Examining Short-term Stability of the Mealtime Interaction Coding System (MICS)

Monica Mitchell, PhD, Carrie Piazza-Waggoner, PhD, Avani Modi, and David Janicke, PhD

Objective  This study assessed the stability of ratings on the McMaster Mealtime Interaction Coding System (MICS), an observational measure of family functioning, across three typical evening meals.  Methods  Participants included families of infants and toddlers with cystic fibrosis (n = 33) and with no chronic illness (n = 33). Three meals were videotaped across a 3-week period (M = 17.4 days) and involved a secondary data analysis from a larger study.  Results  Across both groups, test–retest reliability (paired correlation coefficients) was generally moderate, but significant, for all scales at each time point comparison. Analyses revealed no significant within- or between-group differences across time periods on healthy versus unhealthy ratings.  Conclusions  This study highlights the limitations of coding a single mealtime observation or interpreting multiple observations using the MICS. Findings highlight that family, meal, illness, and assessment factors may impact variability in ratings over time.

Key words  cystic fibrosis; family functioning; infants and toddlers; mealtimes; observational methodology

The Mealtime Interaction Coding System (MICS; Dickstein, Hayden, Schiller, Seifer, & San Antonio, 1994) is a commonly used measure that assesses family functioning during the mealtime. The MICS has a number of strengths. It is theory driven, based on the McMaster Model of Family Functioning (Miller, Ryan, Keiter, Bishop, & Epstein, 2000). It is an observational coding system that utilizes direct observation and assessment of actual behavior in the natural family environment. Finally, the MICS focuses on specific interactions and functioning around mealtimes. Mealtime is often related to a critical aspect of disease management and dietary intake for multiple chronic and acute health conditions (e.g., cystic fibrosis, diabetes, obesity, inflammatory bowel disease, and encopresis). As such, it provides a rich source of clinically relevant data (Dickstein & Martin, 2002; Jacobs & Fiese, 2007; Larson, Branscomb, & Wiley, 2006).

A variety of psychometric data have been reported on the MICS in previous studies. Construct validity is supported by the fact that the MICS Overall Family Functioning Scale is correlated with other widely used measures of family functioning, including the MCSIFF (McMaster Structured Interview of Family Functioning; r = .52) and Family Assessment Device (r = .33), both of which are also based on the McMaster Model of Family Functioning and have similar subscales. The MICS is also correlated with the Dyadic Adjustment (r = .29–.33), and Parent/Caregiver Involvement Scales (r = .38–.56; Hayden et al., 1998) which are based on family systems theory and have similar constructs with the MICS (e.g., communication). In addition, our previous work found a relationship between MICS Overall Family Functioning Scale and the Behavioral Pediatric Feeding Assessment Scale (Child Behavior—Frequency and Parent Behavior Frequency and Behavior—Problem Subscales) (r = −.52 to −.61; p = .01–.02; Mitchell, Powers, Byars, Dickstein, & Stark, 2004). These data provide evidence of the MICS validity. The MICS has been found to consistently differentiate families of chronic illness and normative samples (Janicke, Mitchell, & Stark, 2005; Mitchell et al., 2004). Higher scores on the Overall Family Functioning Scale of the MICS has also been correlated with lower score on mealtime behavior problems in children (r = −.55; Mitchell et al., 2004). Finally, inter-rater reliability has been demonstrated through adequate to strong interclass correlations on all MICS subscales. Average interclass correlations reported across five studies using the complete MICS ranged from .74 (for behavior control) to .86.
(for interpersonal involvement), with the average interclass correlation for overall functioning of .83 (Janicke et al., 2005; Janicke, Mitchell, Quittner, & Stark, in press; Mitchell et al., 2004; Spieth et al., 2001; Jacobs & Fiese, 2007). To date, the MICS has been used in a number of published pediatric CF, diabetes, asthma, and obesity studies.

Although validity data on the MICS and its subscales are newly emerging, previous studies have reported on only one observation or have reported on the MICS as part of a longitudinal design (observations reported over one to three years apart). One important area that has not been assessed is test–retest reliability of MICS scores across observations and scales. The interpretation of data from the MICS must be considered in light of test–retest reliability, which captures both changes in the phenomenon (e.g., family interactions) and how it is measured over time (e.g., MICS; DeVellis, 2003).

