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RESEARCH ARTICLE

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Psychometric evaluation of the web-based physical participation instrument ActiveYou II in children and adults with disabilities

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ABSTRACT

Background: Ensuring inclusive participation in daily physical activities is crucial and valid and reliable instruments are needed.

Aim: To evaluate the test-retest reliability and internal consistency of the self-reported web-based physical participation instrument, ActiveYou II.

Material and Methods: Reliability was examined in 41 children (mean age 10,5 years), and 41 adults (mean age 49 years) with disabilities using intraclass correlation coefficients (ICC), Kappa statistics, percentage of absolute agreement, and Cronbach's alpha.

Results: The test-retest reliability was good for the participation frequency scores (ICC; 0.66 to 0.95) and moderate for the skill-competency and involvement scores (ICC; 0.43 to 0.89). The alpha values for internal consistency were acceptable for the frequency (α = 0.749), skill competency (α = 0.833), and involvement scores (α = 0.795).

Conclusions: ActiveYou II demonstrated good psychometric properties, indicating its potential to inform intervention planning and enhance service provision for individuals with disabilities. Lower reliability in skill competency and involvement scores suggests these factors are transient, varying with experiences, well-being, and mood. ActiveYou II maps and evaluates the interaction between individual and environmental factors, enhancing understanding of participation in physical activities.

Significant: Leveraging insights from ActiveYou II, stakeholders can enhance participation in physical activities and well-being for individuals with disabilities, thereby fostering a more inclusive society.

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Disabled persons; involvement; measurement; physical activity; reliability

Introduction

In today's inclusive society, ensuring the participation of all individuals, regardless of their abilities, is paramount [1]. To achieve this, valid and reliable participation instruments are essential. Participation is vital for maintaining a democratic society and interventions should focus on empowering people to act. Children and adults with disabilities participate less in everyday activities and exhibit more health problems than typically developed peers [2–4]. In Norway, the estimated proportion of people with disabilities ranges from 3% to 20%. These individuals often face barriers to participating in preferred physical and social activities, which become more pronounced with age [4–6]. These challenges not only affect their participation but also have long-term health implications, such as poorer opportunities for physical and social well-being [7,8] and increased risk of mental illness [2,7]. To achieve health-promoting effects and prevent ill health the World Health Organization recommends that all individuals should participate in moderate to vigorous physical activity for 75–150 min per week (WHO). However few children and adults with disabilities reach these recommendations [9]. Physical participation varies across the lifespan, with children with disabilities being the most active in organized sports. Adolescents and young adults often drop out, particularly females, while adults tend to shift towards individual leisure and fitness activities [10,11]. Children's participation patterns are strongly influenced by their developmental stages, motivation, and by the family's interests and time [12]. Adults with disabilities often have greater independence and responsibility for their

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physical activities. Further, adults with disabilities often face more health-related barriers, such as increasing issues with pain and fatigue and up to 50% of adults with CP report experiencing deterioration in walking function, reduced muscle strength, reduced cardiorespiratory functions and fitness [13]. Commonly used measurements of participation in everyday activities in children are, The Child and Adolescents Scale of Participation (CASP) [14], the Children's Assessment of Participation and Enjoyment (CAPE) [15] and the Participation and Environment Measure for Children and Youth (PEM-CY) [16] and in adults' the Assessment of Life Habits (LIFE-H) [17] and the participation scale (P-scale) [18].

Due to the limitations and health challenges faced by individuals with disabilities, participation in physical activity is often one of the most important treatment goals, for children and adults with disabilities, their families, and therapists [19]. Valid and reliable instruments are essential to plan, implement, and evaluate interventions to increase participation in physical activities [20,21]. In a systematic review, Adair et al. [20] pointed out that measures must follow the developing understanding of the participation construct and that the individual's subjective perspectives are often missing. Similarly, Martin et al. [22] emphasized that subjective perceptions, such as autonomy, belongingness, challenge, engagement, mastery, and meaning, should be integrated into both the conceptualization and operationalization of participation. The Participation-Related Construct (fPRC) framework elaborates the comprehension of participation where the construct is defined as two dimensions: attendance and involvement [23]. Attendance is defined as 'being there' and referred to as frequency and diversity. In contrast, involvement is the 'experience of participation while attending' and includes emotional characteristics, such as motivation, engagement, persistence, and social connection [23]. The fPRC framework describes intrinsic factors such as activity preferences, skill competencies, and sense of self as well as extrinsic environmental factors to influence participation in a bidirectional reciprocal way [23].

To understand the children's and adults' participation, they should be treated as experts in their lives [24,25]. Therefore, the evaluation of participation should ideally be based on self-report thus proxy reports of participation may have a poor correlation with the self-reported views [26]. Moreover, measures need to be appropriate for specific settings and regions, since factors influencing participation may vary between national and international settings [11].

To date, there is no valid web-based instrument of participation in physical activities for the Norwegian setting based on the child's, youth's and adult's self-report. Nor instruments that measure the reciprocal influences of intrinsic and environmental facilitating and hindering factors for physical participation according to the fPRC framework. To operationalize the fPRC framework, two web-based self-report instruments have been developed: "ActiveYou I" and "ActiveYou II" [27,28]. ActiveYou I focuses on activity preferences, reflecting a key intrinsic factor [27]. ActiveYou II complements this by assessing actual participation in the same activities, capturing both "attendance" (e.g. "How often do you do this activity?") and "involvement" (e.g. "How fun is this activity?"). In addition, ActiveYou II includes a measure of "skill competency", (e.g. *How good do you think you can do the activity*?) the individual's perceived ability to perform a given activity, which grounded in the fPRC framework as a central intrinsic factor influencing participation. The inclusion of skill competency is particularly important, as it represents a meaningful and sensitive outcome variable when evaluating the effects of interventions. Perceived competence reflects the individual's confidence and self-efficacy in relation to physical activity, constructs that are modifiable through therapeutic or educational efforts [29]. As such, it provides valuable insight into the individual's evolving performance and makes it relevant in rehabilitation settings where enhancing participation is a primary goal.

By incorporating both intrinsic and extrinsic factors, the instrument enables a nuanced understanding of participation and supports the planning and evaluation of interventions [12,27]. Since ActiveYou II is designed to be used both as a mapping tool and as an outcome measure for treatment of physical participation interventions, the internal consistency and the stability of the results between two occasions when no change is expected is important to measure [30,31].

