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# Outcome expectations and use of smokeless tobacco (snus): A cross-sectional study among young Norwegian snus users

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In this study, measures of outcome expectancies related to use of snus (wet snuff) were used to predict reported frequency of snus use. Data stem from a nation-wide survey in Norway among 16- to 20-year-olds. Only users of snus were included in the statistical analyses ($n$ = 589). The main outcome measure, frequency of snus use, was measured as a categorical variable – occasional, weekly and daily use. Four dimensions of outcome expectancies (mood regulation, smoking control, weight control and negative health outcomes) were measured and confirmed in a confirmatory factor analysis. Informants tended to believe that snus use is harmful to health, but still they supported the idea of snus as a way to control own cigarette smoking. In a SEM model, two of the four dimensions of outcome expectancies turned out to be particularly significant predictors of frequency of snus use – mood regulation and smoking control. No significant interactions with gender were found. Males scored higher than females on ''mood regulation'', and ''smoking control'', while females scored higher than males on ''negative health outcomes''. If more smokers were convinced that snus use is a less harmful alternative, more of them might start using snus, not only because there is some association between health outcome expectancies and snus use, but also because snus use by many is perceived as a remedy to stop smoking and as a way to gain some of the mood regulation benefits which are usually associated with smoking.

*Key words*: Outcome expectancy, smokeless tobacco, Norway.

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## INTRODUCTION

Smoking continues to be the most prevailing form of tobacco use in Norway. In the last decades however, there has been a decline, and the reduction in the prevalence of smokers has been particularly fast during the last 10 years. In 2008, the prevalence of daily smokers among adults (age 16–74 years) was 21% (Norwegian Directorate of Health, 2009). In recent years there has been a marked increase in the use of Swedish snus, a moist smokeless tobacco. Swedish snus comes in loose forms or in small sachets and is usually tacked under the upper lip for a number of minutes before it is discarded. With the strengthening of restrictive measures to reduce smoking, the most recent being the 2004 total ban on smoking in restaurants and pubs, the prevalence of snus use may be expected to rise.

Since 1992, there has been a ban on the sale of snus products in the European Union (EU), except for Sweden, which obtained an exemption from the ban when the country joined the EU. Similarly, there is unrestricted access to snus in Norway, as the country is not an EU member. In Sweden, where snus is commonly used by men, one out of four 18-year-old males is reported to be a regular user of the product (Galanti, Rosendahl & Wickholm, 2008). Among Norwegian males under 20, snus use tends to increase with age (Øverland, Hetland & Aarø, 2008). In the adult population, however, the use of snus decreases with age. In a national survey that took place in 2008, 17% of males between age 16 and 24 reported using snus on a daily basis (Norwegian Directorate of Health, 2009). Among 15- and 16-year-old males, daily and occasional use of snus combined is reported to be around 20% (Grotvedt, Stigum, Hovengen & Graff-Iversen, 2008). While snus use is mainly experimental among young females, the proportion of regular users in this group is reported to be increasing (Øverland *et al*., 2008).

Despite the increase in the prevalence of snus use among young people, there has been little attempt to study the underlying mechanisms that contribute to this trend. In the present study, our aim is to examine associations between snus use and one set of factors that may explain the use of snus among young Norwegians: outcome expectations.

The use of snus has generally been associated with smoking cessation. In Sweden, it is suggested that snus has predominantly been used as a smoking cessation aid by males (Foulds, Ramstrom & Fagerstrom, 2003; Lindstrom, 2007). Consequently, there has been a decrease in smoking prevalence as well as mortality and morbidity associated with smoking among males (Foulds *et al*., 2003; Rodu & Cole, 2004). Possibly because of its less harmful effect and its high nicotine content, the proposal has been made to prescribe snus to patients who are finding it difficult to quit using other nicotine replacement therapy (Britton, 2008). Indeed, the general argument has been that snus should be promoted as less harmful and made available to the public (see Fagerstrom & Schildt, 2003). Nevertheless, previous studies suggest that most individuals who quit smoking do so without the use of snus (Gilljam & Galanti, 2003). Smoking and snus use appear to co-exist among young males (Wickholm, Galanti, Soder & Gilljam, 2003), and the evidence that snus is being used to quit smoking among this sub-population is limited.

