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Investigating obesity risk-reduction behaviours and psychosocial factors in Chinese Americans

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Keywords

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Abstract

Aim: The purpose of this research was to examine the attitudes, beliefs and behaviours related to obesity risk reduction in Chinese Americans.

Methods: A questionnaire was administered to a convenience sample of 300 US-born and foreign-born Chinese Americans residing in the New York metropolitan area, ranging from 18 to 40 years of age. Obesity risk reduction behaviours and psychosocial variables derived from the Theory of Planned Behaviour and Health Belief Model were measured. Acculturation was assessed using a modified Suinn-Lew Asian Self-Identity Acculturation Scale. Frequency distributions were delineated and stepwise regression analyses were analysed for different acculturation groups.

Results: 65% of the respondents were female and the mean age of the sample was 26 years. Respondents indicated the most commonly practised behaviour to be eating home-cooked meals instead of restaurant-prepared foods. Perceived barriers to adopting obesity risk-reduction behaviours included convenience of consuming fast foods, cost, lack of time to prepare home-cooked meals, and the physical environment of unhealthy foods. In predicting intention to perform obesity risk-reduction behaviours, attitude was significant for 'western-identified' individuals. In 'Asian-identified' individuals, perceived behavioural control, self-efficacy and perceived benefits were salient.

Conclusions: Nutrition educators working with Chinese Americans need to address self-efficacy in preparing plant-based, home-cooked meals and making healthy choices at fast-food restaurants with portion control. Concrete and perceived barriers such as lack of time and convenience need to be addressed in nutrition education interventions. Educators need to identify new channels and media outlets to disseminate practical, easy-to-implement behaviours for obesity risk reduction that are socially acceptable.

INTRODUCTION

Obesity is a worldwide epidemic affecting all races, ethnic and age groups.¹ It is widely recognized as a salient problem in the USA, with concerns regarding premature death and an array of debilitating health issues.² Often, obesity research among Asian Americans has been overlooked—possibly due to a misperception that weight issues are not significant for this population group. In fact, overweight and obesity-related health risks including heart disease and type 2 diabetes have been identified at lower body mass indexes (BMI) for Asian populations than for other groups.^{3,4} The adjusted prevalence of diabetes is 60% higher in Asian Americans than

non-Hispanic whites when accounting for the lower BMI of Asians.⁵

Asian Americans constitute approximately 5.6% of the American population; this is projected to increase to 9.3% by 2050.⁶ In terms of segment size, Chinese Americans are the largest Asian population in the USA. Due to the changing demographic profile and increasing acculturation of succeeding generations of immigrants, obesity issues are expected to intensify for Chinese Americans.⁷ Acculturation to a western lifestyle increases obesity risk, and escalating obesity rates in subsequent generations of immigrant populations has been well documented, particularly among Asian Americans.⁸⁻¹¹ The anticipated demographic changes and increased risk for

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obesity-related diseases at lower BMIs magnify the importance of investigating obesity-related issues among Chinese Americans.

Dietary and physical activity behaviours that reduce the risk of weight gain among the general American population have been identified.¹²⁻¹⁴ Such behaviours include decreasing intake of energy-dense foods and beverages, reducing portion sizes and choosing healthy snacks. In addition, behaviours that promote a healthy weight include consuming fruits and vegetables along with whole grain foods, and engaging in regular physical activity.¹⁵⁻²⁰ Few studies have been conducted with Chinese Americans to ascertain culturally relevant determinants of these behaviours, as well as beliefs and attitudes pertaining to obesity risk-reduction behaviours.

