Daily Associations of Stress and Eating in Mother–Child Dyads

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Abstract:

Background and Aims. This study used Ecological Momentary Assessment (EMA) in mother–child dyads to examine the day-level associations of stress and eating. *Method.* Mothers and their 8- to 12-year-old children (*N* = 167 dyads) completed between three (weekday) and eight (weekend) EMA survey prompts per day at random nonschool times across 8 days. EMA measured perceived stress, and past 2-hour healthy (i.e., fruit and vegetables) and unhealthy (e.g., pastries/sweets, soda/energy drinks) eating. *Results.* Children reported more healthy and unhealthy eating on days when their mothers also engaged in more healthy and unhealthy eating, respectively. On days when mothers' perceived stress was greater than usual, they reported more healthy eating. *Discussion and Conclusions.* Eating behaviors were coupled between mothers and children at the day level. Mothers' stress was related to their own eating but not to children's eating.

Keywords: children | dyads | eating | ecological momentary assessment | mothers | stress

Article:

The family unit is thought to play a central role in promoting and reinforcing health behaviors in children and parents (American Academy of Pediatrics, 2003). Psychological stress is an understudied factor that may compromise healthy eating practices in families (Norman, Berlin, Sundblom, Elinder, & Nyberg, 2015). Elevated levels of parental stress may interfere with food preparation and feeding practices related to children's eating (Devine et al., 2006; El-Behadli, Sharp, Hughes, Obasi, & Nicklas, 2015). Less is known, however, about how a child's stress influences parental eating behaviors. Furthermore, although a sizeable body of evidence exists on the role of stress in contributing to an adult's own eating behavior (Greeno & Wing, 1994), the relationship between stress and eating in children is unclear (Wilson & Sato, 2014).

The current study applied Ecological Momentary Assessment (EMA; Shiffman, Stone, & Hufford, 2008) methods using smartphones to examine how mothers' and children's stress may influence their own healthy and unhealthy eating behavior, as well as the eating behavior of the other member of the dyad. This approach allows us to disentangle *intrapersonal* or *actor effects* (e.g., the extent to which mother's stress influences her own behavior or how much a child's stress influences his or her own behavior) from *interpersonal* or *partner effects* (e.g., the extent to which a mother's stress influences her child's behavior or how much a child's stress influences the mother's behavior).

The primary objectives of the current study were to examine the day-level associations of mothers' and children's stress with their own healthy and unhealthy eating (i.e., actor effects) as well as those behaviors performed by the other member of the dyad (i.e., partner effects). A secondary objective was to examine the extent to which mothers' and children's healthy and unhealthy eating behaviors were interrelated at the day level. It was expected that mothers and children would display similar eating patterns on the day level, since parents generally prepare meals for their children.

METHOD

Overview and Participants

Participants in the Mothers and Their Children's Health (MATCH) study included ethnically diverse mothers and their 8- to 12-year-old children living in the greater Los Angeles metropolitan area. The inclusion criteria were (1) child in the third to fifth grade, (2) ≥50% of child's custody is with the mother, and (3) both mother and child are able to read English or Spanish. Mothers who worked 2 or more weekday evenings (between 5 p.m. and 9 p.m.) per week or >8 hours on any weekend day were excluded. Parents provided informed consent for themselves and their children. Children provided informed assent for study participation. Procedures were approved by the Institutional Review Boards at the University of Southern California and Northeastern University.

Procedures

EMA data were collected through a custom software application for smartphones running the Android operating system (Google Inc., Mountainview, CA). Each member of the mother–child dyad received random EMA prompts after 5:00 p.m. on the day of the data collection session

(Day 1), across the next 6 complete days (Days 2-7), and up until 5:00 p.m. on the last day when the phone was returned to researchers (Day 8). On weekend days, EMA surveys were prompted up to eight times per day for mothers (between 7:00 a.m. and 9:30 p.m.) and seven times per day for children (between 7:00 a.m. and 8:00 p.m.). On weekdays, EMA surveys were prompted up to four times per day for mothers (between 3:00 p.m. and 9:30 p.m.) and three times per day for children (between 3:00 p.m. and 8:00 p.m.). A more detailed description of the protocol for the MATCH study is published elsewhere (Dunton et al., 2015).

