Original Article

Relationship of social cognitive theory concepts to mothers' dietary intake and BMI

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Abstract

Women tend to have the greatest responsibility for and influence on the home food environment. Understanding theoretical concepts as they pertain to mothers' food-related behaviours could inform the development of interventions that enhance mothers' ability to create healthy family food environments that support optimal child development and help attenuate obesity rates. Likert scales assessed Social Cognitive Theory concepts [i.e. self-efficacy, self-regulation (sets goals, self-reward, self-monitoring, environmental structuring), outcome expectations] and coping of 201 mothers in the context food-related activities. ANOVA determined whether diet and BMI differed among mothers scoring in the highest, middle, and lowest tertiles on the Likert scales. For self-efficacy, coping, sets goals, and outcome expectations scales, lowest tertile mothers had significantly higher BMIs than highest tertile mothers. The lowest tertile for self-efficacy, self-reward, and self-monitoring consumed significantly less fibre, vitamin C, magnesium, potassium, and fruit and vegetables than upper tertiles. On the self-efficacy scale, the lowest tertile consumed significantly more calories, fat, and cholesterol than higher tertiles. Environmental structuring scale findings indicate users of television during dinner had significantly lower intakes of fibre, vitamin C, magnesium, potassium, and fruits and vegetables than those almost never using TV during dinner. Stepwise regression revealed self-monitoring, environmental structuring, self-reward, and outcome expectations were significant positive predictors of self-efficacy. Self-monitoring was a significant positive predictor of outcome expectations. Associations between theoretical concepts, mothers' dietary intakes, and BMIs point to the need to incorporate components that build self-efficacy, self-regulation, outcome expectations, and coping skills into health promotion interventions.

Keywords: home food environment, mothers, social cognitive theory, self efficacy, self regulation, outcome expectations, nutrition, food gatekeeper.

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Obesity is a pervasive and significant international public health problem (James *et al.* 2001; Stamatakis *et al.* 2005; Ogden *et al.* 2006; Institute of Medicine & Committee on Progress in Preventing Childhood Obesity 2007). Environments that promote obesity-favouring behaviours are clearly a root cause of the increase in obesity rates over the past several decades

(Hill *et al.* 1998, 2003; Brinkley *et al.* 2000; Golan & Crow 2004). Obesogenic environments offer easy access to large quantities of affordable, highly palatable, energy-dense foods and encourage (advertise) over-consumption of these foods which displaces other less energy-dense but more nutrient-dense foods (Poston & Foryet 1999; Hill *et al.* 2000; French

et al. 2001; Swinburn & Edgar 2004). Obesogenic environments also include the family unit and food-related and exercise-related household practices, such as home food supplies, mealtime practices, and parental modelling of eating and fitness behaviours (Brinkley *et al.* 2000; Carlson *et al.* 2002; Krahnstoevers *et al.* 2005; Institute of Medicine & Committee on Progress in Preventing Childhood Obesity 2007).

The home food environment is understudied and warrants greater attention for several reasons. First, the home food environment provides a significant proportion of the calories and nutrients consumed (Buttriss 2002; Carlson *et al.* 2002). For instance, the home food supply accounts for 72–93% of the food, by weight, eaten in the U.S. (Carlson *et al.* 2002). Second, the household food supply affects food and nutrient intake. For example, children's intake of and preferences for fruits, vegetables, and milk are positively associated with availability in the home (Gibson *et al.* 1998; Fisher *et al.* 2000, 2002; Wardle *et al.* 2005). British researchers found a strong correlation between fat and calorie intake and the content of supermarket purchases (Ransley *et al.* 2001, 2003). Third, home food supplies differ between households with and without overweight family members (Byrd-Bredbenner & Maurer Abbot 2009). Fourth, interactions and practices between parents, particularly mothers, and children during food-related activities (e.g. food shopping, meal preparation, mealtime) influence the development of eating patterns during childhood and these patterns tend to persist and serve as the basis for adult dietary behaviours (Kelder *et al.* 1994; Crockett & Sims 1995; Story *et al.* 2002; Patrick

& Nicklas 2005; Shepherd *et al.* 2006). For instance, by making healthy foods available and accessible, encouraging children to select healthy foods, modelling the consumption of healthy foods, and allowing children to decide how much of the food to eat, parents help children develop eating patterns that support good health (Domel *et al.* 1993; Ray & Klesges 1993; Resnicow *et al.* 1997; Whitaker *et al.* 1997; Gibson *et al.* 1998; Fisher & Birch 1999; Flynn *et al.* 2006; Temple *et al.* 2006). Finally, obesity tends to 'run in families' (Whitaker *et al.* 1997; Temple *et al.* 2006), which suggests the home food environment supports the expression of this genetic potential and points to the need for interventions addressing this 'family problem' that are presented in a family (ecological) context (Flynn *et al.* 2006; Gillespie & Gillespie 2007).

