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To cite this article: Claire Willis, Catherine Elliott, Siobhan Reid, Astrid Nyquist, Reidun Jahnsen, Sven Bölte, Michael Rosenberg & Sonya Girdler (2021): “Capturing the magic”: identifying the active ingredients of a physical activity participation intervention for children and youth with disabilities, *Disability and Rehabilitation*, DOI: [10.1080/09638288.2021.1907458](https://doi.org/10.1080/09638288.2021.1907458)

To link to this article: <https://doi.org/10.1080/09638288.2021.1907458>



Published online: 05 Apr 2021.



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ORIGINAL ARTICLE



# “Capturing the magic”: identifying the active ingredients of a physical activity participation intervention for children and youth with disabilities

Claire Willis<sup>a,b</sup> , Catherine Elliott<sup>c</sup>, Siobhan Reid<sup>b</sup> , Astrid Nyquist<sup>d</sup>, Reidun Jahnsen<sup>d,e</sup> , Sven Bölte<sup>f,g</sup> , Michael Rosenberg<sup>b</sup> and Sonya Girdler<sup>c,f</sup> 

<sup>a</sup>Sport and Exercise Science, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Australia; <sup>b</sup>School of Human Sciences (Exercise Science), The University of Western Australia, Perth, Australia; <sup>c</sup>School of Occupational Therapy and Social Work, Curtin University, Perth, Australia; <sup>d</sup>Beitostolen Healthsports Centre, Beitostolen, Norway; <sup>e</sup>Research Centre for Habilitation and Rehabilitation Models and Services, University of Oslo, Oslo, Norway; <sup>f</sup>Center of Neurodevelopmental Disorders (KIND), Department of Women's and Children's Health, Karolinska Institutet, Stockholm, Sweden; <sup>g</sup>Child and Adolescent Psychiatry, Center for Psychiatry Research, Stockholm County Council, Stockholm, Sweden

## ABSTRACT

**Purpose:** This study aimed to define the active ingredients of a participation-focused physical activity intervention for children and youth with disabilities.

**Materials and methods:** An ethnographic approach was employed, triangulating participant observation, interviews and focus groups. Participant recruitment occurred through purposive sampling of staff employed at Beitostolen Healthsports Centre (BHC), and paediatric service providers visiting the centre. Interviews were transcribed verbatim and coded together with observation data. Secondary coding linked data to corresponding categories of the International Classification of Functioning, Disability and Health: Child and Youth version.

**Results:** Thirteen staff from BHC and 7 paediatric service providers participated in the study. Fourteen active ingredients were identified and were characterised at the level of the intervention ( $k=8$ ), the organisation ( $k=4$ ), and the individual ( $k=2$ ). Within the ingredients, 53 unique ICF-CY categories were identified. Twenty-six categories belonged to the ICF-CY component of “environment,” and 26 categories to “activities and participation.” No categories related to “body functions” or “body structures.”

**Conclusions:** The role of the environment, and specifically support and relationships, may be an essential consideration for enabling physical activity participation. Outcomes may guide program design and implementation to promote and sustain physical activity behaviours for children and youth with disabilities.

## ARTICLE HISTORY

Received 15 August 2020  
Revised 8 March 2021  
Accepted 19 March 2021

## KEYWORDS

Exercise; environment; cerebral palsy; adolescent; therapist; mechanism

## ► IMPLICATIONS FOR REHABILITATION

1. The active ingredients identified in this study may guide the design and implementation of programs to promote and sustain physical activity behaviours of children and youth with disabilities.
2. Leadership qualities and strength-based attitudes may be key characteristics of organisational practice that optimise outcomes for children and families.
3. A “relationship-centred” approach, i.e., a network of children, families, health professionals, peers, mentors, and services in the community, may support children and young people with disabilities to achieve their physical activity participation goals.

## Introduction

Evidence-based approaches to improving physical activity participation for children and youth with disabilities are evolving [1–4]. Given the high levels of inactivity [5] and the associated risk of chronic conditions in adulthood [6], these interventions are vital for ensuring optimal health outcomes across the lifespan. With effective and promising interventions of varying designs described in the literature, our challenge now lies in understanding the intervention content and mechanisms of change that lead to meaningful outcomes, to support translation into practice [7,8].

Attempts to promote change in physical activity behaviour requires the use of complex interventions. Complex interventions

are those involving a number of interacting components, allow for individualisation of implementation, and contribute to a variety of outcomes [9,10]. Following the widespread adoption of the International Classification of Functioning, Disability and Health (ICF) [11], interventions in paediatric rehabilitation typically target specific components or categories of this framework. The key question in evaluating complex interventions is, “Does it work (i.e., is there change in the targeted ICF component)?” [9] Such interventions are often criticised as being a “black box,” as it can be difficult to know why the intervention worked (or not) without examining underlying processes [12]. Thus the second key question, and one that is answered less often, is, “What are the active

ingredients that maximise outcomes (i.e., what makes an intervention work)?” [9,10]. Active ingredients may include specific intervention parameters, such as dosage or intensity, or more general factors, such as therapist–child interaction [13]. The development of operational definitions of the active ingredients allows an intervention to be teachable, learnable and doable in other settings [14]. Understanding how to capture, define and translate active ingredients across interventions and settings is critical to the implementation process [15].

