“The fact that I can be in front of others, I am used to being a bit behind”: How assistive activity technology affects participation in everyday life

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Abstract

Purpose: This article explores the experiences of mobility-impaired individuals participating in leisure-time physical activities through the use of assistive activity technology. Its purpose is to highlight how these experiences affect participation in everyday life. The article provides new knowledge about the participation of this population in leisure-time physical activities.

Methodology: Qualitative, semi-structured interviews were analysed according to the stepwise-deductive inductive approach. During the analysis, self-determination theory emerged as a theoretical tool for understanding how social context affects motivation as an interacting concept in the participation of leisure-time physical activity.

Findings: Individuals with mobility impairments who use assistive activity technology for leisure-time physical activities experience opportunities to participate in ordinary and valued activities that allow them to improve their social positions. Further, use of assistive activity technology provided the informants with opportunities to alter their daily routines, enjoy time on their own, and enhance their personal awareness. Having opportunities to use assistive activity technology independently is experienced as a recognition of their individuality. Thus, the article highlights a new aspect of participation as performing a socially valued activity in solitude.

Conclusions: How technology provides opportunities for social interaction influences the informants' experiences and motivation to use technology. Leisure-time physical activity through the use of AAT promotes mastery and personal dignity, thereby revealing a new aspect of participation as being involved in an independent activity.

Implications for rehabilitation:

- The allocation system for assistive activity technology requires knowledge about personal motivation for assistive activity technology use and the connection between leisure-time physical activity and social participation.
- Additional education about and understanding of motivational factors for assistive technology use is needed.

Keywords: qualitative research; assistive technology; participation; leisure time; physical activity

Introduction

To be full and active members of society has been a political goal for those with disabilities since the 1990s [1]. In the United Nations Convention on the Rights of Persons with Disabilities (CRPD), participation on an equal basis with non-disabled counterparts is considered an overall vision and right [2, Preamble, Item E; see Articles 1 and 3]. Participation in sports, exercise and other forms of leisure-time physical activity (LTPA) yields numerous positive health outcomes for people with disabilities especially [3,4]. Nevertheless, the majority of those with disabilities do not participate sufficiently in physical activity to benefit from these health outcomes [3]. A literature review of factors related to participation in physical activity for this population [5] addresses challenges including the lack of universal accessibility, access to technology, and information about and education in physical activity. To ensure the full and active membership in society of individuals with disabilities, we need more knowledge about how to promote accessibility and their opportunities for participation in physical activities. Therefore, it is vital to explore the experiences of people with disabilities who actually participate in sports, exercise and leisure-time physical activities (LTPAs). This study explores how people with mobility impairments who use assistive activity technology (AAT) in LTPA experience both individual and social aspects of participation.

This study was conducted in Norway, where citizens can apply for state-funded assistive technology (AT) at the Department of Assistive Technology (DAT). The applicant is required to have a permanent illness, injury or disability that affects his or her everyday life to a significant level [6]. The relative ease of access to AAT makes Norway a suitable frame for studying the experiences of persons with mobility impairments participating in LTPA. The aim of the study was to gain knowledge about individual and social factors that promote participation in LTPA through the use of AAT. This knowledge can contribute to strengthening participation in LTPA for people with mobility impairments.

Assistive activity technology

There is a wide variety of assistive technology (AT), from quite simple to highly sophisticated technological products. In the International Classification of Functioning, Disability and Health (ICF), AT is defined as "any product, instrument, equipment or technology adapted or specifically designed to improve the function of a disabled person" [7,p.73]. The subcategory of assistive activity technology (AAT) includes technology designed specifically to help persons with a disability to participate in physical activity, including outdoor life, exercise, sports, play and physical education [6]. This article draws upon this definition, but we realise that there may be slight differences between AAT and other technological equipment.

Literature on the use of assistive technology demonstrates that understanding the role of technology as an interaction between person, environment and technology is important [8,9,10]. People's assumptions, expectations and responses to using assistive technology are highly individual and influenced by varying needs, opportunities, preferences and past experiences with and exposure to such technology [11–15]. Personal factors are important for meanings assigned to AT and for technology use [16–18]. However, a person-centred practice in the allocation of AT is difficult to implement [19]. Assistive technology can

support participation but can also prevent it because the technology may be perceived negatively as an item or tool that affects the individual's self-image and may, therefore, be abandoned [11,13,20].

