixed methods. The remaining 25% were categorised as

'grey literature' and consisted of a broad spectrum of reports and guidelines, and articles from newspapers or magazines (Table 2).

Table 2. Overview of the 102 included papers: 26 papers [11,26,42–65] on adults with physical disabilities (AwPD) and the remaining 76 papers [66–141] on adults without physical disabilities (AwoPD).

	Type of Paper	AwPD Reference Number	n	%	AwoPD Reference Number	n	%
Scientific	Quantitative studies	[44–47,50,55,62]	7	27	[69,74–77,80–83,85–87,90–94,98,100,103,108,110,118–120,122,123,125,133–137,139,140]	36	47
	Qualitative studies	[11,51,58–60]	5	19	[66,70,79,84,88,99,102,105–107,113,117,121,126,130]	15	20
	Mixed method studies	[43]	1	4	[71,72,114,115,124,132,138]	7	9
	Systematic reviews	[26]	1	4			
	Reviews/opinion papers	[61]	1	4			
	Theses				[89,116]	2	3
Grey	Conference papers	[48]	1	4	[68]	1	1
	Conference poster				[101]	1	1
	Guidelines	[49,52,53,56,64,65]	6	23			
	Reports				[67,95,96,111,112]	5	7
	Magazine articles	[54,57,63]	3	11	[78,97,104,109,131]	5	7
	Newspaper articles	[42]	1	4	[73,127–129]	4	5
	In total		26	100		76	100

3.2. Descriptive Summary

3.2.1. Adults with Physical Disabilities (AwPD)—Barriers and Facilitators

Of the 102 included papers, only 26 [11,26,42–65] included AwPD. Of these 26 papers, almost 60% could be categorised as scientific literature, and the remaining grey literature were conference papers, guidelines, magazines, and newspaper articles. Only six papers included experiences from AwPD themselves [11,42,51,58–60] (of which one was a short newspaper article, and three were from the same author group with an overlapping study population). The included group of AwPD had a very heterogenous level of physical impairment, which was poorly described. Diagnoses included cerebral palsy, spinal cord injury, post-polio syndrome, Parkinson's disease, injuries from accidents, fibromyalgia, and back problems. The remaining 18 papers dealt with outside perspectives (researchers, disability associations, fitness managers, etc.). Those of fitness managers included options intended for AwPD, whereas the other outside perspectives were guidelines on how to make fitness facilities accessible and usable.

For AwPD in general, the focus was mainly on the barriers that explained why AwPD rarely use fitness centres, most of which were due to accessibility issues and non-adjustable equipment, corresponding to 18 out of 26 papers (Table 3, first column). Negative interactions with other people, both instructors/staff and other users, were also reported as barriers to fitness centre participation. Fourteen different subgroups of barriers (Table 3) and 12 different subgroups of facilitators (Table 4) were identified. Consequently, facilitators of fitness centre participation for AwPD were lacking, e.g., the motivational factors for exercise adherence and advantages/effects of physical exercise.

Table 3. Barriers to exercising for adults with physical disabilities (AwPD) distributed across the six modified context factor categories. Numbers in parentheses in the coloured cells refer to the total number of different papers (references in the square brackets) informing each of the six categories.

1. The Fitness Centre Setting (18 Papers)	2. The Fitness Centre User Characteristics (6 Papers)	3. The Fitness Instructor's/Staff Characteristics (7 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (9 Papers)	5. The Fitness/Exercise Characteristics (5 Papers)	6. Other Relationships (7 Papers)
Poor transportation options [11,26,42,45,50,52,55] - Poor public transportation - Parking lots; too few, wrong dimensions, or lack of curve cuts	**Lack of knowledge about accessible and available facilities** [11] - Potential users do not know about the inclusive facilities	**Lack of skilled instructors** [11,26,43,45,50,52,53] - Lacking knowledge of disabilities, accessibility issues, wheelchair transfer, exercise/therapeutic exercise and available programs and services	**Management not being actively inclusive** [11,43,52,53,56,57,62] - Conscious or unconscious discrimination - Lack of policies for service animals - Focus on youth and physical prowess - Prioritising of profit over accessibility	**Lack of tailored classes/ adaptive programs** [11,26,42,46,52] - People with different disabilities not given different types of exercises - Group classes are not accessible and/or usable - Concerns about needing/requesting assistance	**Stigma from non-disabled members leading to direct psycho-emotional disablism** [51–53,59,60] - Negative attitudes from other members - Disability is an unknown phenomenon to many non-disabled people
Poor accessibility to the fitness centre and bathrooms/locker rooms [11,26,44,45,47,50–53,55,57–59,61–63] - Stairs/no elevators - Lack of floorspace and obstructed pathways - Doors; poor grasp function, too heavy or too narrow - Lack of benches and additional seating when resting, getting dressed or showering - Toilets, grasp bars, soap and toilet paper dispensers, mirrors etc. placed out of reach	**High costs** [11,42] - Transportation and memberships are perceived as high cost - Charging additional membership costs for attending personal assistants		**Negative attitudes resulting in direct psycho-emotional disablism** [11,43,52,53,59,60] - Staff and managers tend to view accessibility as a 'necessary evil' or as unimportant - Not an accepting or inviting attitude		**Negotiations about body ideals, rights and power** [58] - The stereotypical ideal body of a 'normal' and fit body being predominant

Table 3. *Cont.*

1. The Fitness Centre Setting (18 Papers)	2. The Fitness Centre User Characteristics (6 Papers)	3. The Fitness Instructor's/Staff Characteristics (7 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (9 Papers)	5. The Fitness/Exercise Characteristics (5 Papers)	6. Other Relationships (7 Papers)
Unsuitable fitness equipment [11,26,45,47,48,50,52,55,57,59,63] - Seats are too small to transfer to and are not movable - Lack of specialised, adaptive and accessible equipment, e.g., cardiovascular and upper body only	**Negative feelings about fitness** [11,51,58–60] - Fear of the unknown and anticipation of the fitness centre as an exclusive space - Feeling unwelcomed, under-represented or misunderstood when being at the fitness centre - Feeling othered, embarrassed or ashamed of their body and not fitting into the 'normal' body ideal		**Lack of knowledge leading to unprofessional assistance** [56,60] - Not knowing how to assist people with physical disabilities - Different understanding of pain, as in warning or 'no pain no gain'		**Lack of support from friends and families** [11] - Resulting in lack of motivation and participation

Table 4. Facilitators of exercising amongst adults with physical disabilities (AwPD) distributed across the six modified context factor categories. Numbers in parentheses in the coloured cells refer to the total number of different papers (references in the square brackets) informing each of the six categories.

1. The Fitness Centre Setting (14 Papers)	2. The Fitness Centre User Characteristics (2 Papers)	3. The Fitness Instructor's/Staff Characteristics (9 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (8 Papers)	5. The Fitness/Exercise Characteristics (7 Papers)	6. Other Relationships (5 Papers)
Universal design/good accessibility [11,44,47,49,53,54,56,57,65] - Removal of physical barriers inside and outside - Wheelchair-friendly surroundings - Automatic doors or power door openers - Extra floor space - Family locker rooms	**Benefits from exercising** [60] - Physical improvements, e.g., improved function, reduced pain, improved fitness, enhance independence - A break that gives an energy boost	**Specially trained staff** [11,43,44,50,55,56,58,64] - Staff who can adapt existing fitness classes to people with disabilities, know how to exercise safely and effectively and know when to stop - Disabled fitness instructors having better skills to adapt equipment/exercises - Managers supporting the education of their staff and hiring those with these adaptive skills	**Correct guidance and assistance from instructors** [56] - Listening to instructions from the individual which provides the best way to assist them - Offering assistance, but waiting until the offer is accepted before helping - Treating the wheelchair as an extension of their body	**Tailored exercise programs to people with physical disabilities** [47,53,55–57,63,64] - Programs and classes for all fitness levels - Different classes, e.g., introductory classes, chronic illness classes or aerobics while seated - Offering assistance with accessible and adaptable equipment - Evidence-based and activity-based interventions	**The fitness centre as a social arena** [51,58–60,63] - Making new friends and meeting peers - Disabled peers who act as role models and friends who encourage and support - Teaming up and having fun with friends - Acting on an even playing field with non-disabled people

Table 4. *Cont.*

1. The Fitness Centre Setting (14 Papers)	2. The Fitness Centre User Characteristics (2 Papers)	3. The Fitness Instructor's/Staff Characteristics (9 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (8 Papers)	5. The Fitness/Exercise Characteristics (7 Papers)	6. Other Relationships (5 Papers)
Specialised fitness equipment [11,44,45,47,52,56,57,63,64] - Offering a wide variety of both strength and cardio exercises - Equipment easy to enter and exit or with swing-away seats so no transferring is needed - Adaptive equipment for gripping, e.g., gloves, hooks, mitts, cuffs - Supportive aids for extra balance, e.g., long Velcro straps or belts, pedal straps, toe clips, weight belts, wedges - Low weights (from 1/2 kg) and small increments in weight equipment (from 2.5 kg) - Raised 'treatment table' or elevated mats for floor exercises	**Positive experiences related to fitness** [59,60] - Feeling empowered and integrated in the gym - Psychological respite, from stress associated with having a disability	**Respectful communication** [11,49,56] - Being friendly and interacting with people with physical disabilities as with any other member - Allowing extra time and having an open communication about abilities and limitations	**Inclusive and tolerant environment** [51,56,58,60] - Disabled fitness instructors acting as role models - Disabled instructors and members who challenge the stereotypical body ideal in fitness settings, and focus on health and personal progress - Marketing materials showing people with physical disabilities/older adults - Comfortable, friendly environment with a sense of community		

Table 4. *Cont.*

1. The Fitness Centre Setting (14 Papers)	2. The Fitness Centre User Characteristics (2 Papers)	3. The Fitness Instructor's/Staff Characteristics (9 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (8 Papers)	5. The Fitness/Exercise Characteristics (7 Papers)	6. Other Relationships (5 Papers)
Use of checklists to improve accessibility [49,56,61] - Use of checklist and guidelines like AIMFREE (Accessibility Instruments Measuring Fitness and Recreation Environments), ADA checklist or Fitness Facilities: An Abbreviated Accessibility Survey			**Membership/low costs** [11,44,50,55,56] - Personal assistants who accompany the clients at the facility free of charge - Offering free trials visits - Sliding fee scale or scholarships		

3.2.2. Adults without Physical Disabilities (AwoPD)—Barriers and Facilitators

Of the 76 papers [66–141] identified on AwoPD, almost 80% were categorised as scientific literature (Table 2). The group of AwoPD seemed more homogenous and was mostly sub-grouped based on age, gender, and membership status, such as being new users or long-time/regular users. Twelve different subgroups of barriers (Table 5) and 13 subgroups of facilitators (Table 6) were identified. For AwoPD, the papers mainly focused on facilitators, corresponding to 43 of the 76 papers (Table 6, column two), and the primary focus was on personal motivation, exercise effects, and exercise adherence.

Table 5. Barriers to exercising for adults without physical disabilities (AwoPD) distributed across the six modified context factor categories. Numbers in parentheses in the coloured cells refer to the total number of different papers (references in the square brackets) informing each of the six categories.

1. The Fitness Centre Setting (8 Papers)	2. The Fitness Centre User Characteristics (22 Papers)	3. The Fitness Instructor's/Staff Characteristics (4 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (6 Papers)	5. The Fitness/Exercise Characteristics (2 Papers)	6. Other Relationships (8 Papers)
Long transportation time/distance to fitness centre [69,71,126] - Long distance to travel and crowded parking lots	**Dislike of the fitness culture** [70,97,99,113,122,123,131] - Discouragement due to the stressful and competitive atmosphere of gyms - Dislike the 'ideal' body attitudes of skinny woman in skimpy spandex and men with rock hard abs - Lacking in confidence or feeling embarrassed about their body or clothes	**Lack of professional guidance** [70,106,107,122] - Lack of practical skills or solid educational background, resulting in faulty guidance, pain or injuries - Lack of social skills	**Negative staff attitudes** [79,97,107,120,122] - Over-ambitions instructors - Judgemental, unethical, unprofessional and intimidating staff - Lack of respect, attention and punctuality from the staff	**Uninteresting/boring exercises** [115,117] - Use of the gym equipment seen as boring and not appealing/enjoyable	**Lack of social connections** [113,115] - Loss of spouse or their workout partner makes older people stop exercising in the fitness centre - Absence of social connections negatively affects motivation
Unattractive fitness facilities [71,100,113,122,123,131] - Noise levels/loud music - Unpleasant odours, poor hygiene/cleanliness - Limited equipment or inadequate equipment for obese/larger size people - Poor safety of lockers	**Lack of knowledge** [70,71,84,90,104,113,123] - Lack of basic understanding of benefits of exercising - Lack of knowledge about how to adjust exercise to suit health problems, medical conditions or pregnancy		**Body ideals and physical performance** [97,115,122] - Super skinny and fit fitness instructors who scare the not-so-fit users - Disbelief or demoralising comments related to poor physical performance - Stigmatising slogans and images in the fitness centre		**Lack of support from health authorities** [113] - Lack of public education campaigns about fitness for older adults - Lack of health practitioner advice

Table 5. *Cont.*

1. The Fitness Centre Setting (8 Papers)	2. The Fitness Centre User Characteristics (22 Papers)	3. The Fitness Instructor's/Staff Characteristics (4 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (6 Papers)	5. The Fitness/Exercise Characteristics (2 Papers)	6. Other Relationships (8 Papers)
	Individual priorities [70,71,73,80,85,90,95,96,99,105,111–113,116,117,123,126] - Lack of time, energy or being too busy with other things - Not interested or motivated - Poor weather or seasonal conditions or holidays - Not a member of a fitness club /short membership time or few entrances - Membership fees are too high or the existence of returned receipts - Lack of a workout body - Having pain or injury				**Not fitting in** [71,78,113,116,122,128,131] - Unwelcome environment - Blame and stigmatisation because of body appearance or age - Not knowing the gym etiquette, newbies vs. gym rats - Social anxiety/doubt about own capabilities

Table 6. Facilitators of exercising for adults without physical disabilities (AwoPD) distributed across the six modified context factor categories. Numbers in parentheses in the coloured cells refer to the total number of different papers (references in the square brackets) informing each of the six categories.