Qualitative research can be employed to reveal how and why an intervention works, including those that seek to alter child, family, or professional behaviour [16]. Specifically, ethnographic methods have demonstrated utility in describing the process of change during an intervention [17,18]. Ethnography is described as the study of social interactions, behaviours, and perceptions that occur within groups, organisations, and communities [19]. While its beginnings can be traced back to anthropological studies of small and rural societies [19], contemporary applications of ethnography have occurred in everyday settings, exploring the nature of a particular social phenomenon [20]. The iterative process of continuous data collection, analysis and reflection make it possible to identify mechanisms that enable the improvement and adaptation of interventions and services [21].

Beitostolen Healthsports Centre (BHC) is a rehabilitation centre in Norway, seeking to enable lifelong activity and participation in local environments for people with disabilities. Rehabilitation practices at the centre are based on theories of adapted physical activity [22] and situated learning [23]. An evaluation of the paediatric program at BHC (the Local Environment Model, LEM) demonstrated that the goal-directed, family-centred intervention improved the performance and satisfaction of participation in physical activities for children and adolescents with a disability and their parents, with these outcomes maintained at three months follow-up [2]. Subsequent investigations have explored intervention mechanisms from the perspectives of children and families [7,8]. While these studies have explained how and why the intervention works from the perspectives and behaviours of those receiving the intervention, of equal importance is understanding mechanisms from those involved in intervention delivery. Therefore, the aim of this study was to explore the perspectives and practices of paediatric service providers in the delivery of a participation-focused physical activity intervention, to define the active ingredients facilitating outcomes.

## Methods

### Design

Adopting an ethnographic approach, the present study incorporated a range of methods [20] including participant observation, interviews and focus groups to explore active ingredients and develop operational definitions.

Ethics approval for this study was obtained from the Princess Margaret Hospital Human Research Ethics Committee (2013099), The University of Western Australia (RA/4/1/6556), and the Norwegian Regional Committee for Medical and Health Research Ethics, section South-East C (2014/1342-1).

### Participants

Participant recruitment occurred through purposive sampling [24] of staff employed at BHC, and paediatric service providers visiting the centre from various locations around Norway. Staff at BHC were invited to participate in the study if they (i) were directly

involved with service provision to children participating in the LEM; and (ii), had been employed at BHC for at least 12 months. Staff at BHC meeting the inclusion criteria were initially informed about the study by the Director of Paediatric Teams, prior to the first authors’ arrival. Following this, selected participants received a written information sheet. Local paediatric service providers (LPSP) were invited to participate if they (i) had a professional relationship with a child participating in a stay at BHC; and (ii), were participating in the three-day course for service providers offered by BHC. Service providers were informed about the study upon their arrival at BHC by the paediatric team leaders and were provided an information sheet if selected to participate.

### Intervention description

BHC is a specialist rehabilitation centre in Norway, striving to enable participation in physical activity for people with disabilities [25]. Programs are designed to change the characteristics of the activity and/or environment within a social context, as a means of facilitating participation in physical activities. Eligibility criteria for participating in the LEM are broad and non-specific; children and adolescents aged 5–17 years with a physical and/or intellectual disability can be referred to BHC. Specifically, the paediatric intervention focuses on co-operation, education and capacity building with children, families and local communities to facilitate long-term physical activity participation for children with disabilities.

The intervention is delivered at BHC, where groups of 8–10 children and their parents stay for 19 days. The children’s stay at BHC is intensive, consisting of physical, social and cultural activities, 2–5 h a day, six days a week. The intervention is based on the child’s goals (e.g., learning to ski), but also designed to introduce children and their families to new and different physical activities and participation experiences (e.g., rock climbing). Three children’s groups (5–17 years), one young adult group (18–30 years), and one adult group (>30 years) stay at the Centre at any one time period, participating in their specific group program simultaneously.

A field team from BHC travels to the community of the children and families one month prior to their stay, engaging children, parents, and LPSP (e.g., physiotherapists and school teachers) within a community in the preparation, intervention and follow-up stages of service delivery. During a child’s stay at BHC, LPSP involved with the child in their local communities are invited to participate in a short training course designed to educate about strategies for adapting environments, connecting paediatric service providers from the same municipality with the goal of encouraging collaboration. These programs are designed to emphasise the role of LPSP as facilitators of a child’s participation in their community.

Following the family’s return to their local communities, the same field team from BHC travels back to the community for a follow up meeting for children, families, and LPSP. This meeting is used to map each child’s progress towards achieving their follow up plan and discuss any barriers families may be experiencing in reaching their goals. The region’s representative from the National Sports Federation (NSF) is also present at this meeting, ensuring any problems that cannot be resolved can be followed up by local communities.

