

## Measurement Article

# Development and Inter-Rater Reliability of the Mealtime Scan for Long-Term Care

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## Abstract

**Background and Objectives:** Poor food intake is common in long-term care (LTC). The mealtime experience has been identified as influential, yet, research has been limited by lack of quality, standardized measures. The purpose of this study was to develop and test for inter-rater reliability the Mealtime Scan (MTS), an observational measure.

**Research Design and Methods:** MTS was derived from the literature on ambiance, mealtime experience, social interactions at mealtimes, and social models of care. Three scales on person-centered care and physical and social environments are used to summarize key aspects observed with MTS. Two raters assessed MTS for reliability at 30 different meals conducted in 10 dining rooms, within three LTC residences. Intraclass correlation coefficient (ICC) was used to assess reliability.

**Results:** MTS demonstrated good to excellent reliability on the three summative scales (physical ICC = 0.73, social ICC = 0.81, person-centered care ICC = 0.83) and other scalable items had good to excellent reliability (e.g., background noise ICC = 0.65, Mealtime Relational Care checklist: negative interactions ICC = 0.85).

**Discussion and Implications:** MTS is reliable and face valid for assessing mealtime experience. Future work will explore construct validity of this measure. MTS can be used to support improving the mealtime experience for residents living in LTC.

**Keywords:** Eating environment, Residences, Measurement

Poor food intake is common in long-term care (LTC; [Aghdassi, McArthur, McGeer, Simor & Allard, 2007](#); [Engelheart & Akner, 2015](#); [Ongan & Rakicioğlu, 2015](#)). Many factors have been suggested or found to be associated with food intake of residents and they have recently been conceptualized into the Making the Most of Mealtimes model ([Keller, Carrier, Duizer, Lengyel, Slaughter & Steele, 2014](#)) under the domains of meal quality, meal access, and mealtime experience. Several studies suggest the importance of the mealtime experience to food intake, sometimes described as the “ambiance” ([Nijs, de Graaf, Kok & van Staveren, 2006](#)) of mealtimes. Yet, research on aspects and variables constituting an ideal experience to support resident quality of life and food

intake is limited. Research to date suggests both physical and psychosocial environments are important at mealtimes and specifically: type and availability of music; home like décor (e.g., pictures, tablecloths/place mats, dishware); orientation cues (e.g., clocks, food aroma); smaller dining areas; table groupings to support interaction (and including staff at the table); involving residents in meal activities; and no other care activities occurring at mealtime ([Vucea, Keller & Ducak, 2014](#); [Abdelhamid, et al. 2016](#); [Bunn, et al. 2016](#)).

Models or theories that support the importance of the mealtime experience and have defined essential aspects of this experience can be extrapolated to the LTC context. Specifically, the Five Aspects of the Meal Model describes

the key elements as: the room (e.g., décor, lighting, sound, color, textiles), the meeting (e.g., the social interactions that occur such as staff to resident, resident to resident, and staff to staff), the product (e.g., the foods and beverages provided, their quality and meeting the needs, and preferences of those eating), the management control system (e.g., work environment, organization, labor laws, efficiency to provide food, and at the right temperature); with all of these working together to result in the final aspect of the “atmosphere” (perception of the total environment), or in essence the mealtime experience (Edwards & Gustafsson, 2008). The authors suggest that although this model was originally based on restaurant meals, it has application to institutions such as care homes. The Life Nourishment Theory developed specifically for persons with dementia, also has relevance to the mealtime experience for residents in LTC (Genoe, Dupuis, Keller, Schindel Martin, Edward, & Cassaloto, 2010; Keller, Schindel Martin, Dupuis, Genoe, Edward, & Cassaloto, 2010). This theory identifies the psychosocial aspects of mealtimes that make them meaningful. Specifically, meals are an ideal time for connecting with others and participating psychologically (Keller et al., 2010). Meals also afford the opportunity to support and honor an individual’s identity. For example, people can be involved in meaningful roles and have their dignity upheld by being able to make choices and being acknowledged as an individual (11; Genoe et al., 2010). Together, these two models/theories provide a strong foundation for considering how to improve the mealtime experience of older adults living in care homes.

Prior work suggests that concepts and factors consistent with these frameworks can be implemented and have an impact. For example, Nijs, de Graaf, Kok & van Staveren (2006) improved the mealtime ambiance in Dutch nursing homes by changing meal provision (i.e., food placed on the table for self-service) and eating situations (i.e., staff members sitting and chatting with residents while eating). Food intake, body weight, and quality of life of residents improved (Nijs et al., 2006). However, the researchers did not fully connect the mechanisms of these ambiance changes to these outcomes, but suggested that the full “package” needed to be implemented as the effects of specific activities could not be determined (Nijs et al., 2006). Specifically considering the psychosocial environment, others have suggested that when choices at mealtime (e.g., food, where to sit, when to eat) are provided, residents have improved outcomes (Desai, Winter, Young & Greenwood, 2007; Kenkmann & Hooper, 2012). As well, interventions focused on making the mealtimes more intimate and involving residents in various mealtime roles have potential to improve quality of life, satisfaction, and feelings of happiness (Huang, Li, Yang & Chen, 2009; Mattson & Gallant, 2012; Perivolaris, LeClerc, Wilkinshon & Buchanan, 2006; Roberts, 2011; Ruigrok & Seridan, 2006). However, these studies often lacked rigor; despite making notable changes in the ambiance, researchers failed to adequately measure changes made. Thus, it

is difficult to identify what mechanisms were influential and should be the core components of any intervention to improve the mealtime experience.