The purpose of the current study, a secondary data analyses of a larger study (Mitchell et al., 2004), was to examine the reliability of the MICS in assessing family mealtime interactions across a three-week period. Overall we predicted at least moderate reliability coefficients (.6 or higher) across the three assessment points on each of the MICS subscales; however, we expected some variability related to family/mealtime variables, and consequently, predicted that there would be differential test–retest trends across the subscales and groups (CF and nonchronically ill). Secondary aims were to examine stability in healthy versus unhealthy clinical ratings of family functioning. The results will inform previous and future research studies on the benefits and limitations of coding single versus multiple observations of family interactions. The findings will also complement the literature on consistency or stability in self-report and interview measures of family functioning, including McMaster measures, which are generally global, subjective, and tend to be stable over time (Miller et al., 2000; Neabel, Fothergill-Bourbonnais, & Dunning, 2000).

Method

Participants

Study participants included 66 children between the ages of 7 and 36 months and their families (families of children with CF = 33, families of healthy comparisons = 33). Participants with CF were recruited from one east coast, two mid-west, and one west coast clinic locations. Eligibility criteria for patients with CF included: age between 6 and 36 months, a diagnosis of CF, and no major comorbid medical diagnoses (e.g., cerebral palsy). Medical chart and database reviews were conducted to identify eligible families. Families were contacted by a member of the research team and interested families provided written consent prior to participation. The final sample included >80% of participants eligible for the original study. There were no significant differences between participants and nonparticipants on age and height/weight status. Children who did not have a chronic illness or a sibling with a chronic illness were recruited from the same cities as their matched counterpart via pediatrician offices and day-care centers for the healthy control group. The healthy control group was matched based on child age (within 3 months), gender, socioeconomic status (SES) (within one category), parent marital status, and number of siblings present at the meal. In the original study, the acceptance rate for those approached to participate was 94%.

Participants had a mean age of 18.4 months (SD = 7.9), 51% were males, 97% were Caucasians, the average number of children in the household was 1.9 (SD = 1.1), and the average number of adults in the household was 2.0 (SD = 0.2). Ninety-five percent of the parents were married, 3% divorced, and 3% were single.1 Regarding SES based on the Hollingshead Four-Factor Index (Hollingshead, 1975), 5% were Level II, 11% Level III, 45% Level IV, and 39% Level V, with higher levels representing higher SES (Table I).

Procedure

Study protocol and consent forms were approved by the Institutional Review Board at each site. For the original study (Mitchell et al., 2004), parents completed a 3-day weighed diet diary on the child with CF or the healthy control child and families participated in three home visits during which family evening meals were videotaped. During these home visits, a research assistant set-up the video camera and then left the room during the family’s meal. After completion of the meal, parents were asked to rate how typical the meal was when considering the child’s behavior and family interactions. Specifically, parents rated the typicality of each videotaped meal on a scale of “1” (not at all typical) to “5” (most typical possible). After the rating was completed, families who endorsed a rating of 1 or 2 were told that an additional meal would need to be completed. The family’s meals were videotaped until three meals were rated as typical (i.e., ratings from 3–5). The average number of home visits needed to collect three representative meals was 3.47 (SD = 0.59). The current study involved coding all three videotaped meals for each

1Marital status was missing for 26 of the families due to lack of data collection on this variable at one site.
The dimensions coded with the MICS parallel those assessed by other McMaster assessment devices: Task Accomplishment (the structure and flow of the meal; effective handling of transitions and disruptions), Communication (use of clear/direct as opposed to masked/indirect communication), Affective Interaction (appropriateness and intensity of affect in interactional exchanges), Interpersonal Involvement (quality of exchanges of thoughts, ideas, experiences), Behavior Control (flexibility/rigidity/consistency in disciplinary style), Roles (degree of adaptiveness, flexibility, and responsibility of roles), and Overall Family Functioning. The final dimension, Overall Family Functioning, is rated in its own right, according to specified criteria, and does not represent an averaging of the other six dimensions. Each dimension is scored on a 7-point scale ranging from 1 “very unhealthy” to 7 “very healthy.” Each dimension has a clinical cutoff score paralleling those established on the McMaster Structured Interview of Family Functioning. Ratings of less than “5” are considered in the “unhealthy range” and indicative of problematic functioning (e.g., families are chaotic, there is significant conflict, children/adults have poor behavioral control). Scores of “5” and greater are considered in the “healthy range” and indicative of adequate/good functioning (e.g., meals are well-planned and well-managed, communication is clear and direct, basic levels of concern and care are demonstrated). The validity of these cutoffs for the MICS have been supported by data demonstrating their utility in discriminating clinical families (mean rating on the dimension of overall family functioning = 4.75) from nonclinical families (mean rating = 5.36; Dickstein & Martin, 2002; Dickstein et al., 1998; Mitchell et al., 2004).

