

Reliability of parental and self-reported determinants of fruit and vegetable intake among 6th graders

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Submitted 28 April 2003; Accepted 7 August 2003

Abstract

Objective: To assess the reliability of newly developed questionnaires measuring theoretical constructs believed to predict fruit and vegetable consumption among 6th-grade pupils.

Design: Participating pupils and parents completed questionnaires twice, 14 days apart.

Setting: One hundred and twenty-nine pupils from 6th-grade classes (average age: 11.9 years) at two schools in Norway and their parents were invited to participate.

Results: The test–retest reliability was found to be good or very good for scales reported both by the pupils and their parents. All scales showed acceptable to strong correlations between time 1 and time 2, and only one scale had significant different mean values at the two times. The internal consistency reliability of the scales was acceptable to good.

Conclusions: Sixth graders and their parents are able to provide reliable reports on theoretical determinants of the pupil's fruit and vegetable consumption.

Keywords
Fruit
Vegetables
Determinants
Reliability
Adolescents
Norway

National dietary surveys show that Norwegians on average eat only about half of the recommended '5-a-day', and that the intake is especially low among young adults^{1,2}. This low consumption is of public health concern, particularly since health-related behaviours developed at a young age are considered important determinants of these behaviours later in life^{3,4}.

Evaluation research has demonstrated that theory-driven interventions are more effective than interventions based on the paradigm that new knowledge leads to behaviour change^{5,6}. For an intervention to be effective it is necessary to target the factors predictive of the behaviour. The identification of important predictive factors is therefore crucial to the development of health behaviour intervention programmes, and the most potent of these factors form the basis of such programmes⁷. To make judgements about the factors influencing a behaviour, and thereby also about the potential effectiveness of interventions⁸, it is critical to be able to measure these predictors in a reliable manner. If the reliability is poor, the ability to detect relationships between the psychosocial measures and the behaviour will be limited⁹.

Most community health interventions have not given the results expected, showing no or only small effects⁹. This is also the case for most fruit and vegetable interventions⁵. Baranowski *et al.*, in their review of psychosocial correlates of dietary fat, fruit and vegetable intake, found that a substantial number of the articles did not report the

reliabilities of the predictor variables employed¹⁰. Only a few studies have actually reported the reliability of determinants of fruit and vegetable intake among young adolescents^{11–14}.

Theories of adolescent behaviour and health behaviour serve as a framework for explaining why behaviours occur⁷. Models of individual health behaviour, like the Theory of Planned Behaviour (TPB)¹⁵ and the extended Attitude–Social Influence–Self-Efficacy model (ASE model)¹⁶, and of interpersonal health behaviour, such as the Social Cognitive Theory (SCT)¹⁷, can serve as guides to select and develop survey instruments.

As part of designing and evaluating a school-based fruit and vegetable intervention in Norway, the 'Fruits and Vegetables Make the Marks Study', questionnaires were developed for use among 6th-grade schoolchildren and their parents. This paper presents the results from a test–retest study conducted with 6th graders and their parents. Test–retest reliability and internal consistency reliability of the instrument assessing constructs guided by the ASE model and SCT are presented.

Methods

Participants

A convenient sample of pupils ($n = 129$) from 6th-grade classes at two schools in the town of Kongsberg, Norway, were invited to participate in the spring of 2001. These two

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schools were chosen because of their geographic and demographic resemblance to the schools invited to participate in the planned intervention study.

A total of 125 pupils participated at time 1 (97% participation rate), while 114 of these pupils also participated at time 2 (88%) and are included in the test–retest reliability analyses. For the internal consistency reliability analyses, all 125 participants at time 1 are included. All children were 11 or 12 years old (born in 1989) and 53% were girls.

At time 1, 106 parents (of the 125 children) participated (85%), and a total of 84 children had a parent participating at both times (67%). For 74 of these 84 children, the same parent completed both questionnaires. In this paper, these 74 parents are included when assessing test–retest reliability. When assessing internal consistency reliability, all 106 parents participating at time 1 are included. The average age of the parents was 40.9 years, and 89% of the parents participating both times were mothers/female guardians.

Procedures

A questionnaire was developed to measure the intake of fruit and vegetables and determinants of this intake among 6th-grade pupils. This questionnaire was administered twice, 14 days apart, to participating pupils in the classroom, each time in the presence of a trained project worker. It took the pupils about 45 minutes (one school session) to complete the questionnaires. At both occasions the pupils brought home a questionnaire to be completed by a parent, preferably the same parent at both times. Informed consent was sought from both parents and the pupils prior to the first survey. Ethical approval and research clearance were obtained from The National Committees for Research Ethics in Norway and from The Norwegian Social Science Data Services.

