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# Determinants and promotion of oral hygiene behaviour in the Caribbean and Nepal

Yvonne A. B. Buunk-Werkhoven<sup>1,2,3,4</sup>, Arie Dijkstra<sup>1</sup>, Pim Bink<sup>5</sup>, Sarah van Zanten<sup>2,3</sup> and Cees P. van der Schans<sup>4</sup>

<sup>1</sup>Department of Social & Organizational Psychology, University of Groningen, Groningen; <sup>2</sup>Center for Dentistry and Oral Hygiene, Hanze University Applied Sciences, Groningen; <sup>3</sup>Department of Oral Health Care, University Medical Center Groningen, University of Groningen, Groningen; <sup>4</sup>Research Group in Health Care and Nursing, Hanze University Applied Sciences, Groningen; <sup>5</sup>Netherlands Oral Health Society, Arnhem, The Netherlands.

The purpose of this study was to identify predictors of oral hygiene behaviour (OHB) based on the Theory of Planned Behaviour (TPB) among dental care seekers in two cultural different regions: the Caribbean (Aruba/Bonaire) and Nepal. In addition, measures of oral health knowledge (OHK) and the expected social outcomes of having healthy teeth (ESO) were investigated. The main effects of the predictors as well as their interactions with region (Caribbean *vs.* Nepal) were examined. The interaction term contributed significantly to the amount of explained variance. In the Caribbean, OHB was determined by Attitude and Social Norms, and in Nepal by Perceived Behaviour Control and ESO. On the basis of these findings, quite different oral health care interventions are called for in developing and underdeveloped countries.

**Key words:** Psychosocial aspects of oral hygiene behaviour, oral health promotion, Caribbean, Nepal

Even though the importance of health and personal hygiene is widely acknowledged, especially in developing and underdeveloped countries it seems that health systems are not performing as well as they could and as they should<sup>1</sup>. Oral health is an important part of total health and essential to quality of life. Nowadays, the WHO calls for a reorientation of oral health systems towards prevention and health promotion. The Oral Health Programme (ORH) of the WHO emphasises the application of evidence-based strategies in oral health promotion and prevention as well as in the treatment of oral diseases worldwide<sup>2</sup>. As a consequence of unsuccessful oral health prevention, individuals often do not perform oral hygiene practices in an appropriate and efficient manner. In addition, the oral health of disadvantaged and poor population groups in developed and developing countries is generally poor<sup>3,4</sup>.

As self-care practices are essential for the promotion of oral health, it is important to re-organise oral health prevention to better fit the needs and expectations of people in a particular culture or region. Due to differences in lifestyles and risk factors that arise from environmental, economic, social and behavioural causes, such as poor living conditions and low education, as well as differences in traditions with regard to

oral self care, a so called *one-size fits all* approach for adequate oral hygiene behaviour will not be effective. Identification and the assessment of the psychosocial determinants of oral hygiene behaviour (OHB) within cultural subgroups or different regions are therefore of great importance for developing oral health care interventions that effectively target the determinants in cultural different regions or cultural subgroups. Such interventions need to be embedded within oral health systems that are financially fair for disadvantaged and poor population groups<sup>1,5,6</sup>.

Health models and health behaviour theories have been applied to oral health care in several studies. On the basis of such a social cognitive theory, the Theory of Reasoned Action (TRA)<sup>7</sup>; one would expect that OHB is determined by the individual's attitude towards it and the perceived social norms of relevant others<sup>8</sup>. In line with this, Freeman and Linden<sup>9</sup> found that tooth brushing and the use of additional cleaning aids were associated with a more positive attitude towards oral health, and with supportive norms of 'important others', such as the dentist, family, and friends. Moreover, in a study by Tedesco *et al.*<sup>10</sup>, it was shown that, in addition to the variables of the TRA, self-efficacy (i.e. self-control) for oral hygiene self-care did increase the explained variance

in brushing and flossing behaviour. Data on students in the context of a regimen of daily brushing and flossing showed the importance of perceived behavioural control, a variable similar to self-efficacy<sup>11</sup>.

However, there are profound OHB differences across regions, countries and within countries. These may relate to socioeconomic status, race or ethnicity, age, gender or general health status<sup>12</sup>. These differences may influence the relationship between psychological factors on the one hand and OHB on the other. Cultural subgroups may differ in the psychological factors that determine OHB. For interventions to be effective, they must take these differences into account. Therefore, the present study aimed to examine the psychosocial determinants of OHB among dental care seekers in two culturally different regions: the Caribbean and Nepal.