Theoretical frameworks

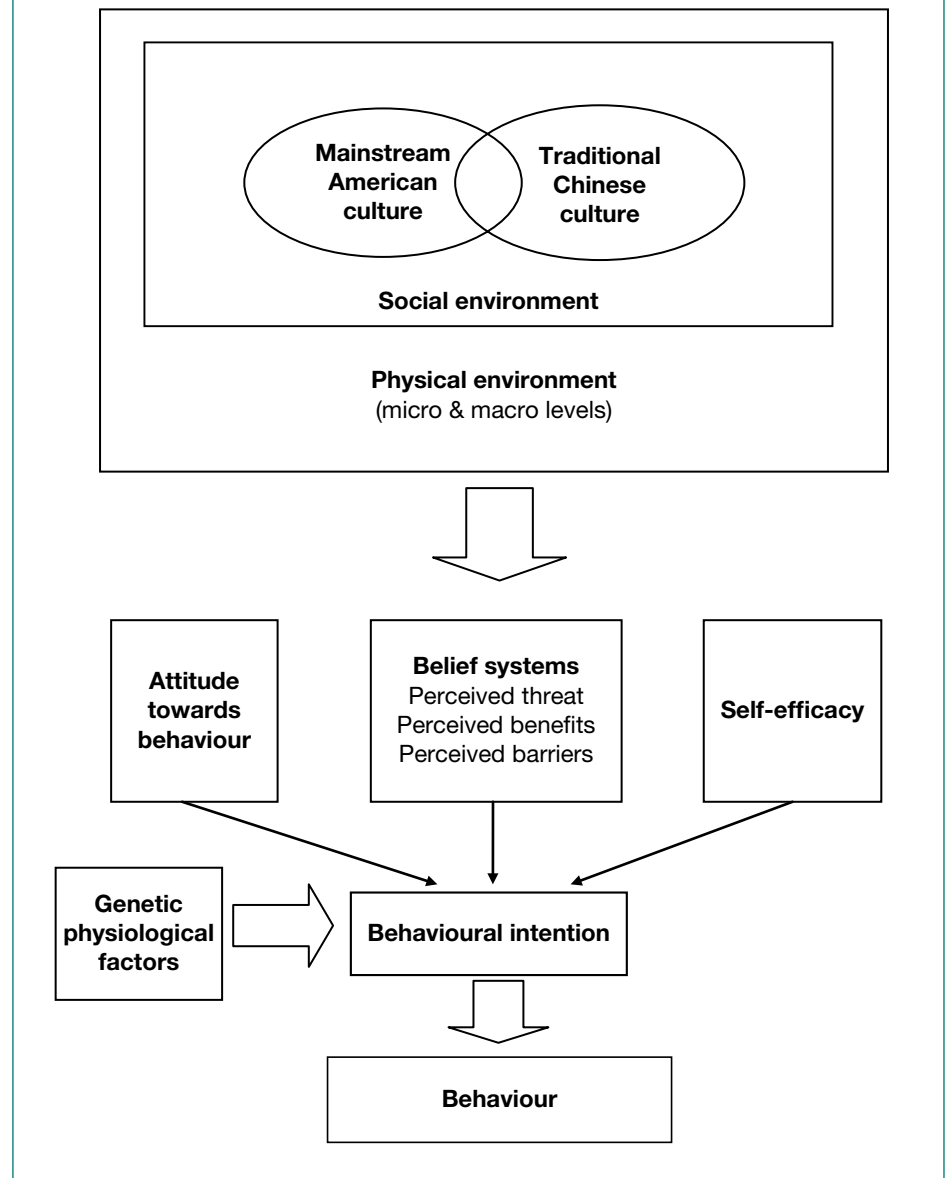
Social psychological theories are instrumental tools for discovering the beliefs and motivations involved in adopting preventive health behaviours. This quantitative study was conducted under the guiding theoretical frameworks of the Health Belief Model (HBM) and Theory of Planned Behaviour (TPB) to discover these factors among young adult Chinese Americans.

The HBM proposes that cognitive factors influence the decision to make and maintain health behaviour changes.²¹ In this model, central to making a decision to change, a person needs to: (1) perceive personal susceptibility to the disease or condition; (2) believe the disease or condition would severely affect quality of life; (3) believe there are specific benefits in taking actions that would effectively prevent or cure the health concern; (4) perceive no major barriers that would impede the health action; (5) be exposed to a cue to take action; and (6) have self-efficacy, that is, confidence in personal ability to perform a specific behaviour.²²

Ajzen's²³ TPB postulates that an individual's health behaviour is directly influenced by the intention to engage in that behaviour. Three factors affecting intention include attitude towards an action, subjective norm and perceived behavioural control. Attitudes are favourable or

Figure 1

Chinese American model for obesity prevention



unfavourable evaluations of the outcomes of a health behaviour. The subjective norm is the perceived social pressure to perform a given behaviour based on the opinion of significant others (normative beliefs) and weighted by the strength of desire to comply with the wishes of significant others (motivation to comply). Perceived behavioural control is the degree to which individuals believe they have control over enacting a specific behaviour.

