



Social Cognitive Theory Constructs That Predict Betel Nut Chewing Among Secondary Students in the Solomon Islands

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Abstract

Background: After alcohol, tobacco, and caffeine, areca or betel nut is the fourth most commonly abused substance in the world. The prevalence of betel nut use in the Solomon Islands is estimated at 68% in young people. Long-term use can result in detrimental health outcomes such as oral cancers and metabolic syndrome.

Methods: The purpose of this quantitative cross-sectional study was to determine whether the constructs of social cognitive theory (SCT) can predict betel nut use in Year 12 secondary students in the Solomon Islands. Five SCT constructs of expectations (outcome expectations and outcome expectancies), self-efficacy, self-efficacy to overcome barriers, self-control, and environment were used to build a model for the study. Data were collected from a convenience quota sample of 138 Year 12 secondary students through a 37-item questionnaire.

Results: Multiple linear regression and multiple logistic regression analysis indicated self-efficacy to overcome barriers ($p < .01$) was the only construct significantly related to intent to not chew betel nut.

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Conclusion: Social cognitive theory (SCT) was weakly predictive with low explained variance for not chewing betel nut in secondary students. Research findings contribute to knowledge useful for developers of school health programs and researchers working on strategies to improve intervention actions to reduce betel nut use. The SCT could be bolstered by newer theories like the integrative model or multi-theory model (MTM) of health behavior change for designing educational interventions aimed at limiting betel nut use in young people, especially school students.

Keywords: *Betel nut, health promotion, social cognitive theory*

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Introduction

Betel nut has been widely used for various purposes by indigenous communities in many regions of the world. Chen and Waigandt (2009) reported that betel nut chewing is popular and widespread in tropical and subtropical areas, including Africa, India, Pakistan, Nepal, South East Asia, Southern China, Taiwan, and the Pacific islands, especially New Guinea, Solomon, and Guam. The extension of betel nut use to other regions of the world has been linked to the immigration of indigenous communities from countries with a high prevalence of use (Beecher et al., 1985). Sullivan and Hagen (2002) reported that after tobacco, alcohol, and caffeine, betel or areca nut is the fourth most commonly used substance of abuse in the world.

Although the areca palm and betel vine grow well in the Pacific Islands region, the World Health Organization (WHO, 2012) stated that the Solomon Islands and the northern islands of Vanuatu are the southernmost extensions of the betel nut chewing habit. In the Solomon Islands, the prevalence of betel quid chewers in the adult population was estimated at 76.8% (Tovosia et al., 2007). In young people, 15–24 years of age, Quinn et al. (2017) reported a prevalence of current betel nut users at 88%. This high prevalence rate is similar to that recorded (63.4%) in secondary students on the Pacific Island of Saipan in Micronesia (Oakley et al., 2005).

Researchers have made several observations concerning betel nut uptake and ongoing use. Ghani et al. (2011) identified that gender, age, ethnic group, and smoking history were factors that influenced the development and cessation of betel chewing behavior. In addition, the age of initiation to betel nut use has been an important factor for consideration about cessation strategies and for assessing long-term complications of use. In the Solomon Islands, Tovosia et al. (2007) reported that in the young generation, men started betel quid chewing early at 13.2 years and women at 14.7 years. However, Tovosia et al. concluded that in the older generation, betel quid chewing started much later, at 18.8 years for men and 18.2 years for women. Investigating the age of betel nut use initiation in Taiwan, Guo et al. (2013) reported that betel nut initiation occurred as early as 13 years. Guo et al. also stated that many of the betel nut users progressed to consume alcohol and smoke cigarettes at around the same age.

The association between betel nut use and tobacco or alcohol use is well recorded in the literature. Wen et al. (2005) reported that nearly 93% of Taiwan's betel nut users were also smokers, and users either began smoking first or took up both habits simultaneously. The WHO (2012) stated that the aggressive marketing of tobacco products had resulted in increased use and also use in combination with betel nut. Tobacco use with betel nut use occurs when tobacco is added to the betel quid or smoking occurs with betel nut chewing (WHO, 2012). In a study of health-promoting behaviors in Taiwan, Guo et al. (2013) found that betel nut chewers

were more likely to smoke cigarettes and consume alcohol and have poor health-promoting behaviors, including poor oral hygiene.