### Data collection

The first author spent a total of 15 weeks at BHC undertaking data collection, over two separate time periods (summer/autumn

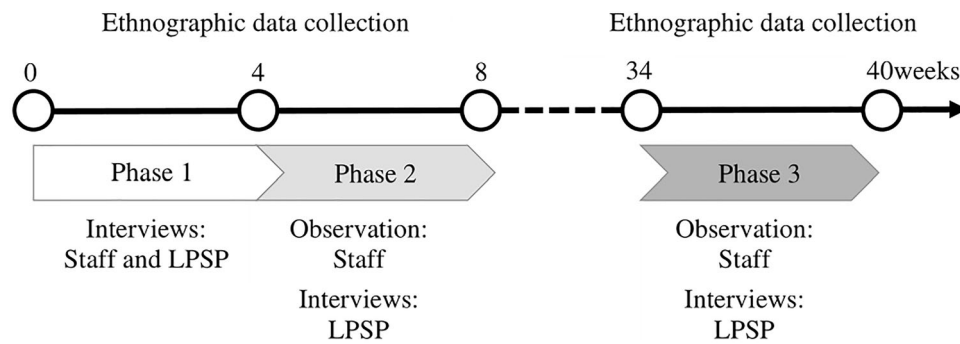


Figure 1. Timeline of data collection in weeks. LPSP; Local paediatric service providers.

and winter/spring), accounting for any intervention-specific seasonal differences (e.g., activities, equipment). The first author lived at BHC, participating in the daily work, social and leisure practices of staff and users of the Centre. Proficiency in the Norwegian language aided in the cultural immersion of the researcher.

Ethnographic fieldwork involved the triangulation of semi-structured interviews, focus groups and observation, employed over two time periods. Interviews with BHC staff were completed in phase 1, and interviews with service providers from around Norway occurred across all phases (Figure 1).

#### Interviews and focus groups

The first author (female, trained in qualitative research methods) undertook all interviews. Semi-structured interview guides were developed in collaboration with a steering group based in Australia. The steering group consisted of nine stakeholders; an adolescent with a disability, parents of children with a disability, health and medical professionals (hospital-based and community providers), representatives from non-government organisations, and a disability policy maker. The interview guide was piloted with a paediatric team leader at BHC to obtain feedback of utility prior to use in data collection. The interview guide covered broad topics for discussion and was revised when new topics were raised during the interviews. Topics discussed during the interviews with staff at BHC and LPSP are outlined in Table 1.

Semi-structured interviews explored the active ingredients of the LEM, based on the perspectives of professionals involved in and/or delivering the program. Interviews were conducted at a mutually convenient time in a private meeting room at BHC. At the time of the interview, the researcher was not known to staff. Depending on the available time and preferences of the LPSP during their stay at BHC, interviews were conducted individually ( $n=2$ ) or in a focus group setting ( $n=5$ ). Interviews and focus groups ranged from 45 to 90 min in duration and were completed in English. The first author transcribed each interview from the recordings verbatim. Copies of the transcripts were sent to participants to check the accuracy of transcription [24], with no alterations requested.

#### Participant observation

During phases 2 and 3, overt observational methods were used to determine relationships between viewpoints from interviews and the actual behaviours of staff. Observations of staff occurred in a range of settings; (i), in the local communities of children and parents participating in a stay at the centre, during the pre- and post-intervention meetings; and (ii), at BHC, during the intake and evaluation interviews, during structured intervention activities (e.g., bike riding, swimming), and periods of informal interactions

and communications (e.g., break times). Observations of staff occurred during the hours of a typical day, 8 am–4 pm.

Observations were documented in the form of field notes, either during or immediately following each observation period. Field notes included descriptions of events, staff behaviours and interactions, informal conversations, and reflections. Field notes were recorded in a paper notebook and structured using the nine observational dimensions (space, actor, activity, object, act, event, time, goal and feeling) [26]. “Society” was added as a tenth dimension, describing observations relating to cultural, language and/or social factors specific to Norway. Following each observation period, field notes were digitally collated and generated into thick descriptions [24]. Thick descriptions included comprehensive and detailed accounts of observations, and explored preliminary relationships with interview data. This allowed reflection and reflexivity to occur as an iterative process during data collection and analysis [21].

Daily contact with participants meant it was possible to check and confirm the meanings of their behaviour and adjust or add to the field notes accordingly. Member checking at the group level occurred in phases 2 and 3. Preliminary results were presented to staff in a workshop format, with their feedback sought to ensure the accuracy of their viewpoints and the researchers’ observations [27].

#### Data analysis

##### Interviews and focus groups

NVivo software (version 11) was used for handling interview and observation data. Interview and focus group transcripts were analysed together with observation data. Transcripts and observations were read multiple times, with meanings emerging inductively from the data [19]. Open coding methods and constant comparative coding were used to synthesise the active ingredients of the intervention identified from interviews [28]. All data was analysed at BHC.

##### Participant observation

Descriptive and thematic analysis of observation data occurred away from the clinical field, but onsite at BHC. This involved elaborating upon, completing and refining descriptions of fieldwork experiences into thick descriptions, reflecting upon the emotional responses of participants and clients, and examining patterns of practice. Observations provided insights into the behaviours of staff, and the interactions, activities, and routines occurring in the BHC setting, enabling the description and linking of ingredients identified from the interviews to actual practices. Triangulation of data demonstrated comparable conclusions from each method, strengthening the internal validity of the interpretation [29] and

**Table 1.** Key topics and example questions within semi-structured interview guide.

Topic	Example questions	
	Beitostolen Healthsports Centre staff	Local paediatric service providers
Model of service	How does the LEM address the goals of children and families? What are the elements of the LEM that contribute to meaningful outcomes for children and families?	What are the elements of the LEM that contribute to meaningful outcomes for children and families? Can you describe any challenges associated with the LEM?
Contextual factors	What is different about BHC compared to services in local communities? What is the impact of having a centralised service?	What is different about BHC compared to services in local communities? What is the impact of being able to observe children at BHC?
Translation to local communities	How are outcomes from BHC translated into the local communities of children and families? What is the role of BHC/communities/families in this process?	What are the needs of local communities? How do you facilitate the child's transition? How do you overcome any barriers?
Practice-related factors	How are staff supported in their roles? What are the best and most challenging aspects of your practice?	Why did you come to BHC? How has this experience influenced your professional practice (if at all)?