1. The Fitness Centre Setting (18 Papers)	2. The Fitness Centre User Characteristics (43 Papers)	3. The Fitness Instructor's/Staff Characteristics (15 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (13 Papers)	5. The Fitness/Exercise Characteristics (14 Papers)	6. Other Relationships (21 Papers)
Easy access [67,70,71,87,91,102,110,114,117,132] - Located near home or work - Transport time a maximum of 15–30 min	**Health and body appearance** [66–68,70,73,75,79,84,86,90,95,96,99,102,105,110–115,117,121,125–130,132,133] - Exercising because of the positive impact on the body and physical well-being - Desire to lose or control body weight - Wanting to maintain/improve physical fitness, e.g., get stronger or enhance endurance maybe for work or other sports - Gaining an attractive, good-looking and fit body - Preventing or reducing pain and other discomforts or managing chronic health conditions - Older people also having focus on fighting some of the negative effects of ageing, e.g., being able to perform daily tasks and other activities and stay independent. - Visiting the gym perceived as a health investment in the future	**The ideal instructor** [70–74,100,102,103,106,107,110,117,124,131,138] - Appropriate level of knowledge/skills, e.g., college degree or other good certifications - Good social skills, being friendly, kind and helpful - Qualities of being engaged, dedicated approachable, visible, empathic, motivating and making exercising fun - Good physical appearance which is important in for-profit settings	**Comfortable atmosphere** [66,76,94,115,124] - A comfortable and welcoming feeling for new members - Diversity in instructors/staff which is important in non-profit settings and is a way of promoting inclusion - Members becoming instructors which helps to influence the fitness centre and gain co-responsibility	Fitness classes [70,100,101,110,117,126,127,129,131] - Wide variety of classes to fit personal preferences and fitness levels - Specially tailored classes for, e.g., seniors, family workout or parent-and-baby fitness classes - Use of structured daily programs which can enhance retention	**Social connections** [66,70,71,81,84,88,97,102,105,113–115,117,121,124,126,132,134,138–140] - A place to meet peers and new and old friends - Group activities which are good for social interaction - Other people act as role models - Motivation to exercise in groups, makes it interesting and fun and provides social support - 'Feeling of belonging or being a part of a community - Group perceptions and satisfaction which predict attendance

Table 6. *Cont.*

1. The Fitness Centre Setting (18 Papers)	2. The Fitness Centre User Characteristics (43 Papers)	3. The Fitness Instructor's/Staff Characteristics (15 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (13 Papers)	5. The Fitness/Exercise Characteristics (14 Papers)	6. Other Relationships (21 Papers)
Pleasant fitness environment [88,91,98,109,110,124,127,129,131,132,141] - Well-maintained locker rooms and showers - Good variety, up-to-date equipment for the right functional level (from physically dependent to elite level) - Not too crowded, which makes easy access to the equipment - Women-only areas - Room for children, childcare, classes for children or families - Positive visual images of people of all sizes enjoying physical activity - No mirrors or areas with limited number of mirrors	**Positive mind and feelings** [68,70,73,79,84,86,89,90,95,96,99,102,110–112,114,115,117,118,126,130,132] - Enhanced mental well-being and feeling good, e.g., relaxation, more energy, better mood and sleep - Self-motivating, where exercising is fun and enjoyable - Feeling of being healthier and happier, builds confidence and the feeling of being empowered - Being disciplined and in control, evokes feelings of e.g., pride, self-confidence, satisfaction, capability and autonomy - Combating negative feelings e.g., stress, depression, frustration, anxiety or anger - Self-identification as an active person and the feeling of having bettered themselves and moved 'up' as well as 'out' of their own social class		**Soft values** [74,94,97,113,115,124,126,138] - The instructor/staff who acts professionally; makes the participant feel welcome, important and not judged regardless of fitness level, size etc. - Motivating, supporting, encouraging and ensuring appropriate levels of assistance - Setting small goals to build up confidence and gain trust with the unfamiliar/new fitness user - Keeping the workouts fun and consistent to increase the likelihood of habit formation	**Individual focus/goal** [76,104,108,110,116,138] - Individually tailored programs developed by skilled personal trainers, e.g., based on pre-exercise evaluation - Personal goals are supported by individual programs and tracking of progress - Use of coaching sessions or motivational interviewing for further progress - Use of individualised small-group workouts	

Table 6. *Cont.*

1. The Fitness Centre Setting (18 Papers)	2. The Fitness Centre User Characteristics (43 Papers)	3. The Fitness Instructor's/Staff Characteristics (15 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (13 Papers)	5. The Fitness/Exercise Characteristics (14 Papers)	6. Other Relationships (21 Papers)
	Feeling comfortable in the fitness centre [67,70–72,92–94,99,110,113–115,119,121,131,132,137] - Past behaviour—e.g., good childhood/youth experience with sport/exercise - Establishing fitness centre exercising as a habit, at a convenient time and location - Identifying as a member, as a part of self-identity - Social connections, meeting new people or having friends or family to train with - Feeling welcomed, valued and comfortable in the centre, with a caring, positive and supportive climate - Exercising which leads to satisfaction, autonomy, competence, enjoyment etc. - Inclusion, the feeling of fitting in with respect to age, looks and room for making mistakes - Having the skills to practically and technically operate the equipment - Exercising at one's own pace		**Membership** [66,76,83,135,136] - Low membership fees and, e.g., seniors' discount - Possibility of short enrolment, e.g., only one month - Commitment lotteries, e.g., exercise x times a month and having the chance of winning a month's free membership - Loyalty programmes, e.g., earning air miles bonus points		

Table 6. *Cont.*

1. The Fitness Centre Setting (18 Papers)	2. The Fitness Centre User Characteristics (43 Papers)	3. The Fitness Instructor's/Staff Characteristics (15 Papers)	4. The Fitness Centre User—Instructor/Management Relationship (13 Papers)	5. The Fitness/Exercise Characteristics (14 Papers)	6. Other Relationships (21 Papers)
	Low costs [70,71,77,91,113,114] - Inexpensive or free exercise programs (e.g., paid by health care or insurance, or under $100 per month) - One month's free membership is an effective reinforcer for attendance at the fitness facility (exercise 12 times in a month to earn it)				

3.3. Comparative Analysis

The amount and type of papers (scientific/grey) differed between the two groups, where the quantity and quality of research were more comprehensive in AwoPD compared with AwPD (Table 2). Further, for AwoPD, the study designs were relatively homogeneous, including many quantitative designs differing on, e.g., gender, age, and exercise experience. This was in contrast to the AwPD, where the papers were heterogeneous with respect to type (many grey) and diagnoses. The participants had different levels of physical ability but were mainly described as one collective group.

Furthermore, the main focus differed. For AwPD, the main focus was on barriers, while for AwoPD, it was on facilitators (Table 7).

Table 7. Overview of the barriers and facilitators for the two groups (Tables 3–6), related to the six context factor categories. Numbers in parentheses refer to the total number of different papers informing each of the subgroups.

	Adults with Physical Disabilities (AwPD)		Adults without Physical Disabilities (AwPD)	
Context Factor Categories	**Barriers (Table 3)**	**Facilitators (Table 4)**	**Barriers (Table 5)**	**Facilitators (Table 6)**
1. The Fitness Centre Setting	Poor transportation options (7) Poor accessibility to the fitness centre and bathrooms/locker rooms (16) Unsuitable fitness equipment (11)	Universal design/good accessibility (9) Specialised fitness equipment (9) Use of checklists to improve accessibility (3)	Long transportation time/distance to fitness centre (3) Unattractive fitness facilities (6)	Easy access (10) Pleasant fitness environment (11)
2. The Fitness Centre User Characteristics	Lack of knowledge about accessible and available facilities (1) High costs (2) Negative feelings about fitness (5)	Benefits from exercising (1) Positive experiences related to fitness (2)	Dislike of the fitness culture (7) Lack of knowledge (7) Individual priorities (17)	Health and body appearance (31) Positive mind and feelings (22) Feeling comfortable in the fitness centre (17) Low costs (6)
3. The Fitness Instructor's/Staff Characteristics	Lack of skilled instructors (7)	Specially trained staff (8) Respectful communication (3)	Lack of professional guidance (4)	The ideal instructor (15)
4. The Fitness Centre User—Instructor/Management Relationship	Management not being actively inclusive (7) Negative attitudes resulting in direct psycho-emotional disablism (6) Unprofessional assistance (2)	Correct guidance and assistance from instructors (1) Inclusive and tolerant environment (4) Membership/low costs (5)	Negative staff attitudes (5) Body ideals and physical performance (3)	Comfortable atmosphere (5) Soft values (8) Membership (5)
5. The Fitness/Exercise Characteristics	Lack of tailored classes/adaptive programs (5)	Tailored exercise programs to people with physical disability (7)	Uninteresting/boring exercises (2)	Fitness classes (9) Individual focus/goal (6)
6. Other Relationships	Stigma from non-disabled members leading to direct psycho-emotional disablism (5) Negotiations about body ideals, rights and power (1) Lack of support from friends and family (5)	The fitness centre as a social arena (5)	Lack of social connections (2) Lack of support from health authorities (1) Not fitting in (7)	Social connections (21)

According to the six categories on contextual factors, the main differences between AwPD and AwoPD were in the two first categories: (1) The setting, and (2) The fitness centre user characteristics, whereas the remaining four categories were more similar for the two groups. Differences and similarities between the groups are described below.

1. The fitness centre setting was viewed differently for the two groups. For AwPD, the barriers were reported as poor transportation options, an inappropriate interior fitness centre environment, and lack of adjustable exercise equipment, while the facilitators focused on means to overcome these barriers, especially for wheelchair users. For AwoPD, the focus was on easily accessible locations and flexible opening hours, along with a pleasant, clean environment and up-to-date equipment.

2. The fitness centre user characteristics also differed between groups. For the AwPD, most papers described barriers, such as not knowing the possibilities for exercising (e.g., where and when), the high cost, and negative feelings towards exercising in fitness centres. Only two papers [59,60] represented facilitators associated with exercising in fitness centres. These studies investigated AwPD in the process of undertaking education to become a fitness instructor, and no studies described the facilitators for the disabled participant exercising to maintain/improve fitness at a recreational athlete level (e.g., 0–2 times a week). This reveals a gap in the descriptions of AwPD and their reflections, wishes, and experiences of exercising in fitness centres. In contrast, for AwoPD, a large number of papers addressed facilitators (such as motivational factors) for fitness centre participation, for different subgroups, such as older people, men/women, and former/current users. Furthermore, few papers [71,113,123] uncovered barriers to fitness centre participation of people who are non-users, such as a dislike of the fitness centre culture or not having the time or motivation to exercise.

3. The fitness instructor/staff characteristics were viewed similarly in both groups, as they both preferred competent instructors with good social skills. One of the minor differences was that AwPD wished that instructors had professional skills to adapt/adjust their exercise programs, whereas AwoPD preferred a motivating instructor with a fit appearance (muscular, slender, and nice-looking). In both groups, the lack of skilled instructors was a barrier, while instructors with a solid background and excellent exercise skills were clear facilitators, together with having good social and communication skills.

4. The fitness centre user–instructor/management relationship did not differ much between the groups. They both favoured comfortable and welcoming fitness environments and positive interactions with instructors/management, but there were differences in the detailed descriptions. AwPD focused on the fitness centre not being actively inclusive, in addition to negative staff attitudes with unprofessional assistance. Facilitators were therefore characterised as an actual inclusive and tolerant environment with professional guidance from instructors. AwoPD focused on the negative attitudes and unachievable body ideals as barriers, leading to a feeling of not fitting into the fitness centre environment, while the facilitators included a pleasant atmosphere combined with professional, motivating, and fun instructors.

5. The fitness/exercise characteristics was the category with the fewest papers, but with considerable similarity across groups. Common to both groups was a focus on their individual needs; consequently, they requested fitness classes tailored to the type and level of physical condition/disabilities, and both groups requested help with the exercises. AwPD lacked access to tailored adapted classes and programs in general and had concerns with requesting assistance. For AwoPD, equipment-based exercising was perceived as boring and they preferred more fun and motivating exercises instead, e.g., fitness classes or individually tailored programs to achieve their goals and improve motivation.

6. Other relationships (relationships with other fitness centre users) showed some similarity across groups, as positive social connections were favoured among both groups. AwPD focused mainly on the negative interactions, e.g., stigma or negotiation about body ideals, while AwoPD focused on the limited social relationships and the experience of not fitting in (feeling of not being part of the community) as being barriers. In terms

of facilitators, both groups found social relationships necessary and characterised the fitness centre as being a place to meet new people, peers, and even role models. Social relationships were further reported as essential for fitness centre-based exercise adherence for AwoPD.