Betel nut chewing is a major health and social problem in the adolescent and adult age groups. Of the medical complications associated with chronic betel nut use, oral submucous fibrosis, which is a precancerous condition, is the most prominent and common to all regions of betel nut use (Aziz, 2010). The International Agency for Research on Cancers (IARC) has classified the areca nut as a carcinogen under Group 1 in its cancer risks classification (IARC, 2004).

Betel nut use is legally unregulated in most countries with a high prevalence of use. In the Pacific Island countries, documented policies and laws developed were mostly concerning the spitting of betel nut quid in public places, especially in health care facilities and schools (WHO, 2012). The WHO (2012) also reported that the Marshall Islands 2010 law to ban the importation, distribution, and sale of betel nut in the country was about the unsightly spitting habit and the expectorated by-products of betel nut quid. Controlling betel nut use through taxation has been another strategy explored by countries. Chen et al. (2001) reported the existence of cross-price elasticity of betel nut and cigarette consumption in Taiwan, where a proposed betel nut health tax could reduce cigarette consumption. Chen et al. further stated that the betel nut tax, once enacted, could provide an additional platform for harm-reduction strategies in relation to cigarette consumption. Legalized control measures and enhanced health-promotion strategies against betel nut use are important components in national efforts to reduce betel nut use in the general population, especially in young people. Apart from health education and health promotion, government policies and regulations can also reduce and limit betel nut use.

Socioeconomic factors linked to betel nut production and use will influence control efforts. Many communities have benefited from the cultivation, marketing, and sales of betel nut and its products. In India, the high market demand for betel nut necessitated improved cultivation practices for areca palm along with recruitment of a permanent labor force to tend to the trees. However, to affect individual consumption, Croucher and Islam (2002) proposed that changes should occur in social and economic policies that could negatively affect cultivation and marketing practices. Furthermore, because betel nut is often used in combination with other substances such as alcohol and tobacco, the marketing of these substances could also influence betel nut uptake and use (Wen et al., 2005).

There are a few health education interventions on betel nut use documented in the literature. Wang et al. (2007) discussed the effects of a prevention intervention for betel nut chewing in school and concluded that health education could enable students to select better options than betel nut use. Social behavioral theories to predict behavior in health education and intervention programs have also been used. The health belief model (HBM) and the social cognitive theory (SCT) are popular theories in health education and have been used to strengthen intervention strategies in health promotion. Tareg et al. (2015) used the HBM in Yap, Micronesia to explore perceptions of tobacco use and betel nut chewing. Their study determined that because of perceived social and withdrawal problems, most adults felt quitting would be difficult (Tareg et al., 2015). In addition, Dai and Sharma (2014) used the SCT to predict prevention behaviors of childhood obesity for elementary school students in Taiwan. According to Dai and Sharma, the study asserted that the SCT could provide a useful basis for preventive health programs specific to the group. The use of theory, including the SCT, to predict behavior in betel nut use has not been tested and reported in the literature.

Methodology

Design, Population, and Sample

The design for this study was cross-sectional, with data collected over 3 months in 2018. The research was conducted in the Solomon Islands and involved secondary school students in Year 12 attending school in the education district of Honiara. We first obtained approvals from the Walden University IRB, endorsement from the national research committees of the Ministry of Health and Medical Services, and the Ministry of Education and Human Resource Development for the research. For community-administered high schools, their administrations also gave their approval for the study. To protect the participants, we did not collect identifying information, such as names or other identifiers. Parental consent was required from students under 18.

Lipsey and Wilson (1993) stated that regarding effect size, utilization of information from previous and similar studies could provide an estimation for the value to be used, and, if none are available, the researcher could make a medium effect size. With no previous studies conducted on predicting behavior on betel nut use using the SCT constructs, the medium effect size of 0.15 was used for calculation. Using G*Power and the parameters of (a) effect size of 0.15, (b) power of 0.95, (c) alpha level of 0.05, and (d) predictors of 5, we identified the sample size of 138. This sample number was inflated by 10% for any potential missing data, thus yielding an a priori sample size of 152. The sample size was adequate as the study population number of 138 was well above the minimum of 100 recommended for regression with five predictor variables. Stoltzfus (2011) stated that a more stringent “rule of thumb” of 20 outcomes per independent variable tends to improve model validity. This number was satisfied for the regression from the study population number.