BHC: Beitostolen Healthsports Centre; LEM: Local Environment Model.

**Table 2.** Participant demographics.

	Beitostolen Healthsports Centre staff ( <i>n</i> = 13)	Local paediatric service providers ( <i>n</i> = 7)
Gender, <i>n</i> (%)		
Male	5 (38%)	4 (57%)
Female	8 (62%)	3 (43%)
Years in current profession Mdn (IQR)	7.8 (2.4–10.8)	10.8 (5.0–14.0)
Position	APA specialist ( <i>n</i> = 4); Director of BHC; Director of research; leisure coordinator; occupational therapist; physician; physiotherapist; riding instructor; social worker; teacher.	Occupational therapist; physiotherapist; NSF consultant; teacher ( <i>n</i> = 3); teaching assistant.

BHC: Beitostolen Healthsports Centre; Mdn: median; IQR: interquartile range; APA: adapted physical activity; NSF: National Sports Federation.

informing operational definitions emerging from the active ingredients.

### ICF-CY linkage

The second process of coding the findings involved using the original data codes as meaning units, and linking these to the ICF-CY (ICF: Child and Youth version) [30] according to the process described by Cieza et al. [31,32]. These linking rules were devised to enable the linkage of interventions and outcome measures to the ICF-CY [31]. A meaning unit is defined as a specific unit of text, a few words, or a few sentences with a common theme [31]. Meaning units making up each active ingredient were systematically linked to all applicable ICF-CY codes. This involved identifying the meaningful concepts in the condensed meaning units associated with each code. For example the code “learning from each other” was linked to the ICF-CY constructs of “acquiring skills” (d155), and “informal relationships with peers” (d7504). Systematically linking the condensed meaning units to all applicable ICF-CY constructs was completed through a process of consensus between two authors (CW and SG). The authors completed the first third of the linking process together, with 100% agreement. CW completed the remainder of the linking independently, with discussion and review by SG to resolve uncertainties. Sums of identified meaning units and meaningful concepts were calculated, and expressed as percentages linked to ICF-CY components, chapters, and categories. Frequencies of ICF-CY codes making up the active ingredients were analysed to identify trends.

### Trustworthiness

Several measures were employed to ensure trustworthiness [24]. Triangulation of data collection methods, and triangulation

between investigators, enhanced the credibility of the research. Member checking with study participants, the researcher documenting reflections in a journal, prolonged engagement at the site, and peer debriefing with all investigators in the interpretation of findings, also contributed to credibility. Employing qualitative methods in tandem and eliciting similar results enhanced the stability and dependability of study findings, with purposive sampling enhancing transferability. Results were also presented to a consumer-driven steering group in Australia as a method of confirmability [24].

## Results

### Participants

All participants accepted invitations to participate in the study, and all provided informed consent. Thirteen staff from BHC and seven paediatric service providers from various regions of Norway participated in the study. Over the data collection phases, six professionals came to the centre to participate in the three-day course. A regional consultant from the NSF was also included. The NSF consultant visits every paediatric group in the final week of their stay to assist in linking children and families to sport and leisure opportunities in their local communities. Participants were employed in a broad range of positions with a range of experience, which is reflective of the staff structure at the centre. Demographic information is detailed in Table 2.

### Identification of active ingredients

The data analysis process revealed fourteen active ingredients. Active ingredients were categorised according to whether they related to the intervention (*k* = 8), the organisation (*k* = 4), and



the individual ( $k=2$ ). Tables 3–5 summarise the active ingredients, the ICF-CY linkage codes relating to the meaningful concepts within each ingredient, and proposed operational definitions.

### Concepts from qualitative analysis

In total, 113 unique meaning units were identified. A total of 148 meaningful concepts were derived from the meaning units. Of these meaningful concepts, 84% were linked to a total of 53 unique ICF-CY categories from the first to the fourth level of the classification. Twenty-six categories belonged to the ICF-CY chapter of “environment,” and 26 categories belonged to “activities and participation.” No categories related to “body functions” or “body structures.”

Nine concepts were not classified on the level of ICF-CY categories but could only be linked to an ICF-CY component in general. These 9 concepts were all linked to the ICF-CY component “personal factors” (pf). The remaining 23 concepts could not be linked to any ICF-CY component or category (nc).

### Environment

The greatest contribution of meaningful concepts within the active ingredients were categories within the component of the environment ( $k=77$ ). All five chapters of the environment were represented in the meaning units of the active ingredients (Tables 3–5). Seven of the eight active ingredients relating to intervention design contained codes of categories within the chapter “support and relationships” ( $k=33$ ). Concepts relating to “services, systems and policies” ( $k=16$ ) contributed mainly to active ingredients relating to the intervention, and codes within “natural and human made changes” related to active ingredients at the organisational level. Categories within “attitudes” ( $k=14$ ) and “products and technology” spanned across both active ingredient categories.