Tobacco use in general and smoking in particular have been associated with several preventable diseases and death. For smokers, however, smoking has several positive aspects. For example, the role of smoking as a weight controller has been the reason behind engagement in the behavior and subsequently, refusal of some smokers to quit the behavior (Johns, Frohlich & Bondy, 2008). While findings on smoking for weight control and its importance for females compared to males are conflicting, females are described to be more concerned about their weight than males (Plotnikoff, Bercovitz, Rhodes, Loucaides & Karunamuni, 2007). Several other motives for smoking have also been observed. Previous studies suggest that smoking is often reported to be reinforcing, apparently because of the calming effect of nicotine. The calming effect or anxiety reduction, however, is observed to occur generally in the presence of distractors (Kassel & Shiftman, 1997). Other motives for smoking that have been observed in earlier studies include enjoyment, social enhancement and concentration aid (Yong & Borland, 2008).

Conceptually, the positive effects that users of products such as cigarettes or snus report as motives for using these products have been referred to as "self-monitored motives" or "functional beliefs" (Piasecki, Richardson & Smith, 2007; Yong & Borland, 2008). In Bandura's Social Cognitive Theory, these positive behavioral effects as well as possible negative effects that are expected by a person are referred to as outcome expectations. Behavioral outcomes may be social, physical or self-evaluative (Bandura, 1986). In Ajzen's Theory of Planned Behaviour, a similar concept is "behavioural beliefs", defined as an individual's beliefs about consequences of a particular behavior (Ajzen, 1991). The idea that behavior to some extent is influenced by the person's expectations of outcomes is common across a number of theories and conceptual models, including models applied in health behavior research. In the present study, we seek to examine how some of the functional beliefs and health-related outcome expectations which have proven to be associated with smoking are linked to the use of snus.

In view of the above discussion, we will examine the following: (1) the support for various possible outcomes of snus use; (2) associations between frequency of use of snus and (a) the belief that it is effective as a regulator of mood, (b) the understanding that it is effective as a smoking cessation aid or as a means to avoid smoking, (c) the belief that it is perceived as a tool to control body weight or overeating and (d) the understanding that it is perceived as not harmful. We expect the relationship between the belief that it is effective as a tool to control body weight or overeating and actual frequency of snus use to be stronger among females than among males; (3) Although snus use may co-exist with smoking, frequency of snus use is expected to decrease with higher frequencies of smoking.

## METHODS

The present study is based on data from a cross-sectional survey among a representative sample of Norwegian adolescents and young adults. The survey was carried out to examine the use of tobacco among this subpopulation. Included in the study are items and scales for measurement of outcome expectancies related to the use of snus.

### *Sample*

For the study sample, the Norwegian Population Registry provided a list of randomly selected 16- to 20-year-olds living in Norway (5,757 persons). Successful interviews were conducted with 2,415 respondents. The analyses in this publication are based on data collected among snus users only ($n$ = 589).

### *Data collection*

Data collection was carried out by a commercial marketing research institute (Synovate MMI). Prior to the survey, 5,000 potential participants received letters informing them of the content of the study, the procedure involved, and encouraging them to participate. During the period, 17 September to 3 October 2007, young people were interviewed on the phone by trained interviewers from Synovate MMI. A number of possible participants ($n$ = 3342) could for a number of reasons not be included in the study: 338 because of wrong telephone numbers, 1,246 because no-one answered the phone call, 1,188 due to refusal to participate in the survey, while 570 were left out either because they were not within the required age or because enough interview had already been conducted.

### *Measurement*

*Use of tobacco:* Snus use among participants was measured by two items. For the first item, "Have you ever used snus", responses were coded (1) "Yes", and (2) "No". Participants answering "yes" were asked a second question: "How often do you use snus at present?" The responses were coded using a four-point scale: (1) "Not at all", (2) "Less than once a week", (3) "Every week" and (4) "Every day". Similar items and response categories were used to measure smoking status among participants.

*Outcome expectations that may be related to the use of snus:* Several beliefs or expectations about mood regulation, smoking cessation and prevention, weight control and health consequences were assessed using the following 14 items: Using snus helps me relax; Using snus helps me control my anger/frustration; Using snus calms me down when I am nervous; Using snus helps me to deal with tension; Using snus satisfies my need for nicotine; Using snus reduces my urge to smoke; If I were to stop smoking, using snus would make it easier; Using snus makes it easier for me to not smoke; Using snus stops me from overeating; Using snus helps me keep my weight down; Using snus would help me not eat more than what I should; Using snus is bad for my health; Using snus increases the risk that I will get a cancerous disease; Using snus increases my risk of getting coronary heart disease. Responses to these items ranged from (1) strongly disagree to (5) strongly agree. There was a sixth option 'don't know' which was defined as missing in the statistical analysis of data. The items were adapted from a study on smokers' expectancies related to use of nicotine replacement products (Juliano & Brandon, 2004).

