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Child-reported family and peer influences on fruit, juice and vegetable consumption: reliability and validity of measures

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Abstract

Family, peers and other environmental factors are likely to influence children's dietary behavior but few measures of these phenomena exist. Questionnaires to measure family and peer influences on children's fruit, juice and vegetable (FJV) consumption were developed and pilot tested with an ethnically diverse group of Grade 4–6 children. Principal components analyses revealed subscales with acceptable internal consistencies that measured parent and peer FJV modeling, normative beliefs, normative expectations, perceived peer FJV norms, supportive and permissive parenting practices, food rules, permissive eating, and child food preparation. Internal consistencies were adequate to high, but test–re-test correlations often were low. Children also completed questionnaires on FJV availability and accessibility in the home, and food records for 2 days in the classroom. Parental modeling, peer normative beliefs and FV availability were significantly correlated with FJV consumption. Further research with these scales is warranted.

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Introduction

Children do not ordinarily eat the prescribed levels of fruit, juice and vegetables (FJV), thereby placing them at risk for future development of chronic diseases (Domel *et al.*, 1993; Frank *et al.*, 1985; Krebs-Smith *et al.*, 1996; Dennison *et al.*, 1998; US Department of Health and Human Services, 1988). Understanding influences on children's FJV consumption could enable interventions to promote their consumption. In Social Cognitive Theory (SCT), the principle of 'reciprocal determinism' postulates that behavior, including dietary behavior, is the result of environmental and personal factors, and in turn it affects these factors in constant reciprocal relationships (Bandura, 1986). Previous research with several personal characteristics revealed that only FJV preferences predicted FJV consumption among Grade 4 and 5 students, accounting for only 9–13% of the variability (Domel *et al.*, 1996; Resnicow *et al.*, 1997). This lack of predictiveness of dominant personal characteristics suggests that other factors may account for FJV consumption. Environmental factors may be important in understanding children's FJV consumption. Family and peer influences appear particularly promising influences on FJV consumption (Baranowski, 1997). However, few studies have addressed the role of environmental influences on children's FJV consumption (Baranowski, 1997; Baranowski *et al.*, 1999). Figure 1 presents a simple model identifying hypothesized SCT-based environmental factors.

Parental influence on children's food consumption is a complex issue (Baranowski, 1997) that appears to involve parental modeling, i.e. whether

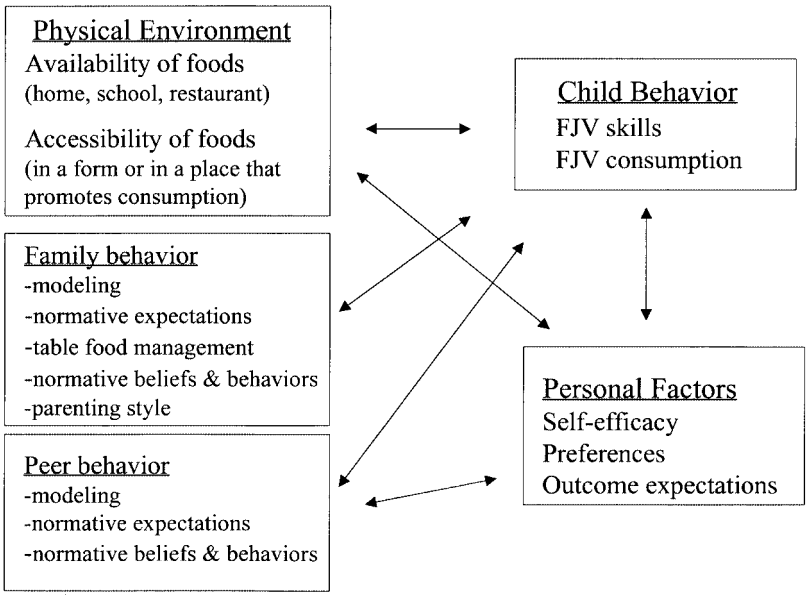

Fig. 1. A social cognitive/reciprocal determinism framework of influences on child food behavior.

parents eat and enjoy certain foods in front of their child (Birch, 1980a; Birch and Fisher, 1998); parenting techniques such as authoritative or permissive (Johnson and Birch, 1994; Birch and Fischer, 1995); social influences such as various forms of encouragement (Hertzler, 1979; Birch, 1980b; Hertzler, 1983; Seagren and Terry, 1991; Cousins *et al.*, 1993; Ianotti *et al.*, 1994; Wardle, 1995); and making foods available and accessible (Crockett *et al.*, 1988; Hearn *et al.*, 1998). In focus group discussions, African-, Euro-, Mexican- and Asian-American students in Grade 4–6 reported some modeling of eating FJV by parents (mostly mothers) (Cullen *et al.*, 2000). These students' parents also reported that parental example (not eating FJV) was an important reason why many children did not eat FJV, and that most children preferred sweets and junk foods. No self-reported measures of parental modeling of, or social influences on, FJV consumption have appeared in the literature. No FJV-specific parenting measure has appeared in the literature.