### Activity and participation

Eight of the nine chapters of the component “activities and participation” were represented in the meaning units of active ingredients. “Interpersonal interactions and relationships” was the most frequently coded chapter within this component ( $k=17$ ). “Learning and applying knowledge” and “community, social and civic life” contributed to active ingredients relating to the intervention and organisation. The remaining chapters made minimal contributions to the active ingredients. The majority of meaningful concepts in the active ingredients relating to the individual were linked to categories within this component.

### Other

Nine concepts were related to the ICF-CY component “personal factors.” This is not further specified in categories, but recommended by Ceiza et al. to be coded if the concept is encompassed within the ICF-CY definition [30,31]. In this component, concepts relating to age, gender and outcomes of being a part of a group (e.g., fun), were explored by staff at BHC as mechanisms contributing to intervention outcomes.

Some concepts contained in the meaning units ( $k=23$ ) could not be linked to any of the ICF-CY components as they were not covered by a specific ICF-CY category (e.g., knowledge translation, time-related aspects, and specific characteristics of the health service). The concept of “diagnosis” was coded as not covered (nc-hc), as recommended by Cieza et al. [32]. The concept was identified by six participants whilst describing the components of LEM groups participating in the intervention.

The frequency of the total number of ICF-CY categories coded ( $k=125$ ) within the active ingredients can be seen in Figure 2.

## Discussion

This study identified the active ingredients of an intervention facilitating participation in physical activity for children and youth with a disability [2]. The active ingredients identified by health professionals were organised into three categories; the intervention, the organisation, and the individual. Concepts derived from qualitative analysis and linked to the ICF-CY highlight the role of the environment, and specifically the role of support and relationships, in enabling physical activity participation for children and youth with a disability. Rather than promote replication of this intervention, this study defines mechanisms that may guide the design and implementation of programs in alternative settings to promote and sustain physical activity behaviours.

Linking the intervention to the ICF-CY verified the substantial role of the environment. While all five chapters of the environment were represented in the meaning units of the active ingredients, the majority contained codes within the chapter “support and relationships.” This is consistent with Anaby et al. [34], who demonstrated that all environmental domains in the ICF-CY influenced a child’s participation, with social support being the most common facilitator. Of interest, active ingredients that contained meaning units coded within services, systems and policies also contained codes relating to support and relationships. These meaning units related not only to the health service (e580), but also association and organisational services (e5550) and education and training services (e5850), reflecting the cooperation between community-based health services, leisure and sporting associations, and universities. In practice, “relationship-centred care” [35] is an approach we may need to consider to optimise physical activity participation; a network of relationships not only between children, families and health professionals, but also considering peers, mentors, and services in the community.

There were no meaning units that related to codes in the body functions or structures components of the ICF-CY. In the LEM intervention, function is not a primary intervention target, nor considered a barrier; everybody of any ability can participate. This finding in itself may be a good indication of intervention fidelity, that the staff deliver the intervention as it is intended. While functional improvements may not be an intervention target, it has been identified as an outcome of participation-focused interventions, in this context [7], and others [36]. Together, these findings should encourage clinicians to consider the bidirectional nature of participation (a process and an outcome of interventions) [37], to support children and young people with disabilities achieve their healthy, active living goals.

There is limited literature specifically describing the active ingredients of participation interventions for children with disabilities. Imms et al. [38] explored the intervention strategies that appeared effective in attaining the majority of sport and recreation goals for adolescents with a disability. Similar to our intervention, it was goal-directed (by the child), focused on changing the environment rather than the individual, and there was engagement with communities. For some participants, the intervention was also conducted within a group [38]. Whilst the active ingredients we identified in this study are not ranked in any order of importance, the group-based design was identified by all participants as a crucial component of what happens after the intervention; children and families develop strong social relationships, and create their own support network to encourage ongoing

Table 3. Active ingredients: intervention.

