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A Cross-Sectional Analysis of Obesity Risk Reduction Behaviors and Demographic Factors among Chinese Americans

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Abstract

Objective: To investigate psychosocial determinants of obesity risk reduction behaviors and sub-group analyses based on gender, age, and country of origin in Chinese Americans residing in the New York metropolitan area.

Methods: The obesity epidemic is widely recognized as a salient health issue in the United States, affecting all races, ethnic and age groups including Chinese Americans. An increased risk for obesity-related diseases at lower body mass indexes magnify the urgency of investigating obesity related issues in this population. This cross-sectional study evaluated a convenience sample of 443 U.S.-born and foreign-born men and women aged 18 to 60 years who completed a self-administered questionnaire. Participants were recruited from academic, religious and cultural institutions, representing a span of educational backgrounds and socioeconomic status. Nineteen obesity risk reduction behaviors were measured along with psychosocial constructs derived from the Theory of Planned Behavior. Participants reported food behaviors over the previous month related to weight management, portion size control, consumption of fruits, vegetables, and whole grain foods, physical activity, and stress management.

Results: The mean age of the entire sample was 35.6 years, with 65% females and 40% U.S.-born individuals. Regression analysis of an index of 19 obesity risk reduction behaviors indicated 27.1% of the variance in behavior was accounted chiefly by intention, attitude, and perceived behavioral control. For male respondents, subjective norm and perceived behavioral control emerged as salient factors, while attitude was significant for female participants alone. When age was regressed on the behavioral index corresponding to different age categories, subjective norm contributed most to the regression model for the 18 to 40 years old category. Attitude and perceived behavioral control were salient predictors for older individuals (aged 41 to 60).

Conclusions: Nutrition professionals working with Chinese Americans need to promote the fostering of positive attitudes and guidance for adopting dietary measures and physical activity to combat weight gain in middle-aged adults. Social normative influences in adopting food-related behaviors need to be highlighted in males and younger adults.

Introduction

The obesity epidemic is one of the greatest public health challenges in the world, affecting all population groups regardless of age, gender, ethnicity, or socioeconomic status [1]. In the United States, prevalence of overweight is 21.8% and obesity is 4.2% among Chinese American adults as compared to non-Hispanic whites (34.6% and 23.6%) [2]. Although rates of obesity among Asian Americans are lower than other racial groups, obesity rates are increasing in this population, especially in younger generations born in the U.S [3]. U.S.-born Asians tend to be overweight and are 3-4 times more likely to be obese than foreign-born Asian individuals [4]. Length of residence in the U.S. is positively related to an increased risk of weight gain [5].

Body mass index (BMI, kg/m^2) is used to classify underweight, overweight, and obesity. A body mass index of 25 or above designates overweight and 30 and above signifies obesity [6]. However, BMI is not always a correct measure of body fat amount [6,7]. For example, Asians tend to have more body fat than whites at lower BMIs. Also, Asians tend to accumulate excess body fat in the abdominal region increasing risk for weight-related health problems such as type 2 diabetes, inflammation, hypertension, and cardiovascular disease [8,9]. Therefore, the World Health Organization (WHO) offers lower cut-off values for overweight and obese Asians, ≥ 23 and ≥ 27.5 respectively [10]. However, the WHO recommends using traditional cut-off values when comparing population groups.

Since Asian Americans have the lowest average BMI of all racial/ethnic groups, obesity related research of Asian Americans has been limited [11]. However, Asians do experience weight related health issues. Evaluation of postprandial hyperglycemia and hyperinsulinemia among Chinese compared with matched Caucasians for age, BMI, and waist circumference show Chinese subjects have higher metabolic risk scores than whites [12]. Asian Americans are 30 to 50% more likely to develop diabetes after adjusting for age and sex [13].

Asian Americans constitute approximately 5.4% of the U.S. population with a predicted increase to 9.3% by 2060 [14]. Chinese Americans are the largest subgroup of Asian Americans. The steady growth of this subgroup intensifies the need to study risk factors

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related to weight gain. Obesity problems for this group are expected to increase due to a shear increase in numbers and increasing acculturation of succeeding generations of immigrants. Acculturation to a Western diet and lifestyle increases obesity risk among various immigrant groups, including Asian Americans [4,15,16].

