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Using the Integrated Behavioral Model of Prediction to Predict Maternal Monitoring of Fruit and Vegetable Consumption among Hispanic Mothers

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Abstract

The purpose of this study was to operationalize the Integrative Behavioral Model (IBM) to identify significant theory-based determinants of maternal monitoring of fruits and vegetables, among low-income, Hispanic mothers of 2-5 year-old children ($n=238$). Mothers completed a survey evaluating each construct of the IBM. Path analysis showed intentions significantly predicted maternal monitoring of fruits and vegetables (5.3% of the variance explained), and autonomy significantly predicted intentions (33.1% of the variance explained). Results from this study help to create foundational work to establish targets for future public health interventions for Hispanic mothers of preschoolers.

Keywords

Integrated Behavioral Model; Childhood Obesity; Hispanic Health; Health Disparities; Preschoolers

Introduction

In the United States, 23% of 2-5 year old children are either overweight or obese (85th BMI-for-age percentile), and 8.4% are obese (95th BMI-for-age percentile).¹ Obesity does not impact all population groups in the same way however, as health disparities exist among certain communities. Hispanic children are at greatest risk to be overweight and obesity. To illustrate, 2-5 years old Hispanic children have the highest overweight and obesity prevalence of 30%, and the highest obesity prevalence of 17%, in the nation when compared to children of other racial and ethnic groups (the next highest group was African American children with 22% overweight and obese and 11% obese).¹ This is particularly concerning, given the health consequences associated with obesity, such as mental health problems, and metabolic abnormalities that place children at risk for chronic diseases once thought only to occur among adults such as type 2 diabetes.²

Childhood obesity is a complex public-health issue. Significant determinants of obesity can be found within the ecological model, and range from intrapersonal level characteristics such as children's own personal preferences and attitudes towards eating healthy or unhealthy foods, to interpersonal level characteristics such as family interactions centered around food and the home environment, and community-wide factors such as the availability and accessibility of food outlets or safe neighborhoods.³ Many obesogenic health behaviors have been identified to occur during childhood: inadequate consumption of nutrient-dense foods (e.g., fruits or vegetables), over consumption of non-nutrient-dense foods (e.g., sugar-sweetened beverages), insufficient physical inactivity, and high amounts of sedentary behaviors are some examples.^{4,5} While community-based obesity interventions that target young minority children are greatly needed to ameliorate the negative consequences associated with health disparities and medical costs for future generations, interventions that include community members during all phase of program planning are fundamental.⁶ Community members help researchers identify needs and wants of the community and assist with uncovering untapped solutions that may already exist.⁷ For young children, important community members are members of their own family since they have the responsibility to shape the home-food environment and encourage positive eating behaviors during early stages of development. Therefore, evidence based home and parent-focused interventions are greatly needed.^{8,9}

Theory-based determinants of parenting practices have not been sufficiently studied, or applied in childhood obesity prevention research. Efforts need to be made to use health behavior theories when planning and designing obesity prevention interventions, given the inherent benefits that theory-based approaches have demonstrated, such as giving interventions measurable program outcomes, specifying methods for health behavior changes, and enhancing communication between and among professionals.¹⁰ While many health behavior theories and models exist in public health practice and research, the Integrative Behavioral Model (IBM-Figure 1) is a new and emerging theory in the field and warrants further investigation. The IBM was conceptualized and developed to integrate the leading theories and models being used in health behavior research, such as the Social Cognitive Theory and Theory of Reasoned Action/Planned Behavior.^{11,12} The IBM posits that behavioral intentions are the strongest predictor of human behavior, barring any environmental barriers (including the social and physical environment) or deficiencies in skills and abilities towards engaging in a specified behavior. Behavioral intentions can be further predicted by behavioral attitudes (or an overall evaluation of a behavior), perceived norms (or individual's perception of social pressure to enact a behavior) and perceived behavioral control (PBC) (or an individual's belief that one is capable of performing a behavior, and has autonomy to enact a behavior).¹¹