Social cognitive theory provides a suitable framework for studying the home food environment because of its focus on reciprocal determinism – the notion that behaviour is the result of the simultaneous interaction of a person's characteristics, behaviour, and the environment within which the behaviour is performed (McAlister *et al.* 2008). This theory further posits that individuals have the ability to transform and create environments with the characteristics they desire (McAlister *et al.* 2008). Key social cognitive theory concepts that affect the ability to change and develop environments include outcome expectations (beliefs about the consequences of behaviours), self-regulation (controlling oneself via techniques like goal setting, self monitoring, self reward, environmental structuring), observational learning (acquisition of

Key messages

- The home food environment provides a significant proportion of the calories and nutrients consumed, and differences exist between households with and without overweight family members.
- Social cognitive theory provides a suitable framework for studying and developing interventions that enhance mothers' ability to create optimal family food environments.
- Mothers of young children who have confidence in their ability to eat a healthy diet, believe in the link between diet and health, and practice self-regulatory food-related behaviours, have healthier BMIs and dietary intakes.
- Components that build self-efficacy, self-regulation, outcome expectations, and coping skills should be incorporated into health promotion interventions.
- Understanding theoretical concepts as they pertain to mothers' food-related behaviours could inform the development of interventions that enhance mothers' ability to create healthy family food environments that support optimal child development and help attenuate obesity rates.

new behaviours via modelling), and self-efficacy (confidence in abilities to bring about desired outcomes) (Chang *et al.* 2008; McAlister *et al.* 2008). A concept related to self-efficacy that affects the ability to create desired environments is the capacity to cope with demands from the environment (stressors) (Chang *et al.* 2008; Viswanath 2008).

In most households, women, especially after having children, have the greatest responsibility for and influence on the home food environment (Lewin 1943; McIntosh & Zey 1998; Coltrane 2000; Hamrick & Shelly 2005; Crawford *et al.* 2007) thereby making them an important audience to study. Little is known about the relationship among social cognitive theory concepts and healthful dietary practices of these family food gatekeepers (Crawford *et al.* 2007). A better understanding of social cognitive theory concepts as they pertain to mothers' food-related responsibilities and behaviours could inform the development of nutrition communication campaigns and health promotion interventions designed to enhance their ability to create healthy family food environments that support optimal child development and help attenuate obesity rates. Thus, the purpose of this study was to examine key social cognitive theory concepts in the context of mothers' food-related activities and compare the dietary behaviour and BMI of those scoring higher on these concepts to those scoring lower on these concepts.

Methods and materials

This study was approved by the Institutional Review Board at Rutgers University. All participants gave informed consent. This study was part of a larger study; the methods are described in detail elsewhere (Byrd-Bredbenner and Maurer Abbot 2008). The methods are described in brief below.

Sample

Participants were recruited from parent-teacher groups, schools, children's extracurricular activities organizations (e.g. scouts), community facilities (e.g. recreation areas, libraries), houses of worship, and workplaces in the United States. Recruitment

announcements invited interested individuals to complete a brief online survey to establish whether they met study eligibility requirements [i.e. were female; had at least one child aged 12 years or younger; were married or living with a domestic partner; neither they nor their partners were employed in a health-related profession; were food secure (all household members had access at all times to enough food for an active, healthy life) (Life Sciences Research Office & Andersen 1990)]; had primary responsibility for household food-related activities (i.e. meal planning, grocery shopping, and meal preparation); and ate dinner at home with most family members at least three times weekly. Invitations to participate were offered as soon as eligibility was established until the study quota of 201 individuals accepted and honoured the invitation to participate.