*Snus products often used and age at which snus use began:* Participants were asked to indicate the following: (1) type of snus products often used; (2) at which age use of snus began, and (3) at which age regular use of snus began. A summary of responses to these questions is presented in Table 1.

### *Statistical analysis*

The analyses of gender differences in scores on outcome expectancies were based on simple, mean scores, one for each dimension (range 1–5). These analyses as well as simple descriptive statistics were done with SPSS version 15. Confirmatory factor analyses with four and five factors were undertaken to examine the dimensionality of scales for the measurement of

Table 1. *Frequency of snus use by snus products often used, age of onset of snus use, age of onset of regular use of snus, and smoking status for male and female snus users*

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| Use of snus | Occasional ($n$ = 94) | Weekly ($n$ = 40) | Daily ($n$ = 260) | Occasional ($n$ = 107) | Weekly ($n$ = 29) | Daily ($n$ = 59) |
| Snus product used often | | | | | | |
| Traditional loose snus | 21.3 | 27.5 | 44.6 | 4.7 | 0 | 5.1 |
| Portion snus | 60.6 | 70.0 | 40.4 | 59.8 | 65.5 | 78.0 |
| Mini portion snus | – | – | – | 25.2 | 27.6 | 11.9 |
| Both loose and portion | 16.0 | 2.5 | 15.0 | 4.7 | 6.9 | 5.1 |
| Don't know | 2.1 | 0 | 0 | 5.6 | 0 | 0 |
| Age use of snus began | | | | | | |
| 9–11 | 2.1 | 0 | 2.3 | 0 | 3.4 | 1.7 |
| 12–14 | 17.0 | 35.0 | 28.5 | 11.2 | 3.4 | 13.6 |
| 15–17 | 66.0 | 50.0 | 62.7 | 66.4 | 75.9 | 72.9 |
| 18–20 | 14.9 | 15.0 | 6.5 | 22.4 | 17.2 | 11.9 |
| Age regular use of snus began | | | | | | |
| 9–11 | 3.2 | 0 | 0.8 | - | - | - |
| 12–14 | 10.6 | 15.0 | 11.9 | 7.5 | 0 | 5.1 |
| 15–17 | 64.9 | 57.5 | 67.7 | 57.9 | 58.6 | 66.1 |
| 18–20 | 21.3 | 27.5 | 19.6 | 34.6 | 41.4 | 28.8 |
| Smoking status | | | | | | |
| No smoking | 50.0 | 45.0 | 55.6 | 50.0 | 37.9 | 61.0 |
| Occasional | 17.0 | 20.0 | 19.3 | 15.1 | 27.6 | 10.2 |
| Weekly | 3.2 | 7.5 | 10.0 | 7.5 | 10.3 | 15.3 |
| Daily | 29.8 | 27.5 | 15.1 | 27.4 | 24.1 | 13.6 |

outcome expectancies. Outcome expectancy items were treated as ordered categorical variables. In the SEM models with latent variables as predictors, the outcome measure, frequency of snus use, was included in the analysis as an ordered categorical variable (i.e. occasional, weekly and daily use). Estimation of correlations among latent outcome expectancy variables, confirmatory factor analysis and SEM analyses were done by using the Mplus statistical programme, version 5. The WLSMV estimator was applied. Missing observations were handled with a pairwise deletion procedure (Muthén & Muthén, 1998–2007).

## RESULTS

### *Demographics, frequency of snus use and smoking*

The analyses presented in this publication include snus users only ($n$ = 589). Among these, 67% were males. Age of participants ranged from 16 to 20, with a mean age of 18.3 years ($SD$ = 1.31) and 18.1years ($SD$ = 1.28) for males and females, respectively.

Among snus users, the proportions of males who reported engaging in snus use on an occasional, weekly and daily basis were 24%, 10% and 66%, respectively. The corresponding figures for females were 55%, 15% and 30%. Gender difference in the frequency of use of snus turned out to be significant ($\chi^2$ = 69.999, df = 2, $p < 0.001$). Portion snus was the most common type of snus product used by both males and females, while mini portion snus was exclusively used by females. The majority of both males and females indicated that they began using snus between age 15 and 17. Similarly, for both genders, regular use of the product began when they were between 15 and 17 years (Table 1).