In rating the dimensions of the MICS, coders determine families’ scores on the 7-point continuum. While ratings are made on a Likert scale of 1 to 7, scores of less than “5” are viewed as categorically different than scores of “5” or greater. Coding of interactions begins when the meal starts, as indicated by the presence of food on the table and the initiation of eating by at least one family member. Coding terminates at the end of the meal or after 20 consecutive minutes, whichever occurs first.

In the current study, three reliable coders each coded one third of the tapes. Inter-rater reliability was calculated using intraclass correlations, which are appropriate for Likert ratings to evaluate exact agreement between raters. Coders were trained to reliability of .80 or greater by coding 30 previously coded archival videotapes. Mid-way through coding of tapes from the current sample, coders received onsite follow-up training to prevent “drift” in coding. In the current study, 10% of the meals were randomly selected and coded by a second rater. For this sample, intraclass correlations were within the acceptable range (Winer, Brown, & Michels, 1991; .60 or higher) for each dimension: Task Accomplishment = .64, Communication = .79, Affective Involvement = .85, Interpersonal Involvement = .83, Behavior Control = .81, Roles = .86, and Overall Family Functioning = .89. Task Accomplishment, though low, is within the acceptable range and is similar to other reliability data published using the MICS (Janicke et al., 2005; Spieth et al., 2001).

**Statistical Analyses**

Paired correlations were calculated to assess test–retest reliability for MICS scales between T1 and T2; T1 and T3;
and T2 and T3 for the total sample, as well as separately for children with CF and healthy controls. Second, group differences regarding healthy versus unhealthy Overall Family Functioning was examined using chi-squared analyses. Third, the stability of healthy versus unhealthy clinical cutoff groupings of Overall Family Functioning was assessed using a Cochran Q Test (e.g., an omnibus test), which evaluates differences among related proportions. Cochran Q Tests were conducted for the total sample, as well as separately for children with CF and healthy controls. Power analyses indicated that to detect a medium effect (r = .30) using a two-tailed test, an alpha set at 0.05, sample size of n = 66, power was .71. Significance was identified as \( p < .05 \).

### Results

#### Descriptive Data Regarding Meals

Regarding meal typicality, the final sample of 198 meals included 1% rated as “somewhat typical,” 34% as “typical,” 41% as “very typical,” and 24% as “most typical possible.” Actual meal length for each of the three meals averaged 19.2 min (range 8–52 min), 19.6 min (range 6–47 min), and 18.3 min (range 7–51 min), respectively.

The number of days between time points was calculated. The number of days between Time 1 (T1) to Time 2 (T2) was an average of 7.97 days (SD = 5.2); Time 2 (T2) to Time 3 (T3) was 9.68 (SD = 8.1); and T1 to T3 was 17.37 (SD = 10.26). There were no significant differences between Time Interval 1 (T1 and T2) and Time Interval 2 (T2 and T3; \( p = .168 \)).

#### Stability of Family Functioning for Total Sample and CF and Nonchronically Ill Groups

Paired correlations are presented in Table II. For the total group, results indicated statistically significant correlations for all time comparisons (T1 and T2; T2 and T3, and T1 and T3) for all MICS subscales. Though significant, reliability coefficients were low to moderate given that they were all below .60. When examining test–retest reliability in the CF and control groups, test–retest reliability rates were more variable (ranging from .17 to .70). Across the total sample and illness-specific groups, Communication, Interpersonal Involvement, and Overall Family Functioning subscales showed higher and more consistent test–retest reliability rates, while Task Accomplishment, Affect Management, Behavioral Control, and Role Functioning appeared to be less stable and variable. Role Functioning had few statistically significant correlations between time points for either group.

Secondary analyses were conducted to assess stability in Clinical MICS Scores by examining changes in healthy (score of 5–7) versus unhealthy functioning over time. Analyses indicated that 36–46% of the CF sample and 27–33% of the healthy comparison sample were in the unhealthy range of Overall Family Functioning across the three time points. Cross-sectional chi-squared analyses for each meal were conducted revealing no significant differences between groups regarding healthy versus unhealthy classification Meal 1 \( \chi^2 (1, n = 66) = 1.02, p = .315 \); Meal 2, \( \chi^2 (1, n = 66) = 1.61, p = .21 \); Meal 3 \( \chi^2 (1, n = 66) = 0.63, p = .43 \). The stability of clinical cutoff groupings (e.g., healthy vs unhealthy) were then examined across three time periods with the Cochran Q Test, which was not significant \( \chi^2 (2, n = 66) = 1.62, p = .45 \). Approximately 71% of the sample retained their healthy versus unhealthy grouping between Time 1 and Time 2, 74% between Time 1 and Time 3, and 76% between Time 2 and Time 3. Cochran Q Test performed for each group also revealed no significant differences in healthy versus unhealthy cutoff grouping across the three time periods [CF sample, \( \chi^2 (2, n = 33) = 1.39, p = .50 \); Control sample, \( \chi^2 (2, n = 33) = .46, p = .79 \)]. Within the CF sample, 67% retained their grouping between Time 1 and Time 2, 76% between Time 1 and Time 3, and 79% between Time 2 and Time 3. In the control group, clinical status was retained.