This study aimed to determine the test-retest reliability and the internal consistency measurement properties of ActiveYou II.

Material & methods

A psychometric study of the web-based self-reported instrument of physical participation the ActiveYou II was performed according to the COSMIN guidelines [32]. Reliability indicates if the measure is stable and precise in different situations and times [33], and retest reliability refers to the stability with which measurements acquired from the same person can be

reproduced on a distinct occasion. The time interval between the two measurements should be short enough that no true change has occurred but long enough to reduce the effects of practice or recalling answers [34,35] The study has been approved by the Norwegian Centre for Research Data NSD Dnr: 783067 and the procedure complied with the Helsinki Declaration of Medical Research.

Participants

Children with disabilities aged 3 to 17 years and adults with disabilities with no, mild or moderate cognitive impairments and with an ability to understand Norwegian were included. All the participants intended to participate in a three-week intensive rehabilitation period at Beitostølen Health Sports Centre (BHC) in 2021. In total, 105 adults and 72 children were invited to participate in the study.

The ActiveYou II was distributed digitally two weeks before the participants arrived at BHC with instructions on how to administrate the instrument. The instrument was then distributed a second time within 14 days. The ActiveYou II was available with an account and password unique for each participant.

ActiveYou II

To our knowledge, ActiveYou II is the only Norwegian web-based participation instrument for children and adults based on the fPRC model. Previous attempts to validate Norwegian versions of the Children's Assessment of Participation and Enjoyment (CAPE) and Preferences for Activities of Children (PAC) faced issues with fit and administration, especially for children with intellectual disabilities. Additionally, the publisher declined to publish the Norwegian versions due to the small market [36]. Consequently, ActiveYou I and II were developed [12,27,28]. ActiveYou II aims to be a self-reported instrument to capture children's, youths' and adults' participation patterns in physical activities. The reason ActiveYou II is web-based is to facilitate easy administration, such as sending it to participants to complete at home, for example, before a rehabilitation intervention. Another reason for the web-based format is that the images of activities can be easily replaced, updated, and adapted to specific contexts. However, the instrument can be administered in paper version in a specific context if wanted. In the development process of ActiveYou II, group interviews with children, parents, and professionals were conducted to identify important facilitators and barriers to participation in physical activities to be included in the instrument [12]. Children and adults with disabilities are expected to administer ActiveYou II themselves or with assistance, and to answer, participants log into a password-protected homepage. The questionnaire can be administered from any device that supports standard internet browser applications. The 16 activities included in ActiveYou II are the same as in ActiveYou I; pool activity, water activities outdoors, training in a fitness room/centre, moving to music, gaming for training (e.g. Happy Rehab, Wii Sports, Let's Dance…), cycling, climbing, horseback riding, cross-country skiing, downhill skiing, skates, going for a walk/hiking, outdoor activities, group activities, individual activities, play outside. The selected activities are based on the most frequent activity goals that children and adults have indicated they wish to learn during a rehabilitation stay at BHC [27]. These activities represent common organized and unorganized physical activities that can typically be performed in or near one's place of residence during different seasons of the year. All activities are visualized by a slideshow of three photos that show the activity at hand with different performance modes with and without assistive activity devices. For each activity, questions are raised about [1] the frequency of attendance [2], with whom you participate [3], if the activity is organized/or informal [4], the activity competence [5], the level of involvement [6], facilitating intrinsic and environmental factors, and [7] hindering intrinsic and environmental factors (Figure 1). The item, "play outside" has been excluded from the adult version of ActiveYou II. Cognitive interviews have been conducted with nine children with disabilities published in a previous study [28] and with a group of adults with disabilities. Overall ActiveYou II was found to be easy to answer, and only minor adjustments were made thereafter, such as merging some response options regarding hindering and facilitating factors. This was done to reduce the risk of fatigue. Some photos were also replaced to better illustrate the activity. See ActiveYou II in Figure 1

Data analysis

All analyses were conducted using Stata Statistics software, Release 18, (College Station TX:StataCorp LLC) In the analysis, the value on the activity competence and level of involvement was set to "0" if the participants did not attend the activity.

Reliability coefficients quantify the degree of agreement between raters or test occasions, provide information about the extent to which a measure can be replicated, and include both a degree of correlation

Item	How often do you do this activity?	
1a	- More than 2 times a week - 1 or 2 times a week - 1 to 3 times a month - Less than 1 time a month - never	
1b	Is this as often as you like it? (smileys) - Disagree (negative) - Neutral - Agree (positive)	
2a	With who to you do the activity? - Alone - With family - With friends - With oters	
2b	Do you like it that way? (smileys) - Disagree - Neutral - Agree	
3a	How do you do the activity? - Organized - Self-Organized	
3b	Do you like it that way? (smileys) - Disagree - Neutral - Agree	
4	How good do you think you can do the activity? (Smileys) - Strongly Disagree (Strongly negative) - Disagree (negative) - Neutral - Agree - Strongly Agree	
5	How fun is this activity? - Strongly Disagree - Disagree - Neutral - Agree - Strongly Agree	
6	What makes it easier for me to participate (Multiple answers possible) - I have someone to participate with - The others respect me - I have a personal assistant or leisure assistant - I can do the activity nearby where I live - I have the equipment I need - other	
7	What makes it difficult for me to participate (Multiple answers possible) - I don't manage the activity - I'm too exhausted - I experience pain - I feel insecure - Nobody can assist me - I don't have the equipment I need - The activity is not available nearby where I live - The date does not work for me - To expensive - Other - There is nothing that makes it difficult for me to participate	

Figure 1. ActiveYou II content.

and agreement between measures [21]. The intraclass correlation coefficient (ICC) provides a ratio between a true variance and an error variance. For this study, the ICC, a two-way random-effects model with absolute agreement was used to calculate test-retest reliability and 95% confidence intervals (CIs). The ICC was calculated for each item individually for the combined sample and separately for the groups of children and adults. Separate analyses were conducted for children and adults to account for developmental

differences, variations in participation patterns, and distinct contextual factors that may influence the reliability and validity of the instrument across age groups. ICCs were interpreted as follows: poor (<0.5), moderate (0.5–0.75), good (0.75–0.9), and excellent (>0.9) [37]. Since ActiveYou II provides data on an ordinal scale level, Quadratic kappa analyses were also carried out. Values ≤ 0 indicating no agreement and 0.01–0.20 as none to slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1.00 as almost perfect agreement [38]. The percentage of absolute agreement was calculated for each item using frequency, involvement, and skill-competency scales. A value ≥75% was considered acceptable [39].