Postmodern theorists have contributed to an understanding of the fluidity and mutual dependence between humans and technology [21–23]. This fluidity means that the meaning and potential outcomes of technology use are created through human–technology interaction. Gibson et al. [24] illustrated how postmodern theories can promote an increased understanding of the interrelationship between disabled bodies, other bodies/humans and assistive technology. Hocking [25] further illustrated that the use of an object to express the self is important for achieving social change and personal-identity aspirations. These postmodern theories can contribute to an understanding of the relationship between the individual, AAT and the social context in which the technology is used, and how this affects the ways people construct their understandings of disability, technology and LTPA.

Earlier research on leisure-time physical activity

Earlier research on LTPA has focused primarily on the psychological and health-related factors of physical activity [8]. To gain knowledge about the experience of using AAT, it is natural to look for research on adapted physical activity, such as sport activities or recreational activities, because AAT is often a prerequisite for disabled persons to participate in such activities [5].

Quality of life is influenced by social participation and interpersonal relationships. Playing an adapted sport might influence one's quality of life and self-esteem by changing society's attitudes towards people with mobility limitations [26]. Participating in an adapted sport has also been found to have a positive impact on psychological factors, especially behaviour-related abilities, including self-esteem, self-efficacy and sense of belonging (ibid.).

Moreover, a reciprocal relationship between positive emotions and belongingness has been identified in earlier research on recreational sport activities [27]. Participation in organised physical activity provides opportunities to experience new interpersonal interactions and different social roles [28]. Adapted sports participation motivates individuals by providing psychological pleasure and offering inclusion in supportive networks [29]. It is also motivating through the awareness of a larger understanding of participation that empowers advocacy and education for others in regard to disabilities and sports (ibid). Furthermore, positive correlations have been identified between physical activity and employment, educational status, leisure-time schooling, voluntary work and participation in disability organisations [30].

Participating in sports, exercise and other kinds of LTPA provides a number of health benefits for people with physical disabilities [3,28,29]. In addition, physical activity often leads to greater personal satisfaction with weight and, under certain conditions, body shape [4]. However, existing challenges related to inactivity remain a political concern with respect to how the future service-delivery system should be organised [31]. These challenges indicate that greater knowledge of how to support participation in physical activity among people with disabilities is needed. Despite research providing evidence of numerous positive outcomes of participating in physical activity for people with disabilities, insight into the processes that actually result in people becoming more physically active is lacking. Research on LTPA does, to a limited extent, question the construction of the self and the social value of technology and physical activity for this population. Research presents technology, physical activity and disability as separate concepts but does not offer thorough insight into the dynamic process involved in how people construct an understanding of these concepts, although this is important in order to understand what participation in physical activity is

about. The present study demonstrates that social context and changes in social position become important catalysts for motivation as an interacting concept in this process.

Participation as an individual experience

There are different understandings and ways of describing participation. The ICF [7,p.123] describes participation as "the extent of a person's involvement in life situations" or "the lived experiences of people in the context they actually live" in relation to impairment, activity level, health condition, and contextual factors (physical, social and attitudinal). The ICF has been criticised for its emphasis on individual performance as the main characteristic of participation [32], while other and more-subjective factors are overlooked.

Participation is a multidimensional concept that might be described as a human right, an invitation from the environment, an outcome of rehabilitation services, an individual experience and a facilitator of the relationship between the individual and society [33]. Hjelle and Vik [34] found that wheelchair users experienced participation as being engaged, both in their own and in other people's lives, being a member of society and interacting as a citizen. Hammel et al. [35] found that participation was understood as a cluster of personal and collective values. This cluster included "active and meaningful engagement/being a part of, choice and control, access and opportunity/enfranchisement, personal and societal responsibilities, having an impact and supporting others, and social connection, inclusion and membership". Another study among persons with chronic pain described engaging in physical activity as an aspect of participation [36]. In the present study, we have an overall understanding of participation as described by the ICF but are aware of the specified personal and collective values connected to the physical, social and attitudinal world. To acquire a thorough understanding of participation, these personal and collective aspects require further exploration.