### Table II. Test–Retest Reliability: Paired Correlations

<table>
<thead>
<tr>
<th>Scale</th>
<th>CF</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1 and Time 2</td>
<td>Time 1 and Time 3</td>
<td>Time 2 and Time 3</td>
</tr>
<tr>
<td>Task accomplishment</td>
<td>0.44*</td>
<td>0.12</td>
<td>0.30*</td>
</tr>
<tr>
<td>Communication</td>
<td>0.56***</td>
<td>0.38*</td>
<td>0.49***</td>
</tr>
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<td>Affect management</td>
<td>0.17</td>
<td>0.40*</td>
<td>0.30*</td>
</tr>
<tr>
<td>Interpersonal involvement</td>
<td>0.42*</td>
<td>0.56***</td>
<td>0.50***</td>
</tr>
<tr>
<td>Behavior control</td>
<td>0.43*</td>
<td>0.13</td>
<td>0.35***</td>
</tr>
<tr>
<td>Role functioning</td>
<td>0.41*</td>
<td>0.19</td>
<td>0.34**</td>
</tr>
<tr>
<td>Overall functioning</td>
<td>0.56***</td>
<td>0.21</td>
<td>0.42***</td>
</tr>
</tbody>
</table>

* \( p < .05 \); ** \( p < .01 \); *** \( p < .001 \)
Discussion

Reliability and validity data are lacking on family assessment measures in general. Data on the MICS are only beginning to emerge and have primarily included construct validity data for a single mealtime observation. No studies to date have examined the short-term, test–retest reliability of the MICS. Findings from this study highlight the complexity of family functioning even within a short period of time (average of 17.4 days; SD = 10.3).

Specifically, differential trends in test–retest reliability across MICS subscales were identified. Constructs that represent more global aspects of family functioning, such as Overall Family Functioning, Communication and Interpersonal Involvement, achieved higher and more consistent test–retest reliability across groups. On the contrary, Task Accomplishment and Role Allocation, the scales that are more proximal to meal factors (e.g., efficiency), had the lowest test-retest reliability. Finally, Behavioral Control and Affect Management, which could be based on stability and meal reactivity factors, were moderate in test–retest stability, relative to global constructs (which were higher in reliability) and meal factors (which were lower in reliability). Although reliability ratings were generally lower than predicted, trends among subscales were generally consistent with FAD test–retest reliability data. Overall, the data support the dynamic and reciprocal nature of family interactions; while the family's interactions and interpersonal styles are more stable, the family system changes in relation to proximal daily demands. This is further supported by the moderate to high consistency (>70%) in families maintaining their clinical grouping (healthy vs. unhealthy) across assessments.

These findings need to be considered in the context of study limitations, which include small sample size and variability in who was present at meals, where families ate dinner, and the scheduling of these dinner meals (e.g., number of days between meals, dinner times). In addition, our sample only included infants and toddlers ages 7–36 months who were of middle to high SES. Although the age span was narrow (30 months) relative to many pediatric studies, the developmental time frame is broad with respect to feeding behaviors and social development. In fact, the variability in child development may have contributed to observed variability in family functioning. Inherent in the developmental limitations of the study is the fact that the findings may not be generalizable to families of older children (Bihum, Wamboldt, Gavin, & Wamboldt, 2002).

This study highlights the potential limitations of coding a single mealtime observation using the MICS, particularly when interpreting meal-specific subscales or those that may be sensitive to mealtime or reactivity factors. Additionally, findings draw attention to the fact that a complex set of variables are involved in MICS ratings, including developmental, family, meal, illness, and assessment/coder factors that may individually and collectively impact stability in ratings over time. Overall, trends were consistent with family systems theory in general and published data on the FAD in particular. Specifically, global factors of family functioning (e.g., communication which assesses family's ability to discuss day to day issues) were more stable than trait or situational mealtime factors (e.g., task accomplishment: families' efficiency in serving and eating the meal). Future research studies using a larger sample could better discern sources of variability and better determine whether multiple MICS assessments provide added value relative to the time and expense needed to capture, code, and analyze these data. It will also be important to clarify how the influences of short-term family functioning are related to long-term child and family outcomes.

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Conflicts of interest: None declared.

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References