Low FJV availability in low-income homes (Baranowski *et al.*, 1993; Kirby *et al.*, 1995; Cullen *et al.*, 1998), low FJV accessibility (e.g. ready-to-eat carrot sticks in the refrigerator) for children in most homes (Baranowski *et al.*, 1993; Kirby *et al.*, 1995; Cullen *et al.*, 1998, 2000) and low FJV availability at fast food restaurants where many children eat (Baranowski *et al.*, 1993; Kirby *et al.*, 1995; Cullen *et al.*, 1998, 2000) have been reported in focus group discussions. FJV availability was identified as a significant determinant of intake among Grade 4 and 5 students both at home and at school (Hearn *et al.*, 1998). A measure of FJV availability and accessibility in the home has been used with parents (Hearn *et al.*, 1998), but not with children.

Peer influences on FJV consumption have been reported in focus group discussions: modeling of FJV consumption and negative remarks about eating vegetables (Cullen *et al.*, 1998, 2000). Sweets, desserts and other snack foods were preferred as meal choices instead of fruit, despite liking many fruits (Cullen *et al.*, 2000). In fact, not eating FJV appeared to be the norm among the participating students (Cullen *et al.*, 2000). The association between normative beliefs (i.e. what children believe significant others believe in regard to eating foods) and healthy food choices has been

investigated among adults (Sallis *et al.*, 1987; Baranowski *et al.*, 1995; Sporny and Contento, 1995). One scale assessing whether 'most people in my family' and 'most kids my age' think eating three servings of vegetables and two servings of fruit each day 'is a good thing' was utilized in the 'Gimme 5' intervention (Baranowski *et al.*, 2000), but this scale did not differentiate peer versus parent.

Erroneous perceptions of a high level and acceptability of drug and alcohol use among peers (perceived norms or normative behavior) have been related to the acceptability of substance abuse among adolescents (Hansen, 1992). Resetting more accurate norms for these behaviors has been a successful approach to reducing substance abuse among adolescents (Hansen and Graham, 1991). However, no research has applied perceived norms, or norm setting, to dietary practices, such as eating FJV. There is no literature on normative expectations (i.e. what significant others expect them to do) for eating FJV.

Understanding what factors influence children's dietary practices is the first step in the design of more effective dietary intervention programs. This paper presents the reliability and construct validity characteristics of questionnaires assessing these family and peer influences on children's FJV dietary behavior among a multiethnic group of children. Items in the questionnaires were generated to represent the theoretical constructs identified in focus group discussions (Cullen *et al.*, 2000).

Methods

Sample

This study was approved by the Institutional Review Board of the University of Texas M. D. Anderson Cancer Center. Eighteen Grade 4–6 classrooms from seven parochial schools in the greater Houston, TX, area were recruited. Parental consent and child assent were obtained. Consent forms were returned by 230 students (Table I). No statistically significant differences in numbers of refusals or consents were detected by type of school. Demographic information was obtained for 221 students: 25% African-American, 29% Euro-American, 37% Mexican-American, 9% Asian/Other; 41% boys; 37% Grade 4, 31% Grade 5 and 32% Grade 6; 76% lived with both parents.

Procedures

Trained data collectors visited each classroom on 3 consecutive days. On the first day, students completed the family/peer questionnaires first. Afterward, they received instruction on how to complete the food record (FR) forms and completed the FR for the meals already eaten that day. Two data collectors provided assistance with the FR as needed (Domel *et al*., 1994). On the following 2 days, data collectors prompted the students to record the rest of the foods eaten each day and helped them to completely identify items recorded (e.g. whether item was punch or 100% fruit juice, method of preparation, skin eaten, etc). Participating children received small gifts. Approximately 2 weeks later, a subsample of students ($n = 50$ from three schools and six classrooms) completed the questionnaires a second time.