Using these psychosocial theories and the findings of a previous comprehensive qualitative study on psychosocial obesity risk-reduction behaviours among Chinese Americans,¹⁵ a survey instrument was systematically developed and validated to examine the attitudes, beliefs and behaviours related to obesity risk reduction in a sample of young adult Chinese Americans residing in the New York metropolitan area.²⁴ The model used to guide this investigation can be found in Figure 1.

METHODS

Study population and design

This investigation used a cross-sectional survey design and included a convenience sample of healthy, free-living US-born and foreign-born Chinese Americans aged 18–40 years. Survey instruments, informed consent forms and self-addressed, stamped envelopes were distributed in person to volunteer participants in universities and Chinese schools, cultural associations and churches in the New York metropolitan area. Participants represented a wide range of socio-economic and educational backgrounds. Some were employed in the business districts of New York City and others worked in outlying suburbs. A raffle drawing for \$25 and \$50 gift cards provided incentives. Institutional review board approval was granted from a New Jersey state university, and data were collected between June 2008 and July 2009. Although the sample size determination guideline indicated a need for a sample size of 55–110,²⁵ 300 participants were recruited to be sure that a sufficient number of responses per variable were examined.

Instrument and variables measured

The instrument included 146 questions focusing on obesity risk-reduction behaviours, psychosocial variables, acculturation and demographic factors. Table 1 contains a listing of all the constructs and sample questionnaire statements for each. The average time to complete the surveys was 20 minutes.

Nineteen obesity risk-reduction behaviours were measured using a scale of 1–4, indicating ‘rarely or never’, ‘sometimes’, ‘often’ and ‘always or usually’ over the past month. This category included five domains: food context (nine items), eating context (four items), physical activity context (two items), psychological context (two items) and knowledge/awareness context (two items). All behavioural domains were derived from the literature^{15–20} and items were modified for their applicability based on qualitative research for young adult Chinese Americans.¹⁵

Psychosocial variables were measured using the TPB as a guiding framework. The survey contained 12 items addressing intention to engage in obesity risk-reduction behaviours in the upcoming week using a five-point scale (1 ‘very unlikely’ to 5 ‘very likely’). Twelve items measured attitude regarding favourable or unfavourable evaluations of enacting health behaviours based on a five-point scale (‘extremely good’ to ‘extremely bad’). A five-point scale (‘strongly agree’ to ‘strongly disagree’) and a ‘not applicable’ category evaluated subjective norm categories and perceived behavioural control statements.

The survey also measured variables from the Health Belief Model. A five-point scale (‘strongly agree’ to ‘strongly disagree’) measured perceived susceptibility (four items), perceived severity (four items), perceived benefits (eight items) and perceived barriers (nine items). Response options to 10 self-efficacy items included a five-point scale ranging from ‘extremely confident’ to ‘not at all confident’.

Age, gender, marital status and self-reported height and weight data were collected. A complete listing of demographic data can be found in Table 2. Nine questions adopted and modified from the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA) assessed acculturation.²⁶ This evaluation included questions about the language(s) they speak, read and think; ethnic food preferences; and ethnic social preferences. Response categories were: (1) ‘only Chinese’, indicating low acculturation or strong Asian identity; (2) both equally, denoting a bicultural classification; and (3) ‘only American/English’, reflecting high acculturation or strong western identity.

Questionnaire validity and reliability

Face validity was assessed via a pilot study of 30 Chinese Americans providing feedback about the clarity and meaning of the questionnaire items. In order to determine content validity, an expert panel of nutrition and behavioural science faculties reviewed the instrument for accurate reflection of the psychosocial

models. Construct validity was established via a comprehensive review of the literature and a principal components exploratory factor analysis of variables. The entire scale produced nine distinct factors accounting for 62.3% of the variance in responses. After performing additional factor analysis for each subscale, we reduced the scale by only keeping items with a factor loading of at least 0.40. As a result, six items were deleted from the entire scale.

The sub-scale of obesity risk-reduction behaviour produced five distinct factors that accounted for 60.3% of the variance in responding. These distinct factors corresponded to the five domains conceptually: food context, eating context, physical activity context, psychological context and knowledge/awareness context. Variances accounted for by the factors of each scale ranged from 43.5% (self-efficacy) to 64.8% (perceived barriers). Reliability was measured using Cronbach’s α internal consistency assessment. The Cronbach’s α coefficients on most of the behavioural and psychosocial variables were above 0.70, indicating good psychometric properties. Thus, the scales were constructed carefully and were consistent with the research literature.

