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ADOLESCENTS

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Opinnäytetyön aiheena on tutkia pystyvyyden ja tapojen muutoksen yhteyttä 11-15-vuotiaiden porilaisnuorten harjaustottumuksiin ja ksylitolin käyttöön. Aihe on tärkeä, sillä pystyvyys on yksi aikuisten omahoitotottumuksiin vaikuttavista tekijöistä, mutta nuorilla aihetta on tutkittu vähemmän. Tutkimuksen on tarkoitus tuottaa uutta tietoa, jota saattaisi olla mahdollista käyttää osana nuorten suun terveyden edistystä. Tutkimuksessa pyritään hankkimaan tietoa myös vanhempien koulutustason ja sukupuolen vaikutuksesta nuorten pystyvyyteen.

Tutkimus on sekundäärianalyysi vuosina 2001-2005 pitkittäisasetelmalla toteutetusta porilaisten yläkoululaisten nuorten kyselytutkimuksesta. Tutkimuksen aineisto kerättiin kolmessa eri aikapisteessä vuosina 2001, 2003 ja 2005. Ennen tilastollista analyysiä suoritettiin kirjallisuuskatsaus PubMed- ja Embase-datakannoista. Tilastolliseen analyysiin käytettiin SPSS Statistics 25 ohjelmaa, jonka avulla analysoitiin pystyvyyden yhteyttä hampaiden harjaukseen, ksylitolin käyttöön, uskomukseen hampaiden säilyttämisestä, vanhempien koulutustasoon, sekä sukupuoleen. Tilastollisina testeinä eri aikapisteissä käytettiin Chi Square -testiä ja Mann Whitney U -testiä. Pitkittäisasetelmassa muuttujia verrattiin käyttäen Cochranin Q -testiä, sekä Friedmanin testiä.

Tilastollisessa analyysissä selvisi, että tytöillä on poikia korkeampi pystyvyys kaikissa aikapisteissä ($p < 0.001$). Sukupuolten välinen ero kasvoi jokaisessa aikapisteessä. Pystyvyys parani tutkittavilla keskimäärin eniten vuosina 2001-2003. Pystyvyyden kasvu oli suurinta niissä ryhmissä, jotka huononsivat hampaiden harjausta ja ksylitolin käyttöä. Pystyvyys muuttui näin ollen eri suuntaan kuin suotuisat harjaustottumukset ja ksylitolin käyttö vuosina 2001-2003. Vanhempien korkea koulutustaso oli yhteydessä korkeampaan pystyvyyteen vuonna 2003. Lisätutkimusta tarvitaan muistakin ikäryhmistä pitkitäin, jotta voidaan päätellä lisää pystyvyyden merkityksestä hampaiden harjaukseen eri ikäisillä nuorilla ja mahdollisesti soveltaa tutkittua tietoa jatkossa myös nuorten suun terveyden edistyksessä.

Asiasanat: pystyvyys, nuoret, harjaus, ksylitoli

Changes in self-efficacy and oral health habits among adolescents (aged 11-15)

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KEYWORDS: adolescent, self-efficacy, oral health, xylitol, tooth brushing

Abstract

Objectives: The aim of this study was to examine whether there were associations between the simultaneous change in adolescents' (aged 11-15 years) self-efficacy in relation to the change in tooth brushing frequency and xylitol use in a longitudinal setting.

Methods: This is a secondary analysis of a questionnaire data collected longitudinally 2001-2005 from adolescents of Pori, Finland aged 11-15 (n=1308). The associations between adolescents' self-efficacy, tooth brushing frequency and xylitol use were measured using SPSS Statistics 25. The changes were reported by gender, parents' education level and age group in a longitudinal setting. The variables were measured using multiple choice questions in three time points.

A literature review was conducted using PubMed- and Embase -databases. Self-efficacy, beliefs, oral health habits (tooth brushing and xylitol use) and parents' education level were analysed statistically using Chi Square test and Mann Whitney U -tests to measure variables in different time points. For longitudinal evaluations Cochran's Q test and Friedman's test were used.

Results: Girls had higher self-efficacy than boys in all time points ($p < 0.001$). The difference in self-efficacy between genders statistically significantly improves in every time point. In 2001 $p < 0.05$, in 2003 $p < 0.05$ and in 2005 $p < 0.001$. Self-efficacy improved with age in all study groups. The biggest positive change in self-efficacy happened with adolescents aged 11-13 years when they decreased their tooth brushing frequency or xylitol use.