The internal consistency of all individual items included in ActiveYou II and the total score was calculated using Cronbach's alpha, which indicates how closely related a set of items are. A reliability coefficient of 0.70 or higher is acceptable in most social science research [40]. The statistical analyses were calculated for all participants and children and adults separately. Descriptive data on the participants are presented in Table 1.

Regarding the fPRC framework it is interesting to look at the correlations between the domains of Frequency and Skill-competency, and between the domains of Skill-competency and Involvement. Spearman's rho (ρ)was used to calculate correlation due to ordinal data scores and a rather small sample [38]. In this analysis, Spearman correlation coefficients (ρ) were interpreted using the following thresholds: values below 0.30 were considered weak, 0.30–0.49 moderate, 0.50–0.69 strong, and 0.70 or above very strong. These cut-offs were used to assess the strength of association between variables and to guide interpretation of the results.

Results

In total, 41 (57%) children with disabilities (54% girls, mean age of 10.5 years, range 3–17) and 41 (39%) adults with disabilities (54% women, mean age 49.2 years, range 19–73) participated in the ActiveYou II study. Participants completed the questionnaire twice within a 14-day interval. However, five children and seven adults did not complete both test and retest questionnaires and were excluded. Demographic characteristics of participants included in the analysis and those who were excluded, are summarized in Table 1. Due to challenges in the data collection, there are missing data regarding participants primary health and developmental diagnosis/problems. However, all the participants had different disabilities with no, mild or moderate cognitive impairments. In the group of children and adolescent two children answered alone, 24 received support and 15 were solely answered by proxy the first time. At the re-test, four answered alone, 21 received support and 16 were solely answered by proxy.

To examine whether participants shifted their engagement in specific activities over time, the percentage of responses that remained in the same category across two time points was calculated. A total of 89.1% of responses remained unchanged, indicating a high level of consistency in activity engagement.

Descriptive statistics on activity frequency, including counts and percentages, are presented in Table 2. More than half of both children and adults reported frequent participation in pool activities, training in a fitness room or centre, cycling, walking or hiking, and other outdoor activities. Additionally, over half of the children frequently engaged in outdoor water activities, movement to music, cross-country skiing and playing outside.

Table 1. Demographics of participants.

Participants	Children	Adults	All participants included	Dropout*
Number	41	41	82	12
Age; Mean (min-max)	10.5 (3–17)	49.2 (19–73)	29.8 (3–73)	40.8 (5–68)
Gender; girls (%)	22 (53.7)	22(53.7)	44 (53.7)	7 (58)
Primary health and development problem**	**25**	**36**	**61**	**2**
Cerebral palsy	5	7	12	
Developmental delay	11		11	
Neurological diseases	4	13	17	1
Muscles/skeletal deformities	3		3	
Sensory loss	1		1	1
Brain injury		7	7	
Hereditary neurological conditions	1	4	4	
Spinal cord injury		2	2	
Spina bifida		2	2	
Sarcoidosis		1	1	

* Participants who dropped out were excluded from the analysis.
** There are some missing information due to unavailable data.

Table 2. Descriptive results of frequency of participation for children and adults.

Activities	Group	1 (More than 2 times a week)	2(1–2 times a week)	3 (1–3 times a month)	4 (Less than 1 time a month)	5 (Never)
Pool activity	Children	2 (4.88 %)	12 (29.27 %)	10 (24.39 %)	14 (34.15 %)	3 (7.32 %)
	Adults	0	3 (7.32 %)	4 (9.76%)	18 (43.9 %)	16 (39.02 %)
Water activities outdoors	Children	2 (4.88 %)	3 (7.32)	2 (4.88 %)	16 (39.02 %)	18 (43.90 %)
	Adults	0	2 (4.88 %)	1 (2.44 %)	9 (21.95 %)	29 (70.73 %)
Training in a fitness room/centre	Children	6 (14.63 %)	12 (29.27 %)	7 (17.07 %)	9 (21.95 %)	7 (17.07 %)
	Adults	11 (26.83 %)	14 (34.15 %)	4 (9.76 %)	3 (7.32 %)	9 (21.95 %)
Move to music	Children	6 (14.63 %)	8 (19.51 %)	6 (14.63 %)	7 (17.07 %)	14 (34.15 %)
	Adults	0	2 (4.88 %)	2 (4.88 %)	5 (12.20 %)	32 (78.05 %)
Gaming for training	Children	3 (7.32 %)	5 (12.20 %)	3 (7.32 %)	5 (12.20 %)	25 (60.98 %)
	Adults	0	1 (2.44 %)	0	4 (9.76 %)	36 (87.80 %)
Cycling	Children	11 (26.83 %)	13 (31.71 %)	8 (19.51 %)	4 (9.76 %)	5 (12.20 %)
	Adults	6 (14.63 %)	7 (17.07 %)	6 (14.63 %)	5 (12.20 %)	17 (41.46 %)
Climbing	Children	0	2 (4.88 %)	1 (2.44 %)	9 (21.95 %)	29 (70.73 %)
	Adults	1 (2.44 %)	0	1 (2.44 %)	0	39 (95.12 %)
Horseback riding	Children	1 (2.44 %)	4 (9.76 %)	4 (9.76 %)	5 (12.20 %)	27 (65.85 %)
	Adults	0	0	0	4 (9.76 %)	37 (90.24 %)
Cross-country skiing	Children	0	2 (4.88 %)	9 (21.95 %)	16 (39.02 %)	14 (34.15 %)
	Adults	1 (2.44 %)	0	5 (12.20 %)	8 (19.51 %)	27 (65.85 %)
Downhill skiing	Children	0	1 (2.44 %)	2 (4.88 %)	9 (21.95 %)	29 (70.73 %)
	Adults	0	1 (2.44 %)	0	6 (14.63 %)	34 (82.93 %)
Skates	Children	0	0	4 (9.76 %)	12 (29.27 %)	25 (60.98 %)
	Adults	0	0	0	2 (4.88 %)	39 (95.12 %)
Going for a walk/ hiking	Children	11 (26.83 %)	15 (36.59 %)	8 (19.51 %)	4 (9.76 %)	3 (7.32 %)
	Adults	12 (29.27 %)	8 (19.51 %)	9 (21.95 %)	5 (12.20 %)	7 (17.07 %)
Outdoor activities	Children	3 (7.32 %)	3 (7.32 %)	16 (39.02 %)	12 (29.27 %)	7 (17.07 %)
	Adults	3 (7.32 %)	1 (2.44 %)	5 (12.20 %)	23 (56.10 %)	9 (21.95 %)
Group activities	Children	5 (12.20 %)	6 (14.63 %)	6 (14.63 %)	2 (4.88 %)	22 (53.66 %)
	Adults	0	1 (2.44 %)	0	4 (9.76 %)	36 (87.80 %)
Individual activities	Children	5 (12.20 %)	4 (9.76 %)	3 (7.32 %)	3 (7.32 %)	26 (63.41 %)
	Adults	1 (2.44 %)	1 (2.44 %)	2 (4.88 %)	2 (4.88 %)	35 (85.37 %)
Play outside	Children	19 (46.34 %)	10 (24.39 %)	5 (12.20 %)	3 (7.32 %)	4 (9.76 %)