Instruments

Food record

The FR contained 24 lines to record the various foods consumed, with columns for the meal at which the food was consumed (breakfast, lunch, supper, snack), number of servings, the people with whom this food was eaten, location where eaten, location where food prepared and preparation method. FR were hand coded for servings of FJV using Food Guide Pyramid serving sizes (Cullen, 1999). Mixed dishes had to provide at least a half serving of fruit or vegetable per usual serving to be counted. For example, one cup of beef stew with vegetables was credited with providing one vegetable serving since the standard recipe included a half cup of vegetables per one cup of stew. A hamburger sandwich with two slices of tomato and lettuce was credited with providing a half serving of vegetables. This has been shown to be a valid measure of FJV intake among 9- to

Table I. *Participation rates for study*

	Total no. of students Grade 4–6	No. of consents (%)		
		Yes	No	Not returned
Predominantly African-American schools (3)	74	40 (54)	6 (8)	28 (38)
Predominantly Mexican-American schools (2)	102	68 (67)	6 (6)	28 (27)
Mixed ethnicity schools (2)	185	122 (68)	11 (6)	50 (27)
Total	361	230 (64)	23 (6)	106 (30)

Table II. *Factor structure for perceived peer norms questionnaire*

	Factor 1 loadings	Factor 2 loadings
Factor 1: Peer FJV normative behaviors		
most kids eat fruit at lunch	0.69	0.08
most kids eat fruit at snack	0.66	0.17
most kids eat vegetables at lunch	0.65	0.10
most kids eat vegetables at supper	0.64	0.11
most kids like to drink 100% fruit juice with breakfast	0.62	0.01
most kids drink 100% fruit juice at snack	0.61	0.21
most kids eat vegetables at snack	0.56	0.21
my friends like to drink 100% fruit juice	0.52	0.01
most kids drink 100% fruit juice at lunch	0.48	0.26
most kids eat fruit at supper	0.47	0.27
my friends like to eat fruit	0.47	0.08
my friends like to eat vegetables	0.40	0.21
Factor 2: Peer LFF normative behaviors		
my friends like to eat low-fat mayonnaise on sandwiches	0.03	0.80
my friends like to drink low-fat milk	0.13	0.72
most kids drink low-fat milk	0.16	0.68
most kids eat low-fat mayonnaise on sandwiches	0.06	0.65
my friends like to eat low-fat dressing with vegetables or salad	0.26	0.63
my friends like to eat low-fat snack foods	0.31	0.59
most kids eat low-fat snack foods	0.27	0.55
Eigenvalue	5.69	2.02
Variance explained	30%	11%
Chronbach's α	0.83	0.81
Pearson test–re-test	0.73	0.45
Mean (SD)	26.9 (6.1)	13.1 (3.9)
Range	12–48	7–28

12-year-old children (Domel *et al.*, 1994; Cullen, 1999).

Perceived norms

Perceived norms for eating FJV (i.e. what FJV children think their family and friends are eating) were measured with 19 items. Table II contains specific items. The responses were measured with a scale whereby 1 = never, 2 = sometimes, 3 = often and 4 = always.

Normative beliefs

Normative beliefs for eating FJV (i.e. what children believe their parents and friends think about eating FJV) were measured with 12 items. (See Table III for specific items.) The response scale was coded

Table III. *Factor structure for child normative beliefs questionnaire*

	Factor 1 loadings	Factor 2 loadings
Factor 1: Peer FJV normative beliefs		
most kids my age think that eating or drinking 1 serving of fruit or juice at breakfast is __	0.81	0.14
most kids my age think that eating 1 serving of vegetable at snack is __	0.81	0.14
most kids my age think that eating 1 serving of vegetable at supper is __	0.78	0.17
most kids my age think that eating or drinking 1 serving of fruit or juice at lunch is __	0.75	0.20
most kids my age think that eating 1 serving of vegetable at lunch is __	0.74	0.25
most kids my age think that eating or drinking 1 serving of fruit or juice at snack is __	0.73	0.19
Factor 2: Family FJV normative beliefs		
most people in my family think that eating or drinking 1 serving of fruit or juice at lunch is __	0.12	0.82
most people in my family think that eating or drinking 1 serving of fruit or juice at breakfast is __	0.18	0.73
most people in my family think that eating 1 serving of vegetable at snack is __	0.25	0.73
most people in my family think that eating or drinking 1 serving of fruit or juice at snack is __	0.12	0.72
most people in my family think that eating 1 serving of vegetable at supper is __	0.11	0.70
most people in my family think that eating 1 serving of vegetable at lunch is __	0.30	0.68
Eigenvalue	5.23	1.98
Variance explained	44%	16%
Chronbach's α	0.88	0.85
Pearson test–re-test	0.30	0.32
Mean (SD)	13.9 (4.9)	17 (5)
Range	6–24	6–24

as 2 = a very good thing, 1 = a good thing and 0 = they don't care or I don't know.