We use self-determination theory (SDT) as a theoretical framework to supplement our understanding of our informants' experiences. Self-determination theory (SDT) is especially focused on how social environments catalyse both within- and between-person differences in motivation and personal growth, resulting in people becoming more self-motivated, engaged and integrated in some situations, domains, and cultures than in others [37,38]. SDT explains people's basic psychological needs for fulfilment that are nurtured by their actions. These include the needs for competence, autonomy and relatedness [37,38]. The most central distinction of SDT is between autonomous motivation and controlled motivation. In autonomous motivation, people identify with one activity's value and experience volition or an endorsement of their actions. In controlled motivation, the behavior is a result of external contingencies of reward or punishment, and people only partly identify with the activity's value [37,38]. SDT offers a useful framework for understanding how the informants' social context and changes in social position become catalysts for motivation as an aspect of the experiences of participation in LTPA through the use of AAT.

Methodology

Study design

The study design is inspired by social constructivism, which explains the truth as something constructed in social interaction and based on different social factors [39]. Individuals seek to understand their world and develop their own particular meanings that correspond to their experiences. Often these subjective meanings are negotiated socially and historically [40]. This perspective provides us with a deep understanding of how the informants construct and experience their use of AAT in LTPA and what significance their social context plays in this relationship. Qualitative inquiries are of special relevance in studying social interaction and how we construct the truth about social phenomena [41,p.11]; therefore, we chose to apply a

qualitative approach to our investigation.

Ethical aspects

The Norwegian Centre for Research Data (NSD) approved the study (Reference no. 45484). The study was also approved by the Norwegian Labor and Welfare administration, Unit for Control and Management. The recruitment of informants was conducted anonymously. The researcher advised the informants that participation was voluntary and that withdrawal at any time was allowed. Personal identifiers were removed from the empirical material. Data such as audio files and notes were stored immediately after the interviews on a secure hard drive at the first author`s workplace. It was made clear that neither the project nor the authors were connected to the Norwegian Department of Assistive Technology and that participation in the study would not affect the informants' services.

Sample and recruitment

The recruitment of informants was based on a strategic sampling method [42]. Criteria for inclusion were that the persons were age 18–67, had mobility impairments and had received an AAT within the last 18 months. DAT, a part of the Norwegian Welfare Administration (NAV), recruited the informants confidentially by sending written invitations and information about the project to all individuals registered in their database who met the inclusion criteria. Informants were identified in their database according to the inclusion criteria. Those who expressed a desire to participate returned the informed consent letters directly to the first author or sent a confirming SMS message or an e-mail. A total of 51 persons confirmed their wish to participate, and 44 took part in the study; 7 persons were unable to meet with the first author during the time she was conducting the interviews.

Data collection

The first author conducted the interviews. The goal of qualitative data collection is to explore the meaning of a social phenomenon and how it is experienced by subjects in their natural situations and environments [42]. Semi-structured, in-depth interviews aimed to provide enlightenment about how users of AAT experienced the use of the devices from a personal point of view and in their social surroundings [41,43]. The interview guide was developed in regard to the following themes, which were based on earlier research [14,16–19,35] on assistive technology: “allocation process and user involvement”, “technology and function”, “identity and personal preferences”, “social interaction” and “physical activity”. The guide used open-ended questions related to these themes. The first author prompted reflections or asked core questions to reveal understandings, actions and personal experiences. Examples of open-ended questions that were asked included: “Can you tell me what your wish or need was to apply for this AAT?” and “What could have been different so that this AAT would have worked better?” The interview started with introductory questions under the theme “background and general mapping” to acquire personal background information such as age, interests and earlier experiences with assistive technology. At the end, there were several closing questions [41,p.117] that made it possible for the informant to ask questions if something seemed unclear before we ended the interview. Interviews were audiotaped and lasted for approximately one hour.

Analysis

To analyse the data, we employed a stepwise-deductive inductive (SDI) approach [41]. This approach is based on an ongoing movement between an inductive interpretation and theory proximity in the analytical work. In this study, the first author transferred electronic transcripts verbatim from the interviews to the software computer program NVivo, which is

suitable for storing and organising data and supporting the analytical work in SDI. The analysis started in an inductive manner, with a strong separation between the inductive and deductive steps of the analysis. Initially, the first author performed a detailed inductive coding, reading the first text (interview) thoroughly. She immediately identified small sections of text that conveyed meaning about experiences and meanings of AAT use and coded them by using the same words and expressions in the text. When coding, it is appropriate to use words and phrases that stand out in the material [41,p.29]. The first author did the coding, for example, by identifying striking nouns, action verbs, anecdotes illustrating the informant's experiences, and the use of irony and comparisons. According to the SDI approach, the goal is to create codes generated from data and not from theories, hypotheses, research questions or previously planned themes [41]. This process resulted in approximately 600 inductively based codes.