The test-retest reliability for frequency scores among the combined group of children and adults ranged from 0.66 (Gaming for training) to 0.95 (Horseback riding), as assessed by both the Intraclass Correlation Coefficient (ICC) and Quadratic Kappa. Most items demonstrated good or excellent ICC values, except for three items (Training in a fitness room, Gaming for training, and Skates) where scores were moderate (0.5–0.75). All items scored above the substantial threshold in Quadratic Kappa, with 10 items achieving perfect agreement (>0.81). The percentage of agreement varied from 57% (Training in a fitness room, Going for a walk) to 93% (Horseback riding). Six items fell below the acceptable threshold (<75%). For the group of children, ICC and Quadratic Kappa values for frequency scores ranged from 0.58 (Training in a fitness room/centre) to 0.96 (Horseback riding). Agreement percentages varied from 49% (Training in a fitness room/centre) to 90% (Horseback riding). For the group of adults, frequency scores had ICC and Quadratic Kappa coefficients ranging from −0.03 (Skates) to 0.97 (Climbing). Agreement percentages varied from 54% (Outdoor activities) to 98% (Climbing and Downhill skiing) (Table 3).

Regarding skill competency scores, the test-retest reliability for the combined group of children and adults ranged from 0.43 (Training in a fitness room) to 0.89 (Cycling) for both ICC and Quadratic Kappa. Six items had moderate ICC scores, while eight scored well (0.75–0.9). Quadratic Kappa showed similar patterns, with two items having moderate scores (0.41–0.6), eight substantial scores (0.61–0.8), and five perfect scores (>0.81). Agreement percentages ranged from 50% (Training in a fitness room) to 90% (Climbing). Nine items fell below the 75% threshold. For the group of children skill-competency scores showed ICC and Quadratic Kappa coefficients ranging from 0.19 (Playing outside) to 0.86 (Horseback riding). Twelve items fell below the 75% threshold, while four exceeded it. For the group of adult skill-competency scores showed variation from −0.02 (Skates) to 1 (Climbing), with agreement percentages from 51% (Outdoor activities) to 100% (Climbing) (Table 4).

The involvement score's test-retest reliability for the combined group of children and adults ranged from 0.46 (Training in a fitness room) to 0.88 (Cycling) based on ICC and Quadratic Kappa. Agreement percentages varied from 55% (Training in a fitness room) to 91% (Horseback riding). In the group of children involvement scores ranged from 0.26 (play outside) to 0.85 (outdoor activities), with agreement percentages from 19% (Training in a fitness room/centre) to 90% (Horseback riding). In the group of adult's involvement scores ranged from −0.03 (Skates) to 0.99 (Climbing), with agreement percentages from 56% (Outdoor activity) to 98% (Climbing). Four items fell below the 75% threshold (Table 5).

Table 3. Test-retest reliability results of ActiveYou II for the domain frequency.

