Towards a Data-Driven Approach to Intervention Design: A Predictive Path Model of Healthy Eating Determinants

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Abstract. Dietary behavior and attitude play major roles in the worldwide prevalence of obesity, as weight is gained when energy intake exceeds energy expenditure. Although research has focused on designing technological interventions for healthy eating behavior, recent reviews have identified a gap in the knowledge base regarding the variables/determinants of healthy eating and the interactions between them. We developed a model of some determinants and their impact on healthy eating as a basis for designing technological interventions to promote healthy eating behavior within a target community. The main goal of this work is to understand how people adopt a healthy eating attitude, the variables influencing such attitudes, the interactions between these variables, and the degree of influence each variable exerts on healthy eating attitudes. We use fast food-related eating behavior as our case study. Our model shows that weight concern, nutrition knowledge, concern for diseases, social influence, and food choice motives predicts 65% of the variance in healthy eating attitudes, showing the suitability of the model for use in predicting healthy eating attitude. This result will inform decisions on the most effective persuasive strategy for designing interventions to promote healthy eating behavior.

Keywords: Dietary Behavior, persuasive intervention, predictive model, obesity, theories, determinants. healthy eating, fast food behavior.

1 Introduction

Obesity is a major health concern worldwide and the prevalence of overweight and obese individuals is especially alarming in developed countries. One of the few uncontroversial facts about obesity is that weight is gained when energy intake exceeds energy needs for a prolonged period. Eating behavior, therefore, becomes an important factor to consider in any interventions targeting obesity. The contributing effect of healthy diet in promoting general well-being cannot be overemphasized. Research has shown that good eating habits can reduce the risk of obesity, heart disease, and diabetes [1]. As a result, several interventions have focused on promoting

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healthy eating attitudes [1, 2]. Most of these interventions are based on health behavior and health promotion theories adapted from various disciplines including psychology, sociology, consumer behavior, and marketing which are highly generalized [3]. Interventions that are informed by theories tend to be more successful than those based on intuition [3, 4]; however, designers of healthy eating interventions often face problems in adapting and applying these theories to the healthy eating behavior domain. This is because the theories are broad, abstract by nature, and lack specific content, therefore allowing room for subjective interpretations and applications. Recent studies have identified a need to determine the variables/determinants of a healthy eating attitude and the interactions between these variables to form the basis for healthy eating interventions [5]. Our study aims to fill this gap by understanding how people adopt a healthy eating attitude, the variables influencing attitude, the interactions between these variables, and the degree of influence each variable exerts on healthy eating attitude using fast food related behavior as case study. Fast food is defined as convenience foods obtained in self-service or 'take-away' eateries with minimal waiting. They are characterized by high energy dense, low in micronutrients and fiber, high in simple sugars and salt, majorly larger in portion size than conventional home-cooked or restaurant foods [6].

Persuasive technology researches have emphasized the need to study and understand the target user group to enable customization of interventions and to inform decisions on appropriate intervention strategies. We focus on a particular target group – university students. We conducted a mixed-methods study with 221 visitors in 10 fast food restaurants within the University of Saskatchewan (UofS) campus. The collection of primary survey data was followed by a 5-minute interview with 15 randomly selected participants. We employed Structural Equation Modeling (SEM) to explore the interaction between various determinants of healthy eating behavior from our survey. We employed SEM to exhaustively generate a predictive model of healthy eating behavior. The results show that weight concern, knowledge, concern for diseases, social influence, and food choice motive (listed in decreasing order of relevance) influence healthy eating attitude and predict 65% of the healthy eating attitude variance, showing the suitability of the model for use in predicting healthy eating attitude. The highest prediction of weight concern (50%) implies that concern for weight is the most significant influencer of healthy eating attitude in this target population and, therefore, should be emphasized by persuasive interventions targeting healthy eating.