In the next step, the first author collected the codes that seemed relevant to the research question into code groups based on a mutual or inner thematic meaning. These code groups represented the main themes in the analysis. This analysis led to six inductively based code groups, two of which laid the foundation for the findings in this article. In table 1, these two code groups and examples of some of the associated codes are presented. At this stage, the authors held a joint analysing session to discuss data saturation and comment on codes and code groups. Preliminary findings from the study were presented at meetings, networks, and conferences. The first author sent information about the findings to the informants, thus giving them an opportunity to offer comments about the findings, although no comments were provided.

Table 1. Code groups and examples of associated codes

In the next phase, theory played a more important role, providing a framework for understanding what kind of phenomena the codes were about and what they told us about the question under research. The SDT approach was chosen because it provided a framework for understanding the informants' experiences about how social context catalyses motivations for engaging in LTPA with the use of AAT. With the perspective of this approach, we could identify how the informants' experiences were influenced by internal and external motivations for the activity.

Findings and discussion

In this study, 11 women and 33 men participated; the youngest participant was 18 years old and the oldest 67. They represented different levels and kinds of mobility impairments (spinal cord injury, multiple sclerosis, cerebral paresis, stroke, other muscular or skeletal disorders, etc.). Following in table 2 is a description of the main features of the sample.

Table 2. Main features of the sample.

In this section, we refer to the informants using pseudonyms. The findings describe experiences of how participating in socially valuable activities led to new understanding for the informants and changed their social position. The findings further describe how using AAT in LTPA in the informants' social contexts resulted in feelings of joy, excitement and pleasure in their lives. Using AAT is about doing things that other people do and taking part in society. It is about mastery and personal dignity and being included in socially valued activities but also having the opportunity to do something on one's own. We discuss the significance of our findings in the following sections.

To do activities others do strengthens motivation and participation

To share common values in society

This theme highlights how the use of AAT can contribute to increased access to activities, provide more opportunities for attendance at different arenas, and increase participation in social life related to LTPA. Participation in LTPA through the use of AAT is autonomously motivated, according to informants' experiences. The findings show how the informants have identified with the society's value of LTPA and with other social activities related to physical activity. When people are autonomously motivated, they experience volition or a self-endorsement of their actions [37]. The informants have integrated LTPA as an important value for themselves and are participating in physical activity as part of their opportunities to socialise in the ways they desire. The findings highlight how using this kind of technology creates new possibilities for engagement in the informants' lives and in other people's lives by sharing commonly valued activities. We interpreted this positive engagement as an expression of autonomous motivation and participation for the informants.

For some informants, this new possibility for engagement represented personal integration of the socially constructed value of being responsible for taking care of their own health. For other informants, however, this was more related to valuated social activities involved in LTPA. We can see this in how Hans (40 years old) talked about the opportunity to participate, using his AAT, in common and valued activities.

> *"It is about participating; it is a bit like that. For my part, one thing is that the physical is a value. However, I do not think I get greatly improved health from the bike. I use it too seldom. The hours I get outside with it means being able to participate in things that others participate in—either with the family or friends, if there is an arrangement at school or in the classroom".*

The quotation illustrates the importance of being able to be involved in LTPA together with

children or friends. His experience illustrates that AAT had an impact on participation as a personal involvement in the lives of his family and friends. Previous studies have found that involvement in other people's lives and in one's own life are important aspects of participation [34]. When AAT was used in social activities, such as doing things with the children, the informants also had opportunities to fulfil a socially valued role as parents. We interpreted doing so as important for feeling like a recognised member of society. Being a member of society and interacting as citizens are dimensions of participation [34].

The feeling of belonging created by doing what other people do and its value became apparent when Berit (28 years) described the pleasure of exercising outside:

"Because it is fun, it is speedy, it is something new, and it is something everybody does".