	Frequency								
	Children			Adults			Combined (Children and adults)		
Activities	ICC (95% CI)	% agreement	Quadratic Kappa (SE)	ICC (95% CI)	% agreement	Quadratic Kappa (SE)	ICC (95% CI)	% agreement	Quadratic Kappa (SE)
Pool activity	0.88 (0.79–0.94)	73.17%	0.88 (0.16)	0.89 (0.81–0.94)	82.93 %	0.89 (0.16)	0.91(0.87–0.94)	78.05%	0.91 (0.11)
Water activities outdoors	0.80 (0.65–0.89)	70.73%	0.79 (0.15)	0.8 (0.65–0.89)	82.93 %	0.79 (0.16)	0.81 (0.72–0.87)	76.83%	0.81 (0.11)
Training in a fitness room/centre	0.58 (0.33–0.75)	48.78%	0.57 (0.15)	0.75 (0.58–0.86)	65.85%	0.75 (0.15)	0.67 (0.53–0.78)	57.32%	0.67 (0.11)
Move to music	0.79 (0.62–0.88)	51.22%	0.78 (0.15)	0.87 (0.78–0.93)	85.37%	0.87 (0.16)	0.86 (0.79–0.91)	68.29%	0.86 (0.11)
Gaming for training	0.65 (0.43–0.79)	56.10 %	0.64 (0.15)	0.14 (−0.17-0.43)	85.37%	0.22 (0.15)	0.66 (0.52–0.77)	70.73%	0.66 (0.11)
Cycling	0.91 (0.85–0.95)	68.29 %	0.91 (0.16)	0.93 (0.87–0.96)	75.61%	0.93 (0.16)	0.93 (0.89–0.95)	71.95%	0.93 (0.11)
Climbing	0.75 (0.58–0.86)	82.93%	0.75 (0.15)	0.97 (0.95–00.99)	97.56%	0.96(0.16)	0.87 (0.80–0.91)	90.24%	0.86 (0.11)
Horseback riding	0.96 (0.93–0.98)	90.24%	0.96 (0.16)	0.73 (0.54–0.85)	95.12%	0.72 (0.16)	0.95 (0.93–0.97)	92.68%	0.95 (0.11)
Cross-country skiing	0.84 (0.72–0.91)	75.61%	0.84 (0.16)	0.85 (0.71–0.92)	85.37%	0.79 (0.15)	0.86 (0.79–0.91)	80.49%	0.86 (0.11)
Downhill skiing	0.88 (0.78–0.93)	87.80%	0.87 (0.16)	0.96 (0.93–0.98)	97.56%	0.94 (0.16)	0.91 (0.86–0.94)	92.68%	0.91 (0.11)
Skates	0.73 (0.55–0.85)	75.61%	0.73 (0.15)	−0.03 (−0.34-0.28)	92.68%	−0.03 (0.15)	0.74 (0.62–0.82)	84.15%	0.74 (0.11)
Going for a walk/hiking	0.72 (0.53–0.84)	53.66%	0.71 (0.16)	0.85 (0.73–0.92)	60.98%	0.84 (0.15)	0.80 (0.70–0.86)	57.32%	0.79 (0.11)
Outdoor activities	0.77 (0.6–0.87)	68.29%	0.76 (0.16)	0.79 (0.65–0.88)	53.66%	0.79 (0.16)	0.79 (0.69–0.86)	60.98%	0.79 (0.11)
Group activities	0.78 (0.62–0.88)	68.29%	0.78 (0.15)	0.70 (0.49–0.83)	87.80%	0.69 (0.13)	0.83 (0.75–0.89)	78.05%	0.83 (0.11)
Individual activities	0.87 (0.78–0.93)	85.37%	0.87 (0.15)	0.77 (0.6–0.87)	92.68 %	0.76 (0.15)	0.85 (0.77–0.9)	89.02%	0.85 (0.11)
Play outside (only Children)	0.59 (0.34–0.76)	60.00%	0.58 (0.16)						
Total activities	0.82 (0.68–0.9)	15.00%	0.78 (0.15)	0.87 (0.77–0.93)	14.63%	0.84 (0.15)	0.90 (0.86–0.94)	14.63%	0.90 (0.11)

Table 4. Test-retest reliability results of ActiveYou II for the domain skill-competency.

	Skill-competency								
	Children			Adults			Combined (Children and Adults)		
Activities	ICC (95% CI)	% agreement	Quadratic Kappa (SE)	ICC (95% CI)	% agreement	Quadratic Kappa (SE)	ICC (95% CI)	% agreement	Quadratic Kappa (SE)
Pool activity	0.71 (0.51–0.83)	60.98 %	0.69 (0.16)	0.81 (0.67–0.89)	80.49 %	0.81 (0.16)	0.82 (0.74–0.88)	70.73%	0.82 (0.11)
Water activities outdoors	0.78 (0.62–0.88)	65.85%	0.78 (0.16)	0.83 (0.70–0.91)	85.37%	0.82 (0.16)	0.82 (0.73–0.88)	75.61%	0.82 (0.11)
Training in a fitness room/centre	0.30 (0.02–0.56)	39.02%	0.29 (0.15)	0.56 (0.31–0.74)	60.98%	0.63 (0.15)	0.43 (0.24–0.59)	50.00%	0.46 (0.11)
Move to music	0.51 (0.25–0.70)	58.54%	0.50 (0.15)	0.68 (0.48–0.82)	78.05 %	0.67 (0.15)	0.69 (0.56–0.79)	68.29%	0.69 (0.11)
Gaming for training	0.55 (0.3–0.73)	58.54%	0.55 (0.15)	0.23 (−0.09-0.50)	85.37%	0.23 (0.16)	0.57 (0.40–0.70)	71.95%	0.56 (0.11)
Cycling	0.74 (0.56–0.85)	70.73%	0.68 (0.16)	0.94 (0.90–0.97)	75.61%	0.94 (0.16)	0.89 (0.84–0.93)	73.17%	0.89 (0.11)
Climbing	0.73 (0.55–0.85)	80.49%	0.72 (0.16)	1	100%	1 (0.16)	0.81 (0.72–0.87)	90.24%	0.80 (0.11)
Horseback riding	0.86 (0.76–0.92)	87.80%	0.85 (0.16)	0.84 (0.72–0.91)	90.24%	0.86 (0.15)	0.88 (0.81–0.92)	89.02%	0.88 (0.11)
Cross-country skiing	0.74 (0.57–0.85)	53.66%	0.73 (0.15)	0.88 (0.77–0.94)	82.93%	0.87 0.15)	0.83 (0.75–0.89)	68.29%	0.83 (0.11)
Downhill skiing	0.72 (0.53–0.84)	78.05%	0.72 (0.16)	0.95 (0.90–0.97)	87.80%	0.94 (0.15)	0.80 (0.70–0.86)	82.93%	0.80 (0.11)
Skates	0.66 (0.44–0.80)	56.10%	0.68 (0.15)	−0.02 (−0.33-0.28)	92.68%	−0.02 (0.08)	0.68 (0.54–0.78)	74.39%	0.70 (0.11)
Going for a walk/hiking	0.64 (0.42–0.79)	48.78%	0.63 (0.15)	0.78 (0.62–0.88)	58.54%	0.71 (0.16)	0.74 (0.62–0.82)	53.66%	0.73 (0.11)
Outdoor activities	0.84 (0.72–0.91)	60.98%	0.82 (0.16)	0.57 (0.32–0.74)	51.22%	0.58 (0.15)	0.71 (0.59–0.81)	56.10%	0.72 (0.11)
Group activities	0.71 (0.51–0.83)	68.29%	0.71 (0.15)	0.41 (0.13–0.63)	90.24 %	0.51 (0.14)	0.74 (0.62–0.82)	79.27%	0.75 (0.11)
Individual activities	0.85 (0.73–0.91)	82.93%	0.84 (0.16)	0.55 (0.30–0.73)	85.37%	0.46 (0.15)	0.78 (0.68–0.85)	84.15%	0.76 (0.11)
Play outside	0.19 (−0.12-0.47)	48.78%	0.19 (0.15)						
Total activities	0.86 (0.68–0.93)	2.44%	0.84 (0.15)	0.88 (0.78–0.93)	12.20%	0.88 (0.15)	0.92 (0.87–0.95)	9.76%	0.92 (0.11)

Table 5. Test-retest reliability results of ActiveYou II for the domain involvement.