Instruments

The instruments developed were guided by available international literature, focus group interviews with Norwegian 6th graders¹⁸, and by the theoretical frameworks provided by the ASE model¹⁶ and the SCT¹⁷. The questionnaires were pre-tested at two different schools prior to the test–retest study presented here.

Separate sets of questions were made for the ASE model and the SCT. The ASE constructs were all targeting the behaviour of increasing the fruit and vegetable consumption (i.e. to eat more) and included: *Intention* (example: I intend to eat more fruit and vegetables than I do now); *Attitude* consisting of behavioural belief statements (example: Eating more fruit and vegetables will make me healthier) and outcome evaluations (example: It is important for me to stay healthy); *Subjective Norm* consisting of normative beliefs (example: My mother wants me to eat more fruit and vegetables) and motivation to comply (example: I usually do what my mother wants

me to); and *Self-Efficacy* (example: If I decide to do so, I can easily eat more fruit and vegetables at home). In addition, the construct of *Perceived Need* was included, as it has been reported to be a strong determinant of intention to eat 5 portions of fruit and vegetables a day¹⁹ (example: I eat too little fruit and vegetables).

The SCT constructs were targeting the behaviour of eating 5 portions of fruit and vegetables a day and included: *Behavioural Skills* (example: It happens that I prepare myself a fruit or vegetable snack), *Accessibility* (example[s]: At home we usually have fruit available in a bowl [have vegetables for dinner every day]), *Modelling* (example: My mother eats lots of fruit and vegetables), *Intention* (example: I intend to eat at least 5 servings of fruit and vegetables every day), *Preferences* (example: Fruit and vegetables make my meals taste better) and *Self-Efficacy* (example: For me, it will be easy to eat more than 5 servings of fruit and vegetables every day).

The parent questionnaire attempted to assess predictors of the fruit and vegetable intake of the child participating in the study. The following constructs, based on the items in the corresponding pupil scales, were measured: *Child's Need* to eat more (example: I think my child needs to eat more fruit and vegetables), *Child's Behavioural Skills* (example: It happens that my child prepares him/herself a fruit or vegetable snack), *Child's Accessibility* (example[s]: At home we usually have fruit available in a bowl [have vegetables for dinner every day]) and *Child's Preferences* (example[s]: My child likes fruit [vegetables] very much).

All items were measured on a 5-point scale ranging from 'I fully disagree' (−2) to 'I fully agree' (+2), except for the Motivation to comply items which were scored from 1 to 5. The number of items for each construct are presented in Table 1.

Statistical analyses

The paired *t*-test was used to test for differences between time 1 and time 2. Test–retest reliability was estimated using Pearson correlation, and Cronbach's alpha was used to estimate the internal consistence reliability of the scales. Attrition analyses were conducted with one-way analyses of variance and chi-square statistics. SPSS version 11 (SPSS Inc., Chicago, IL, USA, 1999) was used for all analyses.

Results

Among the pupils, only Intention (to eat more) showed a significant difference in mean values from time 1 to time 2 (Table 1). The test–retest correlation ranged from 0.51 (Intention to eat 5-a-day) to 0.79 (Perceived Need to eat more). No parental scales showed significant different values between time 1 and time 2. The test–retest correlations for the parental scales were somewhat higher than for the pupils, with a range from 0.71 (Child's Need to eat more) to 0.84 (Child's Behavioural Skills).

Table 1 Scale test–retest reliability and internal consistency reliability

	Items	Range	n	Time 1		Time 2		P-value	Pearson's <i>r</i>	Cronbach's alpha	n
				Mean	SD	Mean	SD				
<i>Pupils</i>			total 114								total 125*
ASE constructs											
Intention (to eat more)	4	− 8/8	100	2.2	3.7	1.4	3.7	0.010	0.63	0.81	119
Attitude (to eat more)	2 × 4 †	− 16/16	101	5.7	6.0	5.9	5.9	0.703	0.62	0.62	120
Subjective Norm (to eat more)	2 × 4 ‡	− 40/40	92	− 0.2	13.5	− 1.3	13.4	0.379	0.63	0.72	112
Self-Efficacy (to eat more)	4	− 8/8	104	2.7	3.8	2.8	3.5	0.707	0.64	0.78	118
Perceived Need (to eat more)	3	− 6/6	108	0.5	3.5	0.1	3.4	0.053	0.79	0.77	120
SCT constructs											
Behavioural Skills	5	− 10/10	96	0.5	4.4	0.4	3.9	0.919	0.74	0.62	116
Accessibility	5	− 10/10	99	4.9	3.5	4.6	3.6	0.397	0.66	0.42	116
Modelling	4	− 8/8	95	2.7	2.7	2.6	2.8	0.739	0.70	0.41	116
Intention (to eat 5-a-day)	1	− 2/2	106	0.4	1.3	0.4	1.3	0.942	0.51	−	−
Preferences	4	− 8/8	97	2.9	3.6	3.0	3.5	0.907	0.74	0.69	116
Self-Efficacy (to eat 5-a-day)	3	− 6/6	102	0.4	3.1	0.3	2.8	0.654	0.61	0.61	121
<i>Parents</i>			total 74§								total 106*
Child's Need (to eat more)	2	− 4/4	72	2.4	2.0	2.3	2.2	0.467	0.71	0.91	106
Child's Behavioural Skills	4	− 8/8	69	0.0	4.0	0.0	4.0	0.958	0.84	0.58	102
Child's Accessibility	5	− 10/10	81	5.0	3.2	5.4	3.0	0.127	0.78	0.31	105
Child's Preferences	2	− 4/4	72	1.1	2.3	1.1	2.3	0.931	0.83	0.59	106