Our work argues that behavioral predictor models that show the inter-relationship between various behavior determinants and their degree of influence on target behavior have a role to play in persuasive technology research. Our work complements the theoretical approach to intervention development by providing a practical way of testing theoretical variables on the target audience prior to intervention design.

2 Related Work

Persuasive technology is fundamentally about inducing behavior change using computers [7]. Developing effective persuasive interventions for behavior change

requires in-depth and practical understanding of human psychology [8]. The most effective persuasive interventions for behavior change usually occur when the intervention is behaviorally focused and theory driven [3, 8]. Therefore, persuasive intervention designers depend on health behavior and health promotion theories adapted from various disciplines to inform their work. Here, we present some relevant theories of health behavior.

Knowledge-Attitude-Behavior Model stresses the importance of knowledge as a prerequisite for intentional performance of health related behavior. An acquisition of new knowledge leads to changes in attitude, which in turn leads to an improved dietary behavior [9]. Research has distinguished between various types of knowledge based on degree of motivation. "Awareness knowledge" is a type of knowledge that captures people's attention, increases awareness, and enhances motivation, whereas "how-to" knowledge is the type people need when they are already motivated [10]. In other words, awareness knowledge enhances people's motivation to take action and instrumental knowledge is needed by people in order to act on their motivation [10].

Health Belief Model (HBM) is one of the first theories of health behavior that was developed to address problem behaviors that evoke health concerns [11]. The primary constructs of HBM include perceived susceptibility (perceived risk of contracting the health condition of concern), perceived severity (perception of the consequence of contracting the health condition of concern), perceived benefits (perception of the good things that could happen from undertaking specific behaviors), perceived barriers (perception of the difficulties and cost of performing behaviors), and cues to action (exposure to factors that prompt action).

While each of these traditional behavior theories is important, they complement each other rather than being mutually exclusive. Again, the impact of these theories could vary depending on the target group. Thus, a predictive model that determines the impact of various variables of the theories/models in a target audience is necessary.

3 Research Method

The data reported in this paper is part of a project aimed at designing persuasive intervention for promoting healthy eating that was approved by the UofS ethics board.

3.1 Research Approach and Measurement Instrument

This study employed both quantitative and qualitative methods of data collection. The quantitative component involved the collection of primary survey data from large numbers of participants with the intention of projecting the results on a wider population [12]. The qualitative part, which involved a post-survey 5-minute interview with 15 participants (7 females and 8 males between the ages 18 to 36) randomly selected from the study participants aimed to help elucidate the reasons behind the behaviors, and to clarify responses from the survey. This is in line with [13], which suggests that the most effective method of data collection is a combination of both quantitative and qualitative methodologies.

The questionnaire was developed after an extensive review of behavior change theories, persuasive interventions for healthy eating, and consumer behavior, and pilot

tested (n=10) for refinement. The survey instrument consists of questions assessing (1) participants' demography (gender, age group, education); (2) health concern (concern for weight and concern for diseases); (3) nutrition knowledge; (4) fast food motives; (5) healthy eating attitude; (6) frequency of purchase; and (7) social influence.

We adapted the 10 questions from Kahkonen [14] to measure the health concern variable. The scale has been validated by several studies [14, 15]. The health related concern measures the participants' degree of concern about food and health related issues using 5-point Likert value ranging from "1 = Not Concerned at all" to "5 = Very Concerned". Typical questions in this variable ask the participants to evaluate their degree of concern for "getting a lot of calories in food". The present study separated concern for health into two variables: Concern for Weight (WC) and Concern for Disease (DC). This is based on the factor loadings and the suggestion by Yu-Hua [16] that WC and DC might impact of health attitude/behavior differently.

Food choice motive measures several factors and their relative importance to the participants in making daily meal choices. The factors refer to health and non-health related food characteristics that might be taken into account when choosing what to eat. We adapted the 36 food choice motives questions developed by Steptoe et al. [17]. Some examples includes "It is convenient", "It is healthy", and "It is cheap". The present study allowed the participants to select from a list of factors that motivate their fast food consumption, which are mostly non-health related.

