

# Feasibility of a novel web-based physical activity questionnaire for young children

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## Abstract

Accurate assessment of children's physical activity is critical in determining associations between childhood physical activity and health later in life. We have developed a web-based questionnaire, KidActive-Q, to assess physical activity in early childhood. The feasibility and reproducibility of KidActive-Q were assessed in a sample of 20 children aged 2 to 6 years. The questionnaire was distributed to parents via e-mail on two occasions. The median time required to complete KidActive-Q was 2.5 minutes. All the parents reported that the questionnaire was *easy* or *very easy* to fill. The intraclass correlations for test-retest reliability were 0.60 (95% confidence interval: 0.31-0.88) for daily time spent outdoors, and 0.85 (95% confidence interval: 0.72-0.97) for daily time watching television. Our results suggest that KidActive-Q is a user-friendly tool for assessing physical activity in early childhood. To our knowledge, this is the first web-based questionnaire specifically developed for young children.

## Introduction

Sedentary behavior and low levels of physical activity in youth has been associated with higher levels of body fat,<sup>1</sup> and physical activity patterns initiated in childhood have been shown to persist throughout life.<sup>2</sup> To better understand the role of physical activity during childhood, and its association to body composition and overweight, this complex behavior must be assessed accurately. However, this assessment is complicated by children's highly variable activity patterns, *i.e.* physical activity is often in short bursts, the velocity and type of movement vary considerably, and they have frequent rest periods.<sup>3</sup>

Paper-based questionnaires have previously been used in most large studies, but increased accessibility to the Internet has made web-based data collection possible.<sup>4,5</sup> Since young children themselves cannot respond to a questionnaire and report duration, frequency or intensity of activities performed, proxy reports from parents or another caregiver are used.<sup>6</sup> A limited number of questionnaires for assessing physical activity in children are available,<sup>7-10</sup> and none have, to the best of our knowledge, been developed specifically for the Web. To fill the need of a web-based questionnaire assessing usual physical activity in early childhood, we have developed KidActive-Q. The main aim of the present study is to describe KidActive-Q, and to report its feasibility and user-friendliness. Further, the reproducibility of KidActive-Q was assessed by comparing two administrations of the web-based questionnaire.

## Materials and Methods

### Study participants

In May 2009, all children (n=28, aged 2 to 6 years, 54 % girls) attending a daycare group in a suburb of Stockholm, Sweden, and their parents were invited, and agreed, to participate in the present study. Parents were given both written and oral information about the study and provided written informed consent prior to enrollment. The weight (kg) and height (cm) of the children were measured at the beginning of the study. The new web-based physical activity questionnaire for children, KidActive-Q, was administered to the parents on two occasions separated by about three weeks. The study was approved by the Research Ethics Committee at Karolinska Institutet, Stockholm, Sweden.

### KidActive-Q questionnaire

KidActive-Q is a web-based proxy questionnaire assessing usual physical activity patterns among young children. A parent or other adult closely associated with the child is asked to report the child's usual physical activity during the past few months. KidActive-Q is an interactive questionnaire, and 10 to 12 questions are answered, depending on the response pattern. The questions assess the overall level of physical activity, method of transportation to and from daycare, time spent outdoors, time spent watching television and/or playing computer games, and athletic activities performed on a regular basis. All questions have predefined answers regarding different activity level, frequency and/or duration. Responses to the questionnaire can thereafter be summarized into a score reflecting the activity level of the child. An example of the questionnaire layout is shown in Figure 1.

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### Study design

The first KidActive-Q was sent out via e-mail on day one of the study and the second was administered three weeks later. Individual user names and passwords served as identifiers in the web-questionnaire program that automatically recorded the response time to the questionnaire. The reproducibility of KidActive-Q was assessed by comparing the results obtained on the two occasions. Immediately following completion of the questionnaire on the first occasion, the parents were asked to respond to questions regarding the user-friendliness of KidActive-Q. Parents were asked to assess whether they thought the questionnaire was easy to fill out, and if they thought the questions were relevant and presented in a suitable sequence. Lastly, the parents were asked to rate the questionnaire on a scale from 1 (worst) to 5 (best).