SD – standard deviation.

*Cronbach's alpha was analysed on the time 1 sample.

†Behavioural beliefs and outcome evaluation items were multiplied to make the attitude items.

‡Normative beliefs and motivation to comply items were multiplied to make the subjective norm items.

§Same parent answering both times.

Most scales reported by the pupils had Cronbach alpha values above 0.5. The exceptions were Modelling and Accessibility. Of the four parental scales, three had internal consistency reliability coefficients above 0.5, the only exception being Child's Accessibility.

Attrition analysis showed that parents who did not complete both surveys had a higher income level (NOK 619 000 vs. 499 000, $P = 0.034$) and used a television (TV)/personal computer (PC) more (2.4 vs. 1.4 h day^{–1}, $P = 0.004$) than did parents who completed both surveys. There were no differences between the two groups with respect to other demographic factors or psychosocial constructs.

Discussion

This study is one of only a few, and (to our knowledge) the first study conducted outside the USA, to assess the reliability of psychosocial determinants of fruit and vegetable consumption among young adolescents. The results from this test–retest study showed that the test–retest reliability was good to very good for the scales assessing the theoretical constructs, and the internal consistency reliability was acceptable to good for most scales.

In this study, we observed equal or somewhat better test–retest results than have been found in similar studies. Birnbaum *et al.* achieved test–retest correlations of 0.37–0.65, on scales assessing several TPB and SCT constructs, in a sample of 7th and 8th graders¹¹. Cullen *et al.* found test–retest correlations of 0.01–0.73 on scales assessing

constructs from the environmental and personal factors of SCT in grade 4–6 children¹². Domel *et al.* found, assessing 4th and 5th graders, correlations of 0.75 and 0.66 for two outcome expectation subscales¹³, and correlations of 0.52–0.67 for four self-efficacy subscales over a 2-week test–retest period¹⁴.

The internal consistency reliability values (Cronbach's alpha) observed in this study were equal to, or in some cases slightly lower than, those reported earlier. In similar studies, the observed Cronbach's alpha values have for the most part been above 0.70^{11–14}, while values reported as part of the outcome evaluation of '5-a-day' intervention studies have ranged from 0.51 to 0.92^{20–22}.

Low internal consistency reliability indicates that a scale does not measure an underlying construct. In this study, all scales except Modelling, Accessibility and Child's Accessibility had alpha values above 0.5, which is considered sufficient for summation of items to form overall determinant scores. The two accessibility scales included items assessing availability/accessibility of fruits and vegetables at home (at meals and between meals), and a high internal consistency reliability was not expected for these composite scales. Similarly, the Modelling scale included modelling by different models, including parents, friends, siblings and the home economy teacher, and a high internal consistency reliability was not expected.

The time period between test 1 and test 2 was 2 weeks. This is perceived as a long enough time for the participants not to remember what they answered the first time, and too short a period for major changes in psychosocial

factors to have occurred. The attrition analyses showed that the parental drop-outs differed from parents participating at both time points with respect to income level (higher) and TV/PC usage (higher). No other demographic differences were observed between the two groups, and we do not believe that this attrition has caused any severe bias to the results presented.

We conclude that the developed instruments have acceptable to good reliability with respect to the theoretical determinants of fruit and vegetable consumption. Thus, these questionnaires can serve as useful evaluation instruments for the planned intervention study among Norwegian 6th graders.

Acknowledgements

This study was funded by the Norwegian Research Council. The authors wish to thank research assistants Marthe Bottolfs, Nina Kolbjørnsen and Jorunn Sofie Randby for their participation in the data collection and processing.

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