We measured attitude towards healthy eating using a 3-item scale adapted from Kearney et al. [18]. An example of a question in this category is "I make conscious effort to eat healthy". The participants state their level of agreement using a 5-point Likert scale, ranging from "1 = strongly agree" to "5 = strongly disagree".

To assess nutrition knowledge, we adapted the questions developed by Alexander [19] and used a 5-point Likert scale ranging from "1 = worst quality" to "5 = best quality". The questions were designed to solicit participants' knowledge about fast food meals by allowing them to rate the subjective nutrition quality of some selected fast food meals. A typical question is "Can you rate how nutritious and healthy you feel that French fries are?"

We included the social influence variable to determine the influence of others on purchase decisions. To do this, participants were presented with questions of the type: "Which of the following influence your decision to purchase fast food (you can select more than one): family, friends, colleagues, restaurant attendants, and self- decision". This particular question was deemed necessary because, although several researches have shown the important role that others play in motivating certain behaviors, the degree of social influence and its relationships with other variables are still unclear.

3.2 Research Participants

The participants consisted of 223 restaurant visitors sampled at selected fast food restaurants within the UofS campus. There were 221 usable responses. The participants were either students or employees of the UofS and the data were gathered over a period of 14 days in 2011. The only eligibility criterion required was that the participants were at least 18 years old at the time of data collection, in compliance with the study ethics approval and also to ensure that the participants were of legal age to make decisions independently (including decisions on what to eat). Gender was relatively evenly distributed; 45% (99) of the participants were female and 55% (122)

were male. The ages of the participants were sparsely distributed: 18-25 (153, 69%), 26-35 (55, 25%), 36-45 (10, 5%), and only 3 (1%) were over 45. Similarly, undergraduate students represent 80% of the university community [20], therefore, most of the participants in this study were high school graduates who are presently pursuing their first degree 104 (47%), 4 (2%) held a diploma degree, 52 (24%) held a bachelor's degree, 54 (24%) were master's degree holder, and 6(3%) were doctorate degree holders. Regarding the frequency of visit to fast food restaurants, more than 60% of the participants visited fast food restaurants at least 2 times in a week (every day: 7, 3%; 3 times a week: 62, 28%; once a week: 71, 32%; 3 times a month: 28, 13%; once a month: 39, 18%; never: 14, 6%). It is important to highlight that the exact frequency of visits might be greater as the interviewed participants revealed that fast food bought as take away or home delivered were not counted.

3.3 Data Validation

To ensure reliability and validity, we selected an analytical method that explicitly models the linear and quadratic effect (non-linear relationships) between the measured variables. We used the SmartPLS [21] Structural Equation Modeling (SEM) tool for simultaneous estimation of multiple equations.

Instrument Validation: To determine the validity of the survey instrument we performed Principal Component Analysis (PCA) using SPSS 19. Before conducting PCA, the Kaiser-Meyer-Olkin (KMO) and Bartlett sphericity tests were determined to measure the sample adequacy [22]. The KMO were all >0.7 and the result of Bartlett sphericity tests were significant at <0.001, thus, the data was suitable to conduct factor analysis [23]. The factor loadings and the corresponding factor scores (weights) the variable were generated. The factor loading resulted in removal of some questions and each factor has larger loading on its corresponding factor (≥0.7) than cross-loadings on other factors (≤0.4). Thus, these items could effectively reflect factors since they have good validity including convergent and discriminant validity [24].

Reliability of the Variables and Indicators: We examined the data for reliability using both SPSS and SmartPLS tool. To check for reliability, we used Cronbach's α, which efficiency ranges from 0 to 1 and can be used to describe the reliability of factors extracted. According to Peter [25], Cronbach's α should be ≥ 0.7, but for 2-3 indicator variables, a Cronbach's α ≥ 0.4 is acceptable. As shown in Table 1, column 4, the Cronbach's α of the variables satisfies these conditions (social influence contains 3 indicators, therefore, Cronbach's α is within the acceptable range of ≥0.4).

