

# Predictors of tooth brushing behavior in Iranian Adolescents: an application of the planned behavior theory

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## Abstract

**Background and Aim:** Contrary to the theory of planned behavior (TPB), intention alone is not sufficient to predict behavior. The aim of the study was application of an extended model of planned behavior in predicting dental brushing behavior among a sample of adolescents in Qazvin.

**Materials and Methods:** A number of 383 adolescents participated in this cross-sectional study. Attitude, subjective norm, perceived behavior control, action and coping scales and a self report questionnaire regarding dental brushing behavior was completed by the adolescents. Data were analyzed by a confirmatory factor analysis (CFA) on an original six-factor structure (attitude, subjective norms, perceived behavior control, intention, action plan and coping plan) and also a hierarchical linear regression analysis.

**Results:** The mean age of the adolescents was 15.41 years. The most of the student were male (50.2). The CFA for the original six-factor structure showed a good fit index ( $\chi^2 = 645.25$ , degrees of freedom  $df=309$ , goodness-of-fit index (GFI) =90, root mean squared error of approximation (RMSEA) =0.054). Action- and coping planning aggregately accounted for 11.1% of the variance associated with dental brushing behavior.

**Conclusion:** Results obtained from CFA analysis approved the six-factor structure including intention, action plan and coping plan. Action plan and coping plan can reduce intention-behavior gap.

**Key Words:** Oral health - Adolescents - Theory of planned behavior - Planning

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## Introduction

Although oral self care behaviors such as brushing and flossing are influential in preventing caries and periodontal diseases [1-3], frequency of these behaviors is still limited [4]. It is reported that only 30–60% of Eastern Mediterranean adolescents brush their teeth twice a day [5]. A report states that only 44% of Iranian 12-year-old adolescents brush their teeth at least once daily [6]. Effective improvement of oral hygiene behavior requires understanding principal factors that play crucial roles in decision-

making of people to brush. Such requirements can be fulfilled only while using theories to identify intermediate factors in behaviors relevant to oral and dental hygiene [7]. One of the most famous ones is the theory of planned behavior (TPB) which establishes a framework for regular evaluation of the issues related to the decision making process for specific behaviors [8,9]. Based on this theory the most important determinant of the individual's behavior is his/ her behavioral intention. Intention results from three attitude, subjective norms and perceived behav-

ioral control (PBC). Individual's beliefs in behavioral results and his/her evaluation lead to formation of attitude. Subjective norms are influenced by individual's beliefs about others' expectations and his/her motivation to fulfill them. Perceived behavioral control describes an amount of the individual's feeling about the point that how much a behavior can be under his/her voluntary control [9]. This theory is able to explain the relationship between hygienic behavior and intention to about 40% (10). As a result, it is claimed that this model has a potential to develop interactions in behavioral modification. On the contrary, few efforts have been done to make use of TPB as a basis for hygienic behavior modifications. A review article by Sheeran showed that intention in 82107 studied samples could only moderately be responsible for 28% of behavior variance [11].

Therefore, there is a gap between intention and behavior. It can be stated that one of the best ways to reduce the gap between intention and behavior is implementation intention. This concept was introduced by Gollwitzer [12,13]. It should be taken into consideration that the intentional proposition is considered as "I intend to do A" while the intentional implementation proposition is considered as "I intend to do A in case of B." Implementation of intention is more important than intention per se, so that, studies show that participants who are included in implementing their intentions, more likely show the behavior of interest such as participation in the screening program, healthy nutrition, smoking abandonment, reducing alcohol consumption, etc [14].

Implementing an intention enhances both the probability of a behavior accomplishment and its starting swiftness. Implementation of an intention collaborates behavior and environmental guides and improves the likelihood of actual behavior revenue (12,13). Planning is a self-regulating potential strategy. With the use of planning, individuals form an active subjective show of the target situation.