## Statistical methods

Paired t-tests were used to assess potential differences in characteristics between boys and girls. The reproducibility of questions assessing overall activity, time spent outdoors, and time spent watching television, was assessed using intraclass correlation coefficients.<sup>11</sup> The significance level was set to  $P < 0.05$ . Analyses were performed using STATA 11.1 (STATA Corporation, College Station, TX, USA).

## Results

Of the 28 children and parents who agreed to participate in the study, 20 completed the KidActive-Q questionnaire on both occasions, and were included in the assessment of feasibility and reproducibility. Characteristics of the children are presented in Table 1. Descriptive results from the first KidActive-Q questionnaire are given in Table 2. The median years of birth of the mothers and fathers were 1971 and 1968, respectively. All parents were highly educated, with 39 out of 40 having a university education. No differences in characteristics were found between boys and girls.

The intraclass correlation for test-retest reliability of KidActive-Q for the question on overall physical activity level was 0.66 [95% confidence interval (CI): 0.41-0.91], while the intraclass correlation for total time spent outdoors per day was 0.60 (95% CI: 0.31-0.88), and for total time spent watching television per day 0.85 (95% CI: 0.72-0.97).

The mean time required for the parents to fill out the KidActive-Q questionnaire on the first occasion was 2 minutes and 37 seconds, while corresponding time on the second occasion was 1 minute and 50 seconds. All responding parents reported that the questionnaire was *easy* or *very easy* to answer and *agreed* or *fully agreed* that the order of the questions presented was good. Eighteen out of 20 responding parents *agreed* or *fully agreed* that the questions were relevant. The remaining two reported that they had no opinion regarding the relevancy. The mean overall score, on a scale from 1 (worst) to 5 (best), was 4.4 ( $\pm 0.7$ ), and 18 out of the 20 of the parents gave a score of 4 or 5.

## Discussion

Our results indicate that KidActive-Q is a user-friendly and reproducible instrument, which is feasible for web-based data collection on the physical activity of young children.

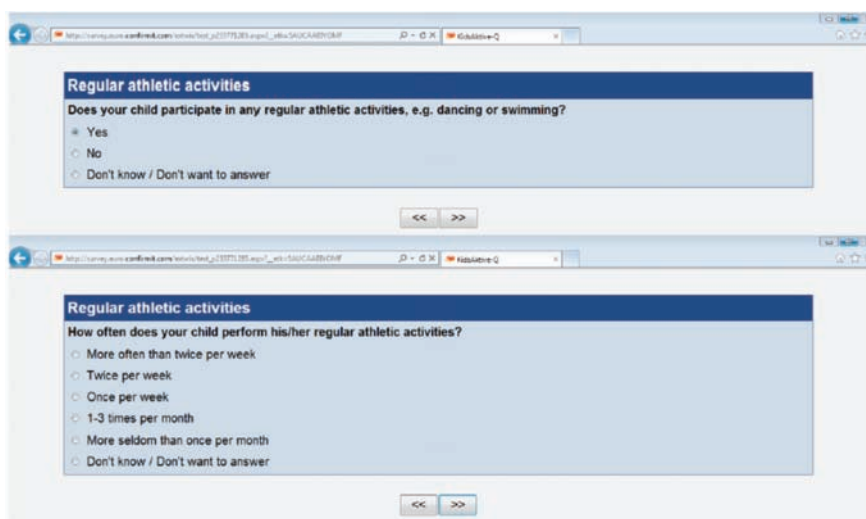
Only a limited number of questionnaires intended to assess different dimensions of