For the study, we undertook a quota convenience sampling procedure on the population size of 152 students of four randomly selected schools in one education district. Convenience sampling is a non-probability sampling method useful for theory testing and allowing non-respondents to be considered for generalizability (Bennett et al., 2018; Cooper et al., 2016). The inclusion criteria for participation in the study were: a 12th-grade student in the selected high school located in the chosen school district who had either given consent or assent or had parental consent. The students also attended a briefing session on the survey objectives, including the benefits and use of the research findings. Exclusion criteria of participation were those students that do not meet the inclusion criteria and those that did not provide complete answers to any one of the listed questions in the survey questionnaire.

The primary construct of SCT is self-efficacy, which is behavior-specific confidence in one’s ability to influence one’s habits. Expectations are a function of outcome expectations or anticipatory outcomes of a behavior and outcome expectancies or the value that a person places on a given outcome. Self-control involves setting goals that are proximal and distal and set the course for change. The environment construct was reflected as situations of social and physical support for the behavior of not chewing betel nut.

Instrumentation

The development of and the formulation of the basic structure of the research instruments were made following reviews of similar studies that used the SCT to predict behavior in school students. Established instruments for substance use such as alcohol, tobacco, and hard drugs were also reviewed. In the research instrument development, key items under the SCT constructs were adapted from studies predicting behaviors. A panel of experts reviewed and approved the final research instrument pertaining to face and content validity.

A pilot study was conducted in a high school in the same education district to evaluate the reliability and validity of the self-designed research instrument. A class consisting of 30 students in the age group 16–17

years old participated in the pilot study. Test–retest of the instrument was administered for stability reliability, whereas Cronbach’s alpha test to assess internal consistency of each SCT construct was undertaken to ascertain internal reliability. In addition, the Cronbach’s alpha test was repeated in the main study as the sample size was small ($n = 138$). In relation to the Flesch–Kincaid readability tests, the research instrument yielded the ease score of 77.1 with a Flesch–Kincaid grade level 7 comprehension.

Outcome expectations construct about not chewing betel nut was operationally defined as the anticipated outcome benefits perceived by the high school students from having better health, improved class performance, improved physical endurance, having cleaner teeth, and eating school lunches better. Outcome expectations subscale was a five-item scale measured using a 5-point Likert-type scale (0 = Never, 1 = Hardly Ever, 2 = Sometimes, 3 = Almost Always, 4 = Always). The score of outcome expectations was included and analyzed with outcome expectancies to provide the overall score for the construct of expectations.

Outcome expectancies construct about not chewing betel nut was operationally defined as the high school students’ personal value placed on having better health, improved class performance, improved physical endurance, having cleaner teeth, and eating school lunches better. Outcome expectation subscale was a five-item scale measured using a 5-point Likert-type scale (0 = Not Important, 1 = Slightly Important, 2 = Moderately Important, 3 = Very Important, 4 = Extremely Important), and the ratings were multiplied and summed. The score of expectations (outcome expectations x outcome expectancies) ranged from 0 to 80 and was a metric score.

Self-efficacy in not chewing betel nut was operationally defined as the confidence of a high school student in finding solutions to stressors and tempting events to betel nut chewing. Self-efficacy subscale was a five-item scale measure using 5-point Likert-type scale (0 = Not at All Sure, 1 = Slightly Sure, 2 = Moderately Sure, 3 = Very Sure, 4 = Completely Sure). The score was summed across five situations, with the resultant metric score ranging from 0 to 20.

Self-efficacy in overcoming barriers to not chewing betel nut was operationally defined as the ability to adhere to this position when under stress, hunger, and influence from family and friends. It was measured through a summative score on a six-item Likert-type self-reporting rating scale. The subscale: 0 = Not at All Sure, 1 = Slightly Sure, 2 = Moderately Sure, 3 = Very Sure (3), and 4 = Completely Sure, was used. The score was summed across the six situations and the resulting metric score ranged from 0 to 24.

Self-control for not chewing betel nut was operationally defined as the ability of the high school student to set goals, monitor progress, and self-reward on successful accomplishment of not chewing betel nut as measured through a summative score on a three-item Likert-type self-reporting rating scale. The subscale: 0 = Not at All Sure, 1 = Slightly Sure, 2 = Moderately Sure, 3 = Very Sure, and 4 = Completely Sure, were used. The score was summed across four situations and the resulting metric score ranged from 0 to 12.