Conclusions: There was a slight association with the positive change in self-efficacy and decreasing of tooth brushing or xylitol use habit among adolescents.

Introduction

Self-efficacy has originally been defined as the confidence in one's ability to execute a difficult or resource-demanding behaviour to attain a desired future outcome (1). In a systematic review with meta-analysis studying the psychosocial correlates of oral hygiene behaviour in people aged 9 to 19, self-efficacy was defined as participants' confidence in their ability to perform behaviour, and specifically as participants' beliefs about one's abilities to successfully perform oral hygiene behaviour. Oral hygiene behaviour was confined in the search so that it had to include at least one of the following terms: tooth brushing, interdental cleaning, fluoride use or flossing behaviour. Essential findings of the review were the correlations between self-efficacy, tooth brushing frequency and other oral hygiene behaviours. The average weighted correlation between self-efficacy and tooth brushing was $r^+=0.36$. In the systematic review, oral hygiene was measured with both clinical measurements such as plaque index and BOP (bleeding on probing value) and self-reports. (2)

Those adolescents (aged 12 or 13 years), who had positive self-efficacy increased their brushing frequency in a randomized controlled trial of 12 months. Increased brushing frequency was seen in both interventions (6 months and 12 months) among the adolescents from groups that received either motivational interviewing (MI) or MI combined with interactive dental caries risk assessment (MI + RA). (3) In another randomized controlled trial the results confirmed the mediating roles of intention and self-efficacy in predicting the desired health behaviour (dental flossing in this study) in adolescent girls aged 11-15 years. Stronger self-efficacy was also associated with better

oral health status (17).

Among adults those with better self-efficacy reported brushing teeth more frequently (8, 9, 10, 11, 12, 13). Also, a positive association between tooth brushing duration and self-efficacy was found (13).

In a review with meta-analysis the relations between attitude change, norms, and self-efficacy to the change in health-related intentions and behaviour were studied. The meta-analysis showed that changing self-efficacy had an effect on changing health-related behaviour, such as disease management behaviour (for example diabetes care or blood pressure self-monitoring) and prevention behaviour (diet, alcohol, sun protection etc.) and even larger effect on intentions.

We could not identify any results regarding the simultaneous change of self-efficacy in relation to the change in tooth brushing frequency in adolescents. In addition, we couldn't identify any results regarding the possible association of self-efficacy and xylitol use among adolescents. Aim of this study is to define whether there is an association between the simultaneous change in self-efficacy in relation to tooth brushing frequency and xylitol use among adolescents. Our hypothesis was that self-efficacy has a positive influence on tooth brushing frequency and xylitol use among adolescents.

Materials and methods

This is a secondary analysis of data collected in the town of Pori, Finland in 2001-2005 as a part of a study for controlling caries (16). The data was collected from 5th and 6th grade students (11-12 years old) who started the school year 2001-2002 in the city of Pori

(n=1691). The data does not include children with physical disabilities or children with learning difficulties attending to special schools. The target-group of the program were school children and the people involved in their daily life.

The data was gathered by questionnaires at the start of the program in the fall of 2001, in an intervention in the spring of 2003 and when the program ended in the spring of 2005. The questionnaires were filled at school by the participants. 1362 questionnaires were properly filled at the end of the program. Of those 1362, 54 questionnaires were excluded from the study due to the lack of answers in the self-efficacy question. Total amount of 1308 questionnaires were included in this study.

In this study, self-efficacy was measured with question "I believe I can't prevent dental decay without professional help". The reply alternatives were: "strongly agree", "partly agree", "partly disagree" and "strongly disagree". The reply alternatives were given a value from 1 to 4. 4 was given to the answer "strongly disagree" and it indicated the highest value of self-efficacy. The data had also an additional question closely related to self-efficacy measuring belief: "I believe I can keep my own teeth throughout life". The reply were: "yes", "I don't know" and "no".

The frequency of tooth brushing with fluoride toothpaste was measured with "How often do you use the items or products listed below?". Both tooth brushing and fluoridated toothpaste had 7 reply alternatives from 3-4 times a day or more often (=1) to less than twice a month (=7). Tooth-brushing variable was constructed from using fluoridated toothpaste variable and participants brushing without fluoridated toothpaste were

categorized in the unfavourable behaviour category. Xylitol use was measured in fourth part of the questionnaire. The use of xylitol had the same 7 answer options as tooth brushing frequency.