4. Discussion

We identified 102 papers, with only one-quarter of the papers dealing with AwPD. Differences in identified barriers or facilitators between the two groups were seen in the fitness centre setting and the fitness centre user characteristics. AwPD mainly reported barriers related to inaccessibility and negative feelings towards exercising in fitness centres, whereas AwoPD mainly reported facilitators, such as individual motivational factors and the benefits of exercising. Large similarities between the two groups were seen in the remaining four categories. This scoping review is novel. To the best of our knowledge, this is the first time that the barriers and facilitators have been assessed for both AwPD and AwoPD, making a comparison between groups possible.

The current results are almost in line with a recent scoping review on gym-based exercise engagement among people with physical disabilities [142], as the reported barriers were lack of gym accessibility, oppressive attitudes within gyms, and also lack of social support during exercising, while the facilitators were reported to be enhanced opportunities to interact with others in the gym settings. That review included 15 papers, and only three of those were included in the current scoping review due to its narrow scope of fitness centre settings, compared with a broader scope in a variety of leisure time and fitness settings.

This focus on barriers to physical activity and lack of representation of AwPD in fitness centres is not new, and during the last two decades, several publications have tried to address the issue [11,47,56,60,62,65,143]. However, this issue still seems to persist as the needs of AwPD are still not being met, with many barriers still present—poor accessibility being the most dominant. Very few reviews about AwPD within the fitness centre setting were found, with one about measurement properties of instruments for assessing accessibility [144], another about accessibility in fitness centres [26], and finally the one mentioned above about gym-based exercise participation, which had a broader scope than fitness centres [142]. This underlines the relevance of our study, providing an overview of a broad spectrum of both barriers and facilitators. In particular, knowledge about wishes, desires, and preferences for exercising in fitness centres with a focus on the facilitators is important to provide guidance for the fitness centres and their users with disabilities.

An interesting point was that the AwPD group was reported as one homogeneous group, while they actually varied in many aspects depending on their level of physical disability and origin (congenital or acquired). In contrast, AwoPD was reported as a heterogeneous group, differing in gender, age, amount of fitness centre experience, pregnancy, obesity, etc. One of the reasons may be due to the group of AwPD being smaller than the group of AwoPD, combined with the limited knowledge of fitness centre participation for AwPD in general, and with only two papers reporting experiences from the perspective of AwPD themselves [59,60]. Moreover, these two papers included participants from an educational program for AwPD who aspired to become gym instructors, limiting the representativeness of AwPD in general.

The most commonly reported barriers differed between the two groups. For AwPD, the most common barrier included all aspects of physical fitness centre inaccessibility, such as inadequate transportation options and non-adjustable exercise equipment, which mirror results from a recent scoping review on gym settings [142]. For AwoPD, the barriers were lack of motivation or adherence to exercise in fitness centres. An explanation for this difference may be that for many AwPD, the physical barriers were the first obstacles determining participation in fitness centre exercising, meaning they did not have much experience with fitness centre participation beyond the front door. For AwoPD, the barriers were related to the individual (lack of time or interest, lack of knowledge, and negative

aspects towards the fitness culture), which ultimately determined whether they entered the fitness centre.

The most commonly reported facilitators differed between groups. Among AwPD, the primary facilitator, not surprisingly, was the positive side of accessibility, namely, an accessible environment/universal design/adjustable fitness equipment. Facilitators for AwoPD were related to a comfortable environment in the fitness centre, as well as the opportunity to become healthier and improve body appearance and well-being. It therefore seems that the majority of barriers and facilitators for AwoPD within the categories (1) The fitness centre setting and (2) The fitness centre user characteristics may also be applicable to AwPD, as they relate to the individual person and not the disability.

Importantly, AwPD experienced negative feelings related to being in the fitness centre, such as respect for users' dignity, perceptions of otherness, feeling a burden, or losing autonomy [51]. These barriers were unique to AwPD and are often referred to as direct and indirect psycho-emotional disablism [145], where direct psycho-emotional disablism ('acts of invalidation') is the negative interaction (verbal and non-verbal) that occurs with other people, and indirect psycho-emotional disablism is the negative influence of structural (physical) barriers on AwPD, resulting in the negative feelings related to exclusion and discrimination [145]. AwPD experience barriers related to their disability and not to them as individuals, and as described, facilitators are often reported as the opposite of the barriers; i.e., good accessibility. This was contrary to AwoPD, where barriers and facilitators were related to them as individual people and their specific interests, motivations, goals, etc. Therefore, for AwoPD, facilitators were not just the opposite of the barriers identified within the same contextual factors. However, due to the few papers concerning AwPD, more research is needed on how interactions with other fitness users act as a barrier or facilitator for participation in fitness centres.

As mentioned above, there were several similarities across the two groups. Generally, they reported facilitators as competent instructors, comfortable and welcoming fitness centre environments, cheap membership, exercising at their preferred type and level, and good social connections during exercising. Overall, both groups reported fitness centres that could meet their individual specific needs as facilitators, whereas differences occurred on how these needs should be met. AwPD were seeking skills from an instructor who could adjust their exercises to suit their specific needs, and AwoPD preferred instructors who could motivate, make exercising fun, and make them commit to exercising. The current findings are mostly in line with a recent systematic review, summarising that facilitators of adherence to exercise referral schemes were social support (from professionals, family/friends and peers), accessible settings (central location and good transportation), individually tailored and varied programs, flexible attendance hours, and perceived benefits of physical and mental health [146].

The included number of papers differed markedly between the groups. This was surprising, as exercising in fitness centres is a more complex task for AwPD than AwoPD, and therefore a higher number of papers involving AwPD with different diagnoses/subgroups was expected. However, this unbalanced distribution in papers may be due to the fact that AwPD is a marginal group in fitness centres and therefore little knowledge about this group is still available.

The included papers further differed between groups on type (scientific/grey) and main focus (barriers/facilitators). Guidelines on how to overcome physical barriers (e.g., by universal design) and plan for the exercise session were only reported in studies on AwPD [49,52,53,56,64,65]. These guidelines varied in size and scientific quality, and some were even more related to general sports facilities than to fitness centres [49,65]. In line with recommendations from the included six guidelines, a recent systematic review [26] summarised that both physical and system access barriers (e.g., policies, programs, and professional behaviour) limit AwPD in using fitness centres. Furthermore, it was reported that accessibility to fitness centres is very dependent on the legislation underpinning building compliance, which seems to still present the minimum standards [26].

In contrast to the focus on barriers for AwPD, papers on AwoPD mostly focused on facilitators of exercising in fitness centres, and some of them investigated the motivational factors for economic and/or health promotion benefits [68,77,107,109]. Surprisingly, despite the large number of papers investigating the facilitators for AwoPD, no reviews within this area were identified.

Method—Limitations and Strengths

The limitations of the study were primarily related to the selected databases, as other databases could have been included (e.g., ProQuest, Cochrane Library, AMED, Web of Science, PEDro, or OTseeker). However, many of these databases are small or with a very narrow scope, and moreover, a high number of duplicates were already present within the six selected research databases, when using database-specific subheadings. Another limitation was that we did not screen the reference lists of all the included papers for additional records, as stated in the a priori protocol. This was only performed for the 'grey literature'. Citation searching of our included records from the databases may thus have increased the number of records. However, the broad search across databases and the large number of screened records are anticipated to compensate for that. Finally, the narrow range of the current scoping review, limited to fitness centres for adults, has led to exclusion of studies on physical activity/general exercising and sports participation, studies related to the healthcare sector and the recreation sector, in addition to studies with mixed groups of children and adults. The literature search also identified references from the year 1995 onwards, resulting in a broad time span, in which fitness centre culture and a customer base may have developed.

One key strength of the current study was the selection of a scoping review rather than a systematic review as the method, which is especially appropriate for this research question due to its broader approach [30,31]. Moreover, we included all types of literature, as recommended for scoping reviews [32]. Another strength of the study is that recommended guidelines for conducting and reporting scoping reviews were followed accurately [38], and the method with procedures was presented in an a priori published protocol [37], including a comprehensive literature search, study selection, and data-extraction performed by two reviewers independently.

Further, the use of the Di Blasi framework was suitable for this scoping review. The Di Blasi framework [39], used to categorise the barriers and facilitators, was slightly modified to target the context of the fitness centres, with the addition of a sixth category to accommodate the fact that exercising in a fitness centre means interacting with other users and staff, in contrast to one patient receiving treatment from a healthcare practitioner. We are aware of the Di Blasi framework [39] originating from a rehabilitation/healthcare setting (practitioner–patient interaction). Whether the transition to a fitness centre setting (staff–fitness centre user interactions) has influenced our analysis and results remains unknown, since aspects such as societal structures, culture, and economics may have an influence. Alternative guidelines or frameworks could have been selected to categorise the identified barriers and facilitators, but the broader terminology in the Di Blasi framework encompassed more aspects of fitness centres (covered by the six categories of contextual factors) than, for example, a checklist for only accessibility [53] or guidelines from organisations or legislation [56,65,147]. The classification of both the barriers and facilitators using the modified Di Blasi framework facilitated their meaningful distribution over the six categories and was found to be comprehensive enough.

5. Conclusions

Based on the six contextual factor categories for exercising in fitness centres, the facilitators and barriers associated with fitness centre use differed between AwPD and AwoPD. The main focus for AwPD was on barriers due to inaccessibility, whereas for AwoPD, it was on facilitators such as motivational factors and benefits of exercising. Similarities were seen in the barriers/facilitators regarding the presence of skilled instructors, a comfortable

and welcoming fitness centre environment, opportunity to exercise at the preferred type and level, and good social connections during exercising. However, the details on these facilitators/barriers differed between groups. For AwPD, the barriers/facilitators were often related to their disabilities and not themselves as individuals, whereas for AwoPD, the barriers/facilitators were related to the individual and their personal wishes, desires, and preferences for exercise.

Since only one-quarter of the studies focused on AwPD, more studies on the actual experiences (barriers, facilitators) of AwPD regarding fitness centre use are especially needed, whereas the main barrier—inaccessibility—is fairly well described. In particular, knowledge on how interactions with AwPD, instructors/staff, and other users can be optimised is lacking. Further, although motivational factors and preferences were reported as important for AwoPD, similarities and differences in relation to AwPD on these contextual factors need more investigation. Finally, more research is needed on the barriers and facilitators for non-users, to attract new members of AwPD to exercising in fitness centres together with AwoPD.

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/ijerph18147341/s1, S1: Search strings of the six databases, S2: Excel sheet for data extraction, Table S3: Excel sheet for data extraction.

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Abbreviations

AwPD	Adults with physical disabilities
AwoPD	Adults without physical disabilities
PCC mnemonic	Population, Concept and Context
WHO	World Health Organization

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Supplementary 1:
Database searches performed October 15th 2018 and May 19th 2020.

Medline via Pubmed:
((((((((((((((((((("Fitness Centers"[Mesh]) OR "fitness center") OR "fitness centers") OR "fitness centre") OR "fitness centres") OR gym) OR gyms) OR "fitness gym") OR "fitness gyms") OR "health club") OR "health clubs") OR "fitness club") OR "fitness clubs") OR "fitness facility") OR "fitness facilities") OR "fitness academy") OR "fitness academies") OR "fitness institute") OR "fitness institutes")) AND ((((((("Adult"[Mesh]) OR adult) OR adults) OR "over 18 years") OR "+ 18 years") OR ("18 years and over"))

Scopus via Elsevier:
((TITLE-ABS-KEY (adults) OR TITLE-ABS-KEY (adult) OR TITLE-ABS-KEY ("over 18 years") OR TITLE-ABS-KEY ("+ 18 years") OR TITLE-ABS-KEY ("18 years and over"))) AND ((TITLE-ABS-KEY ("fitness center") OR TITLE-ABS-KEY ("fitness centre") OR TITLE-ABS-KEY ("gym") OR TITLE-ABS-KEY ("Fitness gym") OR TITLE-ABS-KEY ("health club") OR TITLE-ABS-KEY ("fitness facility") OR TITLE-ABS-KEY ("fitness academy") OR TITLE-ABS-KEY ("fitness institute")))