An environment for not chewing betel nut was operationally defined as the social and physical circumstances and conditions that surround the high school student. This was identified as social support from family and friends on the choice not to chew betel nut and policies made at school and community against betel nut availability and distribution as measured through a summative score on a 5-item Likert-type self-reporting rating scale. We used the scale: 0 = Strongly Disagree, 1 = Disagree Slightly, 2 = Agree Slightly, 3 = Agree, and 4 = Strongly Agree. The score was summed across four situations and the resulting metric score ranged from 0 to 20.

Data Analyses

The IBM Statistical Package for Social Sciences (SPSS) version 25 on Windows 10 was used for the analysis of data collected during the survey. The generated analysis included descriptive statistics, cross-tabulation on

certain demographic and social characteristics, and multiple regression and multiple logistic regression analysis on the study's six hypothetical research questions. Additionally, the SPSS Amos version 25 was utilized for confirmatory factor analysis to determine whether the number of factors and the loadings of measured variables conformed to what was expected based on theory. For multiple linear regression, the a priori criteria of the probability of F to enter the predictor in the model was chosen as less than and equal to 0.05 and for removing the predictor as greater than and equal to 0.10.

Results

Pilot Study

We undertook a pilot study to evaluate the reliability and validity of the research instrument developed. Test-retest reliability, also known as stability, is the extent of association between two or more measurements taken over time (Sharma & Petosa, 2014). Thirty students volunteered in the survey and the same students repeated the survey after an interval of 7 days. For the Pearson coefficient value, Nunnally and Bernstein (1994) recommend a value of 0.70 as acceptable, 0.80 as better, and 0.90 as excellent. Table 1 displays the test-retest reliability coefficient of the betel nut chewing behavior instrument in the pilot study.

Table 1. *Test–Retest Reliability Coefficient of Betel Nut Chewing Behavior Instrument*

Subscale	Test–retest reliability coefficient
Outcome expectation	0.829
Outcome expectancy	0.70
Self-Efficacy	0.710
Self-Efficacy to overcome barriers	0.813
Self-Control	0.733
Environment factors	0.718

Instrument Validation

In this research, the face and content validity of the instrument validity were obtained through a panel of three experts on the SCT. Sharma and Petosa (2014) explained that content validity measures whether the items adequately assess each construct within the universe of content as operationally defined. The panel of experts confirmed the readability, relevance, and clarity of items, hence asserting face and content validity of the SCT subscales of the instrument.

We undertook confirmatory factor analysis (CFA) to confirm factors for the SCT constructs in relation to betel nut use behavior and the maximum likelihood method to estimate the factor loading of each construct. The a priori level was an Eigenvalue greater than 1.0 and factor loadings of each item greater than 0.44. The subscales measuring outcome expectations, outcome expectancies, self-efficacy, and self-efficacy in overcoming barriers, self-control, and environment satisfied all criteria and confirmed one-factor solutions.

For reliability, we calculated Cronbach's alpha to measure the internal consistency for the five subscales used in this study. The scales and findings were, 1–outcome expectations to not chew betel nut (Cronbach's alpha = 0.83), 2–outcome expectancies to not chew betel nut (Cronbach's alpha = 0.76), 3–self-efficacy for not chewing betel nut (Cronbach's alpha = 0.85), 4–self-efficacy in overcoming barriers whilst choosing not to chew betel nut (Cronbach's alpha = 0.88), 5–self-control to not chew betel nut (Cronbach's alpha = 0.80), and 6–environment factors aiding in not chewing betel nut (Cronbach's alpha = 0.84). Collectively for the entire scale, Cronbach's alpha was 0.83. Sharma and Petosa (2014) stated that α coefficients less than 0.5 were

usually unacceptable and purported to be unidimensional. Many methodologists view coefficients between 0.65 and 0.8 for whole scale and subscales as the minimum acceptable value. In the study, all of the subscales were determined to be reliable, with a value above 0.70.

Demographic and Social Characteristics of the Study Population

From a total of 154 students from three secondary schools who participated in the survey, we determined the final sample number of 138. Table 2 displays the key demographic and social characteristics of the sample population. The gender distribution of the final participants was 62 (44.9%) male and 76 (55.1%) female. The students' ages ranged from 17–23 years and the mean age was 18.9 years. The frequency distribution of the participants' age group revealed the following percentages, 17 years = 4%, 18 years = 37%, 19 years = 56%, 20 years = 29%, 21 years = 6%, 22 years = 4%, and 23 years = 2%.