Normative expectations

Normative expectations for eating FJV (i.e. a child's beliefs about whether parents or friends think the child should or should not eat FJV) were measured by 14 items (Table IV). The responses were coded as 2 = encourages a lot, 1 = encourages a little, 0 = neither encourages nor discourages, –1 = discourages a little and –2 = discourages a lot.

Parental control

Parental control refers to methods used by parents to maintain or modify children's behaviors. Three child-control patterns have been identified: authoritarian, permissive and authoritative (Baumrind, 1966; Birch and Fischer, 1995). Authoritative parenting facilitates the development of the child's self-control, while authoritarian and permissive parenting impede its development. The Authoritative Parenting Index (API), a 20-item scale (Jackson *et al.*, 1998), was used to assess children's perceptions of parenting behaviors (Table V). In previous research with Grade 4–9 students, the API yielded two subscales: parental demandingness (i.e. setting and enforcing behavior standards, monitoring and supervising child activities, and maintaining structure and regimen) and responsiveness (i.e. being affectionate, comforting, supportive and accepting, involved with child activities), that were combined using an algorithm to categorize parents as authoritative, authoritarian or permissive. The responses for the API referred to the child's mother or primary guardian: 1 = not like her, 2 = sort of like her, 3 = a lot like her and 4 = just like her.

Parent–child food control

Nineteen items pertaining to parent–child food control issues were generated to tap the same parenting concepts (authoritative, authoritarian or permissive), but specifically in regard to food (Table VI). The API response format was used.

FJV modeling by parents and peers

FJV modeling by parents and peers was measured with 34 items (Table VII). The responses were

Table IV. *Factor structure for child normative expectations questionnaire*

	Factor 1 loadings	Factor 2 loadings
Factor 1: Parent FJV normative expectations		
how much do your parents encourage you to eat fruit at lunch?	0.85	−0.01
how much do your parents encourage you to eat fruit at snack?	0.84	0.13
how much do your parents encourage you to drink 100% fruit juice at breakfast?	0.78	0.05
how much do your parents encourage you to eat vegetables at supper?	0.75	0.16
how much do your parents encourage you to eat vegetables at snack?	0.70	0.22
how much do your parents encourage you to drink 100% fruit juice instead of soda?	0.70	−0.03
how much do your parents encourage you to eat vegetables at lunch?	0.67	0.33
Factor 2: Peer FJV normative expectations		
how much do your friends encourage you to eat vegetables at snack?	0.09	0.83
how much do your friends encourage you to drink 100% fruit juice at breakfast?	0.09	0.77
how much do your friends encourage you to eat vegetables at lunch?	0.11	0.76
how much do your friends encourage you to eat fruit at snack?	0.12	0.72
how much do your friends encourage you to eat vegetables at supper?	0.12	0.69
how much do your friends encourage you to drink 100% fruit juice instead of soda?	0.09	0.65
how much do your friends encourage you to eat fruit at lunch?	−0.01	0.63
Eigenvalue	5.08	2.88
Variance explained	36%	21%
Chronbach's α	0.88	0.85
Pearson test–re-test	0.47	0.50
Mean (SD)	6.4 (6)	−0.20 (5)
Range	−14–14	−14–14

measured with a scale whereby 1 = never, 2 = sometimes, 3 = often and 4 = always.

Availability and accessibility

FJV availability (whether three 100% fruit juices, 13 fruits or 18 vegetables were present in the home in the past week; response = yes/no) and FJV accessibility (whether two 100% fruit juices, three fruits and three vegetables were in a form and location that encouraged their consumption, e.g. peeled, sliced carrot sticks in the refrigerator; response = yes/no) were adapted from a '5-A-Day' project (Hearn *et al.*, 1998).

Data analyses

Principal components analysis with Varimax rotation was conducted on each questionnaire. The number of factors to be retained was determined from the scree plot criterion (Rummel, 1970) and interpretability of resulting factors. Items loading on more than one factor and items with highest factor loading less than 0.40 were removed. Items within each factor were summed and Chronbach's α was calculated for each scale. Pearson and Spearman correlations were calculated to assess test–re-test reliability for the scales between the administrations of the questionnaires at Time 1 and Time 2. Mean FJV intake and FJV intake/1000 kcal (to control for energy intake) were calculated from the FRs. The consumption variables were tested for normality, and, as a result, Spearman correlation coefficients were calculated among the consumption variables and the scales to assess construct validity. Data were analyzed using the Statistical Package for Social Sciences (SPSS version 6.1.2 for Windows, 1995; SPSS, Chicago, IL).