Tooth-brushing frequency was dichotomized into two categories: “at least twice a day”=favourable and “less than twice a day”=unfavourable behaviour. Xylitol use was dichotomised into “at least three times a day” and “less than three times a day”. The categorizing was done based on the Current Care Guidelines of daily tooth brushing frequency and xylitol use (15). 3-class change variables were recoded for each dichotomized outcome: “improved” tooth brushing frequency or xylitol use, habit “stayed the same” or “decreased” habit.

Background factors included in this study were parents’ education level and gender. Parents’ education levels were asked in the start of the program in the fall of 2001 from one of the parents and the alternatives could vary from “both parents have high education”, “one of the parents is highly educated” to “both of the parents have a lower education level”. Parents’ education was recoded to 0=both low educated, 1=one high + one low and 2= both highly educated. The questions included in this study have been found to be reliable and valid (16).

Statistical analysis was conducted using SPSS Statistics 25. The associations between gender, tooth brushing, xylitol use and belief were evaluated in each time point using Chi-square test, and their changes were evaluated using Cochran’s Q -test and Kendall’s W - test.

Differences in self-efficacy in each time point were assessed using Mann-Whitney U test and Kruskal Wallis test, and changes in self-efficacy were assessed using Friedman's test.

Results

Of the participants in the study, 50.1% were girls, and 14.7% came from families in which both parents had high education level, 32.2% came from a family in which the other parent had high education and 53.0% came from families with both parents having lower education level.

Table 1 shows the percentage distributions of tooth brushing, xylitol use frequency and beliefs between genders and among all participants. Girls brushed their teeth more often than boys in each time point, and the differences were statistically significant. At the beginning of the study there was no difference in xylitol use between girls and boys. In 2003 and 2005 girls used more xylitol daily than boys ($p < 0.001$). In 2003 and 2005 girls improved their xylitol use statistically significantly ($p < 0.001$). There was no statistically significant change in boys' xylitol use. On average among all participants, xylitol use improved statistically significantly in each time point ($p < 0.001$). Belief improved on average among participants ($p < 0.05$). "I don't know" reply options seemed to partially divide in to both "yes" and "no" alternatives. Girls had statistically significant improvement.

In table 2 is shown that self-efficacy seemed to improve on average in each time point. Girls had higher self-efficacy mean scores in each time point than boys had. The

difference in self-efficacy between genders increased in every time point. In 2001 it seems that the ones not brushing favourably twice a day had statistically significantly higher self-efficacy mean scores ($p < 0.05$), but in 2005 the participants brushing twice a day had higher self-efficacy than had those who brush less ($p < 0.01$). In xylitol use a statistically significant difference can be found in year 2003. In addition, there is a statistically significant difference between self-efficacy level and parents' occupations in year 2003. Participant with highly educated parents had significantly higher self-efficacy mean scores in year 2003 ($p < 0.001$).

Table 3 describes the percentage of participants whose brushing or xylitol use frequently improved, stayed the same or decreased during time periods of 2001-2003 and 2003-2005 with all participants and between genders. In the time period of 2003-2005 girls had statistically significantly higher ($p < 0.01$) percental changes than boys, which means that bigger percentage of girls improved their tooth brushing frequency in that time period. There was also a statistically significant difference between girls and boys in xylitol use in both time periods.

Mean change of self-efficacy according to the changes in tooth brushing and xylitol use is presented in Table 4. There was a positive change in self-efficacy in all groups (both the ones with improving oral hygiene habits and the ones with no change to negative change in oral hygiene habits) from 2001 to 2003. Between 2003-2005 the change in self-efficacy decreased despite of the change in oral hygiene habits with all participants. However, there was a small positive change in self-efficacy level with girls in years 2003-