Ingredient	ICF-CY linkage code(s)	Example quote	Operational definition
Group-based	e215, e310, e320, e325, e5800, d155, d7400, d750, d7500, d7502, d7503, d760, d8801, d8803, d9100, d9205, pf, nc, hc-nc	<p>"They want to do activities with other children. That really means something to them. So you have to focus on pleasure in activities, and not only on health and improvement. So that's our philosophy, and is also why we do the activities in a group with their peers" – BHC staff member</p> <p>"It's easier to start something at home because you begin in a group here. Together in a group that will also be together when they go home" – BHC staff member</p>	Children's groups are made up of children from the same municipality. Groups may consist of a range of diagnoses and functional abilities. Ensuring similar ages of children within the group is considered important. Groups facilitate peer-based learning opportunities.
Activity-based	d1, d2, d155, d1751, d5701, d880, d920, d9201, e1401, e5800, e215, e460, e350, e220, e2100, pf	<p>"They try many different activities [at BHC] so they find one or many they think are good" – BHC staff member</p> <p>"You have to have these opportunities for great intensity in training to be able to learn" – BHC staff member</p> <p>"A lot of the magic happens outside of the activities, the informal learning. All of these kids running around at 8 pm – that's their choice" – BHC staff member</p> <p>"We aren't focusing on rehabilitation. Our goal is to socialise, to create a friendly atmosphere, and offer different activities than what they otherwise do during the day. That's the difference" – BHC staff member</p>	Children participate in a variety of physical activities. Children participate in between 36–72 h of activity during the intervention. Opportunities exist for unstructured and informal activities to transpire.
Mutual engagement	e325, e355, e360, e450, e455, e5550, e5551, e5800, e5850, d155, d330–d349, d820, nc	<p>"But this interaction between the local community staff and our staff, that we go to them and they come to us, I think it's key to the model's good results ... to be sustainable, it has to be equal" – BHC staff member</p> <p>"... Working with the local service providers and the student [health professionals], who will one day be the service providers, it is important to make sure something happens when [families] leave" – BHC staff member</p> <p>"We must use what we have learned up here and the experience we have had so we can share it together back in the towns that we come from" – LPSP</p>	Engaging in equal relationships with communities to enhance translation and sustainability of physical activity participation into home, school and community environments. There is focus on cooperation, education and resource capacity building in partnership with services in local communities.
Multidisciplinary teams of skilled personnel, including students	e325, e330, e355, e360, e450, e5800, d740, nc	<p>"There is a lot of overlap. But we need to have one sport instructor and we need one physiotherapist. They each bring something different to the team" – BHC staff member</p> <p>"We really need the students. Because some of the children have very individual needs so we need the students. It would not work as well without them, not at all" – BHC staff member</p> <p>"Everyone is equal – doctors aren't seen as superior to anyone else. It's a level playing field, because everybody's input is essential" – BHC staff member</p>	Rehabilitation teams are made up of skilled physical activity specialists, and other allied health professionals. Students across all allied health disciplines are assigned with a team. Formal communication within the teams occurs daily.
Family-centred	e310, e355, nc	<p>"Because the kids and parents are here to learn activities that they can do at home, so it's important to have the parents in the activities so they can do it together when they go home" – BHC staff member</p> <p>"When the family goes home, they often say, 'Wow we can do so much more than we thought because we came here.' And it's so important for the families to do something together. Not so that the mother stays at home with the child with CP because he can't go. Here, they realise and they learn that they all can go" – BHC staff member</p>	Families are incorporated into assessment and intervention. Parent and siblings participate in some (not all) of the activities to ensure that skills and activities acquired during the stay are able to be translated into the family lifestyle. Education is provided to parents on how to make changes to their local environment to facilitate their child's participation in physical activity.
Goal (child)-directed	d330–d349, pf, nc	<p>"The most important thing is to involve the kids in the process. So it's a setting where they can talk about [goals]. The parents also have the chance to say those things too, after the children. Children first! Always" – BHC staff member</p> <p>"We make sure the children's voices are heard, giving the children the possibility to choose the activities they want, so they have the motivation and the opportunity to be in activities that they want and to participate in something that is important to them, but in a good way and a fun way" – BHC staff member</p>	Primary outcome measures are goal-based. Goal setting is collaborative between families and staff, but directed by the child. Children are given the opportunity to express their wants, hopes and goals, to facilitate participation in physical activities meaningful to them.
Evaluation	e5801, e5802, nc	<p>"But the rehabilitation field, especially this part of the field that is focusing on participation, it's not that easy to say 'oh we are succeeding' " – BHC staff member</p> <p>"I think the very best part is the follow up this model allows. It means that three months after their stay here, we can go and check how they are going. And if they are having problems, we fix it there and then. We identify the problem and work together to solve it, to make sure what they learnt with us can continue at home" – BHC staff member</p> <p>"Sending out a questionnaire will give us numbers, but it doesn't capture the magic" – BHC staff member</p>	Assessment is strengths-based, and collaborative with children, families and communities. Focus on identifying barriers and facilitators related to task and environment (pre-, during and post-intervention). Evaluation of the intervention through formal (outcome measures, interviews, intervention protocol) and informal (feedback, observations in activities, self-evaluation) methods.

(continued)

Table 3. Continued.

Ingredient	ICF-CY linkage code(s)	Example quote	Operational definition
Support for stakeholders	e3, e310, e340, e355, d7503, pf	<p>"... I feel I can discuss things with anyone. We have a lot of supportive functions in the teams that help us find information if we need it" – BHC staff member</p> <p>"It's good to get to know the other professionals working in your community ... for us to share ideas, for cooperation, and to ultimately provide the best service" – LPSP</p> <p>"The parents talk together and create their own supportive environment" – BHC staff member</p>	Support networks for staff, visiting paediatric service providers, parents, siblings, and children. This may be in the form of training, regular meetings, access to information, connecting like-others, opportunities to share experiences, and ongoing communication post-intervention.

ICF-CY: International Classification of Functioning, Disability and Health: Child and Youth; pf: personal factor; nc: no code; BHC: Beitostolen Healthsports Centre; LPSP: local paediatric service provider.

Table 4. Active ingredients: organisation.