Results

Mean daily FJV intake was 2.13 (±1.43) servings [fruit servings = 0.57 (± 0.82); juice servings = 0.49 (± 0.72); total vegetable servings = 1.07 (±

Table V. *Factor structure for child authoritative parenting questionnaire*

	Factor 1 loadings	Factor 2 loadings
Factor 1: Supportive parenting practices		
she wants to hear about my problems	0.67	0.03
she makes me feel better when I'm upset	0.66	−0.06
she makes sure I tell her where I am going	0.62	0.11
she likes me just the way I am	0.60	−0.15
she checks to see if I do my homework	0.54	0.09
she listens to what I have to say	0.51	−0.30
she asks me what I do with friends	0.51	0.28
she is interested in my school work	0.49	−0.07
she tells me when I do a good job on things	0.49	−0.06
she is pleased with how I behave	0.47	−0.01
she knows where I am after school	0.45	−0.02
she tells me times when I must come home	0.42	0.02
Factor 2: Permissive parenting practices		
she forgets the rules she makes for me	0.05	0.68
she can be talked into things easily	0.16	0.60
she makes rules without asking what I think	−0.05	0.60
she is always telling me what to do	−0.21	0.57
she is too busy to talk to me	−0.11	0.56
it is hard for her to say 'no' to me	0.12	0.48
Eigenvalue	3.73	2.29
Variance explained	19%	11%
Chronbach's α	0.77	0.63
Pearson test−re-test	0.70	0.01
Mean (SD)	37.9 (6.1)	14.1 (2.8)
Range	18−48	6−21
Items not loading on either factor		
she has rules I must follow	0.31	0.18
she makes sure I go to bed on time	0.17	0.01

0.89)] for the 210 students completing 2 days of FRs. Between 210 and 221 students completed the questionnaires. Mean values for each scale are listed in each table.

Separate subscales for peer perceived norms for eating FJV versus low-fat foods (Table II) were identified. These two factors accounted for 41% of the variability in these items. While internal consistency for three scales were acceptable, 2-week test–re-test reliabilities were moderate to low.

Separate subscales for peer and family FJV normative beliefs were identified (Table III). These two factors accounted for 60% of the variability in these items. While internal consistency of these scales verged on being high, the 2-week test–re-test reliabilities were low.

Separate subscales for parent and peer FJV normative expectations were identified (Table IV). These two factors accounted for 57% of the variability in these items. While internal consistency of these scales verged on being high, the 2-week test–re-test reliabilities were modest.

The API questionnaire yielded two factors: supportive and permissive parenting practices (Table V). These two factors accounted for 30% of the variability in these items. Internal consistency for the supportive parenting practices factor was modest, with an almost equal test–re-test

Table VI. *Factor structure for parent–child food control questionnaire*

	Factor 1 loadings	Factor 2 loadings	Factor 3 loadings
Factor 1: Parent control			
she makes sure I eat my vegetables before I can eat dessert	0.66	−0.25	0.22
she plans all my meals	0.62	0.24	−0.15
she insists on proper manners at the dinner table	0.57	−0.01	0.11
she has dinner ready at the same time everyday	0.56	0.18	0.00
she wants the family to eat dinner together all the time	0.53	−0.09	0.21
she asks me what I eat at school	0.52	0.05	−0.05
she asks me how things went at school	0.50	−0.02	0.10
she prepares all my meals	0.50	0.08	−0.13
she tells me what I will eat for meals	0.49	0.15	0.02
she asks me what foods I would like for meals	0.48	0.16	0.18
she has my favorite foods at home	0.43	0.31	0.15
Factor 2: Permissive eating			
she lets me eat whatever I want for lunch	0.12	0.79	0.21
she lets me eat whatever I want for snacks	−0.10	0.74	0.17
she lets me eat whatever I want for dinner	0.19	0.69	0.10
she lets me eat whatever I want for breakfast	0.12	0.62	0.22
Factor 3: Food self-preparation			
she lets me prepare my breakfast	0.00	0.05	0.85
she lets me prepare my lunch	0.13	0.19	0.79
she lets me prepare my dinner	0.13	0.31	0.65
she lets me prepare my snacks	0.01	0.22	0.59
Eigenvalue	4.26	2.49	1.51
Variance explained	22%	13%	8%
Chronbach's α	0.77	0.76	0.76
Pearson test−re-test	0.59	0.19	0.19
Mean (SD)	29 (6.4)	9.7 (3.3)	10.6 (3.6)
Range	15−44	4−16	4−16

coefficient. Internal consistency for the permissive parenting practices was weak and test–re-test reliability was almost non-existent. Two of the original scale items did not load on either factor.