The quotation shows the multidimensionality of the experience and the motivational factors for using AAT. It was not only for personal enjoyment per se; it was also something novel that satisfied the individual's need to learn new things. Moreover, it was something people usually did together in a social context. Our findings illustrate that AAT facilitates the ability of this population to participate in activities that other people do and that this strengthens their involvement in their social environments. Thus, AAT supports participation as a facilitator of the relationship between the person and society [33,p.1–19]. Social environments, including friends, family and other people in society, catalyse intrinsic and extrinsic motivation [37,38]. This is illustrated not only by the opportunities AAT brings to social interaction and socialising the way the person with a disability wishes to but also the possibility to fulfil a socially valued role, for example, as a parent or a friend. Therefore, it is important to understand how the social context positively interacts with the person, the technology and the activity. Knowledge about this reciprocal interaction can contribute to an understanding of motivational factors of importance for participating in LTPA through the use

of AAT.

Having and sharing experiences with others made the informants feel included

Participation is linked to experiences of being a member of society and interacting as citizens [34]. Experiences of inclusion when using AAT were especially evident when the technology allowed the informants to participate in physical activities together with others. For several of the informants, this feeling of being a part of the larger society was a result of participation in different sports or team activities.

Several informants indicated that sports gave them something to talk about with other people (Berit, 28 years old):

> *"Alpine skiing gives me something to tell others. When other people talk about their skiing trips or that they have done something, then I can tell them about something to which they can relate".*

By offering a common ground for experience, it is easier to engage and interact in social conversations about LTPA. The technology gave the informants opportunities to create memories and common histories with other people. This provided positive memories and feelings that lasted over time. Arne (24 years old), who is a bandy player, talked about his past matches:

> *"I remember the big matches we have played, and thinking of them makes me happy."*

Creating memories and supporting each other in team activities were also important for making new friendships. We see how people bond in team activities when Arne continues by describing what the sport offered him:

> *"To feel that you are part of a team and make new friends."*

Konrad (41 years old) said that the technology contributed to his inclusion in society:

> *"Yes, and that is exactly what I mean when I say that sports include you in society. You will be a little excluded if you do not have anything to do."*

This quotation shows that his drive to participate in the sport was externally motivated. An externally motivated behaviour is a function of external contingencies of reward or punishment [37,p.182]. In this case, the informant talked about a social reward of inclusion and the loss of fear of exclusion by not having much to do.

The findings presented thus far illustrate how the social experiences function as motivators for doing the activity. Even if the informants have an "inner" motivation or personal drive to do the activity, we find the social aspect of their experiences to be a vital motivational factor. This motivation seems to be connected to the person's innate need for socialisation and connectivity. The findings confirm the understanding in SDT; that the social surroundings have a tremendous effect on people's motivation [37,38]. The findings also reveal the importance of giving access to this kind of technology for people with disabilities for socialisation and participation. Access in the local community to arenas for LTPA, such as sports clubs and recreational facilities, is important for opportunities to use AAT, as well as to create and share experiences with others and for people to feel included by participating on an equal basis with others.

Opportunities to engage in different types of activities

Having AAT also affected the possibilities for different types of activities in which the informants could participate. When David (34 years old) talked about how the AAT device influenced the time he spent with other people, he indicated an increase in different types of activities related to the use of AAT:

"I am so lucky I have friends that adapt to the situation. It (AAT) gives us more possibilities to be together. It gives us more choices for what we can do together."

In this way, AAT gave the informant and his social network more opportunities for different types of interactions in which they could engage. Hammel et al. [35] explained "choice and control" and "access and opportunity" as part of personal and collective values of participation. A variety of activities in which to engage leads to more opportunities. Social support is valued, as the quotation reveals, when friends understand and adapt to the situation.

The informants experienced that simply having an AAT device was important for their own perceptions of their possibilities, even if the technology was not used on a regular basis. This is what Gustav (59 years old) said about having the opportunity to use AAT:

"It is one thing to use it and another thing to know that you have the possibility to use it. You do not sit there and think, 'How fun it would have been to go cycling today.' You have the possibility, so you do not have to bother with that kind of thought. And if you really want to, you just pull out the bike and go ahead if the weather is nice."