The proportion of daily smokers was higher among occasional and weekly users of snus (29.8% and 27.5% for males; 27.4% and 24.1% for females) than among daily users (15.1% and 13.6% for males and females, respectively). A majority of snus users of all three categories (occasional, weekly and daily) reported that they did not smoke (Table 1). A chi square analysis of the association between frequency of smoking and frequency of snus use was significant for males ($\chi^2$ = 14.037, df = 6, $p < 0.05$) but only borderline significant for females ($\chi^2$ = 11.351, df = 6, $p$ = 0.078).

### *Outcome expectations (OEs)*

Between 5.9% and 18.2% were neutral or indicated "don't know" in their responses to the items used to measure outcome expectancies related to the use of snus. This signifies a fair interest in the beliefs or expectations focused in the present study. More than 50% of the participants reported that they either agree or totally agree with beliefs such as "Using snus makes me relax"; "Using snus calms me down when I am nervous"; "Using snus satisfies my need for nicotine"; "Using snus increases the risk that I will get a cancerous disease" among others (Table 2). In contrast, a majority of participants indicated that they either disagreed or totally disagreed with beliefs such as "Using snus helps me control my anger or frustration"; "Using snus helps me keep my weight down"; and "Using snus stops me from overeating". Concerning the belief that "Using snus helps reduce tension" the proportions agreeing and disagreeing were similar (Table 2).

### *Dimensionality and internal consistency of scales*

Confirmatory factor analysis of the 12 items that were meant to measure outcome expectancies related to the use of snus revealed four underlying factors, namely mood regulation OEs, weight

Table 2. *Outcome expectancies related to the use of snus – percentage distributions*

| | Totally disagree | Disagree | Neither agree nor disagree | Agree | Totally agree | Don't know | Total | |
|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | N |
| Mood regulation outcome expectations | | | | | | | | |
| Using snus helps me relax | 7.3 | 4.1 | 4.9 | 36.8 | 45.8 | 1.0 | 100 | 589 |
| Using snus helps me control my anger/frustration | 40.7 | 16.8 | 9.2 | 17.7 | 13.2 | 2.4 | 100 | 589 |
| Using snus calms me down when I am nervous | 16.5 | 8.5 | 8.3 | 34.8 | 30.6 | 1.4 | 100 | 589 |
| Using snus helps me to deal with tension | 24.4 | 18.0 | 14.1 | 24.4 | 14.9 | 4.1 | 100 | 589 |
| Smoking control outcome expectations | | | | | | | | |
| Using snus satisfies my need for nicotine | 8.8 | 6.5 | 7.8 | 29.4 | 45.8 | 1.7 | 100 | 589 |
| Using snus reduces my urge to smoke | 14.6 | 5.6 | 9.2 | 27.5 | 38.7 | 4.4 | 100 | 589 |
| If I were to stop smoking, using snus would make it easier | 13.8 | 8.1 | 6.5 | 31.2 | 34.0 | 6.5 | 100 | 589 |
| Using snus makes it easier for me to not smoke | 16.8 | 5.8 | 7.0 | 25.3 | 41.1 | 4.1 | 100 | 589 |
| Weight control outcome expectations | | | | | | | | |
| Using snus stops me from overeating | 47.4 | 16.5 | 11.4 | 10.5 | 9.0 | 5.3 | 100 | 589 |
| Using snus helps me keep my weight down | 49.4 | 21.4 | 10.9 | 7.1 | 6.1 | 5.1 | 100 | 589 |
| Using snus would help me not eat more than what I should | 45.2 | 18.5 | 11.5 | 11.7 | 10.4 | 2.7 | 100 | 589 |
| Health outcome expectations | | | | | | | | |
| Using snus is bad for my health | 3.6 | 7.8 | 10.0 | 34.1 | 43.8 | 0.7 | 100 | 589 |
| Using snus increases the risk that I will get a cancerous disease | 8.8 | 7.5 | 9.5 | 37.4 | 34.6 | 2.2 | 100 | 589 |
| Using snus increases my risk for getting coronary heart disease | 10.2 | 12.1 | 12.9 | 33.3 | 26.3 | 5.3 | 100 | 589 |

control OEs, health OEs and smoking control OEs (CFI = 0.954; RMSEA = 0.067). Given the selection of items used in our study, this corresponds well with a study carried out by Juliano and Brandon (2004), the only difference being that their "craving reduction" and "quitting facilitation" factors in our analyses showed up as a common "smoking reduction" factor. For the four sets of items, Cronbach's alphas were between 0.67 and 0.77, suggesting that the scales had adequate internal consistency. The allocations of items to factors are shown in Table 2.

