

ORIGINAL ARTICLE

Oral Health Locus of Control in a Swedish adolescent population

ANNA-LENA ÖSTBERG^{1,2} & KAJSA H. ABRAHAMSSON³

¹Department of Behavioral and Community Dentistry, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Sweden, ²Public Dental Service, Västra Götaland, Sweden, and ³Department of Periodontology, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Sweden

Abstract

Objective. The aim was to test and evaluate the psychometric properties of the Oral Health Locus of Control (OHL_oC) instrument and its relation to dental anxiety, self-efficacy and self-perceived oral health among Swedish adolescents. **Materials and methods.** A random sample of 758 (63% of 1208 invited) 19-year-old individuals in three residential areas in western Sweden (two rural, one urban) answered a set of questionnaires prior to a dental examination. **Results.** The face and content validity of the OHL_oC was deemed good in pilot interviews with individuals of the target age. Explorative factor analysis verified the dimensions of the OHL_oC sub-scales (internal, external, chance locus of control) with loadings from 0.503 – 0.812, explaining 54.6% of the variance. Construct validity was confirmed in relation to two other psychometric scales, on dental anxiety (DAS) and on general self-efficacy (GSE), with correlations in the expected directions. In multivariate logistic regression analyses, the internal sub-scale displayed the most consistent statistically significant associations with self-perceived oral health, also when accounting for gender, demography and health behavior. There were no significant differences between genders on the OHL_oC, but females scored statistically significantly higher on the DAS ($p = 0.005$) and lower on the GSE ($p = 0.021$) than males. **Conclusions.** The Swedish version of the OHL_oC appears to have acceptable psychometric properties for use in an adolescent population.

Key Words: locus of control, oral health, psychometrics, Swedish, validation

Introduction

Knowledge on influencing factors on health is fundamental in planning evidence-based health prevention and promotion [1]. A number of sociological and psychological theories and models have been developed, attempting to explain and predict health behavior [2].

The concept of Locus of Control was introduced by Rotter [3] in the 1960s. The theory refers to individuals' beliefs about whom and what controls the events happening to them. The most widely used instrument within the health area, based on Rotter's model, was developed by Wallston et al. [4]; it is called the Multidimensional Health Locus of Control (MHLC) Scales. The instrument assesses to what degree individuals interpret how their health depends on their own ability and efforts or on other factors, like powerful other persons, or is simply the result of fate or chance. The MHLC has been used in studies of

various health behaviors, both regarding general and oral health [5–7]. However, scales for specific situations have been developed with the aim to achieve better explanatory power. Adapted versions of the instrument have been developed for oral health and these have been tested on various populations [8,9]. The findings have been somewhat diverse, which may be attributed to different versions of the scales and/or different characteristics of the study samples.

Another concept related to health behavior is 'self-efficacy', which has been defined as an individual's perception of her/his ability to cope with specific and unexpected situations [10]. Self-efficacy has also been related to a person's expectation of her/his own ability to implement healthy behavior [11,12]. A recent review indicated that self-efficacy is a useful tool for predicting oral health behavior [13]. Dental anxiety is also an important factor for oral health outcomes and is shown to be associated with deteriorated dental status [14,15] and dental avoidance [16,17]. The

most common psychological scale for measuring dental anxiety is the Dental Anxiety Scale, DAS [18].

Although the oral health of most children and adolescents in Sweden today is good, recent studies found high levels of plaque and gingivitis in young people [19,20]. Successful oral health education demands knowledge of influencing behavioral and environmental factors. Among those are gender and lifestyle, including tobacco and oral health habits, and socio-economic factors [21–23]; however, less attention has so far been paid to psychological models in oral health research. Likewise, validation studies for appropriate psychological scales are needed in dentistry.

The aim of this study was to test and evaluate the psychometric properties of the Oral Health Locus of Control (OHL_oC) instrument and its relation to dental anxiety, self-efficacy and self-perceived oral health among Swedish adolescents, with special reference to gender. It was hypothesized that significant relationships exist among OHL_oC, dental anxiety and general self-efficacy.