The purpose of this study was to operationalize the IBM to identify significant theory-based determinants of maternal monitoring of fruits and vegetables, among low-income, Hispanic mothers of 2-5 year-old children. Details pertaining instrument development process can be found elsewhere.¹³ In short, focus groups were first conducted with Hispanic mothers of 2-5 year-old children to identify behaviors considered to be the most obesogenic for their children, and important for community obesity prevention interventions. After analyzing the transcripts from the focus groups, mothers reported that making sure their children consume

enough fruits and vegetables was a top priority, therefore the behavior “Making sure my preschooler eats half of his/her plate filled with fruits and vegetables, at least 5 days a week” (Spanish translation - *Asegurarme de que mi hijo(a) coma la mitad de su plato de frutas y verduras por lo menos 5 días a la semana*) was identified for investigation. This behavior was selected for three reasons. First, mothers from the community chose the behavior, which allows community members to gain a sense of ownership for future community interventions. Second, the behavior conformed to the TACT principle of defining behaviors (the behavior contained an *action*, a *target* for the action, a *context* in which the action is performed, and a *time* period to perform the behavior), which is critical for health behavior research focused on predicting and changing behaviors.¹¹ Third, while the behavior could have been defined as overall consumption per day (i.e. making sure children consume 5 cups of fruits and vegetables everyday), Oklahoma extension agents consulted with the study PI (KL), identified this as a key behavior promoted during public health and nutrition education interventions.

Methods

Procedures

This study utilized a cross-sectional design to evaluate the relationship between maternal monitoring of fruit and vegetable consumption and the constructs of the IBM. The study protocol was approved by the University of Oklahoma Health Science Center (OUHSC) Institutional Review Board. Hispanic mothers ($n=238$) were recruited from various settings in the community (i.e. churches, community agencies, preschools, and daycares) located in five zip codes in Oklahoma City where a majority of the Hispanic population resides. Recruitment strategies included the use of media (TV, radio, and newspaper advertisements), fliers, and a community health worker visit to recruitment sites to attract Hispanic families with 2-to-5-year-old children. The IBM instrument was administered in person, along with a brief demographic questionnaire, and participants' acculturation was assessed using three questions that asked: number of years of residence in the U.S., place of birth, and the language they generally read and speak (response options: only Spanish, Spanish better than English, Both equally, English better than Spanish, and only English).¹⁴ All of the instruments used for this study were initially created in English and translated into Spanish. The protocol for translating the instruments from English to Spanish followed Marin's double translation methodology.¹⁵

Survey Instrument

Both authors of this article developed the instrument used in this study. A detailed description of the instrument, describing how the instrument was developed and validated, can be found elsewhere.¹³ Maternal monitoring of fruits and vegetables was evaluated by asking mothers to report the number of days they made sure their preschooler ate half of his/her plate filled with fruits and vegetables, from 0 days to 7 days. For the remaining IBM constructs, items were evaluated on a 5-point semantic differential scale [ex. Strongly Disagree (1) to Strongly Agree (5)]. Behavioral intentions were measured using three items pertaining to the mothers' willingness to monitor the child's fruit and vegetable consumption. All items were summated to create a score ranging from 3 (weak intentions) to 15 (strong

intentions). Attitudes toward the behavior were evaluated using three behavioral belief items and multiplied by a corresponding item evaluating the outcome evaluation. All of the multiplicative scores were summated across items, resulting in scores ranging from 3 (weak attitudes) to 75 (strong attitudes). Injunctive norms were evaluated using three injunctive normative belief items and multiplied by a corresponding item evaluating motivation to comply. All of the multiplicative scores were summated across items, resulting in scores ranging from 3 (weak injunctive norms) to 75 (strong injunctive norms). Descriptive norms were evaluated using three descriptive normative belief items and multiplied by a corresponding item evaluating identification with the referent. All of the multiplicative scores were summated across items, resulting in scores ranging from 3 (weak descriptive norms) to 75 (strong descriptive norms). Perceived capacity was evaluated using three control belief items and multiplied by a corresponding item evaluating perceived power. All of the multiplicative scores were summated across items, resulting in scores ranging from 3 (weak capacity) to 75 (strong capacity). Finally, autonomy was evaluated using three items. All items were summated to create a score ranging from 3 (weak autonomy) to 15 (high autonomy). All survey items can be found elsewhere.¹³