Theoretical framework

Social psychological theories have been instrumental in understanding individuals' beliefs and motivations to engage in health behaviors. Ajzen's [17] Theory of Planned Behavior (TPB) examines the relationship of intention, attitudes, and behaviors, and is useful for identifying essential determinants suitable for interventions. The TPB asserts that behavioral intention is highly predictive of an individual's behavior, of which intention is derived from three components: (1) an individual's attitude toward an action; (2) subjective norm; and (3) perceived behavioral control (PBC). Attitude reflects an individual's behavioral beliefs as well as one's evaluation of the outcome. Subjective norm is defined as the perceived social pressure to perform a given behavior based on the opinion of any given referent (normative beliefs) and weighted by the motivation to comply with the wishes of the referent. Perceived behavioral control reveals the perceived degree of control over enacting a specific behavior.

The anticipated population growth of Chinese Americans and increased risk for obesity-related diseases at lower body mass indexes magnify the importance of investigating psychosocial determinants of obesity related behaviors in this ethnic group. In this study, TPB constructs and sub-analyses based on gender, age, and country of origin were investigated among Chinese American adults residing in the New York metropolitan area.

Methods

This study consisted of a cross-sectional survey design comprised of a convenience sample of free-living U.S.-born and foreign-born Chinese Americans between the ages of 18 to 60 years. Participants were solicited from a wide range of socioeconomic status, income levels, and educational backgrounds. A total of 443 surveys were completed and returned out of approximately 683 surveys distributed in religious, cultural and corporate institutions in the New York metropolitan area (65% response rate). These organizations were selected based on their high concentration of individuals who meet the research criteria. In order to be sure a sufficient number of responses per variable were examined, the researchers aimed for a minimum sample size of 300. As an incentive for participation, a raffle drawing for $50 gift certificates was offered. Data was collected in two phases: from June 2008 to July 2009 (n = 300) and from September 2012 to April 2013 (n = 143). Survey instruments, informed consent forms, and self-addressed, stamped envelopes were distributed to volunteer participants. A New Jersey state university granted Institutional Review Board approval to conduct the research study.

Questionnaire

The questionnaire contained 89 questions measuring obesity risk reduction behaviors, psychosocial variables, and demographic factors. The respondents took an average of 20 minutes to complete the surveys. Nineteen questions measured five domains of obesity risk reduction behaviors over the previous month using a scale of 1 to 4 (never/rarely to always/usually). The five behavioral domains in this category included: food context (9 items), eating behavior (4 items), physical activity context (2 items), psychological context (2 items), and knowledge awareness context (2 items). These domains reflected findings from the literature and items were amended for their applicability based on qualitative research for Chinese Americans [18,19].

Regarding TPB constructs, 12 items addressed attitude towards a given behavior using a 5-point Likert-type scale. For example, "Using large amounts of cooking oils or fat in preparing meals is… (Favorable-Unfavorable)." Twelve items using a 7-point scale (1 'very unlikely' to 5 'very likely') measured intention to engage in particular behaviors in the upcoming week. An example would be "During the upcoming week, I plan to use small amounts of oils and fat when preparing or cooking foods". A 5-point scale (strongly agree to strongly disagree) and a "not applicable" category (coded as 98) were used to evaluate 13 subjective norm questions. This construct entailed normative beliefs (In general, how much influence does your spouse or partner have on your food choices?) and motivation to comply (If my spouse or partner tells me to choose healthy foods, (I would-I would not). Lastly, 4 perceived behavioral control statements were measured such as "I can control the portion sizes of foods I eat".

Demographic factors included birthplace, gender, age, education level, marital and working status, income, and self-reported height and weight. In addition, participants identified their overall stress level (1 'very stressed' to 5 'very calm'), self-reported physical activity levels (1 'sedentary' to 4 'heavy activity'), likelihood of eating nutritious foods related to accessibility, and overall quality of their health (1 'excellent' to 4 'poor').

Questionnaire validity and reliability

A pilot study of 30 Chinese Americans were queried about the clarity and meaning of questionnaire items. Consistency of their responses with the researchers' intended meaning of the survey questions provided confirmation of face validity. An expert panel of nutrition and behavioral science researchers reviewed the contents of the instrument for accurate reflection of TPB constructs. An exploratory factor analysis of principle variables established construct validity. The entire scale produced 9 distinct factors accounting for 62.3% of the variance in responses. After additional factor analysis for each subscale, 6 items had a factor loading of less than 0.40 and were deleted from the scale [20].