	Involvement								
	Children			Adults			Combined (Children and adults)		
Activities	ICC (95% CI)	% agreement	Quadratic Kappa (SE)	ICC (95% CI)	% agreement	Quadratic Kappa (SE)	ICC (95% CI)	% agreement	Quadratic Kappa (SE)
Pool activity	0.74 (0.57–0.86)	78.05%	0.71 (0.16)	0.75 (0.57–0.86)	73.17%	0.73 (0.15)	0.80 (0.70–0.86)	75.61%	0.78 (0.11)
Water activities outdoors	0.79 (0.64–0.88)	70.73%	0.82 (0.16)	0.87 (0.77–0.93)	82.93%	0.87 (0.15)	0.84 (0.76–0.89)	76.83%	0.85 (0.11)
Training in a fitness room/centre	0.44 (0.16–0.65)	18.78%	0.47 (0.15)	0.49 (0.21–0.67)	60.98%	0.48 (0.15)	0.46 (0.27–0.61)	54.88%	0.46 (0.11)
Move to music	0.61 (0.37–0.77)	58.54%	0.63 (0.15)	0.65 (0.43.0.80)	80.49 %	0.66 (0.16)	0.72 (0.59–0.81)	69.51%	0.73 (0.11)
Gaming for training	0.58 (0.33–0.75)	68.29%	0.60 (0.15)	0.38 (0.8-0.62)	82.93 %	0.38 (0.16)	0.60 (0.44–0.72)	75.61%	0.60 (0.11)
Cycling	0.82 (0.69–0.90)	73.17%	0.64 (0.16)	0.88 (0.79–0.94)	75.61%	0.88 (0.16)	0.88 (0.82–0.92)	74.39%	0.87 (0.11)
Climbing	0.76 (0.6–0.87)	82.93%	0.76 (0.16)	0.99 (0.98-1)	97.56%	0.97 (0.16)	0.83 (0.75–0.89)	90.24%	0.83 (0.11)
Horseback riding	0.82 (0.70–0.90)	90.24%	0.82 (0.16)	0.68 (0.47–0.82)	92.68%	0.57 (0.15)	0.80 (0.71–0.87)	91.46%	0.80 (0.11)
Cross-country skiing	0.71 (0.53–0.84)	70.73%	0.71 (0.16)	0.79 (0.65–0.88)	82.93%	0.79 (0.15)	0.78 (0.68–0.85)	76.83%	0.78 (0.11)
Downhill skiing	0.72 (0.53–0.84)	82.93%	0.72 (0.16)	0.91 (0.84–0.95)	90.24%	0.87 (0.16)	0.80 (0.71–0.87)	86.59%	0.80 (0.11)
Skates	0.68 (0.48–0.82)	60.98%	0.71 (0.16)	−0.03 (−0.34-0.28)	92.68%	− 0.03 (0.15)	0.72 (0.59–0.81)	76.83%	0.75 (0.11)
Going for a walk/hiking	0.77 (0.60–0.87)	51.22%	0.76 (0.16)	0.83 (0.70–0.91)	68.29%	0.79 (0.16)	0.80 (0.71–0.87)	59.76%	0.80 (0.11)
Outdoor activities	0.85 (0.74–0.92)	65.85 %	0.85 (0.16)	0.51 (0.24–0.70)	56.10%	0.55 (0.15)	0.65 (0.51–0.76)	60.98 %	0.65 (0.11)
Group activities	0.70 (0.5–0.83)	75.61%	0.72 (0.15)	0.27 (−0.01-0.52)	87.80%	0.20 (0.07)	0.72 (0.60–0.81)	81.71 %	0.74 (0.11)
Individual activities	0.82 (0.69–0.90)	82.93 %	0.78 (0.16)	0.75 (0.57-0.86)	90.24%	0.74 (0.15)	0.80 (0.70–0.86)	86.59%	0,78 (0.11)
Play outside	0.26 (−0.04-0.53)	48.78%	0.27 (0.15)						
Total activities	0.86 (0,69-0,93)	5.88%	0.82 (0.15)	0.80 (0.65–0.89)	14.63%	0.82 (0.15)	0.90(0.84–0.93)	9.76%	0,89 (0.11)

Table 6. Cronbach's alpha results of ActiveYou II for children and adults with disabilities.

	Children	Adult	Combined (Children and adults
Frequency	0.581	0.562	0.749
Skill Competency	0.739	0.690	0.833
Involvement	0.718	0.680	0.795

The internal consistency for the combined group of children and adults was acceptable for the total frequency scores α = 0.749, the total skill-based scores α = 0.833, and the total involvement scores α = 0.795. For the separated groups (children and adults) the Cronbach's coefficient alpha was for the group of children lower than acceptable, α = 0.581, for the total frequency score, but acceptable α = 0.734 for the total skill-based scores and α = 0.718 for the total involvement scores. For the adult group, all three scores were below acceptable respectively α = 0.562 for the total frequency score, α = 0.690 for the total skill-based score and α = 0.680 for the total involvement score (Table 6).

An analysis of the relationship between activity frequency and perceived skill-competence revealed varying strengths of association across different activities and age groups. Among children, moderate to strong positive correlations were observed in activities such as *group activities* (ρ = 0.54, $p < 0.01$), *individual activities* (ρ = 0.55, $p < 0.01$), *going for a walk/hiking* (ρ = 0.45, $p < 0.01$), and *horseback riding* (ρ = 0.44, $p = 0.01$). Adults demonstrated strong correlations in *cycling* (ρ = 0.51, $p < 0.01$), *cross-country skiing* (ρ = 0.55, $p < 0.01$), and *outdoor activities* (ρ = 0.52, $p < 0.01$). When analysing the combined sample, the strongest associations were found in *group activities* (ρ = 0.58, $p < 0.01$), *horseback riding* (ρ = 0.49, $p < 0.01$), *move to music* (ρ = 0.45, $p < 0.01$), and *gaming for training* (ρ = 0.43, $p < 0.01$). These findings suggest that increased frequency of participation is generally associated with higher perceived skill-competence. Notably, some activities such as *skating* and *downhill skiing* showed weak or non-significant correlations, indicating potential differences in how skill is perceived or developed in these contexts (Table 7).