Survey instrument

The survey instrument collected demographic information (i.e. race, age, height, weight, participant's own and spouse's education level and occupation) and seven Likert scales that assessed social cognitive theory concepts. The scales were developed using previously published research, refined by a panel of experts in nutrition, psychology, and/or psychometrics ($n = 5$) in a series of four iterative reviews, with the final draft reviewed by the experts to establish content validity of each scale. Pilot testing ($n = 9$) with participants having characteristics like the study sample, but not in the study sample, was conducted to further refine the survey.

Four of the Likert scales explored aspects of self-regulation: planning meals and food shopping (i.e. goal setting) (Candel 2001; Nijmeijer *et al.* 2004; Scholderer *et al.* 2004); use of food product label information when selecting food (i.e. self-monitoring) (Cowan *et al.* 2003a,b; Nijmeijer *et al.* 2004; Scholderer *et al.* 2004); enjoyment of meal planning, meal preparation, and food shopping (i.e. self-reward) (Wells & Tigert 1971; Jackson *et al.* 1985; Zimmerman & Martinez-Pons 1986; Chetthamrongchai & Davies 2000; Candel 2001; Cowan *et al.* 2003a,b; Scholderer *et al.* 2004; Gittelsohn *et al.* 2006), and television use during dinner (i.e. environmental structuring)

Table 1. Significant differences among mothers' score tertiles of key social cognitive theory concepts and maternal BMI and dietary intake

Measure	N	BMI		Calories		Total fat (g)		Cholesterol (mg)	
		Mean $\pm$ SE*	Main effects <i>P</i> , <i>F</i> -value†, sign. diff. pairs‡	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs
Self-efficacy: confidence in ability to eat a healthy diet (12 item scale, Cronbach α =0.92)									
Lowest tertile	71	28.03 $\pm$ 0.60	<i>P</i> = 0.0112	2468 $\pm$ 15	<i>P</i> = 0.0038	99.37 $\pm$ 2.14	<i>P</i> = 0.0018	248.21 $\pm$ 6.93	<i>P</i> = 0.0059
Middle tertile	65	25.87 $\pm$ 0.56	<i>F</i> = 4.598	2406 $\pm$ 14	<i>F</i> = 5.735	91.64 $\pm$ 2.11	<i>F</i> = 6.537	223.89 $\pm$ 7.40	<i>F</i> = 5.262
Highest tertile	65	25.14 $\pm$ 0.58	AB	2389 $\pm$ 14	AB	89.50 $\pm$ 1.89	AB	218.62 $\pm$ 6.55	AB
Coping: life & stress are under control (6 item scale, Cronbach α =0.86)									
Lowest tertile	58	28.14 $\pm$ 0.82	<i>P</i> = 0.0281	2447 $\pm$ 20		96.74 $\pm$ 2.34		238.98 $\pm$ 7.88	
Middle tertile	62	25.67 $\pm$ 0.78	<i>F</i> = 3.637	2398 $\pm$ 17		90.51 $\pm$ 1.99		221.54 $\pm$ 6.87	
Highest tertile	81	25.71 $\pm$ 0.59	AB	2423 $\pm$ 17		93.92 $\pm$ 1.99		231.97 $\pm$ 6.64	
Self-regulation (sets goals): plans meals & food shopping (3 item scale, Cronbach α =0.75)									
Lowest tertile	67	27.44 $\pm$ 0.76	<i>P</i> = 0.031	2446 $\pm$ 20		97.06 $\pm$ 2.39		240.30 $\pm$ 7.97	
Middle tertile	65	26.90 $\pm$ 0.82	<i>F</i> = 3.531	2419 $\pm$ 16		92.68 $\pm$ 1.88		228.94 $\pm$ 6.71	
Highest tertile	69	24.92 $\pm$ 0.55	B	2403 $\pm$ 18		91.34 $\pm$ 1.99		223.25 $\pm$ 6.53	
Self-regulation (self reward): enjoys meal preparation & food shopping (6 item scale, Cronbach α =0.89)									
Lowest tertile	76	26.66 $\pm$ 0.71		2429 $\pm$ 17		94.58 $\pm$ 2.06		233.93 $\pm$ 6.79	
Middle tertile	69	26.33 $\pm$ 0.76		2409 $\pm$ 16		91.80 $\pm$ 1.88		223.13 $\pm$ 6.26	
Highest tertile	56	26.12 $\pm$ 0.68		2429 $\pm$ 21		94.77 $\pm$ 2.46		235.91 $\pm$ 8.57	
Self-regulation (self monitoring): uses food product label information (3 item scale, Cronbach α =0.87)									
Lowest tertile	69	27.41 $\pm$ 0.75		2452 $\pm$ 18		97.33 $\pm$ 2.16		240.05 $\pm$ 7.10	
Middle tertile	42	26.81 $\pm$ 0.99		2408 $\pm$ 22		91.73 $\pm$ 2.45		226.89 $\pm$ 8.72	
Highest tertile	90	25.43 $\pm$ 0.55		2406 $\pm$ 16		91.79 $\pm$ 1.81		225.48 $\pm$ 6.14	
Self-regulation (environmental structuring): television during dinner (1 item scale)									
Some/most of the time	56	27.18 $\pm$ 0.75		2450 $\pm$ 17		96.49 $\pm$ 2.04		240.18 $\pm$ 7.09	
Almost never	145	26.09 $\pm$ 0.50		2412 $\pm$ 13		92.60 $\pm$ 1.49		227.14 $\pm$ 4.98	
Outcome expectations: belief in link between diet & health outcome (8 item scale, Cronbach α =0.81)									
Lowest tertile	69	27.65 $\pm$ 0.79	<i>P</i> = 0.0388	2445 $\pm$ 18		96.42 $\pm$ 2.11		238.70 $\pm$ 7.09	
Middle tertile	67	26.41 $\pm$ 0.69	<i>F</i> = 3.304	2416 $\pm$ 18		92.72 $\pm$ 2.03		227.85 $\pm$ 6.86	
Highest tertile	65	25.06 $\pm$ 0.65	B	2405 $\pm$ 19		91.75 $\pm$ 2.19		225.37 $\pm$ 7.41	