Methods

Study objects and data collection

A computer-based random sample was selected, comprising 10% of all 19-year-olds living in three different areas of the county of Västra Götaland, Sweden. A total of 1208 youngsters, in Skaraborg (352 individuals) and Fyrbodalen (356 individuals), both areas classified as rural, and in urban Gothenburg (500 individuals) were invited by mail to participate in a survey. Those accepting to participate were scheduled for an appointment at their regular dental clinic. Data were collected with questionnaires, covering socio-economic, attitudinal, behavioral and oral health issues, prior to a clinical examination. The latter is reported on elsewhere [20]. The time to answer the formulas was ~ 25 minutes. The data collection took place during the period August 2005 to September 2006. The Ethics Committee of Göteborg University approved the study and all the participants provided informed consent.

Questionnaire

The socio-economic status of individual participants was represented by ethnicity (born in Scandinavia/other country) and the mother's and father's educational level, respectively (≤ 9 years/upper secondary school or post-secondary education). Health behavior included tobacco habits; that is smoking (yes or party-smoking/no), snuff-taking (yes/no), teeth-brushing ($<$ twice a day/ \geq twice a day) and dental floss usage (seldom or never/at least once a week). Self-perceived oral health was rated on a Likert scale from 1–4: good/fairly good/fairly bad/bad.

Three self-reported psychometric instruments were included: The Oral Health Locus of Control instrument (OHL_oC), the General Self-Efficacy scale (GSE) and the Dental Anxiety Scale (DAS).

Oral Health Locus of Control–OHL_oC. This instrument was developed specifically for the current study and based on the Health Locus of Control (HLOC) [4,24] and its original Swedish version [25]. The HLOC contains three sub-scales assessing the individual's health locus of control; that is, to what degree an individual believes that one's health is controlled by (i) one's own abilities, efforts or behavior (internal locus of control), by (ii) powerful others, such as health professionals (external locus of control) or (iii) is the result of luck, fate or similar (chance locus of control). Each item is assessed on a 6-point Likert-type scale, from 'strongly disagree' (scored as 1) to 'strongly agree' (scored as 6). The original Swedish version for general health was carefully adapted to oral health (OHL_oC, Oral Health Locus of Control), with three items in each sub-scale. This yields a final score ranging from 3–18 on each independent sub-scale.

First, the items were adapted to oral health by the two authors. The wording was then discussed in qualitative interviews with 10 native speakers of the Swedish language in the target age group (females and males, urban and rural). After minor amendments, additional interviews with 10 other young people with the same characteristics were performed. None of these young persons participated in the main study. The resulting version was back-translated into English by a professional translator. The differences between the translator's version and the original English version by Wallston et al. [4] were small and related only to the adjusted health dimension (oral health).

General Self-Efficacy–GSE. The GSE instrument contains 10 items aiming to assess an individual's general sense of perceived self-efficacy to settle different situations and difficulties [26]. A Swedish version was developed and validated by Koskinen-Hagman et al. [27]. The items include, for instance, the following statement: 'It is easy for me to stick to my aims and accomplish my goals'. Item scores range from 1 (totally disagree) to 4 (totally agree), yielding a final composite score with a range from 10–40.

Dental Anxiety Scale–DAS. The DAS assesses dental anxiety with four items [18,28]. Each item scores from 1 (no anxiety) to 5 (severe anxiety), with a possible total score of 5–20. Average scores of ~ 8 have been reported for adult patients in general dental practice, while scores ≥ 13 have been suggested to indicate severe dental anxiety [29].

Table I. Characteristics of the study population by gender, *n* (%).

	Males (<i>n</i> = 351)	Females (<i>n</i> = 407)	<i>p</i>	Total (<i>n</i> = 758)
Country of origin				
Scandinavia	317 (90.3)	370 (90.9)		687 (90.6)
Other countries	34 (9.7)	37 (9.1)	0.779*	71 (9.4)
Residence				
Rural	233 (66.4)	272 (66.8)		505 (66.6)
Urban	118 (33.6)	135 (33.2)	0.896	253 (33.4)
Mother's education ≤9 years	59 (19.5)	69 (17.6)	0.525	128 (18.5)
Father's education ≤9 years	74 (25.5)	99 (27.5)	0.570	173 (26.6)
Smoking	65 (20.4)	99 (26.5)	0.057	164 (23.7)
Snuffing	98 (30.2)	28 (7.4)	< 0.001	126 (17.9)
Tooth brushing <2 times a day	115 (32.8)	67 (16.5)	< 0.001	182 (24.0)
Floss usage seldom or never	299 (85.4)	304 (75.1)	< 0.001	603 (79.9)

*Gender differences tested by χ^2 -analysis.