Table 2. Demographic Characteristics of Study Participants ($n = 138$)

Variable		Frequency (n)	Percentage— Actual (%)	Percentage— Cumulative (%)
Sex	Male	62	44.9	44.9
	Female	76	55.1	100
Age	17 years	6	4.3	4.3
	18 years	41	29.7	34.1
	19 years	55	39.9	73.9
	20 years	30	21.7	95.7
	21 years	5	3.6	99.3
	22 years	1	0.7	100
	23 years			

Table 3 shows certain social and behavioral characteristics of the study population, such as betel nut education, betel nut use, alcohol use, and smoking behavior. In the research questionnaire, these characteristics were listed in 5 subscales, but, for logistic regression, the variables were changed to dichotomy responses of “Yes” or “No.” From the demographic and social characteristics, cross-tabulation analysis was also undertaken to ascertain the association between betel nut chewing and tobacco use.

Table 3. Substance Use and Behavioral Characteristics of Study Population ($n = 138$)

Question	Response	Frequency (n)	Percentage— Actual (%)	Percentage— Cumulative (%)
Have you ever attended a betel nut awareness program?	No	76	55.1	55.1
	Yes	62	44.9	100
Have you ever chewed betel nut?	No	38	27.5	27.5
	Yes	100	72.5	100
Do you currently smoke?	No	125	90.6	90.6
	Yes	13	9.4	100
Do you currently drink?	No	166	84.1	84.1
	Yes	22	15.9	100

For betel nut chewing, 27.5% responded to no previous use and 72.5% for past and ongoing use. Of the 100 (72.5%) students with betel nut use history, 31 (22.5%) were daily users of the fruit. Health education and health promotion against betel nut use was an important strategy against its use, and, in the study population, 76 (55.1%) of students reported not having had any exposure to health education or health awareness sessions against betel nut use. For alcohol use, only 22 (15.9%) students report having used alcohol. For tobacco use, 13 (9.4%) reported being current smokers.

Descriptive Statistics of Study Variables

The descriptive statistics for the outcome variables are summarized in Table 4. The construct table showed the collective summary of participants' responses to the SCT construct. Participants' responses cover all the possible ranges of the scores. All participants scored above the middle of the range and the standard deviation reflects the number of questions in the subscale. Responses to self-control are at the top of the range (10.4 units), whilst the constructs of self-efficacy not to chew betel (15.8 units) nut and self-control to overcome barriers (19.1 units) were closer to the middle of the range.

Table 4. Summary of the SCT Constructs for Chewing Betel Nut (n = 138)

Constructs	Possible Ranges	Observed Ranges	Mean (SD)	Cronbach's alpha
Expectations	0–80	0–80	62.3 (16.8)	0.86
Self-efficacy	0–20	0–20	15.8 (5.0)	0.87
Self-efficacy to overcome barriers	0–24	0–24	19.1 (5.6)	0.88
Self-control	0–12	0–12	10.4 (2.7)	0.86
Environment	0–20	0–20	16.4 (4.8)	0.87

Table 5 displays the findings of the multiple regression analysis.

Table 5. Parameter Estimates From the Final Multiple Regression Model for Betel Nut Chewing as Predicted by Social Cognitive Theory Constructs and Covariates (n = 138)

Variable	B	Std. Error	Beta	t	P
(Constant)	1.191	.210		5.670	.000
Smoke	.288	.208	.167	1.384	.169
Alcohol	.001	.172	.001	.006	.995
Expectation	.000	.002	.015	.144	.886
Self-efficacy	-.008	.010	-.089	-.811	.419
SE—overcome barriers	-.020	.009	-.256	-2.289	.024
Self-control	-.026	.023	-.127	-1.143	.255
Environment	.013	.010	.124	1.298	.197

$F(7, 130) = 3.685, p = .001, R^2 = 0.166$. Dependent variable was not chewing betel nut (yes/no); B = unstandardized coefficient; Std. Error = standard error of coefficient; Beta = standardized coefficient; P -value = level of significance.

Table 6 shows the binary logistic regression analysis on the association of the SCT constructs on betel nut use controlling for the covariates of alcohol and smoking on betel nut use.