2005. With boys the change in self-efficacy from 2003 to 2005 was minimal or even slightly negative.

Discussion

It seems that girls (aged 11-15) have naturally higher self-efficacy levels than boys. Girls also brushed their teeth more often than boys in all time points. In the beginning of the study, girls and boys used similar amount of xylitol daily, but in time period of 2003-2005 girls improved their xylitol use. Boys improved their xylitol use slightly, but the change was not statistically significant. In 2001 participants with lower tooth brushing frequency had higher self-efficacy than those brushing twice a day or more often. The same trend appeared with xylitol use in 2003, when the participants who used favourable amount of xylitol had lower self-efficacy levels than those who didn't. However in 2003 and 2005 the numbers changed and those participants who brushed their teeth twice or more often had higher self-efficacy levels. The change in self-efficacy was biggest in time period of 2001-2003 in both genders and all groups (the ones that improved their oral hygiene habits, the ones with no change and the ones who decreased their oral hygiene habits). In both genders the biggest positive change in self-efficacy happened in the group that decreased their tooth brushing frequency and xylitol use. Therefore the hypothesis of positive association with the change in self-efficacy and tooth brushing frequency or xylitol use can be overruled. Parents' education level was associated with participants' self-efficacy in year 2003, when the participants were around 13 years old.

The strength of this study is the large sized, longitudinal sample. The study sample was heterogeneous due to the publicly funded education and thus children from all social classes were included in the study. There was also high response rate due to the filling of

questionnaires during school time. Limitations of the study were self-reported measures, which can lead to under or over reporting. There was no clinical measuring in this study to support the self-reported data.

Correlations between adolescents' tooth brushing frequency, age, gender and socio-economic status were found in previous studies. (4, 5, 7) Our results were similar to these findings. Parents' education level and tooth brushing frequency were not compared in this study, but these previous studies suggest that there might be an association between the factors.

Other determinants of oral health behaviour were associated with tooth brushing frequency in Swedish and South African adolescents, such as SOC (sense of coherence) and self-esteem (6, 7). In the Swedish study of self-esteem and tooth brushing frequency, the association was statistically significant in 12-14 year olds and then vanished from 14-16 year olds. The study suggest that the relationship between self-esteem could change from cognitive to emotional and have an impact on the results. It could be that in this study the associations between self-efficacy and tooth brushing/xylitol frequency also changed due to some other oral health behaviour determinant and therefore the findings in this study were not constant in every time point. Adults have a positive association between self-efficacy and tooth brushing frequency (8, 9, 10, 11, 12, 13). The positive association between tooth-brushing frequency and self-efficacy was seen in this study in year 2005, when the participants were approximately 15 years old. Our results suggest that there might be a change of importance of self-efficacy to tooth brushing frequency in different ages. A suggestion for further studies could be defining the longitudinal associations of self-efficacy and tooth brushing frequency in older adolescents aged 15-18, so that it can be seen whether the association grows or vanishes with age.

As a result of this study, a correlation between parents' education level and higher self-efficacy in 2003, when the participants were around 13 years old, was found. It was found in a study executed in United-Kingdom that parents influence on the habitual behaviour of adolescents. With age the external environment (peer influence for example) has an increasing influence over behaviour (17). Our study suggests that parents education influence the most in self-efficacy at the age of 13. For further studies it could be interesting to find out at which age parents have the biggest impact on adolescents' oral health habits.

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LIITE 1

Table 1. The distributions of tooth brushing frequency, xylitol use and belief in keeping own teeth between genders and among all participants, presented as % (n).

		2001	2003	2005	P ^a	
Tooth brushing	All	50.8 (664)	52.0 (676)	58.7 (759)	<0.001	
	Girls	*** 60.2 (393)	*** 63.6 (414)	*** 74.1 (480)	<0.001	
	Boys	41.5 (271)	40.4 (262)	43.2 (279)	0.438	
Xylitol use	All	18.5 (235)	27.9 (364)	28.7 (375)	<0.001	
	Girls	18.9 (121)	*** 35.4 (232)	*** 37.0 (242)	<0.001	
	Boys	18.2 (114)	20.3 (132)	20.5 (133)	0.368	
Belief	All	Yes	53.3 (68)	54.2 (687)	58.8 (755)	0.018
		I don't know	43.8 (559)	42.1 (534)	35.8 (460)	0.018
		No	2.9 (37)	3.6 (46)	5.4 (69)	0.018
	Girls	Yes	** 53.1 (340)	** 53.1 (339)	** 59.6 (386)	0.021
		I don't know	44.7 (286)	44.0 (281)	36.1 (234)	0.021
		No	2.19 (14)	2.97 (19)	4.32 (28)	0.021
	Boys	Yes	53.5 (340)	55.4 (348)	62.3 (369)	0.472
		I don't know	42.9 (273)	40.3 (253)	35.5 (226)	0.472
		No	3.62 (23)	4.30 (27)	6.45 (41)	0.472

*p<0.05, ** p<0.01, *** p<0.001 for associations between gender and brushing, xylitol use and belief in every time point based on Chi-Square test.