### *Descriptive statistics and correlations among outcome expectancy latent variables*

In Table 3, means and standard deviations are presented for the various outcome expectancy mean scores. *T*-tests revealed significant mean differences between males and females regarding mood regulation OEs, smoking control OEs and health OEs ($p < 0.01$). Females, more than males, agreed that snus use has negative health consequences. Males, more than females, agreed that using snus makes it easier not to smoke and that it helps as a regulator of moods. No gender differences were found for items that measured beliefs on weight control.

In results not presented in tables, intercorrelations among three factors – mood regulation OEs, smoking control OEs, and weight control OEs – ranged from 0.35 to 0.66, $p < 0.001$. Health outcome expectancies had quite a low association with mood regulation OEs ($r = -0.13$, $p < 0.05$) and insignificant associations with the other latent outcome expectancy variables.

### *Outcome expectations and frequency of snus use*

Presented in Table 4 are results from single group and multiple group (males and females) SEM analyses. Findings from the single group analysis revealed significant associations between all the latent outcome expectancy predictors, age and gender, and the outcome variable, frequency of snus use (CFI = 0.918; RMSEA = 0.078; $\chi^2 = 288.830$; df = 63; $p < 0.001$). A multiple group analysis was run to examine gender differences, if any. A fully constrained model was tested against a model where all paths from predictors of frequency of snus use were released, using the "difftest" procedure in the Mplus statistical programme. This procedure was used as a global test of gender differences of unstandardized coefficients. The differences

Table 3. *Outcome expectations (OEs) mean scores by gender*

| | Males | | | Females | | | Test of differences of means | | | Cronbach's |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean scores[a] | Mean | SD | *n* | Mean | SD | *n* | *t* | df | *p* < | alpha |
| Mood regulation OEs | 3.39 | 0.99 | 393 | 2.98 | 1.02 | 195 | 4.59 | 586 | 0.001 | 0.70 |
| Smoking control OEs | 3.91 | 1.04 | 389 | 3.47 | 1.11 | 192 | 4.63 | 579 | 0.001 | 0.76 |
| Weight control OEs | 2.11 | 1.12 | 381 | 2.05 | 1.06 | 188 | 0.56 | 567 | n.s. | 0.77 |
| Health OEs | 3.68 | 0.99 | 391 | 4.13 | 0.76 | 189 | 6.00[b] | 471.18[b] | 0.001[b] | 0.67 |

[a] Range (1–5).
[b] Since Levene's test for equality of variances proved significant, a *t*-test for equal variances not assumed was applied.

Table 4. *Use of snus by outcome expectations (OEs) (latent variable predictors), smoking habits, age, and gender. Unstandardized coefficients from Mplus SEM analyses (*n = *587)*

| Predictors | Model estimates for single group analysis | Model estimates for multigroup analysis | |
|---|---|---|---|
| Mood regulation OEs | 0.39** | 0.44** | |
| Smoking control OEs | 0.59*** | 0.55*** | |
| Weight control OEs | −0.25** | −0.27* | |
| Health OEs | −0.17* | $-0.10_{\text{MALES}}$ n.s. | $-0.58_{\text{FEMALES}}$ $p = 0.091$ |
| Smoking status | −0.12** | −0.12** | |
| Age | 0.08* | 0.08* | |
| Gender (males = 0, females = 1) | −0.86*** | ….. | |
| Model chi-square | $\chi^2 = 288.830$ df = 63 $p < 0.001$ | $\chi^2 = 190.603$ df = 93 $p < 0.001$ | |
| Fit indices | CFI = 0.918 RMSEA = 0.078 | CFI = 0.961 RMSEA = 0.060 | |

*Note:* Chi square for testing of gender difference in regression coefficients for health outcome expectations of using snus: $\chi^2 = 3.350$, df = 1, $p = 0.067$.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

proved to be non-significant ($\chi^2 = 9.889$; df = 6; $p = 0.129$). Similarly, when only the paths from the outcome expectancies were released, no significant difference was found. Next, each of the paths from the outcome expectancies, one by one, was tested. Only the path between health OEs and frequency of snus use came close to significance. This particular path was released in the final model. Compared to the single group analysis, the final model (multiple group analysis) obtained slightly better fit (CFI = 0.961; RMSEA = 0.060; $\chi^2 = 190.603$, df = 93, $p < 0.001$).