4 Results

After the validation of the data, we developed and tested the path model presented in Figure 1 using SEM in SmartPLS tool, which allows for simultaneous measurement (of indirect and direct influences of the variables) and structural models. In contrast to using SEM for hypotheses testing, our goal is to explore the interrelation/interaction between the various determinants of healthy eating and to generate a predictive model of healthy eating behavior. Therefore, we systematically examined the interactions and the impact of the five determinants (weight concern, concern for diseases, knowledge, choice motive, social influence) on each other and on healthy eating attitude. This enables us to exhaustively explore the significant of each determinants of healthy eating.

Table 1. Scale Reliabilities

Variables	AVE	Composite Reliability	Cronbach's Alpha	Redundancy (Q^2)
Threshold Value	**≥0.5**	**≥0.6**	**≥0.7 (2 to 3 indicators≥0.4)**	**≥0.0**
Choice Motivator	0.554	0.736	0.746	0.015
Concern for Disease	0.577	0.891	0.854	0.265
Healthy Eating Attitude	0.751	0.900	0.835	0.088
Knowledge	0.538	0.770	0.702	0.008
Social Influence	0.454	0.706	0.609	0.001
Weight Concern	0.523	0.839	0.753	0.001

4.1 Test of Proposed Path Model

Partial Least Square (PLS) model analysis essentially proceeds through two stages. The first stage deals with the reliability and discriminates validity analyses of the items and their associated independent variables in the outer model. The second stage estimates the relationships between the dependent variables in the inner model through bootstrapping procedures. Our analysis rigorously followed these two stages to confirm both discriminate and convergent validity and internal consistency. The model fit indices of the structural equation model is presented in Table 1. The square root of Average Variance Extraction (AVE) coefficients from the SmartPLS output is a key statistic at the first stage of the path analyses as it represents the variance extracted by the variable from its indicator items. As shown in Table 1, the AVE indices for all the variables are well above the theoretically ideal value of 0.5 with the exception of social influence, which is slightly below threshold (0.454). However, Cronbach's α values and the composite reliability that analyzes the strength of each indicator's correlation with their variables are higher than threshold values (see Table 1). Similarly, redundancy values are above "0" and the t-test values that measure the significance of the path coefficient are greater than 2.5 (above the recommended threshold of 1.96), as shown in Table 2.

The value of R^2 is shown in Table 2. The table shows that weight concern that determines 50% of variance is the highest predictor of healthy eating attitude followed by choice motivator 13%, and knowledge 2%. Overall, the model's independent variables predict 65% of the variance in healthy eating attitude showing the predictive relevance and the suitability of the model in predicting healthy eating attitude.

Again, to measure the shared variance between the variables and their measures, we evaluated the discriminate validity of the model. The discriminate validity further confirmed that the diagonal elements were significantly higher than the off diagonal values (i.e. correlation values) as shown in Table 3. Since all variables had diagonal elements (AVE) greater than the recommended value of 0.5 (except social influence) and also greater than the correlation values, the data demonstrates successful discriminate validation. Consequently, all calculated quality criteria indicated by SmartPLS are above the recommended threshold with the exception of social influence, which is slightly below the threshold of AVE but scores high in other fit indices and is therefore retained.