We chose to compare two cultural different regions with relatively disadvantaged and poor population groups in so called developed and developing regions, i.e. two islands in the Caribbean (Aruba and Bonaire) and Nepal, using a health behaviour theory, which is the model most often used to map the psychological causes of health behaviours: the Theory of Planned Behaviour (TPB)<sup>13,14</sup>. The TPB includes besides attitude (i.e. a person's positive or negative feelings about a given behaviour) and social norms (i.e. the belief that specific important persons think that one should or should not perform a given behaviour), also perceived behaviour control (i.e. a person's perception of his/her capabilities to perform a behaviour) as an independent determinants of behaviour. On the basis of this TPB model, one would expect that, overall, the more positive the attitude towards oral self-care practices, the stronger the social norms, and the higher the perceived behaviour control, the more likely it is that an individual will perform adequate OHB.

Aruba and Bonaire are part of the Netherlands Antilles. The population on the islands is mainly mixed Black, with the remaining group of being White, Amerindian and Asian background. About 75% of the population is Roman Catholic, and the surplus holds a membership in other religions. In 2005, on Bonaire the unemployment rate for the economically active population was almost 9%, whereas on Aruba the unemployment rate was slightly above 6%<sup>15</sup>.

Nepal is a poor developing landlocked country situated in the Himalayas, and positioned between China and India in Western Asia. Nearly 85% of the population, predominantly children, live in villages, in remote terrain that is difficult to access. Under-nutrition is wide-spread, particularly among children, the growth rate is high, and the expectation of life is around 61 years. Hinduism is practiced by a greater majority of people, and Buddhism by a minority<sup>16</sup>.

Given the differences between both cultural regions, the psychosocial determinants of OHB may also differ.

For example, people in the Caribbean have relatively easy access to a dentist for regular screening or dental problems, and a lack of adequate OHB may be merely a matter of one's individual attitudes. In contrast, for Nepalese there is limited availability of dental care, and therefore, Nepalese may generally experience more problems with their teeth, and may feel more unable to engage in adequate OHB<sup>17</sup>. The summary is that the task of oral hygiene related behaviour is influenced by environmental and cultural factors that may, in turn, influence the psychological determination of OHB.

Health-related concerns are not the only motive for oral hygiene behaviour. For example, tooth brushing may be engaged in to look more attractive, which in turn may influence one's social interactions, and for instance, in some cultures golden teeth are a trend or have become popular and are used as a status symbol<sup>18,19</sup>. In this study, therefore, the perceived social consequences of OHB, i.e. how one feels healthy teeth might affect one's interpersonal interactions (ESO) were also assessed. Finally, given the fact that in developing regions, knowledge about adequate OHB may be limited, and according to the TPB model, people make rational decisions based in part on their oral health knowledge (OHK), this variable was also included. People who have assimilated OHK and experienced some control over their personal oral health are more likely to adopt oral hygiene behaviour<sup>20</sup>.

To summarise, the present research examined the potential psychosocial determinants of OHB as assessed using a culturally adapted questionnaire, including a culturally adapted version of the OHB index in the Caribbean and in Nepal. When different determinants are associated with OHB in cultural different regions, this may have direct implications for the development of interventions promoting oral hygiene behaviour in these regions.

## METHODS

Permission for this cross-sectional study was obtained from the ethical committee of the Faculty of Behavioural and Social Sciences, University of Groningen, and the study was conducted according to universal ethical principles. Moreover, the dental patients and dental care seekers were invited to take part in this international study on oral hygiene behaviour, and after providing informed consent they voluntarily answered a multiple culturally adapted paper-and-pencil-questionnaire, just before the screening/dental examination or dental treatment.

### Participants and procedure

Participants were patients who visited a dental practice in Bonaire and in Aruba, (Caribbean sample), and

dental care seekers who visited a dental camp (Nepal sample). Participants in the Caribbean answered a questionnaire in the dental waiting room before the dental screening. Participants in Nepal were recruited during a dental camp of the Netherlands Oral Health Society (NOHS) in the region of Newalparasi: a questionnaire in Sanskrit was filled out by 69 participants, whereas the data for 39 participants were collected through a semi-structured interview by a Nepalese translator. In both samples the impact of individual's clinical oral health status was examined by a dental hygienist.