Data analysis

Frequency distributions were delineated to describe obesity risk-reduction behaviours, psychosocial factors and demographic data. Self-reported height and weight and BMIs were calculated and grouped into BMI categories according to regular World Health Organization (WHO) guidelines: underweight (BMI < 18.5), normal (18.5 ≤ BMI < 25), overweight (25 ≤ BMI < 30) and obese (BMI ≥ 30).⁴ Stepwise regression analyses were performed using behavioural intention as the dependent variable for the subgroups denoted as ‘western identified’ (acculturation range 3.50–5.00), ‘bicultural’ (2.51–3.49) and ‘Asian identified’ (1.00–2.50). Six constructs of HBM and five constructs of TPB were entered into the regression model to predict the intention to perform the obesity risk-reduction behaviours. In the statistical

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Table 1

Examples of questionnaire items	
Constructs	Questionnaire statements
Psychosocial statements – Health Belief Model	
Perceived benefits	Limiting my intake of high-calorie soft drinks and juice will lower my likelihood of becoming obese.
Perceived barriers	I find it hard to prepare home-cooked meals due to lack of time.
Perceived susceptibility	I may develop obesity because of my sedentary lifestyle.
Perceived severity	If I gain excessive weight, my health would be in serious danger.
Cues to action	Health segments on television or radio are a reminder that I should watch my weight.
Self-efficacy	How confident are you in consuming small portion sizes of food?
Psychosocial statements – Theory of Planned Behaviour	
Behavioural intention	During the upcoming week, I plan to choose smaller portion sizes.
Attitude	Choosing home-cooked meals instead of restaurant-prepared foods is...
Normative beliefs	My parents encourage me to eat a lot of food.
Motivation to comply	I usually follow my parents' opinions on dietary matters.
Perceived behavioural control	As long as I want to, I can prevent myself from gaining excessive weight.
Obesity risk-reduction behaviours	
Psychological context	In the past month, how often did you engage in the following behaviours: <ul style="list-style-type: none"> • Took time to relax and improve my emotional well-being? (e.g. social involvement, positive thinking) • Took time to relax to decrease the amount of stress I feel?
Physical activity context	<ul style="list-style-type: none"> • Exercised at least 30 minutes, on three to five days per week (e.g. walking, biking)? • Engaged in at least one physically active leisure activity?
Eating context	<ul style="list-style-type: none"> • Ate home-cooked meals over restaurant-prepared foods? • Ate smaller portion sizes of foods than usual? • Followed traditional healthy Chinese food patterns (e.g. eating more fruits and vegetables, less red meat)? • Used portion size control methods to help decide how much to eat?
Food context	<ul style="list-style-type: none"> • Ate steamed foods instead of fried foods? • Used small amounts of oils or fat when preparing or cooking foods? • Ate at least three servings of vegetables per day? (1 serving = ½ cup cooked, 1 cup fresh leafy vegetables) • Ate at least two servings of fruit each day? (1 serving = 1 medium fruit) • Ate at least three, 1 oz servings of whole grains per day? • Made healthier choices at fast-food restaurants? • Ate healthy snacks (e.g. fruit, nuts, etc.)? • Ate healthy pre-packaged foods? • Limited intake of high-calorie beverages (e.g. soft drinks, juice, alcoholic drinks)?
Knowledge awareness context	<ul style="list-style-type: none"> • Monitored my body weight? • Learned about obesity risk and prevention (e.g. attending seminars, reading health articles, watching health programmes on TV)?

process, all constructs were entered into the starting regression model, and then statistically insignificant constructs were removed from the model to identify the best-fit regression model. Constructs remaining in the model were significantly influential predictors of behavioural intention. The analysis was performed separately for three subgroups: western identified, bicultural and Asian identified. Influential predictors vary depending on the subgroup because the behavioural intention differs by the characteristics of the target population. Data were analysed using the Statistical Package for Social Sciences (SPSS), version 16.0. The significance level was set at .05.