Socio-economic grouping

An area-based socioeconomic (SE) index was constructed, based on the percentage of individuals between 18–64 years (i) having a native country other than the Scandinavian countries, (ii) receiving social allowance, (iii) being unemployed and (iv) having a low education level (only compulsory school), in relation to corresponding figures for the total population in the community. The adolescents were socio-economically classified according to the SE index assigned to the Public Dental Service clinic at which they were listed as patients [20,30].

Data analysis

All statistical analyses were performed using the SPSS software package, PC version 19.0. Descriptive and analytical statistical methods were used.

The clinics comprising the quintile with the highest SE index, that is with the least favorable socioeconomic status, were classified as the 'poor SE index

group' and used for comparisons of individual scores: in the rural districts represented by SE index 8.5–9.8 (8 clinics of 30) and in the urban district by SE index 19.5–33.8 (five clinics of 24). All other clinics were classified as the 'affluent SE index group' [23].

Differences in proportions regarding health habits and gender differences were statistically tested by χ^2 analysis. The reliability of the OHL_oC sub-scales was estimated by testing the internal consistency with Cronbach's α and by calculating inter-correlations between the separate sub-scales using Pearson's correlation coefficient. Explorative factor analysis with varimax rotation was performed to test the dimensions in the sub-scales. To test construct and criterion validity, the associations between OHL_oC sub-scales and other variables were examined using Pearson's correlation analyses. Moreover, the OHL_oC sub-scales served as independent variables in bivariate and multivariate logistic regression analyses with self-perceived oral health as the dependent variable, dichotomized as good/fairly good (0) and bad/fairly bad (1). The impact of possible

Table II. Description of the scales by gender and in the total group.

Scale	Females		Males		Total group	
	<i>M</i> (SD)	Range	<i>M</i> (SD)	Range	<i>M</i> (SD)	Range
OHL _o C						
Internal	15.8 (1.8)	4–18	15.6 (2.2)	3–18	15.7 (2.0)	3–18
External	13.1 (2.6)	4–18	12.7 (2.9)	3–18	12.9 (2.7)	3–18
Chance	6.5 (3.0)	3–16	6.6 (2.9)	3–18	6.5 (2.9)	3–18
DAS	7.6 (3.4)	4–18	6.6 (2.8)	4–17	7.2 (3.2)	4–18
GSE	29.3 (4.2)	15–40	30.2 (4.7)	11–40	29.7 (4.4)	11–40

Gender differences: OHL_oC sub-scales = no significant differences; DAS, *p* = 0.005; GSE, *p* = 0.021.

Table III. Factor analysis of OHLLoC with varimax rotation (total group).

	Components		
	Internal OHLLoC	External OHLLoC	Chance OHLLoC
I am in control of my oral health status	<i>0.812*</i>	-0.061	0.037
No matter what I do, if I get problems with my teeth and my oral health, then that's the way it is	0.055	0.010	<i>0.811</i>
Whenever my mouth doesn't feel good, I should consult a dentist right away	0.305	<i>0.503</i>	-0.084
The main thing which affects my oral health is what I myself do	<i>0.719</i>	0.140	-0.126
It is primarily the dental personnel that control my oral health	-0.121	<i>0.766</i>	0.139
Chance plays a great part in how my oral health is	-0.120	0.123	<i>0.759</i>
If I take care of myself, I can avoid oral illness	<i>0.625</i>	0.086	-0.192
No matter what I do, I'm likely to get problems with my oral health	-0.302	0.105	<i>0.638</i>
Regarding my oral health, I can only do what the dental personnel tells me to do	0.073	<i>0.701</i>	0.136
Percentage of variance explained	19.9	15.4	19.3
Eigen value	2.23	1.02	1.68

*Figures in italics denote items loading in the three components, respectively.

confounders on the associations was tested by entering individual demographic and health habit variables in the logistic regression models. Associations were expressed as odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was assumed when $p < 0.05$ or when the 95% CI excluded 1.0.