## Measures

The questionnaire included 35 items divided into several parts, including a few demographic questions. Level of education was categorised as low, medium or high. In the Netherlands Antilles, a low educational level referred to vocational training, medium level to advanced vocational training, and high level to college/university training. In Nepal, a low educational level referred to primary school, medium level to 'School Leaving Certificate'/vocational training, and high level to advanced vocational training/college/university training.

Oral Hygiene Behaviour (OHB index) was measured by a culturally adapted version of the OHB index developed by Buunk-Werkhoven *et al*<sup>21-25</sup>. This culturally adapted index includes six items with respect to tooth brushing and tongue cleaning. Based upon the author's experience, consultation with oral health professionals and the relevant literature, realistic tuned weights were assigned to these items. Because of cultural differences, for some items, the weights differed relatively between samples. For example, in Nepal the majority of people brush their teeth not more than once a day, because that is the norm. Therefore, the weights for frequencies of tooth brushing were in Nepal: 'not every day' = 0 points, 'once a day' = 1 point, and if 'once a day before they go to sleep' = 2 points, 'twice a day' = 2 points or 'twice a day, including once before they go to sleep' = 3 points. In contrast, in the Caribbean: 'not every day' = 0 points, 'once a day' = 1 point, 'twice a day' or 'more than two times a day' = 2 points. The OHB index sum score could range from 0 to 14. A high sum score indicated a high level of self-care OHB.

Next, before assessing the variables of the TPB<sup>21,24</sup>, the focal adequate OHB was described as 'brushing your teeth twice a day (once after breakfast and once before going to sleep), using a soft-bristled toothbrush and fluoride containing toothpaste; brushing softly/without pressure for at least 2 minutes; brushing stepwise by making small strokes –sort of massage – near the gum, along the inside and the outside, and on

the jackdaw areas. In addition to the tooth brushing, daily interdental cleaning (i.e. use of floss, tooth sticks, or interdental brushes in the Caribbean, and use of *sinca* (i.e. known as a wooden 'tooth stick' in Nepal) and tongue cleaning is also recommended.'

*Attitude* (ATT) toward this focal OHB was measured using four worded statements in a semantic differential format (Cronbach's  $\alpha = 0.65$  in the Caribbean, and  $\alpha = 0.83$  in Nepal). Participants indicated on seven-point scales how they evaluated this advised oral hygiene behaviour, on the dimensions 1 = *unimportant* to 7 = *important*, 1 = *unpleasant* to 7 = *pleasant*, *unhealthy-healthy*, and *painful-painless*. A sum score for participants' attitudes was constructed by adding the items (ranging from 4 to 28). Higher scores indicated a more positive attitude.

*Social norms* (SN) toward the focal OHB were assessed by having the participants rate the perceived opinions of different significant others with respect to taking better care of their teeth, e.g. 'my dentist,' 'my partner,' 'my (best) friends,' and 'my nearest family (parents, brothers, and sisters).' This seven-point scale for social norms was based on four items (Cronbach's  $\alpha = 0.91$  in the Caribbean, and  $\alpha = 0.86$  in Nepal). A sum score on this SN scale varied from 4 to 28.

*Perceived behavioural control* (PBC) was measured using a sum score constructed from two items (Cronbach's  $\alpha = 0.60$  in the Caribbean, and  $\alpha = 0.40$  in Nepal), e.g. 'Do you succeed in taking care of your teeth based on the daily OHB,' which were answered with endpoints 1 = *don't agree* to 5 = *agree*. The sum score on this five-point scale ranged from 2 to 10.

In all three domains, high sum scores indicated a positive attitude, strong perceived approval from significant others, and a high level of perceived behavioural control of the focal oral hygiene behaviour.

*Expected social outcomes* (ESO)<sup>21-25</sup> of having healthy teeth were assessed with a scale of six items (Cronbach's  $\alpha = 0.68$  in the Caribbean, and  $\alpha = 0.76$  in Nepal). An example of an item is: 'In social contacts fresh breath is important.' Responses varied from 1 = *disagree* to 5 = *agree*, and a sum score was computed by adding all items that measured the concept ESO (ranging from 6 to 30).

*Oral health knowledge* (OHK) was measured with an index consisting of seven items to reveal the status of the individual's oral health knowledge, for example, 'Gum bleeding is a sign of a periodontal disease.' All items could be scored with 1 = *yes* or 0 = *no*, and a sum score was computed (ranging from 0 to 7), so that a total OHK score was formed for each respondent. The higher the total score, the higher the individual's knowledge of oral health issues<sup>21,24</sup>.