The analysis revealed consistently strong positive correlations between perceived skill-competence and involvement across most activities, particularly among children. For children, the highest correlations were observed in *downhill skiing* (ρ = 0.95, $p < 0.01$), *group activities* (ρ = 0.87, $p < 0.01$), *play outside* (ρ = 0.76, $p < .01$), *individual activities* (ρ = 0.74, $p < 0.01$), *gaming for training* (ρ = 0.73, $p < 0.01$), and *climbing* (ρ = 0.71, $p < 0.01$), indicating that greater involvement is closely associated with higher perceived skill

Table 7. Correlation between frequency and skill-competence scores.

	Frequency/Skill-competence					
	Children		Adults		Combined	
Activities	ρ (rho)	p	ρ (rho)	p	ρ (rho)	p
Pool activity	0.26	0.03	0.24	0.10	0,31	<0.01
Water activities outdoors	0.38	0.01	0.29	0.17	0,35	<0.01
Training in a fitness room/centre	0.30	0.01	0.36	<0.01	0,27	<0.01
Move to music	0.40	<0.01	0.31	0.21	0,45	<0.01
Gaming for training	0.31	0.06	0.50	0.15	0,43	<0.01
Cycling	0.35	<0.01	0.51	<0.01	0,42	<0.01
Climbing	0.13	0.56	0.98	0.01	0,31	0.09
Horseback riding	0.44	0.01	1.00	0.01	0,49	<0.01
Cross-country skiing	0.36	0.01	0.55	<0.01	0,43	<0.01
Downhill skiing	0.34	0.10	−0.06	0.82	0,26	0.13
Skates	0.04	0.80	1.00	0.16	0,06	0.71
Going for a walk/hiking	0.45	<0.01	0.43	<0.01	0,45	<0.01
Outdoor activities	0.36	<0.01	0.52	<0.01	0,50	<0.01
Group activities	0.54	<0.01	0.69	0.13	0,58	<0.01
Individual activities	0.55	<0.01	−0.18	0.56	0,36	0.02
Play outside	0.27	0.02				

Table 8. Correlation between skill-competence and involvement scores.

	Skill-competence/Involvement					
	Children		Adults		Combined	
Activities	ρ (rho)	p	ρ (rho)	p	ρ (rho)	p
Pool activity	0.36	<0.01	0.65	<0.01	0.49	<0.01
Water activities outdoors	0.55	<0.01	0.49	0.02	0.52	<0.01
Training in a fitness room/centre	0.63	<0.01	0.56	<0.01	0.62	<0.01
Move to music	0.53	<0.01	0.72	<0.01	0.55	<0.01
Gaming for training	0.73	<0.01	−0.12	0.74	0.56	<0.01
Cycling	0.50	<0.01	0.52	<0.01	0.52	<0.01
Climbing	0.71	<0.01	0.85	0.04	0.72	<0.01
Horseback riding	0.67	<0.01	0.29	0.05	0.57	<0.01
Cross-country skiing	0.63	<0.01	0.46	0.02	0.55	<0.01
Downhill skiing	0.95	<0.01	0.24	0.42	0.70	<0.01
Skates	0.57	<0.01	1.00	0.16	0.56	<0.01
Going for a walk/hiking	0.61	<0.01	0.49	<0.01	0.52	<0.01
Outdoor activities	0.66	<0.01	0.47	<0.01	0.51	<0.01
Group activities	0.87	<0.01	0.00	1.00	0.85	<0.01
Individual activities	0.74	<0.01	0.21	0.50	0.44	<0.01
Play outside	0.76	<0.01				

levels. Adults also showed strong correlations in activities such as *pool activity* ($\rho = 0.65$, $p < 0.01$), *move to music* ($\rho = 0.72$, $p < 0.01$), and *climbing* ($\rho = 0.82$, $p = 0.04$), though some activities like *gaming for training* and *group activities* showed weak or non-significant associations. In the combined sample, strong correlations were found in *training in a fitness room/centre* ($\rho = 0.62$, $p < 0.01$), *group activities* ($\rho = 0.85$, $p < 0.01$), climbing ($\rho = 0.71$, $p < 0.01$), and *downhill skiing* ($\rho = 0.70$, $p < 0.01$). These results suggest that across age groups, increased involvement in physical activities is generally linked to higher perceived skill-competence (Table 8).

Discussion

The test-retest reliability of ActiveYou II, which assesses participation in physical activities among children and adults with disabilities, demonstrated good reliability for frequency scores and moderate reliability for skill competency and involvement scores. Additionally, the internal consistency was acceptable for the combined group of children and adults across participation frequency ($\alpha = 0.749$), skill competency ($\alpha = 0.833$), and involvement scores ($\alpha = 0.795$).

These findings align with the test-retest reliability observed in the participation instrument, CAPE [15], the instrument that inspired the development of ActiveYou II. The test-retest reliability of the CAPE's diversity and intensity total scores were moderate to good, with Intraclass Correlation Coefficients (ICCs) of 0.68 and 0.80, respectively. However, the reliability for enjoyment was poorer, with an ICC of 0.59 [41]. The relatively lower reliability skill competency and involvement scores observed in ActiveYou II suggest that intrinsic factors, such as enjoyment and involvement, are transient events in individuals. Participation in an activity after a two-week interval does not necessarily yield comparable enjoyment or involvement [41]. Furthermore, the perceptions of skill

competence can vary and may be influenced by prior experiences, daily well-being, mood, and social support. Other reasons for low reliability might be the small sample size ($n = 82$ children and adults), large intraindividual variability, and a small variation in item scores. Even if the results are not statistically fully credible, they can be compared with results from studies that have used comparable participation instruments with similar results [36]. Further, the results suggest that concrete organized activities such as climbing and horseback riding exhibit higher reliability than more unstructured activities like outdoor play. It is likely easier to recall organized activities since they occur as planned and sometimes need more arrangement with assistance and devices whereas unstructured activities arise more spontaneously. Additionally, the reliability is influenced by the design of the questionnaire, including instructions, questions/items, scales, and images. In the ActiveYou II, activities are illustrated with photos to enhance clarity. Rating scales consist of smiles that are colour-coded, with red representing more negative experiences and green, indicating more positive ones. The instructions and questions are brief and straightforward to accommodate the study population. While the instrument encompasses a wide range of leisure activities, follow-up questions are triggered only for the specific activities in which individuals actively participate. In other words, if someone engages in only five activities, they will answer follow-up questions solely for those activities. Furthermore, the 16 physical activities should be relatively relevant for the participants as they are common activities that Norwegian children and adults engage in [27]. Cognitive interviews indicate that ActiveYou II is easy to understand and complete [28]. Despite this, the group of children reported that a substantial proportion required assistance in completing the ActiveYou II, or that their parents filled it out on their behalf. This may indicate that the instrument requires further adaptation.