RESULTS

Demographic data

Out of 475 surveys distributed, 300 were returned, resulting in a 63% response rate. The respondents were mostly female (65%) with a mean age of 26 ± 6.8 years. 63% of the respondents had earned at least a college degree and 72% had never married. The three acculturation subgroups were comparable in educational level, marital status, gender ratio, income level and working status. However, there was a statistically significant difference in the neighbourhood income level in which the participants resided. A greater percentage of western-identified individuals resided in middle- to high-income areas than their bicultural and Asian-identified counterparts. The mean value for acculturation for the entire sample was 3.19 ± 0.72 , reflecting bicultural influences in educational, media and social preferences. According to self-reported height and weight data, approximately 67% of the respondents' BMI fell within a normal range, 14% were overweight, 5% were obese and approximately 9% were underweight. The average BMI of the participants in this study was 22.6 ± 3.84 , ranging from 13.82 to 42.08. When evaluating weight according to acculturation, bicultural participants had the highest percentage of overweight (21.1), while western participants identified had the highest percentage (7.5) of obesity ($p = .036$).

Table 2

Demographic profile of acculturation groups				
	Western identified (n = 117) ^a	Bicultural (n = 125)	Asian identified (n = 54)	p
Gender (%)				.907
Male	35.3	35.2	32.1	
Female	64.7	64.8	67.9	
Education (%)				.508
Elementary or less	0.9	0.0	0.0	
Some high school	0.9	3.2	1.9	
High school graduate	9.5	11.3	11.3	
Some college	24.1	26.6	13.2	
College graduate	42.2	34.7	39.6	
Postgraduate degree	22.4	24.2	34.0	
Marital (%)				.373
Married	20.0	24.2	34.0	
Divorced	0.0	1.6	1.9	
Separated	0.9	0.0	0.0	
Never married	76.5	72.6	64.2	
Domestic partner	2.6	1.6	0.0	
Work status (%)				.431
Employed	61.4	52.0	50.9	
Retired/Disabled	0.9	0.0	3.8	
Homemaker	1.8	3.3	1.9	
High school student	1.8	4.1	1.9	
College student	28.1	36.6	35.8	
Temporarily unemployed	6.1	3.3	5.7	
Income (%)				.219
Under \$20,000	46.0	47.5	44.2	
\$20,000 to \$39,999	8.8	11.7	23.1	
\$40,000 to \$59,999	22.1	15.0	11.5	
\$60,000 to \$79,999	8.8	13.3	9.6	
\$80,000 and over	12.4	12.5	11.5	
Neighbourhood (%)				.001
High income	1.8	4.0	0.0	

(continued)

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Table 2 (continued)

	Western identified (n = 117) ^a	Bicultural (n = 125)	Asian identified (n = 54)	p
Middle to high income	38.6	35.5	34.0	
Middle income	52.6	48.4	28.3	
Low income	1.8	7.3	20.8	
College dorm	5.3	4.8	17.0	
Household (%)				.592
One individual	11.2	4.9	9.4	
Two individuals	19.8	25.2	24.5	
Three individuals	25.0	21.1	22.6	
Four individuals or more	44.0	48.8	43.4	
Stress level (%)				.163
Very stressed	12.1	10.4	5.7	
Moderately stressed	50.0	43.2	35.8	
Neutral	26.7	32.0	32.1	
Moderately calm	8.6	8.0	13.2	
Very calm	2.6	6.4	13.2	
Weight classification ^b (%)				.036
Overweight	11.3	21.1	12.8	
Obese	7.5	4.4	6.4	

^a Missing data (n = 4)
^b Based on common World Health Organization BMI classifications

Obesity risk-reduction behaviours

Table 3 provides mean values for 19 self-reported obesity risk-reduction behaviours performed during the past month for the entire sample and according to degree of acculturation. The most commonly practised obesity risk-reduction behaviours for the entire group included 'using small amounts of oils or fat when preparing or cooking foods' (3.03 ± 0.90), 'eating home-cooked meals instead of restaurant-prepared foods' (2.98 ± 0.88) and 'limiting intake of high-calorie beverages' (2.91 ± 1.03). Behaviours that participants were least likely to perform included learning about obesity prevention via seminars and media outlets and using portion size control methods.