The subscale of obesity risk reduction behavior yielded 5 distinct factors accounting for 60.3% of the variance in responses. These distinct factors corresponded conceptually to the 5 domains of obesity risk reduction behaviors: food context, eating behavior, physical activity context, psychological context, and knowledge/awareness context. Reliability was measured using Cronbach's alpha internal consistency assessment. The Cronbach's alpha coefficients of the behavioral variables (0.78) and psychosocial variables (range 0.7 to 0.8) were at or above 0.70, reflecting good psychometric properties. Further details of the instrument's validity and reliability can be found in a previously published study [21].

Statistics

The variance of obesity risk reduction behaviors explained by TPB variables was determined using stepwise multiple regression analyses. Standardized multiple regression coefficients (β) enabled assessment of the relative importance of each psychosocial variable in explaining behavioral intention and obesity risk reduction behaviors. Behavioral, psychosocial, and demographic data were described using frequency distributions. BMI's were grouped into BMI categories according to WHO guidelines using self-reported weight [10]. The BMI categories included underweight (BMI < 18.5), normal (18.5 ≤ BMI < 25), overweight (25 ≤ BMI < 30), and obese (BMI ≥ 30). Analysis of variance indicated statistically significant differences in the mean BMI values among the age groups. Statistical Package for Social Sciences (SPSS), version 16.0 was used to analyze the data. For all data analyses conducted, the significance level was set at 0.05. Seven returned surveys with missing data were discarded and not used in the final data analysis.

Results

Participant characteristics

Table 1 lists socio-demographic characteristics, neighborhood and household factors, and behavior patterns of the participants. Out of 443 surveyed participants, the majority were female (65%) and college educated (65%). The average age of the sample was 35.6 years (SD = 15.1). The participants were grouped into three age categories: 18 to 29 years of age (46%), 30 to 40 (20%), and 41 to 60 (31%). Nearly half of the participants were married and residing in middle income

Table 1: Demographic characteristics of Chinese Americans.

Demographic Characteristics	Frequency (n = 443)	Percent (%)
Gender		
Male	157	35.4
Female	286	64.6
Education		
Elementary or less	3	0.7
Some high school	13	2.9
High school graduate	51	11.5
Some college	88	19.9
College graduate	166	37.5
Post graduate degree	122	27.5
Marital status		
Married	203	45.9
Divorced	9	2
Separated	3	0.7
Never married	222	50.2
Work status		
Employed	263	59.9
Retired/disabled	26	5.9
Homemaker	25	5.7
High school student	9	2.1
College student	101	23
Income		
Under $20,000	168	39.3
$20,000 to $39,999	56	13.1
$40,000 to $59,999	76	17.8
$60,000 to $79,000	54	12.6
$80,000 and above	72	16.9
Stress level		
Very stressed	41	9.2
Moderately stressed	187	42.1
Neutral	146	32.9
Moderately calm	41	9.2
Very calm	29	6.5
Activity level		
Sedentary	111	25.2
Light activity	111	25.2
Moderate activity	203	46
Heavy activity	16	3.6
	Mean	**SD**
Age (years)	35.57	15.07
BMI (kg/m^2)	22.89	3.6
Exercise/week (hours)	3.91	3.48

neighborhoods in the New York metropolitan area. U.S.-born individuals accounted for 40.4% of the entire sample. The mean BMI was 23 ± 3.6 for the entire sample. U.S.-born individuals possessed a higher overall BMI (23.2 ± 4.0) compared with their foreign-born counterparts (22.8 ± 3.4) ($p < 0.05$). Oldest participants (41-60 years) generally possessed higher BMIs than the youngest individuals (18 - 29) ($\bar{x}$ = 23.3 ± 3.2 versus $\bar{x}$ = 22.4 ± 3.7, $p = 0.016$). Likewise, the oldest individuals worked significantly longer hours per week ($\bar{x}$ = 29.9 ± 18.1) than the youngest ($\bar{x}$ = 21.5 ± 20.6) ($p < 0.001$). Also, the youngest age group exercised more hours per week than the middle age group (30 - 40) ($\bar{x}$ = 4.3 ± 3.8 versus $\bar{x}$ = 2.8 ± 3.2, $p = 0.002$).