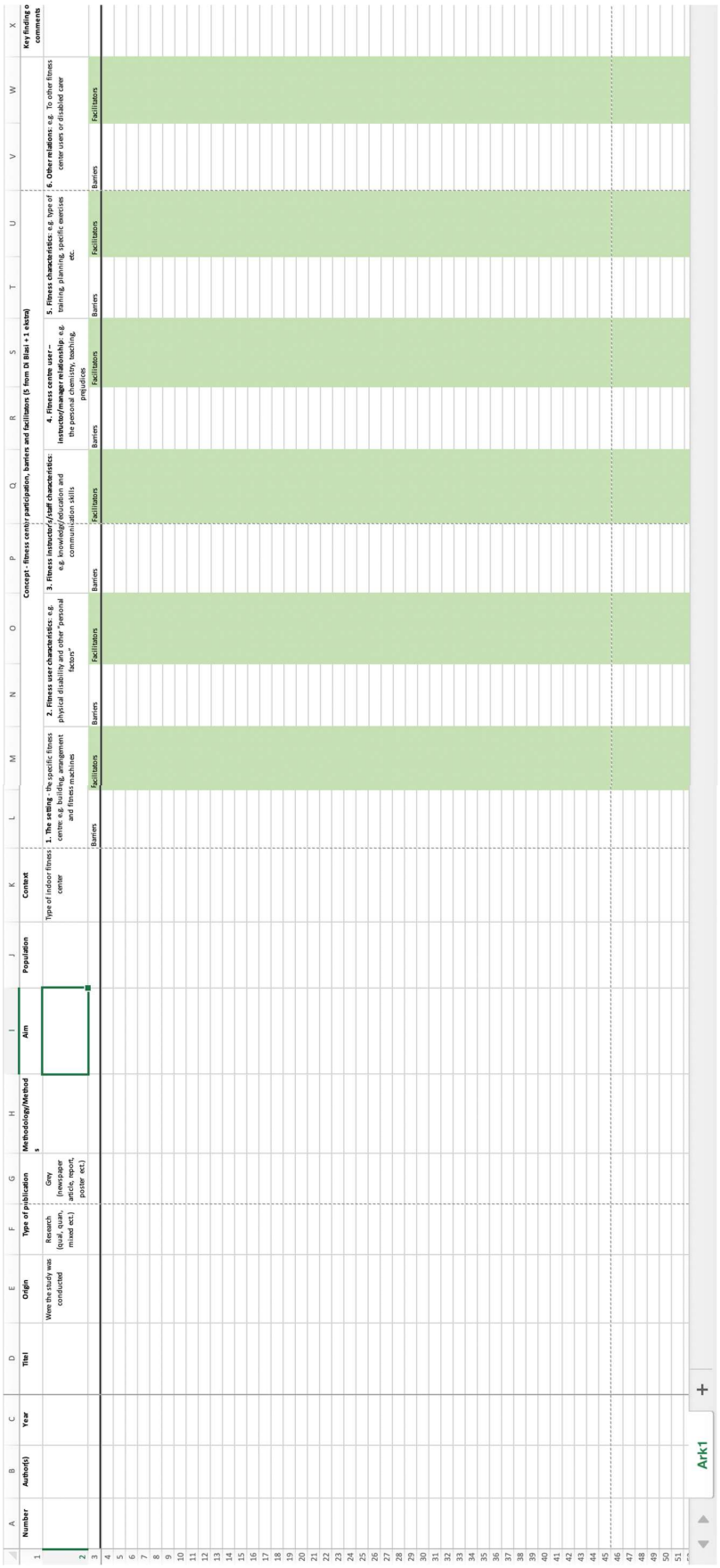
SportDiscus via EBSCO:
(DE "PHYSICAL fitness centers" OR "fitness center" OR "fitness centers" OR "fitness centre" OR "fitness centres" OR gym OR gyms OR "fitness gym" OR "fitness gyms" OR "health club" OR "health clubs" OR "fitness facility" OR "fitness facilities" OR "fitness academy" OR "fitness academies" OR "fitness institute" OR "fitness institutes") AND (adult OR adults OR "over 18 years" OR "+ 18 years" OR ("18 years or over")

Cinahl via EBSCO:
(MM "Fitness Centers" OR "fitness center" OR "fitness centers" OR "fitness centre" OR "fitness centres" OR gym OR gyms OR "fitness gym" OR "fitness gyms" OR "health club" OR "health clubs" OR "fitness facility" OR "fitness facilities" OR "fitness academy" OR "fitness academies" OR "fitness institute" OR "fitness institutes") AND (MM "Adult" OR adult OR adults OR "over 18 years" OR "+ 18 years" OR "18 years or over")

PsycInfo via Ovid:
(("fitness center" or "fitness centers" or "fitness centre" or "fitness centres" or "gym" or "gyms" or "fitness gym" or "fitness gyms" or "health club" or "health clubs" or "fitness facility" or "fitness facilities" or "fitness academy" or "fitness academies" or "fitness institute" or "fitness institutes") and (adult or adults or "over 18 years" or "+ 18 years" or "18 years and over")).ab,hw,id,ti.

Embase via Ovid:*
(("fitness center" or "fitness centers" or "fitness centre" or "fitness centres" or "gym" or "gyms" or "fitness gym" or "fitness gyms" or "health club" or "health clubs" or "fitness facility" or "fitness facilities" or "fitness academy" or "fitness academies" or "fitness institute" or "fitness institutes") and (adult or adults or "over 18 years" or "+ 18 years" or "18 years and over")).ab,hw,id,ti

* id=key concepts. A small change had been made in the database between the searches, so this field was not used for the search in 2020.



Number	Author(s)	Year	Titel	Origin	Type of publication		Methodology/Methods	Aim	Population	Context	Concept - fitness centr participation, barriers and facilitators (5 from Di Blasi +1 ekstra)										Key finding o comments
				Were the study was conducted	Reserch (qual, quan, mixed ect.)	Grey (newspaper article, report, poster ect.)				Type of indoor fitness center	1. The setting - the specific fitness centre, e.g. building, arrangement and fitness machines		2. Fitness user characteristics: e.g. physical disability and other "personal factors"		3. Fitness instructor/staff characteristics: e.g. knowledge/education and communication skills		4. Fitness centre user – instructor/manager relationship: e.g. the personal chemistry, teaching, prejudices		5. Fitness characteristics: e.g. type of training, planning, specific exercises etc.		6. Other relations: e.g. To other fitness centr users or disabled carer	
											Barriers	Facilitators	Barriers	Facilitators	Barriers	Facilitators	Barriers	Facilitators	Barriers	Facilitators	

Table S3: The 102 papers included in the scoping review. Alphabetic order by first author. Papers concerning people with disability are grey.

Ref 102	Author(s)	Year	Title	Origin	Population	Type of publication	
				Were the study was conducted		Research (qual, quan, mixed)	Grey
[1]	Allen J. E.	2001	An exercise in frustration	USA, Los Angeles, California	1 person with post-polio syndrome, 1 Parkinson patient + researchers and scientists (talking about people with disability in general)		Newspaper article
[2]	Anderson et al.	2017	Exercise facilities for neurologically disabled populations - Perceptions from the fitness industry	UK	Fitness facility managers (talking about people with neurological disabilities)	Mixed	
[3]	Andreasson et al.	2016	Keeping Death at Bay through Health Negotiation: Older Adults' Understanding of Health and Life within Gym and Fitness Culture	Sweden	24 older adult gym-goers (10 men, 14 women). Age between 63 and 83 years (median 70).	Qual	
[4]	Arbour-Nicitopoulos et al.	2011	Universal Accessibility of "Accessible" Fitness and Recreational Facilities for Persons With Mobility Disabilities	Canada	None	Quan	
[5]	Asserhøj	2017	Danes' fitness habits and use of commercial sports offers [Danskernes fitnessvaner og brug af kommercielle idrætstilbud]	Denmark	3914 Danish adults >16 years		Report
[6]	Athanasopoulou et al.	2011	Consumer Behaviour in Fitness Centers: A Typologi of Customers	Greece	350 fitness center users (61% women, 39% men) mainly age 24-50		Conference paper
[7]	Berke et al.	2006	Distance as a barrier to using a fitness-program benefit for managed Medicare enrollees	USA, Washington	total sample size of 8,162 people >65 years. A total of 1,728 participants in the unstructured program were matched with 4,838 nonparticipants, and 421 participants in the structured program were matched with 1,175 nonparticipants.	Quan	
[8]	Bethancourt et al.	2014	Barriers to and facilitators of physical activity program use among older adults	USA, Washington	Participants (N = 52), ages 66 to 78, were primarily Caucasian, retired, married, had a college or graduate degree, had good to excellent self-rated health, and had high self-reported levels of PA	Qual	
[9]	Brown et al.	2017	Comparing current fitness center members' perceptions of the motivational climate with non-members	USA	N=657, age 22-76 (65% female, 35% male) never users (n = 138), former users (n = 213) and current users (n = 306)	Mixed	
[10]	Brown et al.	2014	Faculty/staff perceptions of a free campus fitness facility	USA, large Southern university	N=657, age 22-76, (65% female, 35% male) never users (n = 138), former users (n = 213) and current users (n = 306)	Mixed	
[11]	Brownfield	2002	Setting his own pace in the gym rat race	USA, Los Angeles, California	The author a 36 year old male, new fitness user.		Newspaper article
[12]	Calder et al.	2018	The accessibility of fitness centers for people with disabilities: A systematic review	New Zealand - (fitness centers located in USA 10, Kuwait 2, Canada 1, Singapore 1)	None (fitness facilities)	Systematic review	
[13]	Campos et al.	2017	Fitness participants perceived quality by age and practiced activity	Portugal, Coimbra municipality	622 group exercise women, minimum 18 years of age.	Quan,	
[14]	Caudwell et al.	2016	The Effect of Men's Body Attitudes and Motivation for Gym Attendance	Australia	100 male participants age range of 18–68 years, who attended a gym or fitness centre frequently.	Quan,	
[15]	Choitz et al.	2010	Urban Fitness Centers: Removing Barriers to Promote Exercise in Underserved Communities	USA, Pennsylvania	802 adults, new members, 78% women, mean 54 years old, mean BMI 32 (obese).	Quan,	
[16]	Courneya et al.	1997	A Simple Reinforcement Strategy for Increasing Attendance at a Fitness Facility	Canada	300 randomly selected paying members. Age 21-60.	Quan	
[17]	Cyr et al.	2019	Might plight: The social anxiety felt by men in the weightlifting environment	Canada, Southwestern Ontario region	299 male gym-goers, working out in the weight lifting environment		Magazine article
[18]	Dogan	2015	Training at the Gym, Training for Life: Creating Better Versions of the Self Through Exercise	UK, London	32 active gym members of whom 20 were women and 12 men, all students or working adults, ages 23 to 69	Qual	
[19]	Dolbow et al.	2015	Accommodation of wheelchair-reliant individuals by community fitness facilities	USA, Mississippi, (Hattiesburg)	None	Quan	
[20]	Emeterio et al.	2019	Prediction of abandonment in Spanish fitness centres	Spain, Zaragoza and Tudela	14,522 customers of 3 sports centres	Quan	
[21]	Evans et al.	2019	Groupness perceptions and basic need satisfaction: Perceptions of fitness groups and experiences within club environments	USA and New Zealand	293 exercisers (mean age 35.93, *SD* 11.44, 78% female, 22% male)	Quan	
[22]	Evans et al.	2019	Living for Today or Tomorrow? Self-Regulation amidst Proximal or Distal Exercise Outcomes	USA	Study 4; new members at a commercial gym (N = 210)	Quan	
[23]	Faulkner et al.	2019	Examining the use of loyalty point incentives to encourage health and fitness centre participation	Canada, in Alberta, New Brunswick and Ontario	459.146 participants from fitness centres	Quan	

[24]	Fieril et al.	2014	Experiences of exercise during pregnancy among women who perform regular resistance training: A qualitative study	Sweden, Gothenburg	17 pregnant woman, regular exercisers	Qual	
[25]	Fredslund et al.	2019	Can the Easter break induce a long-term break of exercise routines? An analysis of Danish gym data using a regression discontinuity design	Denmark	1210 gym members. 63% women, 37% men Mean age 42.4 years.	Quan	
[26]	Fullerton et al.	2008	Survey of fitness facilities for individuals post-stroke in the Greater Toronto Area	Canada, Greater Toronto Area	Fitness facilities managers	Quan	
[27]	Gjestvang et al.	2019	Are changes in physical fitness, body composition and weight associated with exercise attendance and dropout among fitness club members? Longitudinal prospective study	Norway, Oslo	125 untrained new members, unequally men and women.	Quan	
[28]	Gross et al.	2013	Accessibility of fitness centres for people with disabilities in a region in North East Scotland	Scotland, north eastern part	None	Quan	
[29]	Harada et al.	2014	Perceived and objectively measured access to strength-training facilities and strength-training behavior.	Japan, Tokyo, Nerima & Kanuma	1051 persons, aged 40–69 years categorized into two groups: those who engaged in regular strength-training behavior (minimum 2 time a week) and those who did not.	Quan	
[30]	Heinrich et al.	2017	Mapping Coaches' Views of Participation in CrossFit to the Integrated Theory of Health Behavior Change and Sense of Community:	USA, the midt west	Participants (N=6) were head coaches/owners from six Midwest CrossFit affiliates.	Qual	
[31]	Hosek	1997	Self-motivation and exercise adherence in adult women	USA, Texas, Houston	Healthy female adults: 50 participants in the age range of 18 to 70. All participants were beginners to exercise programs or returning to exercise after non-activity for a period of at least one year.		Thesis
[32]	Hurley et al.	2012	Universal design of fitness equipment criteria to meet the new department of justice accessibility requirements	USA	None (fitness equipment)		Conference paper
[33]	Hurrell	1997	Factors Associated with Regular Exercise	USA, New York, Westchester County	450 adults (*59%, n=267 women and 41%, n = 183 men)* who belonged to the health club sponsoring the study. The majority of the respondents *(76.8%, n =346)* were between *25* and *65* years of age.	Quan	
[34]	Inclusive Fitness Coalition	2015	Making Your Health & Fitness Center a Welcoming Facility	USA	None		Guideline
[35]	Jang et al.	2018	Factors influencing choice when enrolling at a fitness center	Korea, Seoul	283 participants enrolled in fitness centers (60.4% *n* = 171 men and 39.6% *n* = 112 women). Age; 42.0% (*n* = 119) 20-29 years, 37.8% (*n* = 107) 30-39 years, 16.6% (*n* = 47) 40-49 years, 3.5% (*n* = 10) over 50 years.	Quan	
[36]	Jekauc et al.	2015	Prediction of attendance at fitness center: a comparison between the theory of planned behavior, the social cognitive theory, and the physical activity maintenance theory	Germany	Participants were 101 (48 males and 53 females) college students and members of a fitness center. Age ranged from 19 to 32 years	Quan	
[37]	Johnson et al.	2012	ADA Compliance and Accessibility of Fitness Facilities in Western Wisconsin	USA, Western Wisconsin	None	Quan	
[38]	Johnston et al.	2015	Understanding dignity: experiences of impairment in an exercise facility	Canada, Alberta?	21 adult fitness center users (11 women and 10 men) 19–65 years of age. They attended the fitness center to receive exercise support because of self-reported neurological (n = 14), sensory (n = 2), or mobility impairments (n = 5).	Qual	
[39]	Kailes	2008	Using a Fitness Center Does Not Have to be an Exercise in Frustration: Tips for People with Mobility and Visual Disabilities	USA, California, Pamona	None (aiming at people with mobility disabilities)		Guideline
[40]	Kaushal et al.	2015	Exercise habit formation in new gym members: a longitudinal study	Canada, British Columbia, Greater Victoria region	111 participants age of 18–65, and being a recent gym member, which was defined as someone who has joined a gym/recreation centre within the past 2 weeks.	Quan	
[41]	Kaushal et al.	2017	The role of habit in different phases of exercise	Canada	Participants (n = 181) were a sample of adults (18–65) who have been exercising for at least 1 year.	Quan	
[42]	Kirkegaard	2009	Part 2: Portray of the active fitness customers: motives for training, satisfaction and self-reported health [Delrapport 2: Portræt af de aktive fitnesskunder: træningsmotiver, tilfredshed og selvvurderet sundhed]	Denmark	4747 adult active fitness members		Report