Results

Of the original 1208 young people invited, 758 participated in the study (63%). The participation rate was higher in the rural districts than in the urban district (72% vs 51%, $p < 0.001$). The total item non-response rate in the questionnaire was <3%. The distribution of participants by gender regarding demography and health habits is given in Table I. No gender differences were seen in demographic characteristics. Females, however, had more favorable health habits. For instance, females more often than males brushed their teeth \geq twice a day ($p < 0.001$).

Descriptive data for the psychometric scales are shown in Table II. There were no gender differences in the OHLLoC sub-scales. Females more often

reported dental anxiety with a DAS score ≥ 13 (females 10.4%, males 4.4%; $p = 0.002$). They also stated statistically significant lower general self-efficacy ($p = 0.021$) than males. No significant differences were identified between the 'poor SE index group' and the 'affluent SE index group' on any of the scales.

Psychometric properties of OHLLoC

The face validity of the adapted OHLLoC instrument was assessed and secured in interviews with young people prior to the psychometric testing (described above in the Methods section). The item non-response rate for OHLLoC was $\leq 1\%$.

Calculation of the internal consistency of the OHLLoC sub-scales revealed Cronbach's α values of 0.60, 0.41 and 0.64 for the 'internal,' 'external' and 'chance' sub-scales, respectively. The explorative factor analysis with varimax rotation confirmed the dimensions of the sub-scales by loadings in three components (0.503–0.812) with eigen values > 1 , explaining altogether 54.6% of the variance. As

Table IV. Bivariate Pearson's correlations, by gender and in the total group, between OHLLoC sub-scales and GSE, DAS and self-perceived oral health.

	Internal			External			Chance		
	Females	Males	Total	Females	Males	Total	Females	Males	Total
GSE	0.222**	0.407**	0.315**	-0.022	0.221**	0.096**	-0.135**	0.021	-0.057
DAS	-0.161**	-0.065	-0.104**	0.096	0.064	0.093*	0.164**	0.132*	0.146**
Self-perceived oral health	-0.237**	-0.177**	-0.209**	-0.011	-0.074	-0.051	0.232**	0.126*	0.182**

High ratings in GSE are positive; high ratings in DAS and self-perceived oral health are negative.

* $p < 0.05$; ** $p < 0.01$.

Table V. Associations between OHLcC sub-scales and self-perceived oral health. Logistic regression models with the dependent variable dichotomized as bad (1) or good (0).

Independent variable	Adjustment	Self-perceived oral health; OR (95% CI)
Internal OHLcC	Unadjusted	0.82 (0.74–0.90)
	Gender	0.83 (0.75–0.92)
	Gender and demography	0.83 (0.74–0.93)
	Gender and health behavior	0.84 (0.75–0.94)
	Gender, demography and health behavior	0.84 (0.73–0.96)
External OHLcC	Unadjusted	0.92 (0.85–1.00)
	Gender	0.93 (0.86–1.01)
	Gender and demography	0.92 (0.84–1.01)
	Gender and health behavior	0.91 (0.83–1.00)
	Gender, demography and health behavior	0.90 (0.81–1.01)
Chance OHLcC	Unadjusted	1.13 (1.05–1.22)
	Gender	1.13 (1.05–1.22)
	Gender and demography	1.16 (1.07–1.27)
	Gender and health behavior	1.06 (0.97–1.15)
	Gender, demography and health behavior	1.10 (1.00–1.22)

Covariates entered in models as specified: demography (country of origin, rural/urban residence, mother's education, father's education), health behaviour (smoking, snuffing, tooth brushing, floss usage).

seen in Table III, there were clear factor loadings for the separate OHLcC items in the components, with exception for the third item. This item loaded on both the internal and the external component, however it was considerably higher on the external. The inter-correlations (Pearson's correlation coefficients) between the OHLcC sub-scales were: internal vs external 0.139; internal vs chance -0.258 ; and external vs chance 0.168, all statistically significant ($p < 0.001$).

The correlation analyses between the OHLcC and other measures revealed low-to-moderate correlations (Table IV). Hence, the internal OHLcC sub-scale showed the strongest associations with the GSE and with the participants' self-perceived oral health, while the chance OHLcC sub-scale showed the strongest association with the DAS (Table IV). Thus, the results indicate that individuals with high internal OHLcC were more likely to report strong general self-efficacy than those with a low internal OHLcC and individuals experiencing that the control over their oral health was related to chance were more likely to report dental anxiety than their counterparts. The external OHLcC sub-scale displayed the weakest associations. As seen in Table IV, there were gender differences in the associations between the instruments: internal OHLcC vs DAS was only statistically significant for females (negative correlation), external OHLcC vs GSE only for males (positive correlation) and chance OHLcC vs GSE only for females (negative correlation).