Three factors were obtained from the Parent Child Food Control questionnaire: parental control, permissive eating and food self-preparation (Table VI). These three subscales accounted for 43% of the variability in these items with moderate internal consistencies. The 2-week test–re-test reliability coefficients were low, but especially low for the permissive eating and food self-preparation scales.

Separate peer and parent FJV modeling subscales were also identified (Table VII). These two subscales accounted for 33% of the variability in these items. Six of the original items did not load on these two factors. The internal consistencies were acceptable to high, but the test–re-test reliabilities were low.

Internal consistencies for the FJV availability and accessibility scales were adequate to high but test–re-test reliabilities were also low (Table VIII).

The correlations among all the scales are presented in Table IX.

Fruit and vegetable consumption were significantly positively correlated with fruit ($r = 17$; $P < 0.05$) and vegetable ($r = 0.28$; $P < 0.001$) availability, respectively (data not shown). Parent FJV modeling was positively correlated with consumption of fruit ($r = 0.18$; $P < 0.01$), juice ($r = 0.14$; $P < 0.05$), total FJV ($r = 0.20$; $P < 0.01$), fruit/1000 kcal ($r = 0.18$; $P < 0.01$) and total FJV/1000 kcal ($r = 0.23$; $P < 0.01$). Peer normative beliefs were significantly negatively

Table VII. *Factor structure for child modeling questionnaire*

	Factor 1 loadings	Factor 2 loadings
Factor 1: Parent FJV/LFF modeling		
my parents eat vegetables at lunch when I am with them	0.72	0.11
my parents eat fruit at lunch when I am with them	0.69	0.16
my parents eat fruit at supper when I am with them	0.69	0.19
my parents eat vegetables at snack when I am with them	0.67	0.17
my parents eat fruit at restaurants when I am with them	0.67	0.12
my parents eat vegetables at supper when I am with them	0.66	−0.02
my parents eat vegetables at restaurants when I am with them	0.64	0.02
my parents eat salad at restaurants when I am with them	0.63	0.05
my parents eat fruit at snack when I am with them	0.61	0.14
my parents eat salad at supper when I am with them	0.56	0.09
my parents eat low-fat snack foods when I am with them	0.56	0.24
my parents drink 100% fruit juice when I am with them	0.51	0.20
my parents eat salad at lunch when I am with them	0.50	0.24
my parents eat low-fat dressing with vegetables or salads when I am with them	0.47	0.22
my parents eat low-fat mayonnaise on sandwiches when I am with them	0.43	0.28
Factor 2: Peer FJV/LFF modeling		
my friends eat vegetables at restaurants when I am with them	0.11	0.68
my friends eat fruit at restaurants when I am with them	0.09	0.66
my friends eat vegetables at supper when I am with them	0.12	0.65
my friends eat fruit at supper when I am with them	0.17	0.62
my friends eat salad at supper when I am with them	0.14	0.60
my friends eat fruit at breakfast when I am with them	0.20	0.58
my friends eat vegetables at snack when I am with them	0.01	0.53
my friends eat salad at lunch when I am with them	0.13	0.50
my friends eat low-fat dressing with vegetables or salads when I am with them	0.11	0.50
my friends eat vegetables at lunch when I am with them	0.07	0.46
my friends eat low-fat snack foods when I am with them	0.19	0.43
my friends eat fruit at lunch when I am with them	−0.04	0.42
my friends eat salad at restaurants when I am with them	0.15	0.40
Eigenvalue	8.2	3.0
Variance explained	24%	9%
Chronbach's α	0.89	0.82
Pearson test–re-test	0.26	0.60
Mean (SD)	36.4 (9.2)	23.4 (6.1)
Range	15–60	13–43
Items not loading on either or on both factors		
my friends eat fruit at snack when I am with them	0.17	0.38
my friends drink 100% fruit juice when I am with them	0.23	0.37
my friends drink low-fat milk when I am with them	0.19	0.31
tmy friends use low-fat mayonnaise when I am with them	0.21	0.30
my parents eat fruit at breakfast when I am with them	0.43	0.40
my parents drink low-fat milk when I am with them	0.33	0.15

Responses: 1 = never, 2 = sometimes, 3 = often and 4 = always.

correlated with consumption of total FJV ($r = -0.20$; $P < 0.01$) and FJV/1000 kcal ($r = -0.25$; $P < 0.01$). Parenting control was positively correlated with juice consumption ($r = 0.17$; $P < 0.05$).