Statistical Analysis

Since the constructs of the IBM are related in a systematic path, structural equation modeling (SEM) was employed in this study using SPSS AMOS (version 21.0) (Figure 1). All other analyses were performed with SPSS Version 22. In addition to the SEM analysis, independent-samples *t*-tests were conducted with the IBM constructs to compare mothers who reported monitoring their preschoolers fruit and vegetable consumption 5 days per week to mothers who reported monitoring their preschoolers fruit and vegetable consumption 4 days per week.

Results

The mean age of the Hispanic mothers ($n=238$) was 33.1 years (± 6.4) and their children was 3.8 years (± 1.1). Almost half of the mothers were obese (41%) and slightly over a quarter of their children were obese (26%). Almost the entire sample of mothers (92%) was born outside of the US, 61% reported being in the US 11 years, while 39% reported being in the US 10 years, and 80% spoke only Spanish or Spanish better than English at home. Over half of the women in this study were unemployed, and 73% attained a high-school education or less. Table 1 reports the mean and standard deviation of the days of maternal monitoring of fruit and vegetables, along with the IBM constructs. On average, mothers reported monitoring their children's consumption of fruits and vegetables almost 5 days per week (4.86 days). With regards to the IBM constructs, parents' scores were mostly towards the mid- and high-range of each scale, with the attitudes, capacity and autonomy scales much higher than both normative scales.

In the hypothesized path model (Figure 1), attitudes, injunctive norms, descriptive norms, capacity and autonomy were included as predictors of behavioral intentions. In turn, intentions, autonomy and capacity were included as predictors of child monitoring. Fit was assessed using conventional indexes, and overall the model had good fit [Comparative Fit

Index (CFI=0.965), Tucker–Lewis Index (TLI=0.956) and Root Mean Square Error of Approximation (RMSEA=0.49)]. Since the overall fit was good, no model re-specifications were warranted, and the hypothesized model was the final model.

In the final model (Figure 1), autonomy ($b=.586$, $SE=.266$, $p=.028$; $\beta=.554$) was a significant predictors of intentions, accounting for 33.1% of the variance, and attitudes ($b=-.004$, $SE=.015$, $p=.787$; $\beta=-.023$), injunctive norms ($b=-.001$, $SE=.026$, $p=.967$; $\beta=-.009$), descriptive norms ($b=.030$, $SE=.031$, $p=.329$; $\beta=.208$), and capacity ($b=-.006$, $SE=.030$, $p=.837$; $\beta=-.042$) were not significant predictors. In turn, intentions ($b=.639$, $SE=.261$, $p=.015$; $\beta=.212$) was a significant predictors of child monitoring, accounting for 5.3% of the variance, while autonomy ($b=.200$, $SE=.575$, $p=.727$; $\beta=.063$) and capacity ($b=-.019$, $SE=.066$, $p=.776$; $\beta=-.042$) were not significant predictors.

Just over half ($n=137$; 57.5%) of mothers reported monitoring the consumption of their children's fruits vegetables for at least 5 days per week. Similar to the path analysis, independent t -tests found that intentions ($p=0.007$), and autonomy ($p=0.007$) were significantly higher among mothers who monitored their children's fruits and vegetables 5 days per week, compared to those who monitored 4 days per week. No other IBM construct was found to be significantly different between both groups. Both differences were considered a 'medium' effect [intentions (cohen's $d=0.36$); autonomy (cohen's $d=0.35$)] (Table 1).