Table 2. T-ratio and R^2 for the Dependent Variables

Variables	R^2	t-test
CM	0.13	3.033
AT	0.37	5.500
KN	0.02	2.522
WC	0.50	12.446

Table 3. The AVE and Latent Variables Correlation Matrix

	CM	DC	AT	KN	SI	WC
CM	**0.554**					
DC	-0.208	**0.577**				
AT	-0.326	0.345	**0.751**			
KN	0.085	0.139	0.120	**0.538**		
SI	0.255	0.004	0.006	0.038	**0.454**	
WC	-0.121	0.384	0.396	0.049	0.084	**0.523**

CM = food choice motives, DC = concern for disease, AT = healthy eating attitude, N = nutrition knowledge, SI = social influence, WC = weight concern

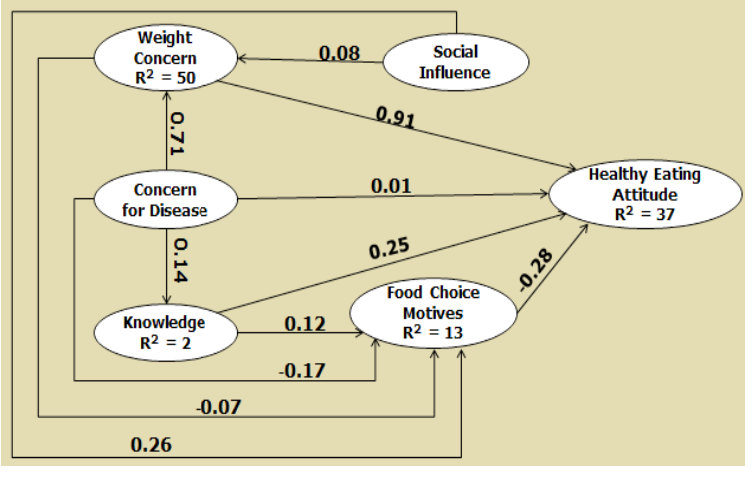

Fig. 1. A path model of healthy eating attitude, associated determinants' interrelations

4.2 Proposed Model

Figure 1 represents our proposed path model. In this model, concern for disease and social influence are the independent variables that influence the dependent variables (weight concern, food choice motive, and health attitude).

Interactions between the Model Variables

As shown in Figure 1, among all the variables, weight concern is most statistically and significantly associated with healthy eating attitude (with path coefficient β = 0.91). Concern for disease unfortunately, has no significant relationship with attitude; however, it exerts a strong positive effect on weight concern and knowledge. Similarly, weight concern and concern for disease reduces the impact of food choice motives on attitude. Knowledge on the other hand positively influences both healthy eating attitude and food choice motive. Contrary to expectations, social influence, interestingly, have no direct effect on healthy eating attitude and does not significantly interact with any other variable apart from food choice motive, for which it exerts the most significant effect. Again, the model shows that food choice motive is the single negative determinant/influencer of healthy eating attitude. The path values (interactions) presented in this model are statistically significant at $p \leq 0.01$.

5 Discussion

The main goal of this study is to use fast food related behavior as a case study, to understand how people adopt a healthy eating attitude, the variables influencing attitude, the interactions between the variables, and the degree of influence each variable exerts on healthy eating attitude. Our model serves as the basis on which to make decisions on the most effective persuasive strategy and approach to employ in the design and development of interventions targeting healthy eating behavior (especially when eating in restaurants). From thorough literature review, this study is the first to exhaustively examine the combined interaction of the variables weight concern, concern for disease, knowledge, food choice motive, social influence, and health eating attitude, and their influence on attitude towards healthy eating. The study also examined the mediating role played by food choice motive.

Health Concern (Weight Concern and Concern for Disease) and Eating Attitude: Surprisingly, although, participants expressed health concerns from consuming fast food in general, the study shows that concern for disease is the least important motivator (as shown in Figure 1) while concern for weight stands out as the most significant motivator of healthy eating attitude. This contradicts the finding by Yu-Hua [13] that weight concern is the least important motivator in making food-related decisions. One possible explanation might be the age group of this study. The majority of our study participants are young, falling within the age group 18-25 (69%) and 26-35 (25%). Most people within this age range believe that having an attractive image or socially desirable traits is associated with having a good personality that is the "physical attractiveness stereotype" [26]. Similarly, according to Kai-Yang [27], people believe that good body image is linked to life of happiness, success, and social acceptance the same way that fatness is associated with laziness, stupidity, and chaos. Our study suggests that physical self-presentation and social physique anxiety are keys to healthy behavior motivation among younger adults. Another likely explanation as noted by Yu-Hua [16], is that "food intake plays only a partial role in the onset of various diseases, while it is usually the only avenue for obtaining calories", hence individuals who exhibit concern of gaining weight from food are more inclined to a healthy eating attitude than those who exhibit concern for developing diseases. It is however important to state that obsession for weight as opposed to diseases control might not be the case for an older population, who are likely to be more sensitive to their general health as they are more prone to acquiring diseases [28].