Among the outcome expectancy predictors, smoking control OEs and mood regulation OEs were the strongest ones. The more the respondents agreed that snus use may help them not to smoke and the more they agreed that snus may help them in regulating their mood, the more frequently they tended to use snus (coefficients = 0.59 and 0.39). The more they believed that using snus is harmful to health, the less they smoked (coefficient = –0.17). This latter association appeared to be stronger for females (–0.58) than for males (–0.10), but the gender difference in unstandardized coefficients was not significant. Use of snus was also associated with smoking. The less frequently they smoked, the more frequently they tended to use snus (coefficient = –0.12). Frequency of snus use tended to increase with age (coefficient = 0.08). The negative and significant association between weight control OEs and frequency of snus use (–0.25) does not necessarily mean that respondents who believed snus may be used in weight control were less likely to use snus frequently. In the absence of other predictors, the above (bivariate) association was not significant.

## DISCUSSION

### *Main findings*

Four dimensions of outcome expectancies were identified in this study, labelled ‘‘mood regulation’’, ‘‘smoking control’’, ‘‘weight control’’ and ‘‘health’’. In this sample of snus users, use of snus was seen as an important way to control own cigarette smoking and as a way to regulate mood. A high proportion of informants, however, regarded snus to be harmful to health. There was considerably less support for the idea that snus is an effective way of controlling own weight. Use of snus was primarily associated with smoking control and mood regulation outcome expectancies. There was no gender difference (contrary to our expectations) in the association between weight control outcome expectancies and frequency of snus use. There was a tendency that use of snus decreases with higher frequencies of smoking.

### *Outcome expectations related to the use of snus*

Most participants were able to take a stand (indicate agreement or disagreement) to the items on outcome expectations of using snus. High proportions agreed that use of snus is bad for their health and that use of snus may make it easier for them to not smoke. Most informants disagreed that use of snus may help them reduce eating and eventually weight. Support for the different items that measured mood regulation OEs was not consistently high, although the mean score revealed a rather strong support for this type of expectation. Significant differences were found between males and females, with males having higher scores on mood regulation OEs and smoking control OEs. In contrast, females scored higher on health OEs, while no gender difference was found for weight control OEs.

In smoking research, outcome expectations or functional beliefs that are perceived as important by smokers include beliefs on enjoyment or pleasure and stress management. In addition, weight control as a functional belief for smoking has been fairly supported (Yong & Borland, 2008). McEwen, West and McRobbie (2008) also found fair support for the perceived importance of several motives for smoking such as stress relief, boredom relief and enjoyment. In a study involving a small sample of women using smokeless tobacco, several perceived advantages of using the product were reported, which included relaxation, pleasure and appetite suppression (Boyle, Gerend, Peterson & Hatsukami, 1998). Based on findings from the present study, the motives for snus use and smoking appear to be similar to some degree. With these similarities and with the current ban on smoking in public places in Norway, smokers who have no intention of quitting tobacco use may tend to use snus instead of smoking cigarettes, in public places.

For individuals attempting to quit smoking or for those with no intention to smoke, the understanding that snus use is effective as a smoking cessation aid or as a means to avoid smoking, may lead to a higher frequency of use of snus. Smoking control OEs were the most supported ones among the four categories of outcome expectations for male informants, although for female informants, health OEs were more salient, perhaps explained by females’

higher level of health consciousness (see Roos, Lahelma, Virtanen, Prättäla & Pietinen, 1998).

There were positive associations among all the three latent variables measuring outcome expectations (use of snus for mood regulation, aid in smoking cessation, and weight control). To the extent that these beliefs predict frequency of snus use, they might represent a powerful influence. Such beliefs are usually significant determinants of tobacco use (see Newman & Shell, 2005; Yong & Borland, 2008).

### *Predicting snus use*

Outcome expectations on mood regulation were significantly and strongly associated with the frequency of use of snus. This finding is consistent with studies on smoking (e.g. Piko, Wills & Walker, 2007). Smoking and snus use, both seen as a mood regulator, may be attributed to the comparable nicotine content of the tobacco products (Hatsukami & Severson, 1999; Holm, Jarvis, Russell & Feyerabend, 1992). Snus use may thus be readily used as a substitute or as a supplement of smoking, for mood regulation.