The show, makes target situational guides more convenient and also makes critical situations more discoverable [13]. Therefore, planned responses can act instantly. Planning can be subdivided into two categories of action and coping plannings [15]. Ac-

tion planning can help in initiating a behavior through determining when, where and how it is carried out. It is exactly synonymous with implementation of intention [13]. Coping planning can help individuals in coping with obstacles and problems through anticipating dangerous conditions that may jeopardize a behavior [15]. The purposes of this study were to determine structural validity of attitude, abstract norm, perceived behavioral control, behavioral intention, action planning and coping planning for tooth brushing. In addition, application of expanded TPB in predicting tooth brushing behavior of high-school students in Qazvin is also taken into consideration.

### Materials and Methods

This cross-sectional study was done on 383 high-school students in Qazvin in 2010. Subjects were selected according to multi-stage cluster sampling. Data were collected using a questionnaire comprising of 8 parts. Part 1 was related to demographic data including age, gender, educational level of the parents, frequency of brushing and the monthly family income. Part 2 comprised of two attitude questions for instance "brushing every day would be ....." Part 3 included two subjective norm questions for example: "people who are important to me (such as my dad, mom, friends, teacher, dentist, etc) think that I should brush my teeth every day." Part 4 contained 5 questions of comprehended behavioral control, for example "For me, brushing daily is ....." Part 5 had 4 questions of behavioral intention, for instance "I intend to brush my teeth every day in coming two weeks." Part 6 composed of a scale for action planning, for example "I have made a detailed plan regarding where I brush my teeth." Part 7 included 8 multiple choice questions to evaluate the coping planning scale, for example "I have made a detailed plan regarding what to do if something interferes with my plans" Part 8 pertained to a self-report question of brushing frequency of students within the past 14 days. All questions were designed in a 5-scale spectrum from 1 (absolute agreement) to 5 (absolutely disagreement). Initially, in order to evaluate the face validity, the questions were given to a group of

students (n=13). They read the questions and highlighted their importance. They considered all of the questions important. Therefore, the questions were kept for further evaluations. In the next step, the questions were given to 10 health education, psychology, oral health and dental experts for evaluation of their content validity according to the relevant criteria. In this evaluation, the mean content validity ratio (CVR) was greater than 0.75 that confirmed the content validity of the tool. Then, the content validity was measured by the content validity index (CVI). The results showed that the constructs had a score of greater than 0.79. Reliability of the questionnaire was evaluated and confirmed using re-test methods, within a 10-day interval using intraclass correlation coefficient as well as evaluation of the internal correlation of the variables through calculation of the Cronbach's coefficient alpha. Confirmatory factor analysis was carried out using LISREL 8.80 software. To assess the fit of the model, several indices were used including:

1. Chi squared and p value < 0.05
2. The ratio of chi squared to the degree of freedom
3. Goodness of fit index (GFI)
4. Adjusted goodness of fit index (AGFI)
5. Comparative fit index (CFI)
6. Root Mean Squared Error of approximation (RMSEA) [16].

## Results

The mean age range of the students was 15.41 years. Among all participants, 50.2% were males and 15.1% reported that they do not brush their teeth at all. Only 29.7% of the subjects brush their teeth regularly. Students reported that they brushed their teeth 6.81 times within the previous two weeks. Intraclass correlation coefficient to evaluate reliability of the questionnaire was reported to be greater than 0.7 indicating a favorable result. Evaluation of the internal correlation of the variables through calculation of the Cronbach's coefficient alpha revealed that internal consistency of the constructs was more than 0.7. Confirmatory factor analysis of the primary model showed that the data including the six suggest

ed constructs of attitude, subjective norm, perceived behavior control, behavior intention, action planning, and coping planning had enough fitness, since all fit indices had at least the minimally required fitness. So that  $\chi^2$  was 642.25, degree of freedom was 2.09, GFI was 0.90, AGFI was 0.90, CFI was 0.98 and Root Mean Square Error of Approximation was 0.054. Factor loading of each construct had a range of 0.59 through 0.86 therefore construct validity for the considered model is acceptable. Taking this into consideration, the p value for  $\chi^2$  is significant.