It is also interesting to highlight the influence of both weight concern and concern for disease on food choice motive. The model shows that they negatively influence food choice motive. This means that individuals motivated to eat healthily due to their concern for health (concern for weight and disease) are less affected by non-health related food choice motives (e.g. convenience, tastes good) and can easily overcome the barriers presented by these factors towards healthy eating attitude. Similarly, although, concern for disease produces no significant direct influence on attitude, it strengthens weight concern and knowledge. Therefore, people who are already concerned about their weight are more likely to also care about disease than people who are not. Notably, concern for disease increases the quest for health-related

knowledge; however, it might not be an advisable key motivator of behavior change for this target group.

Knowledge and Healthy Eating Attitude: As expected, knowledge positively influences attitude. Knowledge is one factor that has generated contradicting views and results from researchers in health intervention. Brown et al. [29] suggest that a high level of nutrition awareness does not reflect in participants' food preferences while Strychar et al. [30] and Leme et al. [31] show a positive link between knowledge and healthy eating. Leme et al. however, stressed that knowledge about healthy eating is not the only determinant of healthy food choice. Therefore, traditional nutritional interventions focusing on healthy eating should be modified to aim at behavioral change. These mixed findings are not surprising considering that none of the researchers have examined the impact of knowledge in line with an individual's health goal. According to Fogg [4], persuasive interventions are more effective when they align with an individual's health goals. One of the findings of our study (although beyond the scope of this paper) shows that individuals have varying health goals. Most knowledge-based healthy eating interventions can be described as arbitrary to most people as they are based on one-goal-fits-all approach, and are therefore, hardly useful. A tailored knowledge will likely increase healthy attitude as it will act as a facilitator in line with an individual's health goals. As Carrillo et al. [32] noted, most food with relative health value often exhibits low consumption frequency due to low knowledge about their health benefit.

Social Influence and Healthy Eating Attitude: Interestingly, the model suggests that social influence has no direct impact on healthy eating attitude but produces an indirect positive effect via food choice motives and weight concern. From literature, social influence is one of the most widely employed persuasive strategies. However, little is known about the interaction between this variable and other behavior change motivators. Our model reveals that social influence is not likely to act as a primary motivator of change; however, it can increase the effectiveness of other motivators. This can find interpretation in friendship patterns and grouping among university students (young adults) who tend to be attracted to people of similar inclinations, therefore, leaving little or no room for intra-group influences. From our post survey interview, 4 participants in the study group who are reportedly overweight and eat fast food at least 3 times a week confirmed that most of their friends exhibit similar behaviors and therefore, it is a normal behavior within their circle of friends. This presents an interesting finding that suggests that inter-group intervention might be necessary to produce significant healthy eating change among this circle of friends. The finding also suggests that self-presentation and social group anxiety might be strongly mediated by group influence as people tend to care and seek the approval of similar others (in-group acceptance) more than they do for any external human influencers [1]. This has been confirmed by a survey that reported that 79% of the students eat lunch with friends [33].