In both samples a relative simple record of dentition characteristics (category I = *healthy dentition*, II = *slightly unhealthy dentition* (i.e. minimal caries and

gingival problems), III = *mutilated dentition*, IV = *pre-edentulous*, and V = *edentulous*) was registered by a dental hygienist<sup>23</sup>.

### Statistical analyses

The Statistical Package for Social Sciences 14.0 (SPSS, Chicago, IL, USA) was used for data analysis. The internal consistency of the used scales was assessed by Cronbach's alpha ( $\alpha$ ). A one-way analysis of variance was performed to determine whether any significant differences in mean scores of the variables existed between the patients in the Caribbean sample and in the Nepal sample. Linear regression analyses were performed to identify the determinants that accounted for a significant proportion of the variance in OHB.

## RESULTS

### Characteristics of Caribbean participants

The Caribbean sample included 113 patients (55% female) with a mean (SD) age of 36.5 (13.2) years. Although Dutch is the official language, Papiamentu – a mixture of Portuguese, Spanish, English and Dutch words – as the native language is spoken by 73% as its mother tongue; 48% of the participants in the sample were married. Only 5% of the Caribbean participants had a low level of education, 74% had a medium level, and 23% had a high level of education. The dentition characteristics in the Caribbean sample showed that just 16% of the participants had healthy teeth (category I), and more than the half had a slightly unhealthy dentition (category II, 54%). Almost one-third of the Caribbean participants had a mutilated dentition (category III, 30%).

Table 1 shows that participants evaluated the focal oral hygiene behaviour very positively, they attached much value to positive social outcomes of having healthy teeth, and their knowledge of oral health was moderate. They reported hardly any pressure from their social environment to perform this behaviour, and they felt they had good control over carrying out the oral

**Table 1** Means and Standard deviation (SD) for the main variables for the *Caribbean* and *Nepal* participants

Measures	Caribbean	Nepal
Attitude*†	24.09 (3.23)	23.71 (5.08)
Social Norms‡§	15.17 (6.73)	24.44 (4.67)
Perceived Behaviour Control¶**	8.6 (1.62)	8.38 (0.97)
Expected Social Outcomes†§	24.8 (3.9)	21.65 (4.42)
Oral Health Knowledge††‡‡	4.05 (1.3)	3.14 (1.1)

In total sample: \**n* = 103, †*n* = 102, ‡*n* = 78, §*n* = 106, ¶*n* = 100, \*\**n* = 104, ††*n* = 107, ‡‡*n* = 94.

hygiene self-care practices. For instance, the findings of the OHB index showed that 83% of the respondents brushed their teeth as recommended, twice a day. In addition, the half of the participants brushed their teeth in the morning and before they go to sleep for two minutes each time; 70% cleaned their tongue twice daily and 23% once a day. 55% of the Caribbean participants reported the use of any interdental cleaning methods, and 77% used fluoride containing toothpaste.

### Dental care seekers in Nepal

A total of 108 dental care seekers in Nepal completed the questionnaire (54% female); their mean (SD) age was 40.1 (16.5) years. The sample is a multi-ethnic group of people related to Brahmin, Magar, and Newari, Tharu, Chetri, and Gurung background. Nepali as the national language is spoken by 90% as its mother tongue; 74% of the participants in the sample were married. The level of education varied from no education (28%), low (27%), medium (32%) to a high level (13%). A record of dentition characteristics in the Nepal sample showed that almost a quarter (23%) of the participants had healthy teeth (category I), and almost half had a slightly unhealthy dentition (category II, 49%). More than a quarter of the Nepalese participants had a mutilated dentition (category III, 28%).

Table 1 shows that Nepalese participants evaluated the focal oral hygiene behaviour positively, they attached much value to positive social outcomes of having healthy teeth, and their knowledge of oral health was moderate. They reported much pressure from their social environment to perform this behaviour, and they felt they had considerable control over carrying out the oral hygiene self-care practices. For instance, the reported results of the OHB index showed that 58% of the participants brushed their teeth once a day, as Nepalese normally do; brushing the teeth only in the morning as a part of their bath ritual; 13% of the participants were not used to brush their teeth daily and 29% brushed twice a day. Very few of them brushed their teeth in the morning and before they go to sleep. About 55% and 34% also cleaned their tongue daily, twice and once a day, respectively. Only 7% reported the use of any interdental cleaning methods, 21% used tooth powder, and only 3% used a 'dattiwan' as a tooth brush and 'ash' as cleaning aids.