This quotation highlights the autonomy aspect of simply experiencing having the opportunity to use the AAT device. According to SDT, choice and opportunities for self-direction enhance intrinsic motivation as they provide people with a feeling of autonomy [38]. Intrinsic motivation is "the human inherent tendency to seek novelty and challenges, to extend one's capacities, to explore and to learn" [38,p.70]. Gustav continued to describe his experiences with AAT use in the interview. What he said shows that his autonomous choice was important for his awareness of personal barriers and a loss of intrinsic motivation for doing the activity:

"At least you have the possibility. There are other things (that might stop you), like your own laziness or other things, that make you not use it."

This quote illustrates how having the equipment made Gustav aware of his own barriers for using it. Thus, it might be equally important to identify potential personal barriers to the use of AAT as potential access barriers or participation barriers to its use.

Mastery and personal dignity

Changing the social position

By using AAT, the informants experienced opportunities to present themselves from a positive point of view and as strong and healthy persons who could master physical activity. The technology made it possible for them to demonstrate their strengths in LTPA and to change how other people saw them. This is what Ellinor (39 years old) said about the importance of non-disabled people not viewing her as a "handicapped" person but as bold and strong:

> *"In fact, I think that it is quite important that they do not look at me as very handicapped. I can challenge them on things they find frightening. It is not everyone who cycles three times a week to work."*

Ellinor's comment illustrates the importance of having an opportunity to show others that one is able to manage physical activity. This relates to the dimension of participation as engaging in physical activity [36] and interacting as a citizen [34]. The next quotation from the interview with Ellinor illustrates how her social role is changed/affected when she engages in LTPA with her AAT equipment:

> *"I must tell you the funniest thing I know is to catch up with joggers and others in front of me. Then I think, 'I am just sliding past them'. The fact that I can be in front of others…I am used to being a bit behind."*

When Ellinor rides fast on her bike, she is motivated by the tangible reward of changing her position in social interactions with others. Moreover, her position might also be an

internalised value from her previous experience of how people look at disabled persons, sometimes with negative reactions and sanctions [44,p.36]. In nearly every setting people enter, certain behaviours and values are prescribed [38,p.71]. Our understanding of what Ellinor describes when she is on her bike and catches up with joggers or others is that, in this specific moment of social interaction, she sees her opportunity and performs the externally motivated behaviour of going faster to change her position from "weak" to strong. We believe this change in social position to be the reason Ellinor describes this as "the funniest thing", like a positive reward of external contingencies [37,38] to her.

The informants expressed that using AAT influenced the role they have in society as "disabled" and that their ability to manage physical activity might change how other people see them. Charles (67 years old) said this about how other people see him in a different way when he uses his specially adapted bike:

> *"I can see something different in people's eyes than [what] I am used to. Before (he became ill) I saw more respect in people's eyes, but there is not much of that nowadays, except when I use my bike."*

Thus, the use of AAT relates to the experience of mastery, managing something and being someone. Being someone to other people, as opposed to not being seen with respect, is part of participation as social connection, inclusion and membership [34,35]. The motivation that results from changing one's social position by using AAT can be understood as an extrinsic motivation for contingent self-esteem [37,38]. To master an LTPA through the use of AAT provided increased self-esteem and the feeling of being someone, and this was transferrable to other contexts.

The technology encourages people challenge their personal barriers and extend their capacities

Appearing as one who is strong and who can manage physical activity made it easier for others to see possibilities for engaging in LTPA with the person with mobility impairments. When other people expect an individual to participate, it leads to a social environment that fosters autonomous motivation. This, in turn, changes the social interaction, as informant Bjarne (27 years old) stated:

> *"Now, I am the one to take them (friends) out, which has meant a lot to me. They see that I got assistive devices so that I can use them together with them."*

This excerpt illustrates that AAT is part of the social interaction between the person using the assistive technology and others in his or her social network. Mutual reinforcement occurs when the user sees himself or herself as a strong person and others begin to expect the person to participate in activities. This strengthens participation as having a positive impact on others [35] and as a facilitator of the relationship between a person and society [33,1–19].