Discussion

The purpose of this study was to investigate the Integrative Behavioral Model as a theoretical framework to predict low-income Hispanic mothers monitoring of fruit and vegetable consumption for their preschool children. According to the final path model, 5.3% of the variance of maternal monitoring was explained as well as 33.1% of the variance of intentions. These results suggest the model may have limited utility for this behavior. It is important to note however, that while not all of the IBM constructs were significantly related with the maternal monitoring behavior and behavioral intentions, it does not discount the usefulness of the model in its entirety. As Fishbein and Ajzen¹¹ have explained, the relative importance for theory-based predictors of intentions and behaviors can vary from group to group, and across different behaviors. To illustrate, in a review of the predictive validity of the constructs within the Theory of Planned Behavior (similar to the IBM), when predicting behavioral intentions for 30 different behaviors, attitudes was the strongest predictor for 16 of the behaviors (ex. walking for pleasure), while subjective norms (ex. going out for a meal) and PBC (ex. getting at least 7 hours of sleep per night) were noted as the strongest predictor for the other 14 behaviors.¹⁶

The results from this study help to create foundational work to establish targets for future public health interventions to help Hispanic mothers monitor their preschoolers' fruit and vegetable intake. First, mothers must be informed of nutrition recommendations such as the fruit and vegetable recommendation under investigation. Then, to enhance behavioral intentions to monitor fruit and vegetable intake in preschoolers, intervention strategies and behavior-change techniques should focus on enhancing parents' autonomy, and to increase

the likelihood that Hispanic mothers monitor their preschoolers fruit and vegetable intake, intentions should be enhanced. Interestingly, autonomy was found to be the only significant predictor of intentions. These findings likely stem from the factors that facilitate Hispanic mothers' ability to monitor their children's dietary behaviors. Theoretically, among the three determinants of behavioral intentions, attitudes towards a behavior and perceived norms are both cognitive constructs that represent one's internal perceptions for deciding to engage in a specified behavior, whereas perceived behavioral control (consisting of capacity and autonomy) represents one's perceptions about performing a behavior when faced with external or environmental barriers. For example, from the behavioral, normative and control beliefs evaluated in this study, a Hispanic mother might believe that monitoring her preschoolers fruit and vegetable intake is a good practice to do for her child to foster healthy eating behaviors (strong attitudes), and her partner/spouse may want her to monitor their preschoolers fruit and vegetable intake (strong perceived norms), but if the mother is not with her preschooler when the child eats meals, then her ability to monitor the child's fruit and vegetable intake is low (weak autonomy). Therefore, the results from this study suggests that public health interventions with Hispanic families that target mothers as agents of change should not be motivationally based or contain strategies that focus on attitudes and perceived norms. Rather, intervention strategies should focus on helping Hispanic mothers enhance their autonomy to monitor their children's diet, such as changing the home environment.

To date, the IBM has only been used to explain or predict one parental monitoring behavior with children, related to sugar-sweetened beverage consumption.¹⁷ The study focused on the behavior "Monitoring my child's sugar-sweetened beverage consumption when they are at home", and results showed that 28.5% of the variance of parental monitoring was explained by intentions, skills and the home environment, and 56.3% of the variance of intentions was explained by attitudes, injunctive norms and perceived behavioral control.¹⁷ While the amount of variance explained in this study was much less for behavioral intentions and monitoring preschoolers fruit and vegetable consumption, it should be noted that mothers were only evaluated in this study, whereas in Housley, et al.¹⁷, mothers and fathers were evaluated. A follow up study to Housley, et al.¹⁷, found there were significant differences for what factors determined how fathers and mothers monitor their child's sugar-sweetened beverage consumption.¹⁸ The age group of children was also different between studies. While in this study, mothers were asked about their preschoolers, in Housely, et al.¹⁷ researchers evaluated parents with children between 7 and 12 years old. Furthermore, theory constructs were evaluated differently between studies. While in the present study the IBM constructs were evaluated using *indirect measures* of the theory constructs, Housely, et. al.,¹⁷ used *direct measures* of the theory constructs. Constructs of the IBM can be measured using both *direct* (i.e. by asking mothers about their overall attitudes monitoring their preschoolers dietary behaviors) and *indirect* measures (i.e. by asking parents about specific behavioral beliefs and outcome evaluations towards monitoring their preschoolers dietary behaviors)¹¹. In the present study *indirect* measures were used to better explain what specific determinants were associated with maternal monitoring of fruits and vegetables. It has been shown that using direct measures of the IMB constructs can result in a higher amount of variance explained, when compared to indirect measures. To illustrate, in a study using the IMB with