Discussion

These analyses identified several new scales encompassing normative, parent and peer influences on children's FJV consumption. The statistical procedures used to identify subscales were standard. Only the correlations between peer FJV normative behavior and peer and parent modeling, peer and family FJV normative beliefs, parent FJV normative expectations and parent modeling, permissive eating and food self preparation, supportive parenting and parental food control, and parent and peer FJV modeling were higher than 0.30, suggesting substantial independence of the majority of the subscales.

The API yielded two subscales based on children's perceptions of their parents' behaviors: supportive and permissive parenting practices. These subscales are in contrast to the demandingness and responsiveness factors obtained with these items from students in North Carolina (Jackson *et al.*, 1998) that were combined in an algorithm to obtain authoritarian, authoritative and permissive parenting styles. This difference may be due to the ethnically diverse group of students participating in the present study, or may reflect cultural/geographic differences between the Texas and North Carolina groups, or some unknown factors.

Three subscales for the Parent–Child Food Control Questionnaire were identified: parental control, permissive eating and child food preparation. Only *parental control* was weakly correlated with juice consumption ($P < 0.05$). The lack

Table VIII. *Reliability of the FJV availability and accessibility scales*

	α ($n = 217$)	Test–re-test ($n = 46$)	Mean (SD)	Range
Accessibility				
fruit	0.85	0.12	1.3 (1.0)	0–3
juice	0.80	0.20	1.5 (.6)	0–2
vegetable	0.82	0.11	1.6 (.9)	0–3
total FJV	0.92	0.23	4.4 (1.9)	0–8
Availability				
fruit	0.45	0.20	5.8 (3.2)	0–13
juice	0.80	0.51	1.6 (1.0)	0–3
vegetable	0.81	0.36	7.3 (4.2)	0–18
total FJV	0.83	0.40	14.6 (6.9)	0–34

Table IX. *Bivariate correlations of family and peer measures (*n *= 221 Grade 4–6 students)*

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. Peer FJV normative behaviors	–	0.24[b]	0.15[a]	0.19[a]	0.24[b]	0.03	−0.03	0.05	0.04	0.02	0.37[b]	0.50[b]
2. Peer FJV normative beliefs		–	0.39[b]	−0.07	0.22[b]	0.08	−0.07	0.15	0.21[b]	0.20[b]	−0.04	0.23[b]
3. Family FJV normative beliefs			–	0.04	0.18[a]	0.17[a]	0.06	0.19[b]	0.15[a]	0.07	0.05	0.09
4. Parent FJV normative expectations				–	0.28[b]	−0.08	0.005	0.08	−0.16[a]	0.07	0.38[b]	0.18[b]
5. Peer FJV normative expectations					–	0.06	−0.008	−0.03	−0.02	−0.04	0.07	0.22
6. Supportive parenting practices						–	0.20[b]	0.50[b]	0.15[b]	0.24[b]	0.08	0.03
7. Permissive parenting practices							–	0.07	0.23[b]	0.10	0.02	0.04
8. Parent control								–	0.19[b]	0.19[b]	0.18[b]	0.12
9. Permissive eating									–	0.41[b]	−0.07	−0.02
10. Food self-preparation										–	0.12	0.10
11. Parent FJV modeling											–	0.40[b]
12. Peer FJV modeling												–

[a]$P < 0.05$; [b]$P < 0.01$.

of correlation between FJV consumption and permissive eating and food self-preparation was surprising. In focus group discussions, Grade 4–6 students reported some food preparation responsibilities. They also admitted that desserts and other snack foods were preferred to FJV items, suggesting that non-FJV items would be prepared (Cullen *et al.*, 2000) leading to negative correlations in the present study. There were significant, but weak, correlations among the API and the newly developed food API subscales. Two days of FRs may be too unreliable to obtain all the hypothesized associations between these scales and FJV consumption. Because recent research has suggested that parental control may be related to child obesity problems (Johnson and Birch, 1994; Birch and Fisher, 1998), further research in this area is warranted.