[43]	Kirkegaard et al.	2010	Part 5: Fitness culture between sports club and business: active fitness users motives for training, satisfaction and self-reported health [Delrapport 5: Fitnesskultur mellem forening og forretning: aktive fitnessudøveres træningsmotiver, tilfredshed og selvvurderede sundhed]	Denmark	Active fitness users; 1.842 members from non-profit fitness centres and 4.623 from commerciel fitness centres		Report
[44]	Klein	2002	Make a Positive Connection	USA	Authors perspective as a former obese fitness user and now as s personal trainer.		Magazine article
[45]	Kruisselbrink et al.	2004	Influence of Same-Sex and Mixed-Sex Exercise Settings on the Social Physique Anxiety and Exercise Intentions of Males and Females	Canada, eastern part	61 women and 35 men, members of a coed fitness facility.	Quan	
[46]	Larson et al.	2017	You can't always get what you want: expectations, outcomes, and adherence of new exercisers	Canada	18 participants (10 female, eight male) aged 35–64 years.	Qual	
[47]	León-Quismondo et al.	2020	Service Perceptions in Fitness Centers: IPA Approach by Gender and Age	Spain, Madrid	414 fitness members 173 women and 241 men) with a mean age of 32.33 years.	Quan	
[48]	Lockett	2011	Information Package on AIMFREE Accessibility Instruments Measuring Fitness and Recreation Environments	USA	None		Guideline
[49]	Lopez-Fernandez et al.	2018	A Weekly Structured Physical Activity Program Enhances Short-term Retention Of Middle-aged Adult Fitness Centre Users	Spain	80 inactive middle-aged adults		Conference poster
[50]	Lübcke et al.	2012	Older Adults' Perceptions of Exercising in a Senior Gym	Sweden, Stockholm	eight elderly, three men and five women between ages 65 and 81. 3–6 months of exercise in the center.	Qual	
[51]	Malek et al.	2002	Importance of Health Science Education for Personal Fitness Trainers	USA, California, Inland Empire area	115 health fitness professionals (61 men and 54 women), ages 20 to 54. Mean age 30.1. Coming from Independent health club, Corporate-owned health club, self-imployed or College facility.	Quan	
[52]	Manning et al.	2019	Adopting a functional fitness approach to membership	USA, North Carolina	None (the perspective of a fitness center owner)		Magazine article
[53]	Martin et al.	2005	Exercise and older women's wellbeing	Australia	10 women. 50 years of age or over who have participated in physical activity for a minimum of thirty minutes on at least three days of the week for the past two years.	Qual	
[54]	McDonnell	2002	Family-friendly locker rooms: as the demographics in your facility change to include more families and older adults, catering to their locker room needs may be to your advantage	USA	None		Magazine article
[55]	Melton et al.	2010	The current state of personal training: managers' perspectives	USA, North Carolina	11 managers of personal trainers (survey data) only 9 of them for the focus group	Qual	
[56]	Melton et al.	2008	The Current State of Personal Training: An Industry Perspective of Personal Trainers in a Small Southeast Community:	USA, North Carolina	11 personal trainers	Qual	
[57]	Middelkamp et al.	2016	The Effects of Two Self-Regulation Interventions to Increase Self-Efficacy and Group Exercise Behavior in Fitness Clubs	Netherlands	122 participants (67% women). Agerange 18-70 years, mean age 42. No membership of a fitness club for the past 6 month.	Quan	
[58]	Milner	2005	Equipping your fitness centre for older adults	Canada	None (fitness equipment for older adults)		Magazine article
[59]	Mullen et al.	2010	Age, gender, and fitness club membership: Factors related to initial involvement and sustained participation	USA, Virginia	Participants N = 326 (71% female), were recruited via a national online research and marketing firm. Ages Young (25-34; N = 58), middle aged (35-54; N = 149), older adults (55 and over; N = 119).	Quan	
[60]	Nary et al.	2000	Accessibility of Fitness Facilities for Persons with Physical Disabilities Using Wheelchairs	USA, Kansas, Topeka	None	Quan	
[61]	North Carolina Office on Disability and Health	2008	Removing barriers to Health Clubs and Fitness Facilities - A guide for Accommodating All Members, Including People with Disabilities and Older Adults	USA, North Carolina	None		Guideline
[62]	Østerlund et al.	2010	Fitnesscentre i firmaidrætten - portræt af de aktive medlemmer: træningsmotiver, tilfredshed og selvvurderet sundhed.	Denmark	226 adult fitness users, mean age 40 years. 53% women, 47% men		Report
[63]	Østerlund et al.	2010	Foreningsfitness – portræt af de aktive medlemmer: træningsmotiver, tilfredshed og selvvurderet sundhed	Denmark	1616 active fitness users. 55% women and 45% men. Mean age 44.		Report

[64]	Pettigrew et al.	2018	A typology of factors influencing seniors' participation in strength training in gyms and fitness centers	Australia, Western part and Perth	service providers (n=18 instructors, n=24 center managers) 4 focus groups health/community care practitioners (n=8), individuals who advise on and implement health policies relating to physical activity (n=5), seniors +60 years (n = 13, n = 11).	Qual	
[65]	Rabiee et al.	2015	Gym for Free: The short-term impact of an innovative public health policy on the health and wellbeing of residents in a deprived constituency in Birmingham, UK	UK, Birmingham	257 users. 144 (56%) men and 113 (44%) women responded to the questionnaire. 9 participated in three focus groups: 2 men and 7 women. 8 staff members from the leisure centres formed the fourth focus group: 6 women and 2 men.	Mixed	
[66]	Rasmussen et al.	2018	An explorative evaluation study of the mechanisms underlying a community-based fitness centre in Denmark – Why do residents participate and keep up the healthy activities?	Denmark, Ålborg	5 instructors and 5 fitness users (3 men and 2 women in each group)	Mixed	
[67]	Rauworth	2006	Designing a fitness facility for all	USA	None		Magazine article
[68]	Rekieta	2002	Exercise relapse prevention: The efficacy of a motivational interview intervention	USA, Memphis	87 adult members (59% women) who had joined the facility within the previous 15 day and were currently exercising less than 5 days per month.		Thesis
[69]	Richardson et al.	2017	Crossing boundaries: The perceived impact of disabled fitness instructors in the gym	UK	10 disabled persons (5 male and 5 female), who were becoming gym instructors. Age ranged from 23 to 60 with an average age of 40. Eight participants had acquired impairments and two were congenital.	Qual	
[70]	Richardson et al.	2017	Collective Stories of Exercise: Making Sense of Gym Experiences With Disabled Peers	UK	18 disabled participants enrolled in a gym instructor training program were recruited; 10 were male and 8 female. The ages of participants ranged between 23 and 60 years, average 40 years. 15 individuals had acquired their impairments in their teenage years or adulthood, and 3 were congenital or became impaired in early childhood.	Qual	
[71]	Richardson et al.	2017	Disability and the gym: experiences, barriers and facilitators of gym use for individuals with physical disabilities	UK	21 disabled participants enrolled in a gym instructor program were recruited; 13 were male, and 8 were female. Age-range between 23 and 60 years, average 40. 18 individuals had acquired their disabilities and 3 were born with them.	Qual	
[72]	Riley et al.	2008	A conceptual framework for improving the accessibility of fitness and recreation facilities for people with disabilities	USA, Chicago	None	Review/opinion paper	
[73]	Rimmer et al.	2004	Physical activity participation among persons with disabilities	USA, participants from 10 regions (Atlanta, Baltimore, Berkeley, Boise, Boston, Chicago, Denver, Houston, Kansas City, and Syracuse)	A total of 42 persons. The four focus groups included: (1) people with disabilities (2) architects (3) fitness/recreation professionals (4) city planners and park district managers.	Qual	
[74]	Rimmer et al.	2017	Fitness facilities still lack accessibility for people with disabilities	USA, 10 states	None	Quan	
[75]	Riseth et al.	2019	Lon-term members' use of fitness centers: A qualitative study	Norway, Trondheim	21 long-term members (> 2 years) membership from 2-20 years 11 females and 10 males average age was 43 years (range 20–71 years).	Qual	
[76]	Rodrigues et al.	2019	Have you been exercising lately? Testing the role of past behavior on exercise adherence	Portugal	293 exercisers (female=166; male=127) age 18 – 65 years (M=36.57±SD=11.25)	Quan	
[77]	Rodrigues et al.	2019	The role of dark-side of motivation and intention to continue in exercise: A self-determination theory approach	Portugal	544 (294 female; 250 male) gym exercisers aged between 18 and 58 years (M = 35.00; SD = 11.57) exercise experience ranged from 3 to 120 months (M = 47.41; SD = 7.54	Quan	
[78]	Rodrigues et al.	2020	The bright and dark sides of motivation as predictors of enjoyment, intention, and exercise persistence	Portugal	575 gym exercisers (female = 230) aged between 18 and 65 years (M = 34.07; SD = 11.47) with at least 6 months of regular exercise practice	Quan	
[79]	Schmidt et al.	2019	"Kicked out into the real world": prostate cancer patients' experiences with transitioning from hospital-based supervised exercise to unsupervised exercise in the community	Denmark	29 men, prostata-cancer-survivers. Median 71 inter quartile range 67–74.	Qual	
[80]	Schvey et al.	2017	The experience of weight stigma among gym members with overweight and obesity	USA, Major cities from different geographical regions	389 gym-users, men (25%) and women (75%) with overweight (25 ≤ BMI <30; 26%) and obesity (BMI ≥ 30; 74%) participated. Average age was 32.98 ± 11.29 years, and mean BMI was 35.59 ± 7.66.	Quan	
[81]	Schwetschenau et al.	2008	Barriers to physical activity in an on-site corporate fitness center	USA, Midwestern part	88 employees. The sample of respondents was 74% female, with a mean age of 37 years (*SD* ± 10.21). Fifty-eight percent of respondents were members of the on-site fitness center	Quan	

[82]	Souza et al.	2018	Perspectives on Increasing Positive Attitudes Toward Larger Members in Fitness Centers	USA	A convenience sample n=155 (120 female, 31 male, and 4 “other” gender participants) Participants identified as a current member, past member or professional employed in a fitness center.	Mixed	
[83]	Sperandei et al.	2016	Adherence to physical activity in an unsupervised setting: Explanatory variables for high attrition rates among fitness center members	Brazil, Rio de Janeiro	5240 individuals (58.8 female), equivalent to all new clients who registered for the first time during the period between January 2005 and June 2014. Age: Up to 25 years 26.7%, 26–35 year 50.1%, 36 years and older 23.2%	Quan	
[84]	Springer et al.	2013	Maintaining physical activity over time: The importance of basic psychological need satisfaction in developing the physically active self	USA, midsized Midwestern city	12 participants (7male, 5 female; age range 29 to 73 years; average = 54 years) who were members at a health/fitness facility and had been regularly active at recommended levels for at least 3 years.	Qual	
[85]	Stein	2003	Bodywork. A swing toward families: gyms are taking a fresh look at classes for kids and parents to encourage old and young to plan their exercise time together	USA, California, Los Angeles, Hollywood	None		Newspaper article
[86]	Stein	2003	Bodywork. Bracing for the attack of the gym 'newbies'	USA, California, Los Angeles	None		Newspaper article
[87]	Stenson	2005	Workout partners: health clubs and videos are incorporating kids into routines so time-strapped parents can Strollercize, lift weights or do yoga with children in tow	USA, California, Los Angeles	None		Newspaper article
[88]	Stewart et al.	2014	The significance of critical incidents in explaining gym use amongst adult populations	Australia, Melbourne	10 gym-users (6 male, 4 female) were employed in professional occupations, or were university students. Their ages ranged from 23 to 64, mean age 44.	Qual	
[89]	Strelsand	2007	No Six-Packs Here, Please	USA	A 58 year old woman		Magazine article
[90]	Swoyer	2008	Equality of fitness centers: are all fitness centers created equal?	USA	None		Magazine article
[91]	Thomson et al.	2016	An exploration into the development of motivation to exercise in a group of male UK regular gym users	UK, London	28 male regular gym users (aged > 21 years) - 5 in the interviews	Mixed	
[92]	Tolle et al.	2018	Establishing the NeuroRecovery Network Community Fitness and Wellness facilities: multi-site fitness facilities provide activity-based interventions and assessments for evidence-based functional gains in neurologic disorders	USA	people with spinal cord injury and other physical disabilities		Guideline
[93]	Ulseth	2008	New Opportunities - Complex Motivations: Gender Differences in Motivation for Physical Activity in the Context of Sports Clubs and Fitness Centers	Norway	Fitness center users n= 1585 (30% men, 70% women	Quan	
[94]	Unger et al.	1995	Social relationships and physical activity in health club members	USA, California	200 members of at health club, age 21-79	Quan	
[95]	United states access board	2003	Accessible sports facilities	USA	None		Guideline
[96]	van der Swaluw et al.	2018	Commitment Lotteries Promote Physical Activity Among Overweight Adults—A Cluster Randomized Trial	Netherlands	163 overweight participants	Quan	
[97]	van der Swaluw et al.	2018	Physical activity after commitment lotteries: examining long-term results in a cluster randomized trial	Netherlands	163 overweight participants	Quan	
[98]	Vlachopoulos et al.	2007	A prospective study of the relationships of autonomy, competence, and relatedness with exercise attendance, adherence, and dropout	Greece	228 exercise participants. (47.4% male, 52.6% female)	Quan	
[99]	Wayment et al.	2017	Sharing a personal trainer: Personal and social benefits of individualized, small-group training	USA, southwestern part	98 regular exercisers (64 women and 32 men). Age range for the subjects was 19–78 years, mean 46.52 years. Average membership time 2 years.	Mixed	
[100]	Whiteman-Sandland et al.	2018	The role of social capital and community belongingness for exercise adherence: An exploratory study of the CrossFit gym model	Cardiff, Wales, UK	100 gym members (50 crosfitt members and 50 traditional gym members)	Quan	
[101]	Wininger	2002	Instructors' and Classroom Characteristics Associated with Exercise Enjoyment by Females	USA, south eastern part	296 women (M age=21.89 yr., SD=3.52 yr.) were attending not-for-credit aerobics classes	Quan	
[102]	Yin	2001	Setting for exercise and concerns about body appearance of women who exercise	USA, South Texas	74 female fitness center members divided in 2 groups: Women-only Area group (n=36) mean age=28.8 years Co-ed Area group (n=38): mean age = 30.4 years	Quan	