*SE, standard error. †In cases where a *t*-test was used, a *t*-value is reported. ‡Comparison of pairs using Student-Newman-Keuls follow-up procedures to ANOVA: A = lowest and middle tertiles; B = lowest and highest tertiles; C = middle and highest tertiles; *P* < 0.05 for all pairwise comparisons.

(Zimmerman & Martinez-Pons 1986; Schunk & Zimmerman 1994). One scale assessed confidence in the ability to eat a healthy diet (i.e. healthy eating self-efficacy) (Bandura 1977, 1986, 2000; Hollis *et al.* 1986; Abusabha & Achterberg 1997; Horan *et al.* 1998; Conner *et al.* 2002; Blue & Marrero 2006; Gittelsohn *et al.* 2006), while another scale examined coping in terms of whether the participant felt her life and stress (i.e. time and responsibilities) were 'under control' (i.e. coping) (Reilly 1982; Cohen *et al.* 1983; Chetthamrongchai & Davies 2000; Candel 2001; Cowan *et al.* 2003a,c; Deboer *et al.* 2004). The final scale assessed beliefs in the link between diet and health (outcome expectations) (Fishbein & Stasson 1990; Armstrong *et al.* 1991; Glanz *et al.* 1993; Abusabha & Achterberg 1997; Wilson *et al.* 1997). The environmental structuring scale had three answer

choices (almost always, sometimes, almost never), scored 1, 2, and 3, respectively. All other scales had five answer choices (i.e. strongly agree, agree, not sure, disagree, strongly disagree) and were scored 5, 4, 3, 2, or 1 for each positively worded statement, with the most positive rating receiving the highest score. Scoring was reversed for negatively worded statements. A score for each scale was derived by summing the score of the scale items and dividing by the number of items in the scale. Thus, scale scores ranged from 5 (strongly positive) to 1 (strongly negative). Table 1 reports the total items in each scale and its Cronbach alpha.

The survey also included Block's Fruit/Vegetable/Fibre Screener and Fat Screener (Block Dietary Data Systems 2000a, 2000b). The screeners yielded estimated intakes of calories, total fat, cholesterol, dietary