Students reported lower FJV normative beliefs and expectations from peers than from parents. Peer FJV normative beliefs were significantly negatively related to total FJV consumption. There were no significant correlations between FJV consumption and peer FJV modeling, peer normative expectations (encouraging eating FJV) or perceived norms (most kids are eating FJV). Despite believing that peers think eating FJV is a good thing (FJV normative beliefs), their peers were not modeling or encouraging the eating of FJV. In fact, focus group discussions with Grade 4–6 students (Cullen *et al.*, 2000) and African-American Boy Scouts (Cullen *et al.*, 1998) revealed that eating vegetables, in particular, would elicit negative comments from peers. Among 12- to 16-year-old students, friends' consumption of the food was a significant influence on eating 'unhealthy foods' from a list of 22 commonly eaten foods (Woodward *et al.*, 1996). Measurement problems may be responsible given the substantial intercorrelation between peer normative beliefs and modeling. Perhaps the results obtained here were influenced by children's knowledge that FJV are good for you. More research in this area is warranted to identify whether peers' consumption of 'healthy foods' is a positive influence on child and adolescent food choices, given the amount of social eating with peers that occurs and whether peer consumption of less healthy foods is a negative influence on healthy food choices.

Parent FJV modeling was correlated (although weakly) with eating fruit, juice and total FJV. This supports the literature on the important role of parents as models for their children's eating behaviors (Birch, 1980; Birch and Fisher, 1998; Cullen *et al.*, 2000).

Child reported FJV availability in the home was also related to FJV consumption. Using this same measure, parent reported home FJV availability was related to their children's FJV consumption (Hearn *et al.*, 1998). Test–re-test reliabilities for the availability and accessibility scales were very low. This could reflect the normal variation in the home food supply between grocery shopping trips, or the students' low awareness of what FJV were actually available or accessible in their homes. The students could have reported FJV that they liked or ate, which could account for the significant correlations between the subscales and consumption. Further testing and validation of these measures with children are needed.

In general, the internal consistencies of these subscales were moderate to high, but the test–re-test reliabilities were low. Since internal consistency reliability was developed to estimate the same phenomenon as test–re-test reliability (but overcome the problem of possible change over time) (Traub, 1994), the low test–re-test reliabilities are disconcerting. One would not expect parental modeling, parenting or normative influences to substantially change over a 2-week interval. It is possible that the high internal consistency values reflect some internal consistency response bias and the response bias changed over time. For example, something may have happened at home or school on the day of assessment to emphasize aspects of family functioning (e.g. a news story) which was not operative at the second assessment. Perhaps the students were bored with answering the same questions within the 2-week period. Perhaps parental modeling and parenting are not as stable as we have presumed. Low test–re-test reliability

on dietary and physical activity measures with previously documented accuracy has been reported (Brownson *et al.*, 1999). More methodological work on these phenomena would be desirable.

Several limitations should be noted. All data were from children's self report and thereby subject to possible comprehension, memory and recording errors. Determining accurate portion sizes and estimating FJV servings from mixed dishes are difficult tasks, but our methods have been shown to provide adequate reliability and validity compared with observation data (Domel *et al.*, 1994). Two days of FRs are not a reliable estimate of usual FJV intake (Basiotis *et al.*, 1987) and thereby attenuate true relationships (Traub, 1994), but budget limitations precluded longer data collection efforts. Higher correlations would likely have been obtained with additional days of dietary assessment. The parochial students may not be representative of the general population of Grade 4–6 students, thereby limiting generalizability of these results. Older children may provide different results than those obtained here. Future tests of theoretically predicted relationships with these variables should control for possible confounding variables, e.g. socioeconomic status, gender, ethnicity, etc.

Conclusion/application

Despite FJV being important foods for children's current and future health, FJV intakes were low. These questionnaires may tap important aspects of family and peer influence, and thereby provide important knowledge about the possible relationships FJV consumption. If these questionnaires are demonstrated to be reliable and valid, future use is warranted. Future work should test these questionnaires with diverse youth groups and obtain a more reliable estimate of usual FJV intake, e.g. 7-day FRs.

Large intervention studies with children have been based on SCT and have attempted to modify child behavior and environments (including parents) (Domel *et al.*, 1993; Perry *et al.*, 1998; Baranowski *et al.*, 2000). Some of the constructs identified in this research such as parental modeling, parental food control and normative beliefs could be included as targets in future intervention research. Identifying and measuring change in the mediating variables associated with dietary behavior would be an important step in efforts to promote positive dietary habits and reduce chronic disease risk.

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