Outcome expectations on use of snus as an aid to abstain from smoking were also related to the frequency of use of snus for both males and females. The likelihood that snus is being used as a substitute or as a supplement of cigarettes is thus more likely to be true for young snus users such as those studied in the present study. The success story of Sweden, where increase in the use of snus is supposed to have led to a decline in smoking among males has been reported in several studies (e.g. Fagerstrom & Schildt, 2003; Hall & Gartner, 2009; Ramstrom & Foulds, 2006). Snus use is thus suggested to be more of a substitute than a supplement of smoking among Swedish males. With the positive health outcomes that come with this shift, a proposal has been made to encourage collaboration between the public health community and the tobacco industry that will regulate the content of the latter's products while making it easier for smokers to make the healthiest choice (Gilmore, Britton, Arnott, Ashcroft & Jarvis, 2009; Hall & Gartner, 2009). Not all have supported this proposal though, as it is suggested that the Swedish success may be unique and may not benefit other countries (see Zhu, Wang, Hartman *et al*., 2009). General Directors of Health from all Nordic countries published a statement in 2008 where they claimed that only 5% of Swedish men who have stopped smoking succeeded because they used snus as a way to control their craving for cigarettes. They argue against using snus as a remedy to stop smoking, and they refer to a number of studies which have documented harmful effects of snus use (Holm, Fisker, Larsen, Puska & Halldórsson, 2008).

High proportions of both male and female participants believed in negative health consequences of snus use. The association between these outcome expectations and frequency of use of snus was significant for both genders combined. The association, however, appeared to be much stronger for females, although this gender difference in unstandardized coefficients was only borderline significant ($p = 0.067$). As mentioned above, females tend to be more health conscious, although males' engagement in health enhancing behaviours has been suggested to be higher. We cannot exclude the possibility that health concerns play a more important role for women than for men. Only a study with a larger number of participants, more females in particular, would be needed in order to have this assumption confirmed or disconfirmed. The rather low association found for men is consistent with an old line of research on health-related behavior (Silversin, 1979). It has repeatedly been confirmed that health concerns play a rather limited role in predicting and changing health behaviors (Peters, Kok, Ten Dam, Bujis & Paulussen, 2009). Other concerns, particularly those related to more short-term effects of behaviours, such as mood regulation, may be of greater importance (Aarø, Schaalma & Åstrøm, 2008).

Although there was no significant association between weight control OEs and frequency of snus use in the bivariate analysis, there was a significant negative association in the SEM model. This surprising finding may have occurred because of high intercorrelations among three of the predictors. It probably just indicates that the weight control motive is of minor predictive importance compared to the other predictors of snus use. This corresponds well to the finding that few of the participants perceived weight control to be a main motive for their own use of snus.

Frequency of use of snus tended to decrease with smoking, relating well with the significant link between smoking control OEs and frequency of snus use. If snus is used as a remedy to control cigarette smoking, it is understandable that we find a lower frequency of smoking among those who use snus daily. Earlier studies suggest that smoking and snus use co-exist among young males (Wickholm *et al*., 2003). In the present study, this was partly confirmed as a quarter of weekly and occasional snus users were also daily smokers. However, daily users of snus were found to be smoking less frequently or not at all. In general, although use of snus appeared to be established more among males than among females, predictors of the behavior were largely the same for both subgroups.

### *Limitations of study*

The study had several limitations that need to be acknowledged. First, although a sampling procedure that would ensure a nationally representative sample was used, less than 50% of the original population participated in the survey. The extent to which this attrition has influenced the findings of the present study is unclear. It is, however, commonly assumed that such attrition influences overall estimates of means and prevalences more than patterns of associations among variables. Second, non-users of snus were not included in the present study although it would not make sense to ask individuals who have no experience with the behavior to report on motives for such behavior. Third, like all other cross-sectional studies, causal inferences can only be made with caution as the direction of influence could go both ways. However, because of the established relationships in the theories that were used as a framework for the present study, a direction of influence between the outcome expectations and frequency of use of snus can to some extent be laid down as a premise for the interpretation of our findings. Future studies using longitudinal designs may nonetheless be more appropriate when the goal is to move in the direction of establishing causal inference.

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