Dietary fibre (g)		Vitamin C (mg)		Magnesium (mg)		Potassium (mg)		Fruit & vegetable servings	
Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs	Mean $\pm$ SE	Main effects <i>P</i> , <i>F</i> -value, sign. diff. pairs
14.05 $\pm$ 0.48	<i>P</i> = 0.0008	121.03 $\pm$ 4.05	<i>P</i> = 0.0003	305.58 $\pm$ 7.14	<i>P</i> = 0.0005	2949.46 $\pm$ 70.52	<i>P</i> = 0.0005	3.70 $\pm$ 0.17	<i>P</i> < 0.0001
15.71 $\pm$ 0.56	<i>F</i> = 7.42	137.00 $\pm$ 4.67	<i>F</i> = 8.292	331.96 $\pm$ 8.34	<i>F</i> = 7.817	3216.09 $\pm$ 82.03	<i>F</i> = 7.982	4.34 $\pm$ 0.18	<i>F</i> = 10.083
17.02 $\pm$ 0.62	AB	146.83 $\pm$ 5.01	AB	350.63 $\pm$ 9.08	AB	3396.27 $\pm$ 88.88	AB	4.84 $\pm$ 0.20	AB
15.19 $\pm$ 0.61		132.22 $\pm$ 5.16		323.87 $\pm$ 9.15		3135.00 $\pm$ 90.21		4.27 $\pm$ 0.20	
14.98 $\pm$ 0.55		130.58 $\pm$ 4.65		320.84 $\pm$ 8.21		3105.48 $\pm$ 81.11		4.23 $\pm$ 0.20	
16.24 $\pm$ 0.54		139.23 $\pm$ 4.42		338.13 $\pm$ 7.97		3269.68 $\pm$ 78.15		4.31 $\pm$ 0.18	
14.76 $\pm$ 0.55		128.25 $\pm$ 4.64		317.20 $\pm$ 8.19		3067.99 $\pm$ 80.87		4.03 $\pm$ 0.19	
15.48 $\pm$ 0.59		133.62 $\pm$ 4.73		327.41 $\pm$ 8.59		3166.46 $\pm$ 84.03		4.18 $\pm$ 0.19	
16.37 $\pm$ 0.56		141.51 $\pm$ 4.74		341.03 $\pm$ 8.42		3302.02 $\pm$ 82.96		4.60 $\pm$ 0.19	
14.65 $\pm$ 0.53	<i>P</i> = 0.0007	127.26 $\pm$ 4.49	<i>P</i> = 0.0014	315.44 $\pm$ 7.90	<i>P</i> = 0.0009	3050.61 $\pm$ 78.13	<i>P</i> = 0.0010	3.92 $\pm$ 0.17	<i>P</i> = 0.0017
14.93 $\pm$ 0.47	<i>F</i> = 7.602	129.86 $\pm$ 4.00	<i>F</i> = 6.788	319.83 $\pm$ 7.06	<i>F</i> = 7.279	3094.70 $\pm$ 69.68	<i>F</i> = 7.123	4.19 $\pm$ 0.17	<i>F</i> = 6.587
17.54 $\pm$ 0.68	AB	150.18 $\pm$ 5.42	AB	357.56 $\pm$ 9.88	AB	3461.32 $\pm$ 96.51	AB	4.88 $\pm$ 0.22	AB
13.55 $\pm$ 0.46	<i>P</i> < 0.0001	117.68 $\pm$ 3.92	<i>P</i> < 0.0001	298.76 $\pm$ 6.92	<i>P</i> < 0.0001	2885.07 $\pm$ 68.34	<i>P</i> < 0.0001	3.76 $\pm$ 0.16	<i>P</i> = 0.0006
15.53 $\pm$ 0.79	<i>F</i> = 12.602	133.63 $\pm$ 6.23	<i>F</i> = 13.373	327.81 $\pm$ 11.41	<i>F</i> = 12.992	3169.16 $\pm$ 111.31	<i>F</i> = 13.137	4.22 $\pm$ 0.28	<i>F</i> = 7.631
17.09 $\pm$ 0.47	AB	147.89 $\pm$ 3.95	ABC	352.02 $\pm$ 7.03	ABC	3411.55 $\pm$ 69.22	ABC	4.70 $\pm$ 0.16	B
14.38 $\pm$ 0.57	<i>t</i> = 2.233	124.19 $\pm$ 4.77	<i>t</i> = 2.383	310.81 $\pm$ 8.45	<i>t</i> = 2.303	3002.25 $\pm$ 83.29	<i>t</i> = 2.331	3.80 $\pm$ 0.19	<i>t</i> = 2.739
16.00 $\pm$ 0.39	<i>P</i> = 0.0267	138.54 $\pm$ 3.26	<i>P</i> = 0.0181	335.58 $\pm$ 5.84	<i>P</i> = 0.0223	3248.89 $\pm$ 57.34	<i>P</i> = 0.0208	4.46 $\pm$ 0.13	<i>P</i> = 0.0067
14.64 $\pm$ 0.55		126.79 $\pm$ 4.60		314.98 $\pm$ 8.22		3044.87 $\pm$ 80.84		4.12 $\pm$ 0.19	
15.70 $\pm$ 0.54		135.51 $\pm$ 4.54		330.69 $\pm$ 8.03		3199.05 $\pm$ 79.30		4.24 $\pm$ 0.18	
16.36 $\pm$ 0.61		141.77 $\pm$ 4.94		341.15 $\pm$ 8.90		3304.34 $\pm$ 87.31		4.48 $\pm$ 0.20	