Obesity risk reduction behaviors

Mean values of 19 obesity risk reduction behaviors (Table 2) indicated the most frequently practiced behaviors were eating home-cooked meals instead of restaurant-prepared foods, using small amounts of oils when preparing food, and limiting intake of high calorie beverages. Behavioral areas needing improvement (mean values 2.25 or below, range of 1 to 4) included learning about obesity and prevention to enhance awareness, using portion size control methods, and eating healthful pre-packaged foods. Foreign-born individuals scored significantly higher in limiting portion sizes of foods ($p < 0.01$), making healthy choices at fast food restaurants ($p < 0.01$), and using portion size control methods to help decide how much to eat $p < 0.01$).

Table 2: Mean values of obesity risk reduction behaviors.

Obesity Risk Reduction Behaviors	Mean	SD
Psychological context		
Took time to relax to decrease the amount of stress I feel	2.59	0.89
Took time to relax and improve my emotional well-being (e.g.: social involvement, positive thinking)	2.73	0.91
Physical activity context		
Engaged in at least 1 physically active leisure activity	2.47	1.09
Exercised at least 30 minutes, on 3 to 5 days per week (e.g. walking, biking)	2.41	1.09
Eating context		
Ate home-cooked meals instead of restaurant-prepared foods	3.06	0.88
Limited my portion sizes of foods	2.37	0.93
Used portion size control methods to help decide how much to eat	2.1	1
Followed traditional healthful Chinese food patterns (e.g.: eating more fruits & vegetables, less red meat)	2.81	0.99
Food context		
Ate steamed foods instead of fried foods	2.62	0.91
Used small amounts of oils or fat when preparing or cooking foods	2.96	0.97
Ate at least 3 servings of vegetables per day (1 serving = ½ cup cooked, 1 cup fresh leafy veg.)	2.74	0.95
Ate at least 2 servings of fruits each day (1 serving = 1 medium fruit)	2.56	0.96
Ate at least 3, 1 ounce servings of whole grains per day	2.56	0.99
Made healthier choices at fast food restaurants	2.4	1.04
Ate healthful snacks (e.g.: fruit, nuts, etc.)	2.64	0.93
Ate healthful pre-packaged foods	2.25	0.99
Limited intake of high calorie beverages (e.g.: soft drinks, juice, alcoholic drinks)	2.91	1.07
Knowledge awareness context		
Monitored my body weight	2.55	1.05
Learned about obesity risk and prevention(e.g.: attending seminars, reading health articles, watching health programs on TV)	2.04	1.04
Average of all behaviors (n = 443)	x = 2.57	x = 0.98

Cross-tabulations

Chi-square tests revealed statistically significant relationships between country of origin (U.S.-born versus foreign-born) and demographic variables such as marital status ($p < 0.001$), income levels ($p < 0.01$), working status ($p < 0.001$), and food preparation ($p < 0.001$). In our sample, 62% of the foreign-born participants were married, as opposed to 21% of the U.S.-born individuals. Participants earning $80,000 or above/year accounted for 13.6% of U.S.-born subjects versus 19% of foreign-born counterparts. Fifty-six percent of U.S.-born subjects were employed as opposed to 63% of the foreign-born cohort. Respondents identified themselves as the main food preparer in 33% of the U.S.-born and 55% of foreign-born individuals. Cross-tabulations revealed no significant relationships between country of origin and physical activity levels and self-reported stress levels.

Regression analyses

Table 3 shows the results of regression analysis with TPB constructs predicting index of obesity risk reduction behaviors for the entire sample. Predictors included intention, attitude, and perceived behavioral control accounting for 27.1% of the variance in behavior. Intention had the largest standardized regression coefficient (beta = 0.40). Using intention as the dependent variable based on the TPB, attitude and perceived behavioral control emerged as salient, contributing 22.1% of the variance.

Subjective norm and perceived behavioral control were significant predictors of obesity risk reduction behaviors for males and only attitude was significant for female respondents. Sub-group analyses by age corresponding to the three age categories showed that subjective norm contributed most to the regression model for the 18 to 40 years old category. For individuals 41 years and older, attitude and perceived behavioral control emerged as salient predictors. For all the age groups, intention was the constant predictor of behavior.