college students predicting sleep intentions and behavior, after measuring both direct and indirect measures of the IBM constructs, in regression models it was shown that the direct measures explained significantly more variance of the sleep behavior (41% of the variance) than the model using indirect measures (19% of the variance), as well as for behavioral intentions (direct measures explained 44% of the variance; indirect measures explained 25% of the variance).¹⁹

There was a number of limitations to this study that should be addressed. First, all of the responses on both instruments were based on self-report. Participants responses may have been biased and the beliefs reported might not truly represent their actual beliefs. Further, participants may have misinterpreted questions and provided erroneous answers. Second, the sample used for this study was from a convenience sample of Hispanic mothers with preschoolers, therefore the results from this study may not be generalizable to other racial and ethnic groups. Finally, this study used a cross-sectional research design, thus it is premature to make any implications of cause and effect relationships between the variables under investigation.

Implications for Advancing Theory in Health Promotion and Community Health

While the IBM was first conceptualized in the early 1990's, it has not been widely used in research and practice. With an increased interest to integrate similar health behavior theories, the IBM represents a new development in the field of community and public health that should continue to be explored. Furthermore, the IBM should be operationalized to different health behaviors, to explore the utility of model across settings. To date, the IBM has mostly focused on predicting sexual behaviors²⁰⁻²², but has not been applied to many nutrition or dietary behaviors. When using the IBM and similar theories such as the Theory of Planned Behavior, more focus should also be given to indirect measures, rather than direct measures only. While direct measures can be highly predictive of intentions and health behaviors, they fail to give substantive information about what drives attitudes, perceived norms and PBC towards behaviors¹¹. Finally, this study demonstrates how to take indirect measures of the IBM, and analyze them using a path analysis, which is more appropriate than running separate rounds of regression predicting intentions and then the behavior, which is oftentimes done.

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Figure 1.

Final path model for predicting maternal monitoring of fruit and vegetable consumption for their preschool children.

Note: Paths and standardized regression weights significant at * $p < .05$.

Table 1

Means and Cronbach alphas of the Integrative Behavioral Model theoretical constructs and Mean differences for IBM constructs for mothers who monitor their preschoolers fruit and vegetable consumption for at least 5 days a week compared to mothers who monitor for 4 days or less per week.

Theoretical Construct	Possible Minimum-Maximum	Observed Minimum-Maximum	Mean (SD)	Cronbach's Alpha
Fruit and Vegetable Behavior (FV)	0-7	0-7	4.86 (1.98)	--
FV Intentions	3-15	3-15	13.61 (2.16)	0.91
FV Attitudes	3-75	11-75	68.07 (13.36)	0.87
FV Injunctive Norms	3-75	3-75	35.09 (19.57)	0.80
FV Descriptive Norms	3-75	3-75	31.68 (17.90)	0.80
FV Capacity	3-75	7-75	62.16 (15.16)	0.85
FV Autonomy	3-15	6-15	13.31 (1.70)	0.59
	5 days (<i>n</i> =137) m(SD)	4 days (<i>n</i> =101) m(SD)	<i>p</i> -value	effect size (Cohen's <i>d</i>)
Fruit and Vegetable Behavior (FV)	6.37 (0.80)	2.84 (1.11)		
FV Intentions	13.93 (1.71)	13.17 (2.60)	0.007*	0.36
FV Attitudes	68.96 (11.52)	66.86 (15.48)	0.231	--
FV Injunctive Norms	34.76 (18.81)	35.54 (20.63)	0.760	--
FV Descriptive Norms	31.61 (17.66)	31.79 (18.31)	0.937	--
FV Capacity	63.45 (14.83)	60.38 (14.83)	0.122	--
FV Autonomy	13.56 (1.56)	12.97 (1.84)	0.007*	0.35