fibre, vitamin C, potassium, magnesium, and fruit and vegetables. These widely used screeners were selected because they were developed using large representative dietary survey data, generate valid estimates of dietary intake, and are concise and easy to administer and score (Block *et al.* 1990, 1992, 2000).

Data analysis

Descriptive statistics were calculated to describe participant characteristics, mean scales scores, and calorie and nutrient intake. Height and weight were used to calculate BMI. The participant's own and her spouse's education level and occupation were used to estimate socio-economic status (SES) using an occupational prestige scale (Stevens & Cho 1985; Warren *et al.* 1998). The highest tertile (i.e. ≥ 66.7 th percentile), middle tertile (i.e. > 33.3 rd and < 66.7 th percentile) and lowest tertile (i.e. ≤ 33.3 rd percentile) were calculated

for the scores of each of the Likert scales [i.e. Self-Efficacy: Confidence in Ability to Eat a Healthy Diet, Coping: Life & Stress Are Under Control, Self-Regulation (Sets Goals): Plans Meals & Food Shopping, Self-Regulation (Self Reward): Enjoys Meal Preparation & Food Shopping, Self-Regulation (Self Monitoring): Uses Food Product Label Information, Self-Regulation (Environmental Structuring): Television During Dinner, and Outcome Expectations: Belief in Link between Diet & Health Outcome, which for simplicity will be referred to as *healthy eating self-efficacy*, *stress under control*, *plans meals*, *enjoys food-related activities*, *uses food labels*, *TV during dinner*, and *diet and health outcome expectations*, respectively]. Tertiles were used to permit the comparison of the relative impact of higher or lower social cognitive theory concept scale scores on BMI and dietary intake. Tertiles were compared using analysis of variance (ANOVA) and Student-

Newman-Keuls follow-up procedures to determine whether the groups differed in BMI and intake of food components (i.e. calories, fat, cholesterol, dietary fibre, vitamin C, potassium, magnesium, and fruit and vegetable servings). Similar comparisons were conducted to determine if those who almost never had television on during dinner differed from those who had television on during dinner. Previous research has reported that those with more favourable self-efficacy and outcome expectations scores are more likely to implement self-regulatory strategies (Bandura 1997, 2004), thus two stepwise regression analyses were conducted with self-efficacy and outcome expectations each serving as the dependent variable in separate analyses with all other social cognitive theory scales included as independent variables. Stepwise regression analysis was used because it identifies the most efficient predictors from among social cognitive theory variables. Significance level was set at $P < 0.05$. The threshold values for the F -ratio test to add (F -to-enter) or delete (F -to-delete) independent variables from the stepwise regression were set at 4.00 and 3.996, respectively.

Results

Study participants ($n = 201$) were 37.9 ± 5.1 SD (mean $\pm$ standard deviation) years old and had 2.3 ± 0.8 SD children under age 18 years. Participants were of moderate to high SES and most were white (91%). Approximately one-quarter were overweight (BMI > 25) and another quarter were obese (BMI > 30) (Centers for Disease Control and Prevention 2007). The overall mean BMI for the study sample was 26.4 ± 5.9 SD. Most participants almost never had television on during dinner (72%). Because so few participants reported that television was nearly always on during dinner (8%), these individuals were combined with those who reported sometimes having the television on at dinnertime and a t -test was used to compare these two groups.