A descriptive analysis of responses regarding activity frequency reveals that certain activities are performed by only a small proportion of respondents. The frequency distribution of responses indicates that children are more active than adults and engage in a wider variety of activities, whereas adults tend to participate more in individual leisure and fitness activities. This is consistent with findings from other studies [6–11]. Nevertheless, it is considered important to include a representative variety of activities in the questionnaire to capture the diversity of participation among individuals with disabilities. However, this approach may pose challenges for reliability analysis due to the low number of respondents for some activities, and this should be taken into consideration.

The correlational analyses conducted in this study provide important insights into the relationships between frequency of participation, perceived skill competence, and involvement in physical activities among children and adults with disabilities. Overall, the results support the theoretical assumptions of the Family of Participation-Related Constructs (fPRC) framework, which emphasizes the reciprocal influence of intrinsic and environmental factors on participation [19]. Moderate to strong positive correlations were found between frequency of participation and perceived skill competence across several activities. This suggests that individuals who engage more frequently in physical activities tend to perceive themselves as more competent in those activities. These associations were particularly evident in structured and familiar activities such as group activities, horseback riding, and walking/hiking among children, and cycling, cross-country skiing, and outdoor activities among adults. The findings align with previous research indicating that repeated engagement can enhance self-efficacy and perceived ability, which are key drivers of sustained participation [24,29].

Furthermore, the study revealed consistently strong correlations between perceived skill competence and involvement, especially among children. Activities such as group play, gaming for training, and climbing showed the highest associations, indicating that children who feel more competent also report higher levels of enjoyment, engagement, and emotional investment. Among adults, similar patterns were observed in pool activities, moving to music, and cycling. These results underscore the importance of perceived competence not only for participation frequency but also for the quality/involvement of the participation experience. For several adult activities, fewer than 10 respondents reported participation. This limited sample size may reduce the reliability of the correlation results and should be considered when interpreting the finding.

Interestingly, some activities such as skating and downhill skiing showed weak or non-significant correlations, which may reflect the episodic nature of these activities or the challenges in developing competence due to environmental or accessibility barriers. These findings highlight the need for tailored interventions that consider both the type of activity and the individual's perceived ability and motivation. Taken together, the results suggest that enhancing perceived skill competence may be a key strategy for

increasing both the frequency and involvement of participation in physical activities. This has important implications for rehabilitation and health promotion programs, which should aim to foster competence through adapted equipment, supportive environments, and opportunities for mastery. The strong associations between competence and involvement also emphasize the need to prioritize experiential aspects of participation in intervention design. Future research should further explore these relationships longitudinally and in larger samples to confirm the stability and generalisability of the findings. Additionally, examining how changes in perceived competence influence participation over time could provide valuable insights into the responsiveness of the ActiveYou II instrument and its utility in evaluating intervention outcomes.

The reliability statistics have their pros and cons where the intraclass correlation coefficient (ICC) is recommended for interval data and provides a ratio between a true variance and an error variance while the Quadratic Kappa coefficient is more appropriate to use for nominal and ordinal data. A drawback of the Quadratic kappa statistic is if the true prevalence of a population is high or low, agreement expected by chance increases and the magnitude of kappa goes down [42]. This means, that a low kappa score will be likely in a population that has a very low or very high prevalence of scoring or one that is homogenous [43]. The percentage of absolute agreement is maybe the easiest, and most obvious statistics to interpret. However, the analysis has been criticized in the field of reliability testing as it does not control for chance agreement between raters or occasions. For a better interpretation of the reliability statistics, it is recommended to present the Kappa statistic alongside the percentage agreement score [43]. What could be seen in this study was that the results from the different reliability analyses were similar which increased the confidence of the results.

The Cronbach's alpha examined how each item of the ActiveYou II correlates with the total score on the scale. However, the rather modest values of Cronbach's alpha may indicate that the scale is not homogenous and includes multiple dimensions [40]. ActiveYou II contains a variety of 16 indoor and outdoor physical activities. Adding more similar items related to physical activities can increase the alpha value (internal consistency reliability). However, including too many redundant or overly similar items may result in participant fatigue or frustration. This, in turn, can contribute to higher measurement error and reduced reliability [37,38]. Researchers and practitioners should approach internal consistency estimates with caution when evaluating outcome measures in rehabilitation. Rigid benchmarks (e.g. the 0.70 threshold) may not always apply. Factors such as data assumptions, item count, and scale width can impact reliability. Overestimation may occur with large item sets [44].

Conclusion

ActiveYou II is a web-based self-report instrument grounded in the theoretical framework of the Family of Participation-Related Constructs (fPRC). It provides a multidimensional assessment of physical activity participation among children, youth, and adults with disabilities, illustrating a wide range of physical activities with and without assistive devices. The instrument captures key dimensions such as frequency, involvement, perceived skill competence, and individual and environmental facilitators and barriers. ActiveYou II is applicable in clinical settings, where therapists can use it to assess and promote inclusive participation. Additionally, it holds potential for use in community planning, enabling stakeholders to identify and address barriers to recreational participation. The findings from this study confirm the instrument's test-retest reliability and internal consistency, supporting its use in diverse populations. However, it is important to consider that changes in self-reported participation and competence may reflect not only actual behavioural change but also shifts in internal standards, values, or understanding a phenomenon known as response shift [40]. This is particularly relevant in rehabilitation contexts, where individuals may re-evaluate their goals and sense of competence over time. Future research should investigate the sensitivity of ActiveYou II both at individual and group levels. Understanding its responsiveness is essential for its use as an outcome measure in intervention studies. Ultimately, ActiveYou II contributes to a deeper understanding of participation and can inform the development of inclusive rehabilitation and health promotion strategies.

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