Measures

Ecological Momentary Assessment

Perceived stress was measured using two items adapted from the Perceived Stress Scale (Sheldon, Kamarck, & Mermelstein, 1983). For mothers, questions asked were "How certain do you feel that you can deal with all the things that you have to do RIGHT NOW?" and "How confident do you feel about your ability to handle all of the demands on you RIGHT NOW?" There were four response options ranging from 0 = *not at all* to 3 = *extremely*, which were summed for a total perceived stress scores ranging from 0 to 6. In children, perceived stress was also assessed with two items. Participants selected 0 = *no* or 1= *yes* to two questions: "I can manage with all the things I have to do RIGHT NOW" and "Things are working out as I have planned RIGHT NOW," which were summed for a total perceived stress score ranging from 0 to 2. Both mothers and children responded to dietary EMA items by indicating *yes* or *no* if they had consumed healthy (one item on fruit/vegetables) and unhealthy (four items on chips/fries, pastries/sweets, fast food, soda/energy drinks) foods in the past 2 hours. Within each 2-hour EMA window, a summary score (0-4) was created representing the total number of the four unhealthy food items (i.e., chips/fries, pastries/sweets, fast food, soda/energy drinks) with a *yes* response. Mothers indicated *yes* or *no* whether they had spent any time together (in the same location) with their child over the past 2 hours.

Height and Weight

Height and weight were measured in duplicate using an electronically calibrated digital scale and professional stadiometer. Body mass index (kg/m^2) was calculated for mothers, and age- and gender-specific body mass index percentiles were calculated for children.

Demographic Factors

Mothers completed questionnaires assessing a range of demographic factors (e.g., age, race/ethnicity, education level, employment status). Children self-reported age and sex.

Data Analyses

Prior to data analyses, EMA data were aggregated at the day level. For the predictor variables, the total perceived stress scores from EMA were averaged for each day. For the outcome variables, the day-level healthy eating outcome variable represented the proportion of answered EMA prompts indicating *yes* to the fruit/vegetables item on that day. The day-level unhealthy

eating outcome variable represented the average number of different unhealthy food items reported per EMA window on that day. Days were excluded from analyses when all EMA prompts were unanswered, or mothers answered *no* to all prompts asking if they were with their child in the past 2 hours.

Day-level aggregated data were analyzed with multilevel modeling in HLM (Version 7, SSI Inc.) using the HLM2 procedure with days (Level 1) nested within people (Level 2). Four separate models (N = 167 each) were run to test each of the following outcome variables: (1) mothers' day-level healthy eating, (2) mothers' day-level unhealthy eating, (3) children's day-level healthy eating, (4) and children's day-level unhealthy eating. Each model entered both mothers' and children's day-level stress as predictor variables. Between-subject (BS; Level 2, person) and within-subject (WS; Level 2, day) versions of these predictor variables were generated (i.e., partitioning the variance; Hedeker, Mermelstein, & Demirtas, 2012), and both were included in each model. The BS version represents the individual mean deviation from the grand mean, and the WS version represents deviation from one's own mean on any given day (Curran & Bauer, 2011). Therefore, the WS (i.e., day-level) results can be interpreted as adjusted for BS (i.e., person-level) effects. To examine coupling of mothers' and children's healthy and unhealthy eating, each model also included predictor variables representing WS and BS versions of healthy or unhealthy eating of the other member of the dyad. All day-level multilevel models controlled for day of the week (weekend day vs. weekday) and annual household income quartiles (<$35,000, $35,001-$74,999, $75,000-$104, 999, ≥$105,000). Statistical models also individually controlled for those person-level demographic factors that were significantly (p < .05) associated with the outcome variable of interest from the following list: mothers' age, race and ethnicity, immigrant status, type of household (single parent vs. not), education level (college vs. less than college), work status (fulltime vs. not), number of children under 18 in house, and children's age and sex.