When other people began to expect the informants to join in LTPAs, this made the informants view themselves from a new perspective: as capable persons who can be someone for others and manage things, rather than as persons whom others must watch over and support at all times. Bjarne (27 years old) continued:

> *"I can be someone. I am not the person who has been a sick person for five years or that they have to pay attention to all the time. Now I can go with them outside and do things."*

This quotation illustrates the informant's experience of "being someone". Bjarne's focus has shifted to what he is capable of managing and activities he and his friends can enjoy together. A social environment that allows for inner motivation has shown to be of great value for personal growth and positive social behavior [37,38]. Intrinsic motivation is the inherent

tendency to extend one's capacities, catalysed when individuals are in conditions that are conducive towards such expression. As Ryan and Deci [38,p.70] explained: "It will flourish if circumstances permit". The way in which Bjarne talked about the change in how he experiences himself as a more capable person can be understood as an expression of his intrinsic motivation for being someone for his friends and as an extension of his capacities. Social-contextual events that elicit feelings of competence can enhance intrinsic motivation for such events if the behaviour is self-determined [37,38]. This means that a social environment that conduces a feeling of competence when AAT is used might enhance intrinsic motivation for that specific type of action, such as doing things with friends.

Many of the informants talked about trips they had taken as organised team activities. Although these were organised activities together with other people, they might also have served as important first steps in extending one's capacities for doing things independently. The importance of mastering activities on one's own was illustrated when Lars (34 years old) talked about his first trip abroad to meet and ride with his cycling team for adapted bikes. When he travelled with his wheelchair and his bike, with all the practical planning and tasks that were involved, he pushed the limits of what he expected to accomplish by himself:

> *"You burst boundaries for what you can manage, and you build more confidence. That trip was extremely important to me; it was the first time that I went abroad after the accident."*

This shows how AAT interacted with the informant and led him to strive to manage new tasks that extended his capacities after the accident. The findings thus far have demonstrated that, for this population, managing physical activities is not an isolated performance of a task but rather the performance of something that has a broader meaning in both a personal and social context. The activities are autonomous, externally and intrinsically motivated by integrated social values and personal or inner values or interests.

According to the ICF, assistive technology is part of the environmental component [7]. This study confirms that AAT is a highly significant component of the interactional relationship between the person, the environment and the technology, as described in previous studies on assistive technology [8,21]. The meaning that the informants attributed to AAT illustrates a socially constructed individual meaning [40], according to the opportunities the technology offers for social interaction. Our study reveals how AAT is enabling this population by providing new experiences that increase their independence and capabilities. Additionally, we have observed that the process of positive reinforcement between a person and his/her social surroundings when AAT is in use reduces negative attention; this strengthens the positive relationship between the person, the technology, and his or her social environment.

Getting away and just exist

This theme was an underlying element in both of the code groups "to be with other people and to do what others do" and "to show other people and yourself that you manage/master". AAT was sometimes used to take a break from the social aspects of life, away from family life, work or the physiotherapist, as Cecilie (26 years old) shared:

> *"I am riding alone because it is a decoupling from my home. Just my bike and music in my ears, and just to be by myself. No one else, just me. I find it very delicious really".*

Additionally, we see the pleasure of disconnecting from daily routines when Bernt (28 years old) talks about his cycling trips alone:

> *"You get a chance to switch off your thoughts for a moment, to put it that way. That is what I like. If you are cycling and you have planned to go for a 5–6 mile trip, and it is only you, and the drinking bottle, and music in your ears and all that. Then you get the chance to disconnect from all the other things".*

To get away by themselves with the AAT equipment offered the informants a break from their daily routines and allowed for "alone time". This led to an existential awareness, and this was further illustrated when Berit (28 years old) talked about alpine skiing, despite the fact that she actually used the alpine equipment with assistants present:

> *"It is nice to do something where you do not necessarily have to talk so much or feel so much or… just to exist".*

The AAT equipment enabled the informants to experience time alone, disconnecting from social interaction, practical life, and the physical places where the informants usually stayed. Time on their own gave them a personal awareness of inner experiences of peace and quiet, joy and pleasure. SDT has always maintained that the development of integrated autonomous functioning depends on some kind of awareness [37,p.184]. The use of AAT allowed the informants to experience this awareness. Recently, researchers have incorporated mindfulness, defined as an open awareness and interested attention to what is happening within and around oneself [45], in SDT studies (ibid.). The informants experienced this kind of awareness when they used AAT in activities where they were alone.