Degree of acculturation affected performance of specific obesity reduction

behaviours. Asian-identified as compared to western-identified participants were more likely to consume steamed foods instead of fried foods ($p = .018$), eat at least two servings of fruit each day ($p = .015$) and follow traditional healthy Chinese food patterns ($p < .001$). In addition, Asian-identified individuals were more likely to monitor their body weight than bicultural or more acculturated groups. Asian-identified individuals also made healthier choices at fast-food restaurants than bicultural individuals ($p = .083$).

Beliefs and perceptions

Participants perceived benefits of adopting specific behaviours to reduce their obesity risk, such as exercising (4.10 ± 0.88), limiting intake of high-calorie soft

drinks and juice (4.10 ± 0.86) and using less oils and fat in cooking (3.77 ± 0.95). Perceived barriers to adopting obesity risk-reduction behaviours included the belief that unhealthy snack foods were cheaper than healthy snacks (3.50 ± 1.14). Another perceived barrier was inconvenience and the belief that it is convenient to eat pre-packed, high-calorie foods (3.43 ± 1.06). In addition, participants generally agreed that lack of time in preparing home-cooked meals was also regarded as a barrier (3.38 ± 1.27). Finally, participants believed that in order to eat healthily, they would need to spend more money (3.34 ± 1.17).

Regression analyses

Stepwise regression analyses were performed using behavioural intention as the dependent variable for the three acculturation subgroups. For the western-identified subgroup, a total of 7.1% of the variance was explained and attitude towards obesity risk-reduction behaviours was the most significant contributor (Table 4). In the bicultural subgroup, 27.1% of the variance was explained chiefly by subjective norm and self-efficacy. In the Asian-identified subgroup, 41.0% of the variance was accounted for chiefly from perceived behavioural control, perceived benefits and self-efficacy.

DISCUSSION

Investigations of obesity risk-reduction behaviours and psychosocial theory variables among Chinese Americans have been limited.²⁷⁻²⁹ In addition, health values and belief systems related to obesity risk have been relatively unexplored according to degree of acculturation among Chinese Americans. Acculturation is a complex process in which individuals adapt to a new cultural milieu and develop ways to function in a new environment affecting their behaviours, values and beliefs.³⁰

The intention to adopt obesity risk-reduction behaviours among Asian-identified individuals in our study was largely influenced by perceived behavioural control, perceived benefits and self-efficacy. Less acculturated Chinese Americans possessed a strong Chinese identity and belief in the benefits of healthy behaviours. In particular, they

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Table 3

Mean values of obesity risk-reduction behaviours for entire sample and by acculturation groups

Obesity risk-reduction behaviours	Western identified <i>M</i> (SD) (<i>n</i> = 117) ^a	Bicultural <i>M</i> (SD) (<i>n</i> = 125)	Asian identified <i>M</i> (SD) (<i>n</i> = 54)	<i>p</i>	Whole sample <i>M</i> (SD)
Used small amounts of oils or fat when preparing or cooking foods	3.11 (0.87)	2.99 (0.92)	2.96 (0.93)	.465	3.03 (0.90)
Ate home-cooked meals instead of restaurant-prepared foods	2.88 (0.82)	3.02 (0.92)	3.13 (0.93)	.202	2.98 (0.88)
Limited intake of high-calorie beverages (e.g. soft drinks, juice, alcoholic drinks)	2.93 (1.07)	2.91 (1.02)	2.88 (0.99)	.953	2.91 (1.03)
Took time to relax and improve my emotional well-being (e.g. social involvement, positive thinking)	2.74 (0.92)	2.81 (0.87)	2.77 (0.92)	.837	2.77 (0.89)
Followed traditional healthy Chinese food patterns (e.g. eating more fruits and vegetables, less red meat)	2.43 (0.99)	2.72 (0.96)	3.07 (0.96)	< .001***	2.67 (1.00)
Ate healthy snacks (e.g. fruit, nuts, etc.)	2.61 (0.98)	2.60 (0.89)	2.74 (0.80)	.656	2.63 (0.91)
Engaged in at least one physically active leisure activity	2.71 (1.07)	2.64 (1.07)	2.33 (1.06)	.097	2.61 (1.08)
Ate at least three servings of vegetables per day (1 serving = ½ cup cooked, 1 cup fresh leafy vegetables)	2.50 (0.91)	2.66 (0.94)	2.72 (1.01)	.257	2.60 (0.94)
Took time to relax to decrease the amount of stress I feel	2.52 (0.90)	2.54 (0.86)	2.72 (0.91)	.384	2.57 (0.89)
Ate steamed foods instead of fried foods	2.43 (0.88)	2.55 (0.88)	2.85 (0.85)	.018*	2.56 (0.88)
Made healthier choices at fast-food restaurants	2.43 (1.05)	2.36 (0.91)	2.76 (0.99)	.083	2.46 (0.99)
Ate at least two servings of fruit each day (1 serving = 1 medium fruit)	2.26 (0.96)	2.52 (0.95)	2.68 (0.92)	.015*	2.45 (0.96)
Ate at least three 1 oz servings of whole grains per day	2.41 (0.97)	2.47 (0.98)	2.48 (1.04)	.892	2.45 (0.99)
Monitored my body weight	2.27 (1.03)	2.50 (1.01)	2.67 (0.99)	.043*	2.44 (1.03)
Exercised at least 30 minutes, on three to five days per week (e.g. walking, biking)	2.31 (1.05)	2.40 (1.11)	2.29 (1.03)	.767	2.34 (1.07)
Ate healthy pre-packaged foods	2.21 (1.01)	2.24 (0.94)	2.56 (0.90)	.087	2.28 (0.97)
Ate smaller portion sizes of foods than usual	2.12 (0.84)	2.23 (0.72)	2.16 (0.87)	.571	2.17 (0.80)
Learned about obesity risk and prevention (e.g. attending seminars, reading health articles, watching health programmes on TV)	1.83 (0.89)	2.06 (1.08)	2.05 (1.04)	.195	1.97 (1.00)
Used portion size control methods to help decide how much to eat	1.83 (0.93)	1.98 (0.93)	2.00 (0.93)	.395	1.92 (0.93)