Table 3: Regression analysis of Theory of Planned Behavior variables predicting obesity risk reduction behavior.

	Significant predictors	β	b	SE of b	p
R = 0.521	Intention	0.399	0.242	0.028	0
R^2 = 27.1%	Attitude	0.147	0.114	0.036	0.002
P < 0.001	Perceived behavioral control	0.093	0.068	0.032	0.033
Regression analysis of psychosocial variables predicting behavioral intention.					
	Significant predictors	β	b	SE of b	p
R = 0.47	Attitude	0.406	0.519	0.056	0
R^2 = 22.1%	Perceived behavioral control	0.142	0.172	0.053	0.001
P < 0.001					
Regression analysis predicting obesity risk reduction behavior based on gender.					
Males	Significant predictors	β	b	SE of b	p
R = 0.669	Intention	0.599	0.446	0.055	0
R^2 = 44.7%	Subjective Norm	-0.156	-0.012	0.006	0.028
P < 0.001	Perceived behavioral control	0.157	0.141	0.066	0.034
Females	Significant predictors	β	b	SE of b	p
R = 0.602	Intention	0.463	0.323	0.043	0
R^2 = 36.3%	Attitude	0.225	0.212	0.058	0
P < 0.001					
Regression analysis predicting obesity risk reduction behavior based on age categories.					
30-40 years old	Significant predictors	β	b	SE of b	p
R = 0.506	Subjective norm	-0.19	-0.012	0.006	0.046
R^2 = 25.6%	Intention	0.46	0.305	0.062	0
P < 0.001					
41-60 years old	Significant predictors	β	b	SE of b	p
R = 0.599	Perceived behavioral control	0.162	0.149	0.067	0.027
R^2 = 35.8%	Intention	0.366	0.204	0.044	0
P < 0.05	Attitude	0.245	0.168	0.055	0.003
Regression analysis predicting obesity risk reduction behavior based on country of origin.					
U.S.-born	Significant predictors	β	b	SE of b	p
R = 0.444	Intention	0.444	0.251	0.038	0
R^2 = 19.7%					
P < 0.001					
Foreign-born	Significant predictors	β	b	SE of b	p
R = 0.550	Intention	0.396	0.248	0.038	0
R^2 = 30.2%	Attitude	0.161	0.123	0.047	0.01
P < 0.05	Perceived behavioral control	0.126	0.109	0.048	0.025

In U.S.-born participants, 19.7% of the variance of behavior was accounted for by intention alone. In foreign-born individuals, 30.2% of variance of behavior was accounted for by intention, attitude, and perceived behavioral control.

Discussion

This study examining psychosocial predictors of obesity risk reduction behaviors in Chinese Americans with sub-analyses based on age, gender, and country of origin residing in a large urban metropolitan area in the U.S. revealed a number of important points. The major findings included: (1) the TPB constructs explained percent of variance in behavior comparable to studies on Caucasian populations; (2) attitude and perceived behavioral control (PBC) were significant contributors of intention; (3) subjective norm was predictive of behavior for male participants only; and (4) subjective norm was predictive of behavior for the youngest age category, while older participants were influenced by attitude and PBC.

In our study, variance in intention and behavior was adequately explained by the TPB model, indicating the applicability of this theoretical framework to understand obesity reduction behavior among Chinese Americans. For example, our finding that the TPB explained 27% of the variance for behavior is accordance with the fact that most psychosocial models predict less than 30% of the variance of dietary behavior [22]. Also, our findings were in accordance with previous studies showing that attitude, subjective norm, and perceived behavioral control account for anywhere between 6% and 32% of variance in behavior [23].

In particular, our study pointed to the importance of attitude and PBC in predicting intention to adopt obesity reduction behaviors among Chinese Americans. Likewise, meta-analysis found attitudes regarding eating behavior were the strongest predictor of intentions, followed by PBC [22,24,25]. These strong predictors can provide direction for the design and implementation of nutrition intervention and health promotion efforts in Chinese American communities.