^aLongitudinal testing based on Cochran's Q -test and Kendall's W -test (belief).

LIITE 2

Table 2. Self-efficacy mean (SD) values in 2001, 2003 and 2005 in different groups.

		2001	2003	2005
All		2.60 (1.08)	3.01 (0.983)	3.10 (0.971)
Gender	Girls	*2.63 (1.04)	**3.03 (0.923)	***3.22 (0.874)
	Boys	2.57 (1.12)	2.98 (1.04)	2.97 (1.04)
Brushing	2x/day	*2.59 (1.10)	3.02 (0.972)	**3.19 (0.943)
	Less than 2x/day	2.61 (1.07)	3.00 (0.993)	2.98 (0.997)
Xylitol use	3x/day	2.51 (1.04)	**2.87 (0.974)	3.07 (0.964)
	Less than 3x/day	2.63 (1.09)	3.06 (0.982)	3.11 (0.974)
Belief	Yes	*2.67 (1.12)	***3.10 (0.985)	***3.20 (0.980)
	I don't know	2.53 (1.03)	2.92 (0.950)	2.97 (0.932)
	No	2.22 (1.16)	2.61 (1.16)	2.80 (0.979)
Parents' education level	Both highly educated	2.72 (1.05)	***3.25 (0.827)	3.15 (0.945)
	One has a high education	2.66 (1.10)	3.03 (1.02)	3.13 (0.966)
	Both have lower education	2.57 (1.08)	2.95 (0.984)	3.07 (0.973)

*p<0.05, ** p<0.01, *** p<0.001 for associations between groups are based on Mann Whitney U test for oral hygiene habits and Kruskal Wallis test for belief and parents' education level.

LIITE 3

Table 3. The distribution (%) of participants according to change (improved, decreased, stable) in brushing and xylitol use frequency during time periods of 2001-2003 and 2003-2005.

		2001-2003			2003-2005			P ^a
		Improved	Stable	Decreased	Improved	Stable	Decreased	
Tooth brushing	All	15.9	69.3	14.7	16.5	73.6	9.89	0.092
	Girls	17.8	68.0	14.2	**18.0	**74.4	**7.6	0.816
	Boys	14.0	70.7	15.3	15.0	72.9	12.2	0.032
Xylitol use	All	18.5	72.5	8.92	13.7	73.5	12.8	0.193
	Girls	***23.9	***68.6	***7.5	***16.6	***68.2	***15.1	0.011
	Boys	13.1	76.5	10.4	10.8	78.7	10.5	0.309

*p<0.05, ** p<0.01, *** p<0.001 for associations based on Chi-Square test between genders.

^aLongitudinal testing based on Friedman's test.

LIITE 4

Table 4. Mean values of change in self-efficacy according to the changes in behaviours (tooth brushing and xylitol use).

		Change in behaviour 2001–2003			Change in behaviour 2003–2005		
		Improved	Stable	Decreased	Improved	Stable	Decreased
Tooth brushing	All	0.40 (1.25)	0.38 (1.34)	0.50 (1.27)	0.12 (1.18)	0.10 (1.21)	-0.02 (1.30)
	Girls	0.39 (1.16)	0.39 (1.28)	0.41 (1.18)	0.25 (1.10)	0.19 (1.12)	0.08 (1.23)
	Boys	0.42 (1.29)	0.38 (1.39)	0.58 (1.36)	-0.04 (1.26)	0.02 (1.29)	-0.09 (1.34)
Xylitol use	All	0.34 (1.28)	0.39 (1.32)	0.66 (1.31)	-0.03 (1.14)	0.12 (1.22)	0.09 (1.21)
	Girls	0.37 (1.22)	0.40 (1.24)	0.63 (1.41)	0.06 (1.07)	0.20 (1.16)	0.28 (1.01)
	Boys	0.27 (1.40)	0.38 (1.39)	0.69 (1.24)	-0.16 (1.25)	0.04 (1.27)	-0.19 (1.41)

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