Ingredient	ICF-CY linkage code(s)	Example quote	Operational definition
"The history is in the walls"	e450, e460	<p>"Erling Stordahl, who started this ... he had a unique way of creating and running this Centre and being a leader. So people say the same thing, that he is still living here, that his spirit lives on. We, in some unwritten way, bring that out a little" – BHC staff member</p> <p>"I think the whole environment is filled up with good feelings. It's the history in the walls" – BHC staff member</p>	Transformational leadership [33] defines organisational behaviours. This includes building identification with the leader's vision, challenging staff to think differently, inspiring staff to extraordinary efforts, and building confidence in families and communities.
"No limit to possibility"	e450, e430, d7200	<p>"They [the children] say 'no we can't' and we [BHC staff] say 'yes you can'" – BHC staff member</p> <p>"The focus is very much on [physical] activity and participation, giving the children the possibility to be more active in their daily life" – BHC staff member</p> <p>"Instead of changing the individual, you adapt the activity to the individual" – BHC staff member</p> <p>"You are not focused on the diagnosis. You are more focused on what [children] can do" – BHC staff member</p>	Staff embody a strengths-based attitude. Focus is on changing the characteristics of the task and/or environment to facilitate participation. This may be in the form of adapting the activity, using assistive or adaptive equipment, individual instruction, and training others in how to facilitate this. Enabling the opportunity to participate is emphasised.
Across the lifespan	e7503, d7504, e325	<p>"[The children] say they have someone to look up to and see that it works to be an adult also. That you can have a good time and exercise and have friends and everything" – BHC staff member</p> <p>"The effect is positive both ways. The adults observe and get to know the children for their own reflection about their own situation. And from the children's side, to see adults with the same disability, to understand that I am going to have this thing when I grow up. Some children think that this [disability] will go away when they are an adult. And adults with wheelchairs teach tricks to the younger ones ... they learn from each other" – BHC staff member</p>	Adults with disabilities participate in physical activities in separate groups. There is no formal or organised interaction between child and adult groups. Adult and child groups coexist in daily life during a stay at BHC.
The physical environment	e2100, e210, e220, e225, e1400, e1401, e155, e1550, e1552 d910, d9100	<p>"The area we have is quite flat, it has been adapted to the users' abilities ... so it gives opportunities to be active in the [built and natural] environment" – BHC staff member</p> <p>"A lot of the equipment we have is standard equipment. You find it in everyday school. So when we have those local service providers come up here, a lot of that time is used to show them that they can do a lot with the equipment they already have. Of course, we have some special equipment ... but most of the time it's about showing them that it exists" – BHC staff member</p> <p>"It's a community they can come to and just relax. A lot of them say that their shoulders go down and they can just be themselves" – BHC staff member</p> <p>"They often talk about this bubble that they have to burst out of, and go home. So it's back and forth this institution system ... there are some pluses and some minuses" – BHC staff member</p>	The built and natural environment is accessible. Equipment (including adapted or specially designed equipment) is available. Characteristics of the human environment are centred on "creating a community."

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physical activity participation in their local communities. The importance of groups, and specifically a community of practice, has also been identified by parents as a key ingredient that supports the maintenance of physical activity participation in the longer term [8]. As interventions alone are not enough to sustain outcomes, this may be a key consideration for clinicians in their attempts to support children, youth and families in creating life-long activity habits.

Active ingredients related to the attitudes and behaviours of health professionals are important to highlight. The interactive nature of most rehabilitation interventions suggests that therapist behaviour and characteristics are mechanisms for effectiveness [13]. In this study, transformational leadership [33], a multidisciplinary team, and a strength-based approach [39] were identified as intervention and organisational features that led to optimal outcomes. This is similar to literature describing qualities of



Table 5. Active ingredients: individual.

Ingredient	ICF-CY linkage code(s)	Example quote	Operational definition
Mastery experiences	d155, d750, d8800, d8801, d8803, pf	"I see how happy the kids get when they can do something. Because a lot of these kids don't think they can do all of the things other kids can do. But when they see they can do it, then their face are like ... glowing" – LPSP "This is not treatment, this is not therapy, this is learning" – BHC staff member "Everyone gets to achieve something" – BHC staff member	Several mechanisms create mastery experiences for children. These include; a variety of activities, individualised goal setting, child's preference for activities, opportunity for practice, feedback, learning from and with peers, and opportunities for success.
Friendships	e320, d7500, d9205	"Some of [the children] haven't got friends or have never had a friend ... so it's much more than just swimming, canoeing, and biking" – BHC staff member "And when they arrive back home, they have their friends who they can do their activity with and they're not the only person with a disability" – BHC staff member	The development of friendships is promoted through the group-based model, and opportunities for unstructured activities. The environment facilitates positive social experiences. Children are from the same communities, enabling the continuation of friendships after the intervention.

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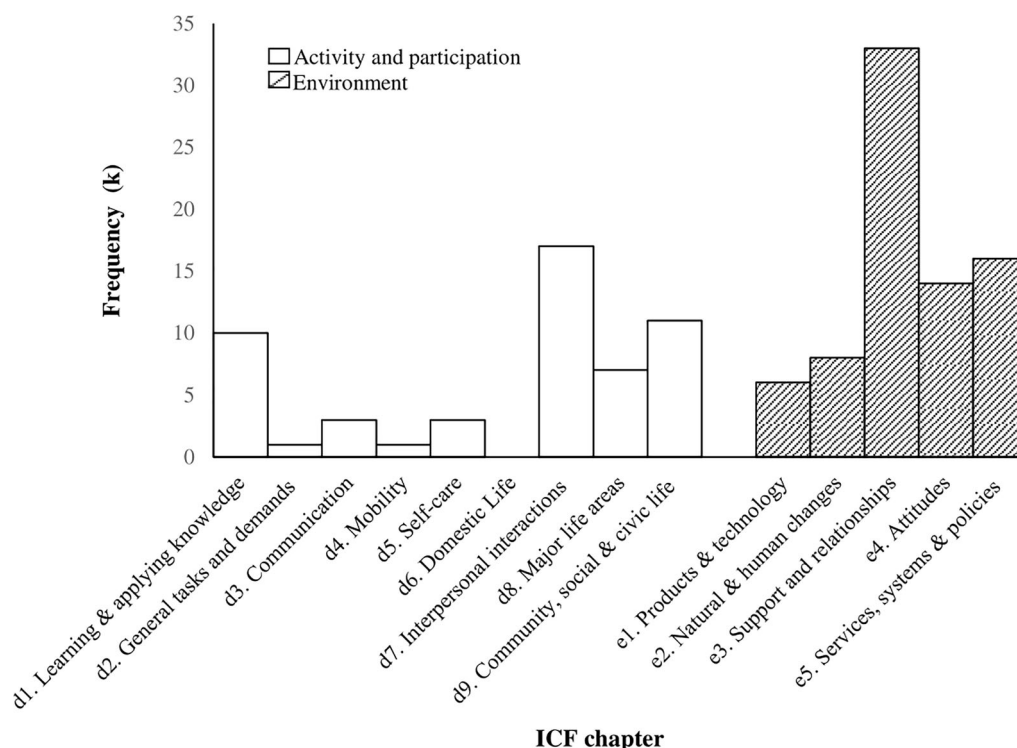