RESULTS

Data Availability and Participant Characteristics

A total of 191 mother–child dyads initially enrolled in the study, of which 170 dyads had at least some EMA data for both the mother and child. Of these dyads, mothers answered an average of 78.5% (range 3.4% to 100%) of delivered EMA prompts, and children answered 75.1% (range 10.0% to 100%) of delivered EMA prompts. Three mothers did not report being with their child during any EMA prompts and were excluded from analyses, leaving an analytic sample size of 167 dyads at Level 2 and between 947 and 972 observations at Level 1. Mothers' age ranged from 26 to 57 years (M = 41.1, SD = 6.1), and children were 8 to 12 years old (M = 9.6, SD = 0.9). About half of mothers were Hispanic (54%), and about 30% were born outside of the United States. A majority of mothers had graduated from college (60%) and worked full-time (57%). Approximately 20% of mothers reported living in a single-parent household, and about a quarter of mothers had an annual household income of less than $35,000 (25%). About half of the children were female (52%). Approximately 66% of mothers and 37% of children were either overweight or obese.

Descriptive Statistics

On average, 31.2% of children's and 33.3% of mothers' answered EMA prompts reported healthy eating (i.e., consuming fruits or vegetables) across the day. The average proportions of answered EMA prompts reporting unhealthy eating across the day were as follows: chips/fries (10.5% for children and 7.5% for mothers), pastries/sweets (12.8% for children and 10.4% for mothers), fast food (7.4% for children and 6.2% for mothers), and soda/energy drinks (9.0% for children and 6.8% for mothers). At the day level, the average number of different unhealthy food types (i.e., chips/fries, pastries/sweets, fast food, soda/energy drinks) reported per EMA prompt was 0.42 (range = 0-2.60) for children and 0.31 (range = 0-1.65) for mothers. At the day level, the average rating for mothers' total perceived stress was 1.86 (*SD* = 1.34) on a scale ranging from 0 to 6, and the average rating for children's total perceived stress was 0.30 (*SD* = 0.54) on a scale ranging from 0 to 2.

Actor and Partner Effects of Daily Stress on Children's and Mothers' Healthy Eating

Table 1 shows that children's day-level healthy eating was not significantly associated with children's own perceived stress (WS actor effect, coefficient = −0.049, *SE* = 0.61, *p* = .428) or perceived stress reported by their mothers (WS partner effect, coefficient = −0.003, *SE* = 0.034, *p*= .927). Mothers reported more healthy eating on days when their own levels of perceived stress were higher than usual (WS actor effect, coefficient = 0.056, *SE* = 0.028, *p* = .047). Yet mothers' day-level healthy eating was not associated with their children's levels of perceived stress (WS partner effect, coefficient = 0.014, *SE* = 0.051, *p* = .788). Children reported more healthy eating on days when their mothers engaged in more healthy eating than usual (WS partner effect, coefficient = 0.152, *SE* = 0.048, *p* = .001), and mothers reported more healthy eating on days when their children engaged in more healthy eating than usual (WS partner effect, coefficient = 0.100, *SE* = 0.033, *p* = .003).

Table 2 shows that children's unhealthy eating was not associated with their own levels of perceived stress (WS actor effect, coefficient = −0.152, *SE* = 0.106, *p* = .154) or with perceived stress reported by their mothers (WS partner effect, coefficient = 0.040, *SE* = 0.059, *p* = .503). Children reported more unhealthy eating on days when their mothers engaged in more unhealthy eating than usual (WS partner effect, coefficient = 0.198, *SE* = 0.061, *p* = .001), and mothers reported more unhealthy eating on days when their children engaged in more unhealthy eating than usual (WS partner effect, coefficient = 0.082, *SE* = 0.026, *p* = .002).

Table 1. Results of Multilevel Models Examining the Actor and Partner Effects of Daily Stress on Children's and Mothers' Healthy Eating.