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Paper III

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Additional file:

Sup 1: English translation of the interview guide

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RESEARCH ARTICLE Open Access

Fitness for all: how do non-disabled people respond to inclusive fitness centres?

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Abstract

Background: Representation of people with disabilities in fitness centres is lacking, despite initiatives to promote inclusion mainly in the UK and USA. Success creating these inclusive spaces is mixed and few were crafted taking into account attitudes and biases of non-disabled co-members. Inclusive fitness centres have not gained much attention in Denmark, and the campaign "Fitness for All—fitness for people with physical disabilities" was initiated. The aim of this study was shaped by two key questions; 1) what is the ideal fitness space from the perception of non-disabled fitness users? and 2) how might their dis/ableist attitudes negate inclusion in three future pilot inclusive fitness centres across Denmark?

Method: Three focus groups involving 5–7 (total $n = 18$) adult non-disabled participants were conducted. Aged ranged between 19 and 75 years, both men and women were involved, with fitness centre experiences ranging from 0 to 20+ years. Interviews were transcribed and analysed using Malterud's four-step method of systematic text condensation.

Results: Of most importance was a pleasant atmosphere which should make them feel welcome and comfortable. Good social relations within the space were also highly valued. Participants welcomed people with physical disabilities but predicted many challenges with an inclusive fitness centre and expressed unconscious ableist attitudes.

Conclusion: The current study adds essential knowledge regarding how non-disabled people perceive the ideal inclusive fitness centre. A welcoming and inviting atmosphere is essential whereas social skills, ableism, ignorance, and preconceptions are important barriers that may hinder inclusion of participants with disabilities in inclusive fitness centres.

Keywords: Qualitative research, Focus group interviews, Fitness, Fitness centre, Gym, Inclusive fitness centre, Disabilities, Inclusion

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Background

Despite the global focus on physical activity and health and a booming fitness industry, there is a lack of people with disabilities in fitness centres [1, 2]. This is a considerable problem as about 15% of the world's population is estimated to live with some form of disability [3] and this group has a higher prevalence of illness and lifestyle diseases related to inactivity [4]. As well as reduced health-related benefits and decreased physical function, psychological and social health can be impacted due to inactivity as this can enhance feelings of isolation, stigmatisation, and lack of social relations [5].

Fitness centre training appeals to a broad audience of people with disabilities because of relatively easy access, flexible hours and no requirements of specific physical skill (e.g. like ball games) or physical fitness level [6]. However, they are perceived as a particularly exclusive space by people with disabilities [7]. Using a critical disability studies lens and contesting conditions of ableism and disablism in society [8], numerous complex and interrelated phenomena illuminate why people with disabilities are excluded and underrepresented in fitness centres [9].

Ableism frames images, policy and discourses as if all people are non-disabled [10] excluding any representation of a different physical form [11]. Ableism values self-sufficiency, autonomy and independence, leading to the exclusion of many people who do not align to a culturally created imagery of 'ableness' [8]. Ableism is proposed as a regulator within sport and exercise settings, including fitness centres, as they are often spaces that value one particular muscular, fully functional, aesthetic physical form, leading to the exclusion of people with disabilities in these spaces [12]. This leaves people with disabilities feeling intimidated, unwelcome, excluded, and oppressed in this setting [13].

Disablism, which refers to the social oppression people with disabilities experience from the physical environment and relationships with others [14, 15], can be another barrier to inclusion in fitness centres. It arises in two different forms; (1) indirect and (2) direct psycho-emotional disablism. Both are keenly apparent within fitness centres. Indirect psycho-emotional disablism relates to structural barriers that exclude people with disabilities from physical spaces and project messages that this community is not welcome and does not belong [16]. Fitness centres send these exclusory messages through lack of physical access, inaccessible changing facilities, unsuitable equipment and lack of space to transfer to equipment [2, 17–19]. Direct psycho-emotional disablism refers to the negative interactions people with disabilities have with others such as negative or invalidating responses, being stared at, having jokes made about them, or dealing with callous remarks or comments which can result in feelings of anger, otherness, lacking self-worth and feeling excluded [20]. Both ableism and disablism are substantial barriers in fitness centres in UK [13, 21].

Over the last 2 decades, research has focused on identification of barriers and facilitators of disability inclusion in fitness settings (e.g. [1, 7]). This dearth of research shows that over this time, little has changed as the same structural, attitudinal, and relational issues such as no access, ableist and disablist interaction are continually reported [1, 2, 7, 13, 17, 22]. As a result, scholars have called for academics to move beyond these types of exploratory studies as, at this point, findings are merely repetitive and descriptive as the inclusion of people with disabilities has changed so little adopting this approach [23]. Instead, scholars must take the leap to develop strategies to address inclusion issues rather than merely describe them [22].

In this research, we move towards developing a strategy to improve inclusion in fitness centres and a country that has yet to be contextualised within the greater global disability inclusion movement. Disability research is strongly represented in welfare states in Scandinavia, however Denmark is lacking behind with fewer research environments than both Norway and Sweden [24]. Thus, Denmark requires particular attention for improving and promoting disability inclusion. In Denmark, as in other countries, people with disabilities have lower levels of education and fewer people are in the labour market [25, 26]. This makes leisure time and associated activities an opportune place for people with and without disabilities to meet [27], as such, fitness centres may be a meaningful place where disability prejudice can be broken-down. Unfortunately, leisure time sporting activities in Denmark are segregated into 'traditional' sport (non-disabled) and parasport which does not align to inclusion. As such, creating an inclusive fitness centre could be the first step to meet on equal terms and reduce prejudice. As there is little work on disability inclusion in Denmark, there is an exciting opportunity not only to promote inclusive sport and exercise, but also to create a space that is truly inclusive by addressing dis/ableist attitudes. To bring disability inclusion to attention, the campaign 'Fitness for All—fitness for people with physical disabilities' was initiated, establishing three new pilot inclusive fitness centres across Denmark. This programme sought to rethink non-profit, club-based fitness centres and create an equitable space for both people with and without disabilities as peers. An inclusive exercise space may not only provide a space for people with disabilities to access equitable fitness opportunities but also educate non-disabled people about disability and reduce ableist prejudice. Further, results from this research could begin the important dialogue of

informing the design of a fully inclusive fitness centre that will satisfy both groups and inform other fitness centres in inclusive practice.

Thus, the purpose of this paper was to improve inclusion in fitness centres by first identifying the ableist attitudes we will inevitably encounter from non-disabled members. This underscored our aim of identifying ableist barriers to inclusion, wherein we could anticipate the potential barriers, attitudes and perceptions that may hinder inclusion, and address these before members with and without disabilities use this exercise space. The aim was shaped by two key questions; (1) what is the ideal fitness space from the perception of non-disabled fitness users? and (2) how might their dis/ableist attitudes negate inclusion in three future pilot inclusive fitness centres across Denmark?

Methods

We adopted a qualitative, cross sectional design whereby we sought to develop an in-depth, detailed data set of Danish non-disabled persons' perceptions of an inclusive fitness centre. The steering committee of the project "Fitness for all—fitness for people with physical disabilities" selected the three specific centres for intervention after receiving applications from potential non-profit and club-based fitness centres to be a part of the campaign. The chosen non-profit, club-based fitness centres are located in three different municipalities in Denmark; one was located in a village awaiting an extension and establishment of a fitness centre, another was a small fitness centre awaiting a new and bigger building within an already established sports club in a minor city and l the third was a newly established fitness club awaiting a building were under reconstruction located in a suburb to a big city. A focus group interview was conducted at each location with a group of non-disabled adults. The interview project was scientifically approved by the University of Southern Denmark, Research and Innovation Organisation on behalf of The Danish Data Protection Agency, journal number 2015-57-0008. The COREQ checklist for qualitative interviews and focus groups [28], was used for reporting.

Sampling and participants

Employees/volunteer workers at the three selected fitness centres acted as gatekeepers to participants and were partly responsible for recruiting the participants for the focus groups. They were asked to compile a list of 'potential fitness users of the coming inclusive fitness centres' with information about gender, age and fitness centre-experience (limited: none to a few visits in fitness centres, former: regular fitness users/membership in the past, and current: active user in a fitness centre at the time of the interviews). The list was used to secure maximal variation of the participants included in the study. This enabled a wide and in-depth range of experiences and demographics to be collected that would allow for comprehensive accounts of non-disabled persons perceptions of inclusive fitness centres.

The inclusion criteria for the participants defined as 'potential members' were; adults (≥ 18 years) who were users of the already established fitness centres and/or future users of the upcoming three inclusive fitness centres. Participants were excluded if they had physical or cognitive disabilities or a severe visual or hearing disability or were unable to speak and understand Danish. Participants' previous experience and contact with people with physical disabilities were not taken into consideration in the sampling process.

Participants were recruited through a notice in the local fitness centre or through relevant groups on a social media platform supplemented with snowball recruitment. The gatekeepers used snowball recruitment in their network to compile the list of potential users. Further, we used snowball recruitment when contacting the persons on the list if we lacked participants of a specific gender or age, especially when recruiting the younger participants. In total, 18 people (nine females and nine males) participated in the interviews (see Table 1). The three focus groups comprised five-to-seven people each and participants were contacted by telephone by the first author to orally confirm their interest in participation, double check the eligibility and to secure maximal variation within groups in terms of gender, age and fitness centre experience. Fitness centre-experience was self-reported, and the information was validated through the information from the interviews. Further, the participants could ask questions and obtain more detailed information about the practical arrangements of the interview and the relation to the 'Fitness for all-campaign. Written

Table 1 The three focus group interviews; numbers of participants, gender, age, and fitness centre experience

Focus group interviews	Numbers (female/male)	Age range (years)	Mean age (years)	Fitness centre experience (limited/former/current)
Location 1	6 (3F/3 M)	19–51	36	3/2/1
Location 2	7 (5F/2 M)	23–75	55	1/5/1
Location 3	5 (1F/4 M)	19–67	54	0/1/4
Total group	18 (9F/9 M)	19–75	48.5	4/8/6

informed consent was obtained before the interviews. All names reported in this article are pseudonyms.

Data collection

Data were collected using a focus group at each fitness centre. Focus groups were used as they facilitate the creation of new knowledge in areas that are underresearched, bring forth spontaneous, dynamic dialogue between people, participants have a higher degree of control over discussions, and people may be more willing to discuss things in depth as part of a group rather than one on one [29]. A semi-structured guide with open-ended questions (see Additional file 1, for an English version) was developed for this study to ensure both width and depth in the focus groups. To increase internal validity, two pilot interviews were conducted with 2 and 3 participants respectively, all were current fitness centre users in a similar non-profit club-based fitness centre setting but at another location. Only small adjustments were performed by adding extra cues to the interview guide and rephrasing a few questions to facilitate participant specific examples of their experiences.

The guide was developed with three overall themes: (1) the physical surroundings and accessibility, (2) activities and usability, and (3) atmosphere in the fitness centre. Broad open-ended questions were composed for each of the themes, focusing on the participants' experiences and perceptions—both positive and negative. Examples of questions included: What are your experiences with fitness centres? What is good accessibility to you? Where do you experience problems? How do you use the fitness centre (both in the past, present and future)? How do we make a successful inclusive fitness centre for both people with and without physical disabilities? Pros and cons? All three themes were discussed in each interview, but the order differed and as the topics are linked together the conversation naturally jumped from one topic to another. Further, all subthemes were mentioned within each of the interviews.