The Mediating Role of Choice Motives: The model indicates that food choice motive (e.g., convenience, time saving) negatively influences healthy eating attitude. However, individuals who are concerned about their weight and diseases will have a lesser effect of food choice motive and will make a conscious effort to eat healthily. Hence, weight concern positively influences healthy eating attitudes both directly and

indirectly via food choice motive for health [16]. Social influence is the only variable that produces a significant positive effect on food choice motive. The explanation follows closely from the results of social influence. Friends eat together as social bonding, and fast food restaurants are convenient, fast, and inexpensive places to do this. Notably, food choice motive reduces healthy eating tendencies. This is not surprising as most motives for fast food consumption are non-health related (e.g., fast, cheap, fun). Overall, our results suggest that persuasive researchers targeting healthy fast food consumption should plan to deal with the inhibiting effect of food choice motive on healthy eating attitude.

6 Implication

Recent persuasive technology research has emphasized the need to study and understand the focus group of interest to enable customization of interventions and decision on appropriate intervention strategy. Similarly, it is a common practice for persuasive interventions to employ multiple or a combination of strategies in a design (to increase the persuasiveness of their applications) with the hope that at least one out of the many strategies will suit the target audience. This approach, however, unnecessarily increases the complexity of the intervention, and therefore, contradicts the need to make technological interventions usable (useful and simple). It also makes it hard to pinpoint the most effective strategy that actually motivated the behavior change. To solve these problems, there is a need to understand the target audience, the important variables, and the interactions between these variables. This will not only inform the design decision on effective strategy but will make it easier to imitate any successful strategy or to pinpoint the strategy that produced the highest degree of influence on the target behavior.

Our findings have both theoretical and practical implications. On the theoretical front, our study shows how models can be used to predict behavior. Specifically, they highlight the separate role of concern for disease and weight, nutrition knowledge, and social influence on healthy eating attitude. The results strongly support the assertion that food choice motives have independent and mediating effects on healthy eating attitudes. We hope that this study spurs research into examining the role of these variables and other variables of interest on other health behaviors, such as exercise. Our work argues for the use of models as the basis for behavior intervention design.

From a practical point of view, our results shed light on important variables that individuals consider when forming healthy eating attitudes. Among all the variables, concern for weight exhibits the strongest direct influence on healthy eating attitude. Thus, persuasive interventions targeting healthy eating in younger adults should emphasize the relationship with weight rather than diseases. Furthermore, the model suggests that knowledge is an important factor in the design of healthy eating persuasive interventions. This is an area that has been largely ignored by persuasive researchers; however, our results show that the addition of a knowledge component has both direct and indirect effects that help healthy eating attitude formation. This means that integrating healthy eating education in persuasive interventions may be helpful. Similarly, the impact of social influence need not be ignored; although social influence has no direct influence on healthy eating attitude, it increases the effect of weight concern on healthy eating attitude.

Thus, to achieve better result, persuasive interventions should use social influence along with any strategy emphasizing weight concern.

This research study has some limitations that must be acknowledged. One practical limitation for generalizability stems from younger participants from the university community, the majority of whom are students. We are careful not to generalize for a population older than 35.

7 Conclusion

In general, we argue that behavioral predictor's models which show the inter-relationship between various behavior determinants and their degree of influence on target behavior have a role to play in persuasive technology research. The findings support the use of models as a basis for the study of eating behavior and the influence of various healthy eating determinants. The model can also serve as a foundation to inform an effective intervention. In summary, the results show the need to emphasize weight concern when designing persuasive interventions especially those that target young adults. Also, worth considering is the impact of knowledge and the mediating role that food choice motive play. Overall, this result suggests that persuasive researchers targeting healthy fast food consumption should effectively plan to deal with the inhibiting and mediating effect of their food choice motive on healthy eating attitude. The finding also shows that our model's variables predicted a sizable percentage of variance (65%) in healthy eating attitude, indicating the appropriateness of the model in predicting healthy eating attitude. The work contributes to the persuasive interventions literature by illuminating how various variables influence healthy eating attitude and the relationship between these variables. Future research may consider modifying the model to improve its predictability, this include adding other important determinants and mediators.

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