Figure 2. Frequency of ICF-CY categories, by chapter, represented in the active ingredients.

physical activity interventions for overweight and obese children and adolescents, where in addition to emphasising a multidisciplinary approach, "choice of fitness trainer matters" [40]. With clinicians proposed as the missing link to sustainable community-based physical activity participation for children with disabilities [41], it is integral that health professionals are able to effectively embody a supporting role in the learning and empowerment process for children and families.

In order for participation to continue following targeted interventions, resource capacity building in partnership with services in local communities is essential. As emphasised by Brunton, simply providing information to families is not enough [41]. Optimising physical activity participation may require clinicians to attend initial sessions of community activities together with the child, establish interprofessional communication and support networks (including physical activity specialists [42] and community leisure services [43]), and utilise local funding opportunities that support individuals to meet goals relating to participation in

community, social and recreational activities. We acknowledge this may represent a deviation from conventional practice, and will likely require investment from policy and healthcare decision makers to be financially sustainable.

From a methodological perspective, the combination of observational and interview methods enables researchers to explore both what is described and what occurs in practice, and (of particular relevance in disability) to examine the transactions between individuals and their environments. In this study, the first author was an overt observer, participating and coexisting within the same context as the participants. This approach provides increased opportunity for in-depth discussion and observation of everyday actions and allows processes (rather than outcomes) of practice to be explored [44]. However, the influence of the researcher's presence on participant behaviour, including the potential of more favourable responses from participants, must be acknowledged. This is a challenge in health service settings where participant consent to observation is, ethically, essential [45].

In this study, prolonged engagement at the site and daily contact with the researcher may have allowed BHC staff to adjust to and overcome any distortions constructed by the researcher's presence. For researchers engaging as participant observers, it is also essential to acknowledge the impact of their own beliefs as a source of bias. Utilising structured frameworks such as Spradley's dimensions of observation [26], reflexive journaling and peer debriefing (with researchers away from the site) are processes that can support data confirmability.

There are a number of limitations with this study. This research was conducted in one rehabilitation centre in one country, making further investigation into identifying active ingredients of effective interventions in other settings desirable. This study was also limited in its access to community-based paediatric service providers, which may have limited what we know about the needs and behaviours of this group. However, the involvement a steering group (including community-based providers) in the development of interview guides, and the exploration of how these active ingredients could be applied in other settings, may denote the relevance of the outcomes. Lastly, the ICF-CY linking process includes an element of subjective interpretation about meaningful concepts within an intervention and their corresponding ICF categories. Although two authors completed the process with minimal variation, this is acknowledged as a potential limitation.

## Conclusion

Given that participation is a multidimensional construct, and participation is intimately linked with context and the environment, there cannot be one recipe for success. However, understanding the mechanisms that are effective at improving outcomes is a required, and often neglected, step in advancing evidence-based practice. The active ingredients and operational definitions described in this study may guide families, exercise specialists, health professionals, and policy makers in the design and implementation of programs that optimise participation in physical activity for children and youth with disabilities. The environment, and specifically support and relationships, may be essential considerations for the promotion and sustainability of outcomes.

## Acknowledgements

The authors wish to thank all of the participants who took part in this study. We wish to thank Team Leader Tor Erik Nyquist (MSc) for his assistance in the organisation of data collection. In addition, we wish to acknowledge The Participate Project Steering Group for their valuable input, direction and discussion. A Princess Margaret Hospital Foundation scholarship supported the first authors' time compiling this article.

## Disclosure statement

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

## ORCID

Claire Willis  <http://orcid.org/0000-0002-3794-2902>  
 Siobhan Reid  <http://orcid.org/0000-0002-2589-3576>  
 Reidun Jahnsen  <http://orcid.org/0000-0002-0694-0410>  
 Sven Bölte  <http://orcid.org/0000-0002-4579-4970>  
 Sonya Girdler  <http://orcid.org/0000-0001-7992-0800>

## Data availability statement

The authors obtained ethical approval for this study from Princess Margaret Hospital, The University of Western Australia, and the Norwegian Regional Committee for Medical and Health Research Ethics under the condition that data be kept confidential. Participants were also recruited under the same conditions. Aggregate anonymised datasets will only be made available from the corresponding author on request, and with ethical approval.

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