Evaluation of the correlation coefficients indicate that all constructs have mild to moderate correlations with each other. In order to evaluate predictive validity of the dental brushing behavior, a hierarchical regression analysis was conducted in which brushing frequency was considered as a dependent variable while independent variables included attitude, subjective norm, perceived behavioral control, behavioral intention, action planning and coping planning. In the first step, attitude, subjective norm, and perceived behavioral control was added to the model. In the next step, intention was added. In the next steps, action and coping planning was added to the model. The results indicated that constructs such as attitude, subjective norm, and perceived behavioral control predicted 51%, whereas intention predicted 3.1% variance of the brushing behavior. Addition of constructs such as action and coping planning to the model caused an 11% increase in predicting brushing behavior variance (See table 1).

## Discussion

In this study, the effect of action planning, coping planning and some motivational variables derived from the TPB (i.e. attitude, subjective norm, perceived behavioral control, behavioral intention, action planning and coping planning) was evaluated in a sample of high-school students. Factorial validity of the proposed questionnaire was also evaluated in this study to determine behavioral intention, action planning and coping planning for the high-school students. The results of the confirmatory factor analysis confirmed the validity of the six constructs of

**Table1:** Hierarchy regression model of brushing frequency for the variables of attitude, abstract norm, comprehended behavioral control, behavioral decision, action planning and coping planning

	<b>R<sup>2</sup>changes</b>	<b>F changes</b>	<b>Standard B coefficient</b>	<b>Confidential interval</b>	
<b>Step 1</b>				<b>minimum</b>	<b>maximum</b>
Attitude			*0/127	0/598	3/842
Abstract norm			0/043	-0/585	1/949
Comprehended behavioral control	0/512	132/351	*0/614	5/609	7/569
<b>Step 2</b>					
Attitude			*0/090	-0/024	3/160
Abstract norm			0/030	-0/751	1/709
Comprehended behavioral control			*0/440	3/527	5/920
Behavioral decision	0/031	35/374	*0/270	1/707	3/893
<b>Step 3</b>					
Attitude			0/044	-0/715	2/257
Abstract norm			0/012	-0/951	1/329
Comprehended behavioral control			*0/366	2/804	5/052
Behavioral decision			*0/173	0/755	2/837
Action planning	0/066	63/547	*/326	2/238	5/359
<b>Step 4</b>					
Attitude			0/043	-0/645	2/152
Abstract norm			0/010	-0/911	1/236
Comprehended behavioral control			*0/210	1/091	3/410
Behavioral decision			*0/132	0/386	2/360
Action planning			*0/170	1/088	3/397
Coping planning	0/045	48/597	*0/374	3/319	5/927

P&lt;0/001

attitude, subjective norm, comprehended behavior control, behavioral decision, action planning and coping planning. Also, differentiation of the aforementioned constructs were endorsed. Nevertheless, the p value for X2 was significant. Since X2 was sensitive with respect to the sample size, studies suggest that other fitness indices should be taken into consideration [16]. The current study showed that the internal consistency for behavioral intention, action planning and coping planning was accepted. These results are in line with the results of other studies [17-20]. This study showed that the expanded theory of planned behavior could result in 65% variance change in brushing behavior through action and coping planning. These results can be compared with meta-analyses and review articles [10-12]. As stated in these studies, theory of planned behavior was responsible for 20-40% variance of different behav-

iors. In another relevant investigation by Astrømetal showed that expanded theory of planned behavior can be responsible for 38.7% of flossing behavior through action and coping planning [20]. Rise and colleagues indicated that theory of planned behavior can be responsible for 29% variance of flossing behavior. Therefore, it can be concluded that expanded theory of planned behavior is more capable of predicting behavior variance than the original theory [21]. In this study, it was shown that perceived behavior control was the strongest predictor of brushing behavior. Other studies indicate that behavioral intention and perceived behavioral control are the strongest predictors of the flossing behavior [19-21]. It seems that brushing and flossing behaviors can be considered under the individual's control, so that when the students considered them within their control they brushed their teeth more probably. When

the students were pre-scheduled to brush their teeth, they brushed more than others who were not pre-scheduled. Nonetheless, variance changes for these two planning constructs are low.

Previous studies corroborate results of the present study [13,20].

### Conclusion

Improving the students' attitudes did not appear to be adequate for increasing the rate of brushing.

In addition, they should be scheduled regularly to brush their teeth. Scheduling precisely for an action (action planning) can help people do a behavior. Therefore, in order to improve the students' oral health, interventions aiming at relevant action planning is necessary.

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