Table 6. *Parameter Estimates From the Final Binary Logistic Regression for Betel Nut Use as Predicted by The SCT Constructs and Controlling for Covariates of Smoking and Alcohol Use (N = 138)*

Variable	<i>B</i>	SE	Wald	<i>Df</i>	<i>Sig.</i>
Smoke	20.494	11002.583	.000	1	.999
Alcohol	-.339	.986	.118	1	.731
Expectation	.008	.014	.329	1	.566
Self-efficacy	-.054	.059	.839	1	.360
SE Overcome barriers	-.144	.062	5.374	1	.020
Self-Control	-.244	.172	2.018	1	.155
Environment	.061	.061	.987	1	.320
Constant	5.527	1.768	9.771	1	.002

The test of significance generated the following results; $\chi^2 (5, n = 138) = 21.56, p < 0.001$. The model as a whole explained between 20% (Cox and Snell *R* square) and 28% (Nagelkerke *R* squared) of the variance and can correctly predict 74.6% of betel nut chewing. The Hosmer and Lemeshow chi-square was non-significant ($p > 0.10$), indicating a good fit of the model.

Discussion

Age and Gender

Findings indicated that students in Year 12 were much older than the anticipated age group of 16 to 18 years. More than 65% of the students were 19 years old or older and having this older age group meant that the use of betel nut was well established amongst the students. Students reporting daily use of betel nut chewing were 22.5% of the study sample. Guo et al. (2013) reported that betel nut use initiation in Taiwan occurred as early as 13 years of age. Similarly, Tovosia et al. (2007) reported that betel quid chewing starts as early as 13.2 years of age in men and 14.7 years of age in women in the Solomon Islands.

Betel Nut Chewing Prevalence

Having up-to-date information on the current prevalence of betel nut chewing in young people, especially in schools, is important for health education and health promotion efforts by national authorities. For the Solomon Islands, the most recent study indicated a prevalence rate of 88% (90% males and 84% females) of betel nut chewers in the 15–24 years age group (Quinn et al., 2017). In the current study, the reported use of betel nut chewing (previous and current users) was 68% (59.3% males and 74.7% females). The age range of the study participants (17–22 years) fell within the age group of the Quinn et al. study, but the latter included both out-of-school youths (59%) and high school students (41%).

Expectations to Chewing Betel Nut

The study found that expectations were not significant for predicting betel nut chewing ($p = 0.866$). Outcome expectation was linked to outcome expectancy as the former is about the expected costs and benefits for different health habits, while the latter describes the value placed on the desired outcome following behavior or action (Bandura, 2004; Sharma, 2021). Lowenstein et al. (2013) stated that outcome expectation has a positive association with self-efficacy, and some studies have demonstrated the theoretical and clinical utility of applying both SCT constructs.

Outcome expectation is important in making decisions regarding engaging in a behavior or action and could be improved upon through education (Bandura, 2011). In addition, outcome expectations can be examined in

future studies by employing the MTM construct of participatory dialogue in which the health educator can have a two-way session with the students regarding the benefits of behavioral change.

Self-Efficacy to Chewing Betel Nut

The current study results from the regression models revealed that self-efficacy was not significantly associated with chewing betel nut ($p = 0.419$). According to Sharma (2021), self-efficacy is considered the strongest predictor of the SCT. Self-efficacy is akin to the construct of perceived behavioral control in the theory of planned behavior and behavioral confidence in the MTM (Sharma, 2015). According to Sharma, self-efficacy may have varying predictive power in different regions and cultures in the world and this may explain the difference in outcomes in the Solomon Islands and Taiwan betel nut studies.

Wang et al. (2007) employed self-efficacy in a health education intervention against betel nut chewing for adolescent students and concluded that after the intervention, there was a significant difference in the attitude and practice of betel nut chewing and self-efficacy of anti-betel nut chewing behavior among the students.

Self-Efficacy in Overcoming Barriers to Chewing Betel Nut

The study results obtained from the regression models revealed that self-efficacy in overcoming barriers was significant and weakly associated with not chewing betel nut ($p < .001$). This construct was the only one found to have some association with the behavior of not chewing betel nut in the study population. Self-efficacy to overcome barriers, along with other SCT constructs explained 14% of the betel nut chewing behavior. In addition, there was a significant ($p < .001$) association between self-efficacy to overcome barriers to not chewing betel nut and betel nut chewing.