* *p* < .05, *** *p* < .001^aMissing data (*n* = 4)

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Table 4

Regression analysis of intention to perform obesity risk-reduction behaviours by acculturation groups

Acculturation group	Significant predictors	R ² (%)	R	β	b	SE of b	p
Western identified	Attitude	7.1*	0.266	0.266	0.168	0.687	.01
Bicultural	Subjective norm	27.1***	0.520	0.430	0.059	0.012	< .001
	Self-efficacy			0.283	1.298	0.428	.003
Asian identified	Perceived behavioural control	41.0	0.641	0.336	0.307	0.116	.012
	Perceived benefits			0.284	0.226	0.096	.023
	Self-efficacy			0.294	0.227	0.097	.024

*p < .05, ***p < .001

Note: All Health Belief Model and Theory of Planned Behaviour variables were included in the regression models

were confident in their ability to consume steamed foods instead of fried foods, eat at least two servings of fruit each day and follow traditional healthy Chinese food patterns. Health educators can capitalize on this confidence by planning interventions that reinforce their self-efficacy as well as perceived control. For example, providing nutrition messages in a step-by-step manner fosters self-efficacy and maximizes perceptions of control. Similarly, Liou and Contento's study of dietary fat behaviours in Chinese Americans identified the importance of self-efficacy in Asian-identified individuals.²⁷

Among bicultural individuals in our study, self-efficacy was a significant contributor of intention to adopt obesity risk-reduction behaviours. Previous studies indicate that a bicultural orientation is related to positive psychological functioning.³¹ We postulate that individuals with high self-esteem and positive feelings towards self tend to channel their confidence towards the performance of health-related behaviours. Subjective norm was also a salient contributor for bicultural individuals in our study, indicating the importance of significant others when making health behaviour choices. Health educators should consider incorporating these individuals into nutrition education interventions.

In our study, attitude was the major factor contributing to the intention to engage in obesity risk-reduction behaviours among western-identified

individuals. Prior studies conducted with Caucasian Americans have also shown the predominant influence of attitudes in the prediction of behavioural intention.^{32,33} American culture emphasizes individualism and the freedom to express one's own opinions and predispositions towards behavioural patterns. We postulate that this strong internalization of personal predispositions outweighs the influence of other psychosocial factors such as subjective norm. Thus, the results of the regression analysis for the western-identified group depicted a smaller variance than the other acculturation groups.