The focus groups were conducted by the first author acting as moderator at the three different locations, which was a meeting room either in relation to the coming fitness centres in the local sports club or in the city hall. The interviewer (first author) has a background as a trained physiotherapist, MSc in Health Science and has personal experience with both non-profit sport clubs and commercial fitness centres. Therefore, she was familiar with the jargon in the interviews, but had no associations with the 3 fitness centres and no local knowledge. The interviews were conducted as a part of a PhD-study. Only the first author and the participants were present during the interviews. The duration of each interview was 98–112 min, which led to a total of 5 h and 10 min data material from all three focus group interviews. The interviews were conducted in March and April 2018. Field notes was made after each interview, to get capture new reflections after each interview.

Data analysis

The audio recorded interviews were transcribed in a slightly modified verbatim mode as proposed by Malterud [30]. That is, focusing on the content of the interviews and carefully making smaller adjustments from spoken language to written language e.g., by erasing repetitions and empty words and adding punctuation. The first author performed the transcriptions. With a descriptive and explorative analytical approach, the data analysis was thematic with a cross-case approach and data driven. The analysis was performed in 4 steps, following the Systematic Text Condensation (STC) method by Malterud [31]. The four steps were: (1) total impression—from chaos to themes, (2) identifying and sorting meaning units—from themes to codes, (3) condensation—from code to meaning, and (4) synthesizing—from condensation to descriptions and concepts.

Four authors (HN, LFT, EVR, JT) were involved in the analysis, focusing on the participant´s perceptions on fitness centres, the non-profit club format, and the new inclusive concept. The coding was performed in Nvivo 12 software. An initial coding process (step 1) was performed by two researchers (HN and LFT) to ensure structure and content of the analysis. The first author performed the coding (step 2) and the overall analysis was performed with many different meaning units on a detailed level from the beginning and subsequently grouped together in code groups and subgroups. Two authors (HN and EVR) discussed the code groups and subgroups (step 3) and (HN and JT) discussed the analytical categories (step 4).

Results

According to the analytical categories, the results was divided into two subsections. First, an account of how the participants describe their ideal fitness centre, and secondly perceptions of sharing an inclusive fitness centre with participants with physical disabilities. Interview no. 1, 2 and 3 refer to the three different locations for interview.

The ideal fitness centre: room for comfort and diversity

Basic expectations for a non-profit club-based fitness centre

The participants had certain expectations for the upcoming inclusive Danish non-profit fitness centre. Locations with easy access both by car, bicycle or public transportation were highlighted as very important. If the location was considered inconvenient, they would not use it. Further, participants requested a bright, welcoming,

and well-maintained, clean environment to make the exercise setting attractive and comfortable. Susanne explained:

> I think it is important with light, how it falls and the illumination. Colours on the walls and not in the linoleums-municipality-way, and no smelly rubber. […] so, when you go in you think 'this is a nice place to be'; I like to be here because something is calling for me. (Interview 2)

The participants stressed the discomfort of the stench of sweat and rubber, and the intimidation of posters and other media on the walls with 'protein-commercials' and extreme examples of 'fit' men and women. In general, the participants drew upon past experiences of a traditional commercial fitness centre. Marie-Louise talked about one of her experiences:

> When I started exercising, I thought the easiest thing was to start in my local commercial fitness centre right across the street. I opened the door and there it was; the smell of sweat, the loud music going on 'duff duff duff' and the very high stress-level. So, I thought, this is not what I'm looking for. […] Later when I became a more experienced fitness centre user I went back to try again, but I am not going in there; it's a no-go. (Interview 2)

Regarding the use of space, the participants underlined the importance of the 'right' training equipment and room for socialising. They also asked for flexibility. They expected long opening hours (e.g., from 5 am to 11 pm) with key tags so, members could come and go as preferred. The price level for membership and how to get value for money was very much debated among the participants. They sought a balance of price levels between very cheap prices in volunteer sports clubs and more expensive in commercial fitness clubs. Participants generally agreed price levels of 100–150 DKK (13–20 EURO) per month would be reasonable. Maya stressed:

> If it costs 35 Euro a month, and if I only come once every two weeks, I must admit that I am too stingy for it. (Interview 1)

User exercise knowledge and skills are required

The participants all agreed that basic user competences were required to exercise in a fitness centre and stated that if someone did not know what to do and why, then they would never enter or be a regular user. Therefore, in order to feel comfortable (especially newcomers) the participants strongly recommend that an introduction session would be very important, e.g., one-on-one sessions or small group introductions. David talked about his practical limbo:

> I would sit on such a machine and say, 'uh yes, what next?' I've been practicing handball and soccer, and like to run for a ball, but jumping on a treadmill…, I've never tried it, so I think I would fall off. (Interview 1)

Participants also found it very important to have someone to consult with regarding how to use the fitness equipment, compose/adjust exercise programs and someone to lead classes and maintain the equipment. They were aware of potentially heavy employee costs, so participants suggested volunteer instructors should be available on specific hours, or collaboration with educated professionals or students within sports science or physiotherapy. Marie-Louise told how it was done in her non-profit fitness centre:

> The volunteer staff have to be users of the fitness centre, because they are often there anyway and know exactly how all the machines work so they can assist others […] Being a volunteer is only something you do if you gain something out of it. It could be free instructor courses, fitness clothes, paid membership and a dinner once a year with all the other volunteer staff. (Interview 2)

Rules and behaviour in fitness

The participants were very engaged regarding how to run codes of practice., i.e., etiquette, and rules regarding how users should behave and what is allowed in the centre (e.g., in relation to doping issues.) Several examples were brought up about annoying behaviour such as inconvenient use of equipment and mobile phones, inappropriate attire, failing to clean-up or forgetting to wipe off the fitness machines after use. Charlotte illustrated:

> I get so annoyed if people sit on a machine or bench without exercising, then I say, 'So, do you use it as an armchair or what?' (Interview 3)

In general, participants wanted to confront other members in a polite, suitable, or humoristic way, but found it hard to do as an ordinary member and believed it was easier to do for the volunteer staff with more authority. Issues regarding other users who puffed and groaned aloud, sweated, smelled, or became noisy when using the equipment was considered harder to regulate.

Birger gave an example of an uncomfortable situation:

> Some time ago, a woman used to come and work out in the fitness centre, and not many liked her

because she smelled. The other users knew when she used to come and exercise, and they simply stayed away or came an hour later. (Interview 3)

The atmosphere: fitting in with social relations

The participants kept returning to talk about atmosphere or the 'right spirit' in the fitness centre as a key aspect when deciding if they would actually use the fitness centre or not. They stated the importance of felling that they 'fit in'. Sylvester explicated:

> Many times, when you come into such a fitness centre, you feel so overlooked because you have such a feeling that it is a crowded bunch and the users come in such super smart clothes and everything. So, it must be a place that is nice to come and where you feel at home. (Interview 1)

The feeling of belonging and fitting in was perceived to be possible if there were greetings when seeing others, sharing the space with peers in terms of similar age, appearance, and preferences for specific training types. In particular, participants discussed intimidation of not being able to live up to super fit body norms with big muscles or skinny appearance, which made them feel uncomfortable, out of place and not welcome. Contrary to many commercial fitness centres, they wanted a place without body-shaming with room for 'normal' overweight persons. Tommy summed up:

> This new fitness centre should be for everybody – Fitness for all – it has to address the local people, so as you say, there should not be any body-shaming – it should be a place for Mr. and Mrs. Denmark or Mrs [name of the little town]. (Interview 1)

Social relations were also very important for participants. They noted enjoyment in meeting people they knew, but also making new acquaintances. Often new relations began with small talk, progressed to a cup of coffee and later developed into friendships. In general, participants found other users friendly and helpful. Tommy gave examples:

> After all, most people are kind and sweet if you ask: 'Sorry, can you please tell me how to do this?' Or if they can see that it is completely hopeless what you are doing, then most people can also come and say: 'Shouldn't I just show you how to do this?' or 'Shouldn't I just lend you a hand?' (Interview 1)

Generally, participants expressed the need for good social relations for long-term commitment to exercise. Being part of a team who exercised regularly, had fun, and met in the cafeteria afterwards were noted as very important. Although some preferred to exercise on their own, the majority preferred training in smaller groups of 2–5 persons matched by age, fitness type and fitness level. The participants underlined the importance of social relations and being part of a club based on experiences from other sports clubs they had been members of earlier in life. Josefine gave an example:

> If it is a club, then there should also be a common room where you can sit down and drink sodas and meet people and have the opportunity to talk. Otherwise, it's not a club. (Interview 2)

Ideal inclusive fitness centres: reflections on sharing a fitness space with people with disabilities

The degree of disability

All participants responded very positively towards establishing new inclusive fitness centres for both fitness users with and without disabilities. Several participants made clear that people with disabilities were more than welcome to join. However, there were also inherent ableist perceptions and statements made such as others may choose a different fitness centre because of the presence of people with disabilities and the further inclusion of people with disabilities should not happen at the expense of those people without disabilities who were already using the fitness centre.

Specifically, the participants were focused on the severity of a member's disability., i.e. whether that person required a carer, could exercise independently or something in between. Ib was straightforward, but also showed some already inherently ableist perceptions of members with a disability:

> You could be crude and say that when we say 'disability', we do not really mean the multi-disabled who need help with everything, right? It is the ones who – you can say – in many cases are self-sufficient, possibly supported by a carer. (Interview 3)

Adaption of settings

The participants quickly address the requirements for physically inclusive adjustments such as lifts, extra space for wheelchairs and zones with special fitness machines suitable for both people with and without disabilities. They also discussed the need for extra cleaning when dirty wheelchairs enter a centre where only indoor shoes are allowed. Several of the participants stated the importance of securing the feeling of a volunteer fitness centre with no resemblance to hospitals, rehabilitation centres or other medicalised buildings. Charlotte reflected on the sense of belonging:

> I may be I, but I think we can easily make a disability-friendly centre where people can get around and where things are placed so that it fits when sitting in a wheelchair, but still so that we others can be there without feeling we're in a hospital room. (Interview 3)

Social codex for inclusive centres

Participants discussed separated or integrated training classes but struggled on how to put this into practice. Tommy summed up:

> I think it is harder to adjust so they can participate in our classes than for us to participate in disabled classes because of the big difference; we run, do push-ups and squats etc. It would be hard to remove all these things – I think it would be easier to adjust classes especially for them and then we could also participate there. (Interview 1)

Another issue was when people with disabilities should use the fitness centre. Some of the participants assumed that people with disabilities would use the fitness centre in daytime, and therefore not take up the more desirable times after normal working hours from 4 to 8 pm.

A sense of community was important for the participants, and they said that they wanted people with disabilities to be part of that as well. They valued diversity and that everyone should feel welcome, regardless of age, background, or social class. But at the same time, participants thought it much easier to be tolerant and inclusive towards people with physical disabilities in contrast to people with cognitive issues or mental disabilities making it difficult to follow the codex for 'normal' interpersonal behaviour. Birger explained:

> I don't know if it is wrong to call it for a social disability/handicap, but if you do not have boundaries like most other people, you could bother other users in the fitness centre, that would be a problem. (Interview 3)

Being part of a voluntary-based community, it is important to help each other and create a culture where all people take care of the place and clear up after oneself. Participants valued this kind of atmosphere where members helped each other during exercise. This also involved helping people with disabilities, but only to a certain extent, as participants did not want to be obligated to help or be delayed in their own exercises. Maya reflected:

> I don't mind sharing the fitness centre with disabled people, but on the other hand I would be annoyed if I went to exercise and ended up behind a wheelchair user who takes forever to transfer between the fitness machines. It is not nice to say I know, but I would be annoyed. (Interview 1)

Interaction with users with disabilities

Finally, several participants stated that they had some fear of interacting with people with disabilities because they were afraid to do something wrong or be misinterpreted. They wanted everybody to feel comfortable but felt insecure regarding how to behave so that they did not unintentionally offend. Josefine elaborated:

> Either you have reluctance to deal with people with disabilities or you want to help, but they don't need your help and react with disappointment if you ask. It is problematic, should you ask, or shouldn't you? Do you look at them or should you not when you yourself are non-disabled and they are disabled? You need to take these problems into account, so everybody feels comfortable, and you don't get snapped at and refuse to engage or talk to this [disabled] person again. (Interview 2)

Participants believed that no one should be offended, disappointed, insulted or snapped at, so that people with disabilities had the experience of dignity and pride. In general, the participants were very engaged in how to do things right, be respectful and treat people with disabilities as everyone else. Ib summed up:

> It sounds like a cliché, but you have to respect them as they are, I can't explain it in any other way. (Interview 3)

Some participants felt that they lacked social competences on how to do interact in practice because of their limited relations with people with disabilities in daily life. Henning shared his thoughts on how to handle specific situations:

> I would just say: 'You just give me a sign if you feel in need of help'. Then you have not directly asked, and they do not have to say no. Then they know that if they have a need for help, they can get it. (Interview 2)

The above section highlights that participants may have good intentions regarding sharing a space with members with disabilities, but it is apparent through many comments that there are inherent ableist perceptions and biases held by non-disabled members. These perceptions shed a light on the various disabling encounters that must be addressed during the conception of an inclusive fitness centre to avoid the pitfalls of early research.