The validity of the Swedish OHLcC was further tested by examining its associations with self-perceived

oral health in bivariate and multivariate logistic regression analyses, accounting for a number of possible confounders (Table V). The associations were the strongest and the most consistent regarding the internal sub-scale; that is, a higher degree of internal OHLcC corresponded to a lower probability of a poor perception of one's oral health. On the other hand, a higher degree of chance OHLcC increased the risk of perceiving one's own oral health as poor; however, health behavior modified the significance of the association. The regression models formulated for the external OHLcC sub-scale displayed no associations with the self-perceived oral health.

Discussion

In this study, the Swedish version of the Health Locus of Control (HLcC) was adapted to oral health (OHLcC) and the psychometric properties were evaluated. The results verify sufficient reliability of this Swedish version of the OHLcC and its dimensional structure. Moreover, the results suggest that the Swedish OHLcC is a valid instrument with regard to face validity as well as construct validity in relation to two other psychometric scales, on dental anxiety (DAS) and on general self-efficacy (GSE). There were no significant differences between genders with regard to the OHLcC, but females scored statistically significantly higher than males on the DAS and lower on the GSE.

The adaptation and validation process was carefully performed, including oral interviews with representatives of the target group, back-translation and

psychometric tests. The sample was random and included both rural and urban contexts from a large region in Sweden, which are strengths of the study. The overall participation was in concordance with recent studies [19]. However, it was considerably lower in the urban area, corresponding to an earlier similar study [30]. The reason for not participating was mostly unknown, but relocation was common [23]. The age of 19 years was selected, as this represented the final year of organized free-of-charge dental care for young people and one objective was to explore their oral health conditions on the threshold to adulthood [20]. This can be regarded as a limitation of the present study, as adults may have had different views. Still, the main aim was to test the OHLoC instrument and this was considered easy to understand by the individuals in the oral interviews. The low item non-response rate for the questionnaire also supports the legibility and ease of understanding.

The factor analysis of the OHLoC revealed high and consistent loadings in three components, as could be expected, representing internal, external and chance locus of control. This strongly supports the validity of the instrument. However, a confirmatory factor analysis in another population will be required in future to further test the construct validity of the scales. The inter-correlations between the sub-scales were, although low, all significant and in the expected directions. The values of Cronbach's alpha were acceptable for the internal and chance sub-scales; however it was not for the external sub-scale. According to Wallston et al. [4], moderate values should be expected, which was also found by Stenström et al. [9]. A larger number of items in each sub-scale might have increased the alpha value [31]. The reliability of OHLoC should preferably also be explored by a test-re-test.

The scores on the DAS and GSE were similar to those in other studies of young people in Western contexts [32,33]. Regarding the OHLoC instrument developed for this study, the scores could be compared with the findings of Stenström et al. [9], who investigated a convenience sample of university students with a mean age of 23 years. Our random sample from the general population had fairly similar scores; however, somewhat higher on the internal and external sub-scales, but somewhat lower on the chance sub-scale. The differences between the studies may be due to different versions of the scales and different sampling techniques.

In our study, the internal sub-scale of the OHLoC showed the strongest and most consistent associations with the GSE and self-perceived oral health. The inverse relation between the internal OHLoC and the DAS was in concordance with findings in a study among Indian students [7]. Galgut et al. [5] concluded that both participants with high internal and participants with high external general HLoC

responded better to a plaque control regime than those who believed that disease was simply a result of chance [5]. Likewise, Stenström et al. [9] found that a high internal dental LoC was related to better plaque control, but this did not apply to the other sub-scales of the dental LoC. Thus, the internal sub-scale may be the most important to explore in clinical studies and practice.

There were gender differences in the study. Earlier studies showed better health behavior among females than males [16,34,35] and higher levels of dental anxiety among females than among males [36,37]. According to our findings, high internal OHLoC in females was related to a lower probability of dental anxiety. The differences between genders regarding self-efficacy vs external OHLoC may be interpreted as males with high self-efficacy relying more often than females on powerful others. Skaret et al. [16] found higher levels of self-efficacy among young males than young females. Health inequalities between men and women have been attributed to different social and individual expectations [38,39]. However, in the logistic regression analyses, gender as an adjustment variable had little impact on the associations between the OHLoC sub-scales and self-perceived oral health, as had the other possible confounders. Likewise, no socioeconomic differences on the OHLoC could be identified at group level [23].