An examination of Table 1 reveals that mothers scoring in the lowest tertile on the *healthy eating self-efficacy*, *stress under control*, *plans meals*, and *diet and health outcome expectations* scales had significantly higher BMIs than those scoring in the highest tertile

on these scales. Mothers scoring in the lowest tertile on the *healthy eating self-efficacy*, *enjoys food-related activities*, and *uses food labels* scales had significantly lower intakes of dietary fibre, vitamin C, magnesium, potassium, and fruit and vegetables than those in the middle and highest tertiles. In addition, mothers in the lowest tertile for the *healthy eating self-efficacy* scale had significantly higher intakes of calories, total fat, and cholesterol than those in higher tertiles. An inspection of the *TV during dinner* scale findings shows those who used television during dinner had significantly lower intakes of dietary fibre, vitamin C, magnesium, potassium, and fruits and vegetables than those who almost never used TV during dinner.

Stepwise regression analysis data are presented in Table 2. When *healthy eating self-efficacy* was the dependent variable and all other social cognitive theory scales as independent variables, *uses food labels*, *TV during dinner*, *enjoys food-related activities*, and *outcome expectations* were significant predictors (Adj- $R^2 = 0.26$; $F_{4,196} = 18.26$; $P < 0.0001$; all were positive coefficients). When *diet and health outcome expectations* served as the dependent variable, only *uses food labels* emerged as a significant predictor (Adj- $R^2 = 0.08$; $F_{1,199} = 18.55$; $P < 0.0001$; positive coefficient). Correlations between the social cognitive theory scale scores were all less than or equal to 0.31, indicating they were not collinear (SAS Institute 1995).

Discussion

This study examined key social cognitive theory concepts vis-à-vis food-related activities of mothers. BMI tended to be higher among those scoring lowest on the *healthy eating self-efficacy*, *stress under control*, *plans meals*, and *diet and health outcome expectations* scales. Healthier diets were consumed by those with the highest *healthy eating self-efficacy*, *enjoys food-related activities*, and *uses food labels* scores and those who almost never had TV on during dinner.

Study findings support the notion that self-efficacy, or the confidence in one's ability to execute a behaviour such as eating a healthy diet, is associated with healthy nutrition patterns (Bandura 1997; Anderson et al. 2007). Outcome expectations associated with

Table 2. Stepwise regression findings of mother's social cognitive theory constructs with self-efficacy or outcome expectations scores as dependent variables ($n = 201$)

Dependent variable: self-efficacy: confidence in ability to eat a healthy diet, adjusted $R^2 = 26$				
	DF	Sum of squares	Mean square	$F = 18.26$; $P < 0.0001$
Regression	4	19.53	4.88	
Residual	196	52.39	0.27	
Variables in model	Coefficient	SE	Standard coefficient	
Intercept	1.08	0.43	1.08	
Self-regulation (self monitoring): uses food product label information	0.20	0.04	0.30	
Self-regulation (environmental structuring): television during dinner	0.26	0.08	0.20	
Self-regulation (self reward): enjoys meal preparation & food shopping	0.20	0.05	0.26	
Outcome expectations: belief in link between diet & health outcome	0.19	0.09	0.14	
Dependent variable: outcome expectations: belief in link between diet & health, adjusted $R^2 = 0.08$				
	DF	Sum of squares	Mean square	$F = 18.55$; $P < 0.0001$
Regression	1	3.36	3.36	
Residual	199	36.00	0.18	
Variables in model	Coefficient	SE	Standard coefficient	
Intercept	3.83	0.14	3.83	
Self-regulation (self monitoring): uses food product label information	0.15	0.03	0.29	

DF, degrees of freedom; SE, standard error.

dietary practices can serve as enticements or deterrents to practicing healthier dietary behaviours (Bandura 1997; Pelletier *et al.* 2004; Anderson *et al.* 2007). Although the dietary practices in this study did not differ among those with higher and lower *diet and health outcome expectation* scores, BMI (a direct outcome of dietary practices) was lowest among those with the strongest outcome expectations. Self-regulatory strategies also tended to be associated with healthier diets, including higher intakes of dietary fibre and fruits and vegetables. The consistency of these findings with other studies (Bandura 1997; Hersey *et al.* 2001; Ammerman *et al.* 2002; Pelletier *et al.* 2004; Anderson *et al.* 2007; Crawford *et al.* 2007) suggests that incorporating techniques that build confidence (e.g. coaching, providing guided opportunities to apply knowledge and skills) and reinforce the relationship of lifestyle choices to health outcomes could boost the effectiveness of health promotion efforts. Promotion of self-regulatory behaviours, such as planning meals ahead of time, finding ways to increase enjoyment of food-related activities, using food label information, and

turning the television off at mealtime, also could improve dietary intake as well as maternal BMI and overall health (Davison & Birch 2001; Wiecha *et al.* 2006; Anderson *et al.* 2007; Crawford *et al.* 2007). Another benefit of promoting meal planning is this self-regulatory behaviour can help mealtime feel more relaxed and minimize the negative effects associated with frenzied mealtimes, such as increased anxiety, withdrawal, and depression in children (Fiese *et al.* 2006). Indeed, parents report a desire for 'less scrambling' for meal preparation and less chaos at mealtime (Fulkerson *et al.* 2008).