Discussion

Participants expressed opinions about the 'right' settings for non-profit club-based fitness centres with room for comfort, inclusion, and diversity, and how the ideal inclusive fitness centres should be to include people with disabilities, but ableist perceptions were apparent throughout. In this section, by means of four discussion points, we discuss how these expectations and suggestions may be operationalised with reference to existing knowledge on inclusive fitness centres, and potential pitfalls regarding ableism and how this must be considered when designing and inclusive fitness space.

Non-profit fitness centres compared with commercial fitness centres

Participants had certain expectations and ideas about the ideal fitness centre based on their experiences with commercial fitness centres and non-profit fitness centres.

In general, and in line with existing knowledge, participants stated several important issues when choosing a fitness centre, such as locations with easy access [32–34] clean and well-maintained settings with a variety of up-to-date equipment [35, 36] and a centre not too crowded [37], noisy or smelly [38]. When participants evaluated the settings, it all came down to how the space affected them; how it made them feel. These findings underline that people have different preferences [39, 40], and this can explain the booming fitness industry whereby the centres become more and more niche orientated. Our findings further highlight the importance of creating a welcoming and comfortable space.

The participants preferred low-cost memberships as previously reported [35, 41], and quickly calculated the price per expected visit when arguing expense. On the other hand, they also preferred equipment with high standards found in commercial centres, so this is a trade-off to be aware off. Room for socialising was much in demand in non-profit fitness clubs in contrast with commercial centres where places to meet before and after almost are non-existent. Good social relations and a sense of community were highlighted in several studies [42–44], but for the current participants, it differed because they prioritised social relations beyond training. Studies of regular fitness centre users in commercial centres also stressed friendship both inside and outside the fitness centre [45]. We found, however, that room for socialising and focus on social relations may attract a specific kind of user to the non-profit fitness centres instead of commercial fitness centres.

Motivating atmosphere

The atmosphere in a fitness centre was very important for the participants and they kept returning to this topic, stressing an atmosphere and welcome and invite motivated their use. In that sense, a good atmosphere is prioritised over functionality which is notable as a good atmosphere has not been widely described as motivating in previous studies focusing on non-disabled people. Generally, studies concluded motivation related to improving body appearance and performance, reducing health issues or improving mental well-being [39, 46–50]. In only three studies the atmosphere was associated with feelings of being comfortable, valued and welcomed [34, 42, 51].

To further create a motivating atmosphere, participants highlighted the importance of fitting in and belonging, regardless of age, bodily appearance, clothes, or type of training preferences, which could be facilitated through verbal and non-verbal interactions with members and staff. Indeed, staff members play key role in creating a good atmosphere [52, 53], which may be the reason why participants requested rules for behaviour and staff to enforce them to avoid stigma and enhance pleasant experiences for everybody.

Regarding ensuring welcome and invitation, participants were concerned about newcomers' lack of knowledge and confidence entering a fitness centre. For beginners, fitness equipment can be complicated, so guidance is needed on both what to do and how to do it right. These issues have not been well established previously, but is described in relation to older adults [43, 50]. Lack of skill and knowledge may be considered a barrier that needs further consideration if all new members with limited or no experience should be included in fitness centres as it is not only related to age. Staff and other fitness centre members can play a key role helping and introducing newcomers to the space, trainings, and equipment to ensure a welcoming, inviting atmosphere.

Interactions with people with disabilities– lack of experience

Participants believed they were welcoming of people with disabilities in fitness centres and expressed a more positive attitude compared to other countries. For example, only three quarters of participants in a survey from the UK were open to taking part in sport or active recreation with people with disabilities [54]. The current participants were overtly openminded, but also foresaw many potential barriers for inclusion on a more interactive level, especially when including persons with intellectual disabilities, due to a lack of social codex which is supported by previous studies [55, 56]. This is further supported in our specific work in Denmark as early analysis of focus groups from persons with disabilities points to similar findings. For example, in a quote from one of the interviews, Maria described problems when

interactions between persons with and without disabilities go wrong:

> 'Many things regarding people with disabilities are kind of shushed down and you should not ask as a non-disabled person. But it results in non-disabled people not knowing, - they are not mean, they just don't know better. They don't know how to do or how not to do in situations you are not familiar with, and then it gets awkward, and you might say things that are taken in differently than they were meant. I think it goes both ways.' (Interview 3a with a group of participants with physical disability)

This example is provided for context and an in-depth focus on people with physical disabilities is forthcoming.

While the participants in this study in general had a positive attitude, they expressed a distinct absence of interactions with people with disabilities; they simply lacked experiences from their daily life with this group of people. This might be due to the national sport organisation where leisure time sports activities are split in traditional sport and parasport which does not favour inclusion. If attitudes, however, predict behaviour then inclusive fitness centres have a good starting point supported by a global movement with more positive attitudes to people with disabilities [57]. Intergroup contact theory [58] describes how direct contact between groups work in changing attitudes and reducing prejudice. This theory has been used in disability inclusive efforts previously including within schools [59], university [60] and the workplace [61], and may have considerable impact within a fitness centre. However, this is the case only assuming that positive attitudes towards people with disabilities is not just a consequence of politically correctness but reflecting their actual attitude. Yet, while participants perceived they had positive attitudes to people with physical disabilities, in general, they struggled with defining and exemplifying the group of people with physical disabilities. They found it difficult not to stigmatise when talking about 'the others' and 'us normals'. Unfortunately this common way to portray people with disabilities as 'other' and not an integral part of the 'normal' world may be a barrier for social inclusion [57]. The non-disabled participants tried to omit these expressions, but they lack concepts and terminology to express themselves otherwise, highlighting unconscious ableist attitudes.

Ableism: what is normal?

The participants welcomed inclusive fitness centres but did not pay much attention to how fitness centres could be inclusive, except for mentioning the obvious; the need for accessible environment and adaptive fitness equipment, but this is only one element of inclusion and will primarily be solved by the fitness centre and not by the participants themselves. The participants were not aware of their own implicit bias and role in exclusion regarding different ableist aspects of prejudice and ignorance, which can be a vital barrier for inclusion as it can lead to direct psycho-emotional disablism. For example, within the context of this study, participants expressed the importance of helping others to create a positive atmosphere but stated that persons with a disability requiring regular assistance may become annoying. Further, participants discussed the importance of supporting people with disabilities, but were concerned about time, resources and staff being taken away at the expense of non-disabled users. These ableist examples may negate an inclusive effort and result in persons with disabilities experiencing direct psycho-emotional disablism.

The issue about direct psycho-emotional disablism is further supported by preliminary analysis from our focus groups with participants with disabilities about their perspectives for inclusive fitness centres. One quotation from Caroline underlined her experiences of ableism from non-disabled persons:

> 'Maybe it is also the fear of actually living up to some of the prejudices [about persons with disabilities] you feel that [non-disabled] people are looking at you and if you ask for help you feel the look even stronger.' (Interview 1a with a group of participants with physical disability)

In the literature direct psycho-emotional disablism is both related to other fitness centre users, staff members, and management (all arguably influenced by ableist perceptions) [13, 62]. This narrow perspective is what Anderson et al. describe as an ableist-environment being exclusive towards people with disabilities [63]. The non-disabled participants in this study are, not surprisingly, viewing inclusive fitness centres through the lens of their perspective and they mention several situations where they imagine irritation with people with disabilities. Chouinard would characterise this as ableism of ideas, practices, institutions and social relations that presume able-bodiedness, and by doing so, construct persons with disabilities as marginalized, oppressed and largely invisible 'others' [64]. This is stigma that should be avoided but might be difficult to counter unless the perspective of both fitness users with and without disabilities are represented and included when establishing and running the new inclusive fitness centres. In that way, 'normal' is not defined by the non-disabled group of people with an (unconscious) ableist perspective but as the variety of both people with and without disabilities using the fitness centres.

Limitations and future directions

To improve naturalistic generalisability, we strove for maximal variation within the group of adult non-disabled potential participants in the upcoming inclusive fitness centres, which we successfully achieved in terms of gender, age, and fitness centre experience. The participants were geographically recruited in 3 different parts of Denmark and are anticipated to be representative for all of Denmark. However, they are not representative for commercial fitness centre users, which is arguably a space with heightened ableism that excludes persons with disabilities [13]. This is a market that continues to see growth, thus if ableism is not challenged in this space as well, exclusion of people with disabilities may become even more of an accepted norm. Research focusing on inclusive efforts to resist ableism and disablism in other fitness spaces, such as commercial centres, are essential in order to stop the continued acceptance and normality of ableist practices in the fitness domain.

This article focused on the perspective of the non-disabled fitness users of the coming inclusive fitness centres, but of course the perspective from fitness users with physical disabilities were very important as well. Their perspective will be presented in an upcoming publication, based on three comparable focus group interviews. Studies show that the perspective of fitness users with disabilities is underrepresented in the scientific literature [65]. However, barriers for people with disabilities is reported when wanting to participate in gym-based exercising e.g. lack of accessibility, lack of social support, oppressive attitudes within gyms [7, 65], and further, instructors/staff have a key role in promoting inclusiveness or the opposite [66, 67] in fitness centres. Less has been written about the overt and unconscious ableism that must also be addressed to craft inclusive fitness spaces. While we did focus on ableism as a lens in our work, more much be done to explore the foundations, influences and strategies to dismantle ableism not only in the fitness domain, but wider society. A further limitation of the study is that the 'Fitness for All' initiative may only be applicable in Denmark and similar cultures as disability is so socially, culturally, and politically influenced. We encourage other countries to address the ableism, attitudes, and socio-cultural influences that shape attitudes and discrimination of people with disabilities within their own specific cultures and share ideas for interventions to create more inclusive fitness spaces. In this way, we can create a global inclusive movement such that there is better understandings and support of disability, culture and potential contributions and collaborations that may be made across countries.

Conclusion

This is one of the first papers to explore the perceptions of inclusive fitness centres within Denmark, thereby adding essential knowledge to the literature. This paper's aim was shaped by two key questions; (1) to identify the ideal fitness space from the perception of non-disabled users and (2) to explore their dis/ableist attitudes related to the future inclusive fitness centres. First of all, participants pinpointed the importance of a place with a good atmosphere—a place that made them feel welcome and gave them a feeling of belonging. The participants mirrored themselves in relation to other users and aspects, like body ideals, gender, age, exercise preferences, and furthermore social relations were found important when they consider whether they fit in or not. Therefore, it is important that fitness centres not only focus on location and advanced fitness equipment, but also how to create the right atmosphere.

Participants welcomed people with disabilities and wanted them to feel included in the fitness community, but they predicted challenges for the future inclusive fitness centres and expressed unconscious prejudices. This underlines that accessibility (indirect psycho-emotional disablism) is not the only barrier for inclusion, since social skills, ableism, ignorance, and preconceptions can be important barriers too (direct psycho-emotional disablism). Inclusive fitness centres must address this so the definition of 'normal' is not only defined by the non-disabled group with an unconscious ableist perspective. This could be adjusted, e.g., by having staff members who are good role models to uphold policies and rules, by having both fitness users with and without disabilities joining the fitness centre and even have fitness users with disabilities as a part of the staff to make a greater impact. We need, however, to research the perceptions of people with disabilities regarding inclusive fitness centres and this will be presented in a forthcoming publication.

Abbreviations

IFC: the inclusive fitness coalition; IFI: the inclusive fitness initiative; STC: systematic text condensation

Supplementary Information

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Additional file 1.

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Authors' contributions
BJK and JT conceived the project. HN, BJK, and JT designed the study. HN conducted the interviews. HN, LFS, EVR and JT analysed the data. HN, EVR and JT drafted the full manuscript. All authors read and approved the final manuscript.

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Availability of data and materials
The datasets generated and/or analysed during the current study are not publicly available due to confidentiality of the participants but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The interview project was approved by the University of Southern Denmark, Research and Innovation Organisation on behalf of The Danish Data Protection Agency, Journal Number 2015-57-0008. Written informed consent was obtained from the participants prior to participation in the study.

Consent for publication
See above.

Competing interests
The authors declare that they have no competing interests.

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Publisher's Note

Paper III - Sup 1

Interview guide – translation from Danish to English

Themes	**Cues/subthemes**	**Questions**
Introduction	participation motivation	What are your experiences with fitness centres? Can you share some examples with us? (Both good and bad experiences) Why do you use the fitness centre? / What would it take for you to use it?
1. The physical surroundings/ accessibility	Transportation / location Reception area Clear floor space Ramps/stairs/lifts Locker room/bath/toilets Fitness area Classes/studio Fitness machines/exercise equipment Mirrors psycho-emotional disablism - indirect (structural barriers) Economy?	What is good accessibility to you? Where do you experience problems? What is important and why? What is good interior design in a fitness centre? Any examples and experiences?
2. Activities/ usability	Individual exercising Classes Events Supervision Social activities Staff?	How do you use the fitness centre (both in the past, present and future)? What do you do when you are there? What kind of activities are important? What does it take to makes a fitness centre usable?
3. Atmosphere/ feeling	Relations to other users and staff Preconceptions/stigmatising Disability vs. non-disability psycho-emotional disablism - direct (looks, words or actions) Communication	Give some examples of unwritten rules/gym etiquette? Dos and don'ts… What makes it comfortable to be in a fitness centre? Any experiences? Do you have any experiences with preconceptions/stigmatising in fitness centres? explain How do we make a successful inclusive fitness centre for both people with and without physical disability? Pros and cons? What should we be aware of and what are the challenges? How are you being treated in the fitness centre? - Was your participation effected? - How did you handle the situation? - Could the physical environment remedy or prevent this?
Recapitulation	"The ideal fitness centre" Sum up	What is the most important key points to pass on into the Fitness for all-campaign? What is the most important things in a (coming) fitness centre? Other comments?