The SCT construct of self-efficacy is influenced by a person's specific capabilities and other individual factors, as well as by environmental factors of barriers and facilitators. Sharma (2015), in discussing the HBM, stated that perceived barriers were the most important predictors of behaviors and addressing them would be essential for the model to be successful. As with other theories, the applicability of all the constructs of SCT to one public health problem may be difficult, especially in developing focused public health programs (Sharma, 2015).

Self-Control and Betel Nut Chewing

Self-control was found not to be a significant predictor for not chewing betel nut in secondary school students in the study ($p = 0.255$). Sharma, Wagner, & Wilkerson (2004) stated that self-control involved setting goals that are proximal and distal and set the course for change. Some other studies using the SCT construct of self-control have demonstrated the positive predictive power of the construct. Wills et al. (2008) tested the prediction that self-control would have buffering effects for adolescent substance use (tobacco, alcohol, and marijuana). The study findings concluded that the risk factors on substance use were reduced among persons with higher scores on good self-control (Wills et al., 2008). Utilizing self-control in prevention programs against betel nut chewing was an important consideration in this study. With the low predictive power demonstrated in this study, it would be worthwhile to consider incorporating the MTM construct of practice for change in future studies.

Environment and Betel Nut Chewing

The study results obtained from the regression models revealed that environment was not significantly associated with not chewing betel nut ($p = 0.197$). In the study, the SCT construct was referred to both for the social and physical environment factors.

In health education and health promotion for behavioral changes to betel nut chewing, limitation in obtainability and accessibility would at least support strategies to limit and curb use in the student

population. Both physical and social environments should be ensured and strengthened in future betel nut use studies and interventions.

Covariates of Tobacco and Alcohol

Alcohol and tobacco use are two of the known covariates of betel nut chewing behavior. The stepwise multiple regression of all SCT constructs and the two covariates together showed that, as a set, only self-efficacy to overcome barriers was significantly related to intent for not chewing betel nut ($p < .01$). In addition, covariates analysis showed that only smoking accounted for 4% of the variability in the outcome variable ($p < .05$).

Implications for Practice

The primary construct of SCT is self-efficacy, which is a behavior-specific confidence in one's ability to influence one's habit. Employing self-efficacy in health education intervention, Wang et al. (2007) explored the effects of preventive health education intervention in the knowledge, attitude, and practice of betel nut chewing and self-efficacy of anti-betel nut chewing for adolescent students in Taiwan. Wang et al. concluded that health education enabled students to better resist betel nut use and reaffirmed its importance in dealing with the health risk of betel nut chewing.

The findings of this research identified the need for generally more health education and health promotion programs on betel nut use in schools. The inclusion of behavioral theory concepts in health education and health promotion strategies would aid and improve decision-making and behavior adoption. Building self-confidence and observational learning in students could be enhanced through strategies to involve mentors and role models and activities such as role-play, training, and workshops. Social support systems for positive behavior encouragement should also be considered alongside and developed for the local communities and school administration structures.

Limitations of the Study

The study had some limitations. First, the study used a convenience sample that tends to limit generalizability of the results. Second, the design was cross-sectional in nature, which precludes causal inferences due to lack of temporality. Third, self-reports were utilized, which tend to introduce biases, such as dishonesty, exaggeration, etc. Fourth, the finding of students aged 19 years or older in the study may have negatively influenced results as betel nut chewing behavior could have been well established by then. Finally, from a practical point of view, it was not feasible to operationalize all the constructs of SCT.

Conclusion

This is the first study on betel nut chewing behavior that employed the SCT to predict its use in high school students in a defined setting and population. In the study, the estimated betel nut use prevalence was 68% in the 17–22 year age group of high school students. The high prevalence rate of betel nut chewing in young people posed serious and ongoing challenges to authorities in their efforts to control substance use. Behavioral change intervention using theory is the ultimate goal towards limiting betel nut chewing in young people. In the study, the SCT was weakly predictive with low explained variance for not chewing betel nut in secondary school students. Of the five SCT constructs tested in the study, only self-efficacy to overcome barriers had a significant effect on betel nut chewing behavior. Similar to previous studies in the use of SCT to predict behavior, the findings showed that the SCT needs to be bolstered by newer theories like MTM of health behavior change for designing health educational interventions aimed at enhancing compliance.

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Ethical Issues

The authors declare no ethical issues.

Conflict of Interest

The authors declare no conflict of interest in this study.

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