The finding that perceptions of greater stress were related to higher BMIs also is congruent with previous research (Greeno & Wing 1994; Korkeila *et al.* 1998). Failure to cope appropriately with perceived stress can cause changes in eating behaviour and is associated with unhealthy eating practices (Kalimo & Meijman 1987; Greeno & Wing 1994; Mclean *et al.* 2001; Laitinen *et al.* 2002; Pinaquy *et al.* 2003; George *et al.* 2005) that may lead to the development of obesity (Laitinen *et al.* 2002). In addition, maternal stress may increase the risk of overweight in their children (Gundersen *et al.*

2008). The negative effects of stress on eating may be ameliorated by belonging to a social network that provides emotional comfort and helps reduce the reliance on eating as a self-comforting action. Hence, promoting the development of skills that build social networks and providing instruction on stress management using constructive, health-protective coping methods could offer defence against obesity and weight-related diseases (Laitinen *et al.* 2002; George *et al.* 2005; Chang *et al.* 2008; Ozier *et al.* 2008). An added advantage of helping parents better cope is that reduced stress may positively influence their children's eating patterns (Kitzmann & Beech 2006).

Nutrition interventions designed to promote healthier dietary patterns have met with modest success (Crawford *et al.* 2007), perhaps because they often focus exclusively on dietary intake practices (e.g. consuming less fat, eating more fruits and vegetables) rather than positioning them within the full continuum of food-related behaviours. That is, few interventions place dietary intake practices in the context of preparatory self-regulatory food-related behaviours (e.g. meal planning, grocery shopping behaviours, food purchasing skills such as label reading, food preparation skills and behaviours, food storage practices) and behaviours that are concurrent with eating (e.g. meal service, mealtime rituals, interpersonal relationships and exchanges during mealtime, television or other distractions during mealtime). The findings of this study, as well as others (Hersey *et al.* 2001), suggest that health promotion strategies aimed at encouraging healthier diets and lifestyles should address the full continuum of food-related behaviours. Little is currently known about the extent to which health interventions can influence preparatory and concurrent food-related behaviours, which points to an important area of investigation (Hersey *et al.* 2001; Anderson *et al.* 2007; Beck 2007).

The consistent association seen in this study between higher maternal BMI and the lowest *healthy eating self efficacy, diet and health outcome expectations*, and self-regulation behaviours scores is worrisome in that behaviours modelled by parents are mimicked by children. Learning these behaviours early may predispose children to developing dietary behaviours and lifestyle patterns that undermine

health and are difficult to change. The effects of observational learning suggest that nutrition interventions for mothers, in particular, should emphasize the importance of their behaviours, as a role model, on the health outcomes for the entire household (Gabel & Lutz 2000; McAlister *et al.* 2008).

The cross-sectional nature of the study and sampling of mothers residing in a single geographic region who had specifically defined demographic characteristics limit the generalizability of this study to other groups. A further limitation is that weight and height data likely are underestimates because they were self-reported, however, the rate of mothers in this study with a BMI greater than 25 is similar to those reported for the general American population (Ogden *et al.* 2006). Despite these limitations, this study does offer a more thorough understanding of the relationship of key social cognitive theory concepts to BMI and dietary intake of mothers – a group that has a profound influence on family nutrition and health.

Conclusion

The findings of this study indicate that mothers, who have confidence in their ability to eat a healthy diet, believe in the link between diet and health, and who practice self-regulatory food-related behaviours, have healthier BMIs and dietary intakes. These theory-guided insights into food-related practices of mothers can serve to inform nutrition communication and health promotion interventions for an audience who has a major impact on the entire family. Future research should investigate the effectiveness of interventions based on the insights gained from this study coupled with positioning dietary intake practices within the full continuum of food-related behaviours.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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