Other studies using the TPB have found gender differences related to food behavior including intake of snack food [26] and fruit and vegetable consumption [27]. In our study, men indicated that subjective norm was a strong driving force for behavior but females were primarily driven by attitude to adopt obesity prevention behaviors. Similar TPB construct differences among males and females were found in an analysis of cross-sectional fruit and vegetable intake data from the National Cancer Institute's Food Attitudes and Behaviors survey [28,29]. In that investigation, women reported more fruit and vegetable intake, greater perceived behavioral control, and more favorable attitudes than men. Males reported greater perceived norms (subjective norm), but subjective norms did not predict their fruit and vegetable intake. Although this finding indicates men perceive to be influenced by the opinion and pressures of others, this pressure may not influence men's intentions and behavior if they misperceive their own plant-based intake as adequate. This may point to the need to increase men's knowledge of dietary recommendations [30].

Our results also point to age differences in the prediction of health behavior. For example, PBC had higher associations with behavior in older Chinese Americans (41-60 years) compared to younger age groups (18-40 years). Similarly, Mc Eachan, et al. [25] found PBC to have stronger associations with intentions in older participants as opposed to their younger counterparts. Others have suggested that TPB may be less likely to predict dietary patterns in youngest age groups due to their likelihood of living at home with less control over the foods they consume [31].

However, a review of previous studies investigating TPB constructs, age and behavior do not show a consistent pattern. Mc Dermott's, et al. [24] study reported younger participants (17 years and below) had stronger PBC-behavior associations than older participants (18-29 years). Ouellette & Wood [32] stated that older age groups may have inaccurate perceptions of control over their dietary behavior as compared to younger groups, possibly due to their dietary habits being more ingrained and driven by habit. Clearly, the moderation of TPB variables by age within dietary behavior requires further investigation.

In our study, perceived social pressure to perform dietary behavior was found to be significant for the younger age group of Chinese Americans as opposed to individuals over 40. This might be the fact that young adults may be influenced more by the subjective norm of friends and parents than older, middle-aged adults [33]. Because of shared food experiences, living at home may lead to more dependency on parents' opinions on dietary matters and living on college campuses may result in additional social pressures from peers. Future studies are needed to examine direct social pressure/support or descriptive norms as important determinants of eating behaviors in addition to subjective norms [34].

Nutrition and health professionals working with Chinese Americans need to gauge individuals' intentions to engage in obesity prevention behaviors. It is critical to address this population group as the overall BMI of our participants was 23 ± 3.6. This is higher than the national average of 21.8 for Chinese Americans and above the Asian WHO overweight cut-off value of ≥ 23 [2,10]. Our study reported a higher overall BMI in U.S.-born participants as opposed to their foreign-born counterparts. This is consistent with previous investigations indicating U.S.-born Asian Americans are more likely to be overweight or obese than foreign-born individuals [35].

There are notable strengths in our study which includes the recruitment of participants in various religious, cultural, and academic institutions located in a large urban area of the country. Our sample also includes a wide range of ages spanning from young adult to middle-aged individuals which provides useful segmentation of data based on key demographic characteristics. Study limitations point to a limited ability to generalize the findings to the entire Chinese American population due to a non-randomized, convenience sample obtained in the New York metropolitan area. A cross-sectional survey design also precludes the ability to indicate causal relationships between psychosocial predictors and obesity risk reduction behaviors. Lastly, social desirability bias may have influenced participants' reporting of behaviors and their height and weight. Future studies can expand on the measurement of the psychological context component of obesity risk reduction behaviors such as cognitive processes for food choice behavior and mindful eating. These psychological factors would be in addition to measuring behaviors related to stress management conducive for obesity prevention.

Conclusion

A shortage of Chinese American obesity research points to a need for more specific and in-depth analysis of health and nutrition-related interventions that target this population [36]. The Theory of Planned Behavior is a parsimonious framework in examining predictors of behavior, which provides a cornerstone underlying the design and implementation of effective nutrition education interventions. Intention to engage in behaviors conducive to obesity prevention is pivotal in fostering positive health-related practices. Based on our study, psychosocial factors influencing these motivations may differ according to demographic segments within a sample group of Chinese Americans. Nutrition professionals and behavioral researchers working with Chinese Americans need to foster positive attitudes and confidence in the ability of middle-aged adults to adopt healthful dietary and physical activity behaviors to combat weight gain. Social normative influences in adopting healthful dietary behaviors need to be highlighted in male and younger adult individuals. Knowledge of these salient psychosocial predictors can contribute to culturally-sensitive practices of educators and clinicians serving the Chinese American community.

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