### Comparing the Caribbean and Nepal

Participants in the Caribbean reported a higher OHB-score (in a realistic way they reported 'control' over carrying out their oral self-care practices) compared to the Nepalese,  $F(1,209) = 73.15$ ,  $P = 0.001$ . In addition, they attached more value to positive social

outcomes of having healthy teeth,  $F(1,206) = 29.65$ ,  $P = 0.001$ , and their oral health knowledge was more explicit,  $F(1,199) = 27.96$ ,  $P = 0.001$ . However, Nepalese participants indicated that they felt much pressure from their social environment to perform OHB than participants in the Caribbean,  $F(1,182) = 121.78$ ,  $P < 0.001$ .

### Differential prediction of OHB in the Caribbean and in Nepal

To examine whether the various predictors played a different role in the two regions, a regression analysis was performed in the combined sample with region as the moderator. The interactions between each of the five predictors on the one hand and region on the other hand were entered in a linear regression analysis. The interaction terms contributed significantly to the amount of explained variance (7.2%),  $F(11,138) = 8.28$ ,  $P < 0.001$ . Three of the five variables had significant interaction effects with region: attitude ( $\beta = -0.71$ ,  $P < 0.05$ ), perceived behaviour control ( $\beta = 0.55$ ,  $P < 0.05$ ), and ESO ( $\beta = -0.68$ ,  $P < 0.05$ ). Thus, the findings clearly underline that these three predictors had different relations with oral hygiene behaviour in the Caribbean than in Nepal. To examine how these predictors differed between regions, separate regression analyses were carried out in both samples.

### Predicting OHB in the Caribbean

A linear regression analysis, in which the same five predictors were included as in the total sample, was performed in the Caribbean sample (Table 2). The model proved to be significant,  $F(5,54) = 3.55$ ,  $P < 0.001$ , and accounted for 17.7% of the variance, which is a substantial proportion for oral hygiene behaviour. Not only the factor attitude ( $\beta = 0.31$ ,  $P < 0.05$ ), but also the factor social norms ( $\beta = 0.24$ ,  $P < 0.05$ ) emerged as significant predictors of OHB.

**Table 2** Linear regression of oral hygiene behaviour (OHB) for all variables

Determinants	OHB Caribbean	OHB Nepal
	B	$\beta$
Attitude	0.31*	-0.08 ns
Social Norms	0.24*	0.02 ns
Perceived Behaviour Control	-0.09 ns	0.28**
Expected Social Outcomes	0.22 ns	-0.23*
Oral Health Knowledge	0.15 ns	0.03 ns

\*\* $P < 0.01$ , \* $P < 0.05$ .

Caribbean:  $R^2 = 0.177$ .  $F(5,54) = 3.55$ ,  $P < 0.001$ .

Nepal:  $R^2 = 0.066$ .  $F(5,84) = 2.26$ ,  $P < 0.05$ .

### Predicting OHB in Nepal

The linear regression model with five predictors was significant,  $F(5,84) = 2.26$ ,  $P < 0.05$ , and accounted for only 6.6% of the variance, which is lower than in the Caribbean sample. Only perceived behaviour control ( $\beta = 0.28$ ,  $P < 0.01$ ), and expected social outcomes ( $\beta = -0.23$ ,  $P < 0.05$ ) emerged as significant predictors of OHB (Table 2).

### DISCUSSION

The results of this study show that besides the fact that the predictors of OHB were determined in different regions, the culturally adapted version of the OHB index appears to be a useful method for assessing and evaluating oral hygiene self-care practices of individuals in the Caribbean and in Nepal. In contrast to the four-item oral hygiene scale including only self-reported tooth brushing and dental flossing<sup>26</sup>, this OHB index included all brushing details and other potential components of personal oral hygiene regimens, such as the use of interdental cleaning methods, fluoride concerning toothpaste, and tongue cleaning<sup>27</sup>. These findings are particularly important as this culturally adapted version of the OHB index corresponds closely to the actual oral hygiene behaviour of the participants.

While, overall, the power of the TPB in explaining differences in OHB was substantial, the TPB did perform quite differently in the two different sociocultural contexts examined in this study. That is, clear differences emerged between the Caribbean and Nepal regions in the importance of the TPB predictors of OHB.