In this study, convenience and taste were major motivating factors for food choice and the driving forces for the selection of pre-packaged, high-calorie American food. Preparing home-cooked meals was viewed as time-consuming and inconvenient. In general, participants identified fast food as tasty and reported relatively weak intentions to make healthy choices at fast-food restaurants. Likewise, Lv and Brown¹¹ found convenience to be a major factor influencing food behaviour in first-generation Chinese Americans. Similarly, other studies of Chinese Americans show an increased consumption of sweet snack foods and non-traditional, high-fat protein foods after immigrating to the USA.^{28,34}

In general, participants in our study felt that their physical and social environments provided an abundance of unhealthy food choices and they identified readily available fast-food restaurants

as a major impediment to weight control. Similar barriers to healthy eating were identified in the Harrison *et al.*³⁵ focus group interviews with Asian Americans. In their study, participants identified fast food as convenient and that it contributed to the adoption of American eating habits among children.

In our study, we analysed BMI data using WHO common BMI standards. The proportion of Asian individuals with a high risk of type 2 diabetes and cardiovascular disease is substantial at BMIs lower than the common WHO cut-off point for overweight (BMI = 25). WHO experts recommend using lower cut-off points of 23 to denote overweight and 27.5 to denote obesity for organizations considering public action. However, they suggest using the standard cut-offs for study comparisons.³⁶ Using these common cut-off standards, our analysis found 25.5% of US-born to be overweight and/or obese as compared to 18.1% of foreign-born participants. Similarly, data derived from the 2000 National Health Interview Survey indicated that among various immigrant subgroups, number of years of residence in the USA was associated with higher BMI.³⁷ Yeh *et al.*³⁸ examined baseline data collected from a multi-stage probability sample of Chinese Americans living in two communities in New York City. Length of residence in the USA positively correlated with BMI status, particularly among adults who had been residing in the USA for 16 years or more.

Limitations

Limitations need to be addressed in this study. First, a randomized sample of individuals was not attempted in the selection process. Since this study used a convenience sample, participants may have exhibited more positive health-related characteristics than the population at large. The majority of the respondents were educated, young, female adults. In order to compensate for this limitation, the researchers targeted a wide range of sociocultural, religious and educational institutions for potential recruitment of study participants. Second, since this was a cross-sectional survey investigation, longitudinal data were not available to assess the stability of respondents' beliefs, attitudes and behavioural measurements. Third, participants provided self-reported height and weight, which may be biased as over 70% of respondents were categorized as either normal weight and/or underweight. The results of this study may not be generalized to all overweight and obese Chinese American individuals for whom the research findings would be most relevant. Additional research is needed to assess differences between normal weight and overweight/obese individuals in terms of beliefs, intentions and obesity risk-reduction behaviours. Finally, since the survey instrument was developed and written in the English language only,

the study sample may be more biased towards western-identified Chinese Americans than to the less acculturated, recent immigrants in the New York metropolitan area. Future investigations need to consider bilingual translations of the survey instrument in order to capture a more accurate representation of the Chinese American population.

CONCLUSIONS

With increasing levels of obesity among all segments of the US population including Chinese Americans, health professionals need guidance regarding effective intervention approaches. Research studies have shown that individuals tend to adopt a more westernized diet with increased acculturation, resulting in a higher prevalence of obesity and diet-related chronic diseases.^{28,34} Tackling this epidemic needs to be multifaceted, with effective interventions incorporating psychosocial factors influencing obesity risk-reduction behaviours.

If obesity rates among Chinese Americans are to be mitigated, concrete health actions that focus on all segments of the population including individual, family and community are necessary. Health professionals can be involved with policy development so as to influence food availability and food choices. There needs to be collaboration with the food industry to promote lower-calorie and

higher-nutrient-dense foods and beverages among Asian Americans. Nutrition professionals working with Chinese Americans can address the importance of preparing healthy, plant-based meals at home and making healthy choices at fast-food restaurants. Barriers such as time constraints and convenience need to be addressed in nutrition education and counselling sessions. Since peer influence tends to be strong, educators can identify new channels to disseminate practical, easy-to-implement behaviours for obesity risk reduction that are socially acceptable. Our investigation of young adult Chinese Americans found that psychosocial factors related to obesity risk-reduction behaviours vary according to degree of acculturation. Thus, nutritionists working with Chinese Americans need to approach weight-reduction interventions with an appropriate tailoring of messages to account for the difference in acculturation. Additional research on psychosocial factors, acculturation, length of US residence and weight status are necessary for future investigations of Chinese Americans, preferably on a wider range of ages.

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