In conclusion, we found that this Swedish version of the OHLoC has acceptable psychometric properties. However, tests in other age groups and different patient groups are needed. Moreover, further studies should include longitudinal designs to test the stability over time of the OHLoC.

Acknowledgments

This study received support from The Research Foundation for Västra Götaland, The Swedish Dental Association, The Swedish Patent Revenue Fund for research in preventive odontology and from The Public Dental Service, Västra Götaland, Sweden. The authors want to thank the staff who helped with the data collection.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

- [1] Kay E, Locker D. A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dent Health* 1998;15:132-44.
- [2] Hollister MC, Anema MG. Health behavior models and oral health: a review. *J Dent Hyg* 2004;78:6.
- [3] Rotter JB. Generalized expectancies for internal versus external control of reinforcement. *Whole* 1966;80:1-28.

- [4] Wallston KA, Wallston BS, DeVellis R. Development of the Multidimensional Health Locus of Control (MHLC) Scales. *Health Educ Monogr* 1978;6:160–70.
- [5] Galgut PN, Waite IM, Todd-Pokropek A, Barnby GJ. The relationship between the multidimensional health locus of control and the performance of subjects on a preventive periodontal programme. *J Clin Periodontol* 1987;14:171–5.
- [6] Stenström U, Andersson P. Smoking, blood glucose control, and locus of control beliefs in people with type 1 diabetes mellitus. *Diabetes Res Clin Pract* 2000;50:103–7.
- [7] Acharya S, Sangam DK. Dental anxiety and its relationship with self-perceived health locus of control among Indian dental students. *Oral Health Prev Dent* 2010;8:9–14.
- [8] Knecht MC, Syrjälä AM, Knuutila ML. Locus of control beliefs predicting oral and diabetes health behavior and health status. *Acta Odontol Scand* 1999;57:127–31.
- [9] Stenström U, Einarson S, Jacobson B, Lindmark U, Wenander A, Hugoson A. The importance of psychological factors in the maintenance of oral health: a study of Swedish university students. *Oral Health Prev Dent* 2009;7:225–33.
- [10] Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977;84:191–215.
- [11] Strecher VJ, DeVellis BM, Becker MH, Rosenstock IM. The role of self-efficacy in achieving health behavior change. *Health Educ Q* 1986;13:73–92.
- [12] Tedesco LA, Keffer MA, Fleck-Kandath C. Self-efficacy, reasoned action, and oral health behavior reports: a social cognitive approach to compliance. *J Behav Med* 1991;14:341–55.
- [13] Kakudate N, Morita M, Fukuhara S, Sugai M, Nagayama M, Kawanami M, et al. Application of self-efficacy theory in dental clinical practice. *Oral Dis* 2010;16:747–52.
- [14] Berggren U, Meynert G. Dental fear and avoidance: causes, symptoms, and consequences. *J Am Dent Assoc* 1984;109:247–51.
- [15] Thomson WM, Locker D. Dental neglect and dental health among 26-year-olds in the Dunedin Multidisciplinary Health and Development Study. *Community Dent Oral Epidemiol* 2000;8:414–18.
- [16] Skaret E, Raadal M, Kvale G, Berg E. Gender-based differences in factors related to non-utilization of dental care in young Norwegians. A longitudinal study. *Eur J Oral Sci* 2003;111:377–82.
- [17] Forslund HB, Lindroos AK, Blomkvist K, Hakeberg M, Berggren U, Jontell M, et al. Number of teeth, body mass index, and dental anxiety in middle-aged Swedish women. *Acta Odontol Scand* 2002;60:346–52.
- [18] Corah NL. Development of a dental anxiety scale. *J Dent Res* 1969;48:596.
- [19] Hugoson A, Koch G, Göthberg C, Helkimo AN, Lundin SÅ, Norderyd O, et al. Oral health of individuals aged 3–80 years in Jönköping, Sweden during 30 years (1973–2003). II. Review of clinical and radiographic findings. *Swed Dent J* 2005;29:139–55.