Many of the informants reported that they used AAT alone to exercise, but "alone" seemed to be a truth with some modifications. These involve how they relate to the rest of society when they talk about how the AAT gives them opportunities for a kind of self-centred activity of personal pleasure. Given the opportunity to engage in this personally valued activity with its inherent positive emotions, the informants indirectly expressed a feeling of social recognition of personal preferences. This can be interpreted as an invitation from the environment to perform a socially valued activity and, thus, as one of the identified aspects of participation [34]. This indicates that performing activities alone might offer a new aspect of social participation and that use of AAT facilitates this aspect.

Theoretical contribution

This study's contribution to the existing knowledge base is how participation in LTPA through the use of AAT is a relational and socially constructed phenomenon, and how participation is reciprocally reinforced by external and internal motivations. To change one's social position is a vital external motivation, to extend one's capacities and to have time on one's own for an existential awareness are vital internal motivational factors for participating in LTPA and AAT use. Moreover, this study contributes new knowledge to the field of participation by illustrating how performing a socially valued activity in solitude is one aspect of social participation.

Implications for practice

In designing an AAT service-delivery system that strengthens people's participation in society, it is important to understand the social construction of participation. Following this, it will be important to organise the service-delivery system in a manner that reveals the individual AAT user's intrinsic and extrinsic motivational factors for using this technology. Thus, employees in the service-delivery system need to gain insight into the interactional relationship between the person, the AAT and the social environment where LTPA takes place. To achieve this, we believe that user involvement and a person-centred delivery process is important and vital to the successful allocation and outcomes of AAT use.

Conclusion

This study's findings underscore that using AAT in LTPA is part of a broader cultural and social context. AAT provides people with disabilities opportunities to be recognised and acknowledged as competent persons participating in socially valued activities. This means that the use of AAT challenges the dominant perspective in regard to mobility-impaired

individuals. A common political goal in many countries is to ensure the right to equal participation for people with disabilities [2]. While LTPA is a socially valued activity in most countries, participating in such activities, whether in social settings or alone, should be recognised as an integrated aspect of social participation.

Limitations

Conducting in-depth interviews may be a good choice for creating a personal and safe atmosphere between the interviewer and the informant [42,p.69]. Nevertheless, they represent a constructed/unnatural situation, and an informant might feel obliged to provide responses that he or she believes the researcher expects. Thus, methodological limitations may exist with respect to the power relations between the researcher and the informant; the researcher has the power to shape the questions and guide the conversation [43]. According to a social constructivist worldview, researchers interpret what they are told based on personal, cultural and historical experiences [40,p.25], which can also influence those interpretations and any follow-up questions they ask the respondent during the interview. Group interviews might have been a solution for balancing the power relations and for viewing the negotiation process from the perspective of how the informants constructed their experiences of AAT use. The study focused on experiences with the use of AAT, which involves a limited presentation of technology abandonment and negative experiences that reduce use. This study took place in Norway, which has a Department of Assistive Technology in each county. Earlier research identified local differences between the departments in the allocation process, and this was confirmed during interviews in this study. This might have influenced the generisability of the findings both national and internationally.

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Table 1. Codes and code groups.

Code groups:	Codes (examples):
1. to be with other people and to do what others do	✓ the activity has given me new friends ✓ to tell about something that other people can relate themselves to ✓ to have other areas where you can meet, share experiences ✓ this is the first time I can get friends who has this activity ✓ it's fun, its speedy, it is something new, it is something everybody does
2. to show other people and oneself that you manage/master	✓ fun to be fastest ✓ other people are not used to see me so quick ✓ I can talk about it and we can have something in common ✓ the bike is well known for non-disabled people, I think they can imagine (how it is to use) ✓ it is important that other people don't look at me as very a disabled person

Table 2. Main features of the sample.

Gender	Female (n=11)	Male (n=33)			
Age	18-30 years (n=7)	31-45 years (n=14)	46-60 years (n=16)	61-67 years (n=5)	Unknown (n=2)
Mobility-Equipment used	Electric Weel Chair (n=27)	Manual Weel Chair (n=19)	Crutches /Caine (n=9)	Foot prosthesis (n=3)	No mobility equipment (n=10)
Activities by using AAT	Outdoor individual summer activity (n=41)	Outdoor individual winter activity (n=14)	Outdoor team activity/sport (n=12)	Indoor individual activity (n=4)	Indoor team activity (n=9)