In the Caribbean sample, attitude (ATT) and social norms (SN) were found to be significant determinants of OHB. Thus, in the Caribbean, individuals are more inclined to engage in OHB when they have a more positive attitude towards it, and perceive more favourable norms towards OHB. This result is in line with the classical prediction of the Theory of Reasoned Action, suggesting that for Caribbean people OHB is indeed a type of planned behaviour that is dependent on rational considerations<sup>7</sup>. In contrast, in the Nepal sample, attitude and perceived social norms were not related to OHB. Although the Nepalese do have attitudes and experience social norms with regard to OHB, these factors seemed not to influence their actual OHB. In the Nepalese sample, however, perceived behavioural control (PBC) was the most important predictor of OHB. Thus, the perceived task complexity of OHB and the feelings of control over OHB seem to be important for the Nepalese. These differences in psychological determinants between both cultural groups must be related to environmental and cultural differences. For example, for the Nepalese, tooth brushing is part of their bath

ritual and has primarily a symbolic meaning in the sense of fostering purity. Therefore, OHB as defined in this study may only be performed when they feel able to do so.

In addition to PBC, ESO was the only other factor that contributed to OHB in Nepal. Unexpectedly, for the Nepal region, a higher ESO was associated with a *lower* OHB. A possible explanation for this finding may be that in Nepal the used ESO-measure reflects primarily the concern with social outcomes. Therefore, Nepalese participants who felt in control of performing their OHB may have felt less concerned or worried about their dental status or oral health in the social domain.

In both the Caribbean and Nepal sample, the factor oral health knowledge (OHK) was not associated with OHB. It must be noted that knowledge concerning the benefits of fluoride containing toothpaste was not measured, because in the Caribbean, fluoride toothpaste is generally accepted, whereas in Nepal hardly any toothpaste is sold, including many global multi-national brands, contained any fluoride at all.

In conclusion, although not all relations can be interpreted unequivocally in this cross-sectional design, these data illustrate that there are substantial differences between the two regions in the way people perceive and experience different aspects of oral health and their personal oral hygiene behaviour (OHB). The results of this study suggest that the importance of the different TPB constructs for actual oral hygiene behaviour depends to a considerable extent on the context. In the Caribbean, OHB was determined by Attitude and Social Norms, and in Nepal by Perceived Behaviour Control and ESO. These differential associations should be considered when designing practical recommendations for improving oral hygiene behaviour. According to the WHO: ‘...Self-care practices in relation to oral hygiene are essential to promotion of oral health, and one of the significant reforms is to re-organize oral health services around people’s needs and expectations, so as to make them more socially relevant...’. On the basis of these findings, promotion of oral hygiene self-care in the Caribbean should be primarily geared towards *attitude change*, and use methods that may foster a more positive attitude and social norm with respect of appropriate oral hygiene behaviour. In contrast, such an approach would be likely fail in Nepal, where promotion of oral hygiene self-care should be geared primarily towards *increasing perceived control*. Instruction and feedback on how to execute the appropriate behaviour would be the most effective method in this context. The gained integrative insight into the determinants of OHB is needed for the development of specific oral health interventions for people in different cultures, and for the implementation of evidence-based, simple, and cost-effective preventive

approaches into public-health systems. This study may assist all oral health professionals working with cultural subgroups in what are referred to be ‘the most dignified tasks’ of these professionals, i.e. educating these cultural subgroups in oral health and changing their oral hygiene behaviour<sup>28</sup>. Especially dental hygienists may play a central role in promoting OHB, and may deliver these prevention oral health messages globally<sup>22,29</sup>. According an editorial in *The Lancet*<sup>30</sup>, dentists are at times not primarily focussed on educating patients, and in promoting good oral health, preferring to treat rather than prevent oral diseases. Moreover, in low-income and middle-income countries, dental care provided only by dentists is in general costly and unrealistic<sup>1,5,6,17</sup>. Therefore, in such countries dental hygienists may be the primary professionals involved in oral health care as they are well-trained to promote desirable oral hygiene behaviour by adequate professional communication with the people in diverse cultures<sup>25</sup>. Finally, while the results of this study need replication in other regions and countries to gauge the generalisability of the findings, and the fact that not all three TPB variables including the two additional variables contribute to the prediction of OHB, this expanded TPB model may be a fruitful tool to guide future research and practice in oral hygiene behaviour in diverse contexts.

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Correspondence to:

Dr Yvonne A. B. Buunk-Werkhoven,  
Rozenstraat 74a, 1016 NX,  
Amsterdam,  
The Netherlands.  
Email: Yvonne@apbuunk.com