- [20] Ericsson JS, Abrahamsson KH, Östberg AL, Hellström MK, Jönsson K, Wennström JL. Periodontal health status in Swedish adolescents: an epidemiological, cross-sectional study. *Swed Dent J* 2009;33:131–9.
- [21] Locker D. Deprivation and oral health: a review. *Community Dent Oral Epidemiol* 2000;28:161–9.
- [22] Thomson WM, Poulton R, Milne BJ, Caspi A, Broughton JR, Ayers KM. Socioeconomic inequalities in oral health in childhood and adulthood in a birth cohort. *Community Dent Oral Epidemiol* 2004;32:345–53.
- [23] Östberg AL, Ericsson JS, Wennström JL, Abrahamsson KH. Socio-economic and lifestyle factors in relation to priority of dental care in a Swedish adolescent population. *Swed Dent J* 2010;34:87–94.
- [24] Wallston KA, Wallston BS. Who is responsible for your health. The construct of health locus of control. In Sanders S, Suls J, editors. *Social psychology health and illness*. Hillsdale, NJ: Erlbaum; 1982. p 65–95.
- [25] Stenström U, Wikby A, Andersson PO, Rydén O. Relationship between locus of control beliefs and metabolic control in insulin-dependent diabetes mellitus. *Br J Health Psychol* 1998;3:15–25.
- [26] Schwartz R. Measurement of perceived self-efficacy: psychometric scales for cross cultural research. Berlin: Freie Universität, Institut für Psychologie; 1993.
- [27] Koskinen-Hagman M, Schwarzer R, Jerusalem M. Swedish version of the general self efficacy scale. 1999. Available online at <http://userpage.fu-berlin.de/~health/swedish.htm>. Accessed 11 September 2011.
- [28] Berggren U, Carlsson SG. Usefulness of two psychometric scales in Swedish patients with severe dental fear. *Community Dent Oral Epidemiol* 1985;13:70–4.
- [29] Hägglin C, Berggren U, Hakeberg M, Hällström T, Bengtsson C. Variations in dental anxiety among middle-aged and elderly women in Sweden: a longitudinal study between 1968 and 1996. *J Dent Res* 1999;78:1655–61.
- [30] Abrahamsson KH, Koch G, Norderyd O, Romao C, Wennström JL. Periodontal conditions in a Swedish city population of adolescents: a cross-sectional study. *Swed Dent J* 2006;30:25–34.
- [31] Streiner D, Norman G. Health measurement scales. A guide to their development and use. 2nd ed. Oxford: Oxford University Press; 1995.
- [32] Skaret E, Kvale G, Raadal M. General self-efficacy, dental anxiety and multiple fears among 20-year-olds in Norway. *Scand J Psychol* 2003;44:331–7.
- [33] Thomson WM, Broadbent JM, Locker D, Poulton R. Trajectories of dental anxiety in a birth cohort. *Community Dent Oral Epidemiol* 2009;37:209–19.
- [34] Hugoson A, Koch G, Göthberg C, Helkimo M, Lundin SÅ, Norderyd O, et al. Oral health of individuals aged 3–80 years in Jönköping, Sweden during 30 years (1973–2003). I. Review of findings on dental care habits and knowledge of oral health. *Swed Dent J* 2005;29:125–38.
- [35] Östberg AL, Halling A, Lindblad U. Gender differences in knowledge, attitude, behavior and perceived oral health among adolescents. *Acta Odontol Scand* 1999;57:231–6.
- [36] Moore R, Birn H, Kirkegaard E, Brodsgaard I, Scheutz F. Prevalence and characteristics of dental anxiety in Danish adults. *Community Dent Oral Epidemiol* 1993;21:292–6.
- [37] Skaret E, Raadal M, Berg E, Kvale G. Dental anxiety among 18-yr-olds in Norway. Prevalence and related factors. *Eur J Oral Sci* 1998;106:835–43.
- [38] Östlin P, Danielsson M, Diderichsen F, Härenstam A, Lindberg G. Gender inequalities in health: a Swedish perspective. Cambridge, MA: Harvard Center for Population and Development Studies; 2001.
- [39] Eriksson J, Dellve L, Eklöf M, Hagberg M. Early inequalities in excellent health and performance among young adult women and men in Sweden. *Gend Med* 2007;4:170–82.