**Table 1. Characteristics of children included in the study, n=20 (50% girls).**

	Mean	Standard deviation	Min	Max
Age, years	4.15	1.3	2	6
Weight, kg	18.2	4.2	10.9	28.8
Height, cm	106.0	11.8	82.0	127.5
Body mass index, kg/m <sup>2</sup>	17.6	3.2	12.0	25.5

**Table 2. Descriptive data based on responses to some questions in the KidActive-Q on the first occasion (n=20).**

Activity	Time per day	Minutes	Number	%
Watching television	Weekdays	0	1	5
		30	12	60
		90	7	35
	Weekends	180	0	0
		0	2	10
		30	2	10
Using the computer	Weekdays	90	14	70
		180	2	10
		0	2	10
	Weekends	0	17	85
		30	3	15
		30	3	15
Playing outdoor	Weekdays	0	18	90
		30	2	10
		0	17	85
	Weekends	30	3	15
		90	6	30
		180	11	55
		300	3	15
		360	0	0
		90	2	10
Weekends	180	10	50	
	300	6	30	
	360	2	10	



**Figure 1. Screenshots of KidActive-Q showing a question regarding the performance of regular athletic activities, and a follow-up question if the response to the initial question is Yes.**

physical activity in children have been validated. Corder *et al.*<sup>8</sup> found a significant correlation ( $r=0.42$ ) between minutes per week of moderate to vigorous physical activity using the Children's Physical Activity Questionnaire and accelerometer measurements in a sample of 27 children with a mean age of 4.9 years. The relative validity of the Netherlands Physical Activity Questionnaire was assessed by Jantz *et al.*<sup>9</sup> in sample of 204 children with a mean age of 5.7 years. Comparing an arbitrary numerical score of the questionnaire against measurements from accelerometers, significant correlations were found for total ( $r=0.33$ ) and vigorous activity ( $r=0.36$ ). Burdette *et al.*<sup>7</sup> have reported a significant association ( $r=0.20$ ) between parental reports of preschool children's outdoor playtime and a direct measure of physical activity using accelerometers in a sample of 250 preschool children with a mean age of 3.7 years.

In the present study, data were collected in a small and selected sample of children, with highly educated parents. This created a homogenous group limiting the generalizability of the results due to the fact that the sample was not representative of the whole population. Results from this study should therefore be interpreted with caution. All children attended daycare, as do most young children in Sweden,<sup>12</sup> so this characteristic is not a limitation in a Swedish population. The wide confidence intervals for the intraclass correlation point estimates that indicate test-retest repeatability, may partly be explained by the small sample size and sampling variability. Nonetheless, the point estimates do indicate good reproducibility. The reproducibility of specific questions in KidActive-Q was assessed by comparing the results of the questionnaire administered on two occasions approximately three weeks apart. This time interval was chosen as it would be long enough to ensure that the parents would not remember their answers from the previous questionnaire administration, and short enough to ensure that the children's physical activity had not changed between the two occasions.

KidActive-Q assesses the activity patterns of

children and gives an overall picture of whether a child is physically active or inactive. Marked developmental advances occur through the early childhood years, affecting the kind of activities children are able to perform, and posing a challenge to any instrument evaluating the physical activity of children in this age group. Because of differences in activity patterns during this period, the results from KidActive-Q must be interpreted while bearing in mind the age of the child. However, stratification by age was outside the scope of our analysis due to the small sample size. To ensure the validity of KidActive-Q, results from the questionnaire should be compared with those from other objective and thoroughly validated measures, e.g. the doubly labeled water method or accelerometers, depending on the dimension of physical activity to be validated. Larger validation studies are needed to assess both the criterion and construct validity of KidActive-Q.

## Conclusions

In conclusion, our results suggest that KidActive-Q is a modern and easily applied tool for assessing physical activity among young children. The questionnaire was developed for and is currently being used in an ongoing large prospective cohort study.<sup>13</sup> To the best of our knowledge, this is the first report on a questionnaire for assessing physical activity among young children specifically developed for web-based use.

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