	Children's healthy eating,[a] *N*		Mothers' healthy eating,[b] *N*	
Variable	Coefficient (*SE*)	*p*	Coefficient (*SE*)	*p*
Level 1 (days)	972		972	
Level 2 (people)	167		167	
Intercept	0.353 (0.023)	<.001	0.355 (0.018)	<.001
Mothers' stress				
BS	0.026 (0.040)	.507	−0.020 (0.031)	.512
WS	−0.003 (0.034)	.927	0.056 (0.028)	.047
Children's stress				
BS	0.117 (0.105)	.266	−0.014 (0.082)	.864
WS	−0.049 (0.061)	.428	0.014 (0.051)	.788
Mothers' healthy eating				
BS	0.389 (0.096)	<.001		
WS	0.152 (0.048)	.001		
Children's healthy eating				
BS			0.251 (0.058)	<.001
WS			0.100 (0.033)	.003

Note. BS = between-subject (centered on the group mean); WS = within-subject (centered on the person mean). Each column represents a separate model. Random intercept models are used. Unstandardized regression coefficients are reported.
[a]Adjusted for day of the week (weekend day vs. weekday), annual household income (quartiles), and whether child attended an after-school program more than 50% of time (or not). [b]Adjusted for day of the week (weekend day vs. weekday), annual household income (quartiles), and household type (single parent vs. not single parent).

Table 2. Results of Multilevel Models Examining the Actor and Partner Effects of Daily Stress on Children's and Mothers' Unhealthy Eating.

	Children's unhealthy eating,[a] *N*		Mothers' unhealthy eating,[b] *N*	
Variable	Coefficient (*SE*)	*p*	Coefficient (*SE*)	*p*
Level 1 (days)	972		947	
Level 2 (people)	167		163	
Intercept	0.424 (0.040)	<.001	0.347 (0.023)	<.001
Mothers' stress				
BS	−0.050 (0.069)	.464	0.069 (0.040)	.083
WS	0.040 (0.059)	.503	0.002 (0.038)	.950
Children's stress				
BS	−0.218 (0.181)	.231	0.064 (0.108)	.553
WS	−0.152 (0.106)	.154	−0.090 (0.070)	.219
Mothers' unhealthy eating				
BS	0.350 (0.135)	.010		
WS	0.198 (0.061)	.001		
Children's unhealthy eating				
BS			0.111 (0.045)	.015
WS			0.082 (0.026)	.002

Note. BS = between-subject (centered on the group mean); WS = within-subject (centered on the person mean). Each column represents a separate model. Random intercept models are used. Unstandardized regression coefficients are reported.
[a]Adjusted for day of the week (weekend day vs. weekday), and annual household income (quartiles). [b]Adjusted for day of the week (weekend day vs. weekday), annual household income (quartiles), immigrant status (born in the United States vs. not born in the United States), and household size.

DISCUSSION

The current study offers a novel approach to examining the intradyadic associations of daily stress with healthy and unhealthy eating in mothers and children. It is one of the first known studies to employ EMA to disentangle actor and partner effects of stress on eating at the day

level. Findings provide preliminary evidence that on any given day, healthy and unhealthy eating behaviors are highly coupled between mothers and their children, which may be attributable to parents preparing or purchasing the same food for themselves and their children (Campbell & Crawford, 2001).

Results indicated that daily stress in mothers is related to their own eating behaviors but not the eating behaviors of their children. On days when mothers consumed more healthy foods, they reported more stress than usual. This finding is somewhat contradictory to research on stress-induced eating in adults (Greeno & Wing, 1994) where more unhealthy eating happens under stress. The current results could be suggestive of stress induced by circumstance surrounding healthy food consumption (e.g., worried about bodyweight). Also, whether shopping for, cooking, or serving healthy food is a source of daily stress among mothers is also an avenue for further investigation. Overall, children's stress did not appear to influence mothers' eating.

Limitations of the current study include a lack of information about other types of healthy foods consumed (e.g., whole grains, lean meats), the portion size, and nutritional content of food items. Additionally, the current study cannot disentangle the temporal (i.e., causal) direction of the associations between stress and eating. A further potential limitation is that the study did not assess stress during periods of the day when mothers may have been at work or children were at school. Last, the findings may not be generalizable to lower income families (especially those below the poverty level), single mothers, or mothers with lower education levels. Results also may not apply to father–child dyads or to young children or adolescents. Strengths of this study include the use of novel methodological and analytical techniques to assess day-level associations for actor and partner effects. These findings provide new insights into the roles of daily stress and family system dynamics in the eating behaviors of mothers and their children.

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