The mealtime experience has been shown to be an important aspect of LTC and residential care environments, influencing food intake, quality of life, and perhaps other outcomes relevant to residents and homes (Vuca et al., 2014). A recent research agenda focused on improving food intake and mealtimes ranked the dining environment as number three in terms of importance (Keller, Beck & Namasivayam, 2015). Yet, research will continue to be limited in this area by lack of a standardized tool to assess physical and psychosocial aspects of the mealtime environment. Such a tool could not only help to differentiate ambiance in various settings, but could be used as a basis to transform and improve the mealtime experience. The first objective of this study was to describe the development of the Mealtime Scan (MTS), a standardized measure to assess the varied factors that influence ambiance at mealtimes in LTC. The second objective was to describe the inter-rater reliability of the scan using two trained assessors in several dining rooms and over several meals.

## Design and Methods

### Development of the MTS

The MTS for LTC was developed to objectively measure the psychosocial and physical environments in shared dining environments when they were in use for a meal; in essence to capture the mealtime experience. A tool focused on the physical environmental features that support home likeness and functionality, the Dining Environment Assessment Protocol (DEAP), was already developed and is used to assess the environment when the dining room is empty (Chaudhury, Keller, Pfisterer, & Hung, 2016). A complementary tool to measure the mealtime experience while a meal was taking place was considered necessary for fully understanding the influence of the ambiance on food intake and other outcomes. The primary author had participated in several studies focused on mealtimes that led to the development of the MTS. Specifically, the Eating Together Study defined what persons with dementia and their family care partners considered meaningful to the mealtime experience. Key findings indicated that mealtimes were essential for building and sustaining connection within families (Keller et al., 2010) and that meals provided an opportunity for individual identities to be honored and respected (e.g., roles, preferences, choices, etc.; Genoe et al., 2010). Subsequent to this study, several investigations in LTC and retirement residences helped to identify poor and better ambiance at mealtimes. For example, an observational study described the types of social interactions that occurred at mealtimes in retirement homes (e.g., making conversation, excluding/rebuffing) and the physical and psychosocial features (e.g., physical environment, resident characteristics) that influenced these interactions were described (Curle & Keller,

2010). As persons with dementia and/or their care partners were followed as they transitioned into residential care living, the changes they experienced in mealtimes were noted (Henkusens, Keller, Dupuis, & Schindel Martin, 2014). Of specific relevance was the “institutionalizing” of meals to be inflexible, task-focused events. A review of the literature identified how person-centered care at mealtimes was conceptualized and confirmed the “promise of mealtimes” as a time for social interaction, choice, and the showing of respect (Reimer & Keller, 2009). Finally, an opportunity to observe and study a home transitioning from a medical model to a social model of care resulted in the identification of observable changes at mealtimes that improved the mealtime experience. These changes included physical features of the dining space, as well as the way the meals were provided and the interactions among residents and staff at mealtimes (Ducak, Sweatman & Keller, 2015). This study helped to describe the end goal of a social model of care at mealtimes or “relational meals”. Relational meals are more home like, with family and residents feeling relaxed and accepted in the environment. They are person-centered in that the needs, preferences, and choices of residents are known and fulfilled. Opportunities for psychological and social engagement exist for all residents, even those who are unable to verbally communicate. Rapport exists between residents, family, and staff, such that they have mutually beneficial relationships, consistent with a family home (Ducak et al., 2015).

Based on this vein of research, the mealtime experience to be measured by MTS was conceptualized as the psychosocial environment that leads to relational meals, as well as the physical or built environmental features that impact this psychosocial environment. Prior work suggests that the physical and psychosocial aspects of the mealtime environment are inextricably linked (Edwards & Gustafsson, 2008; Ducak et al., 2015). Physical environmental features that support the psychosocial environment included on MTS were: lighting levels, number of residents, staff and others in the dining space, number involved in specific roles (e.g., passing plates, providing eating assistance); presence of orienting cues, such as place mats, as well as food smells, measured temperature and humidity, and television or music type and level and if this interfered with conversation. Sound level in decibels (dB) was also included on the MTS as well as a background noise level scale rating to capture aberrant noise, based on 11 sounds commonly observed at mealtimes in LTC (e.g., noise from carts, overhead speakers, residents calling out) that could negatively affect the mealtime experience. Each item was ranked from 0 (low/absent) to 4 (high/frequent) and the 11 ratings were summed for an overall background noise level score. These features are detailed in Supplementary Appendix Table 1.

The psychosocial features included on MTS were based on the prior work by the first author (Ducak et al., 2015; Henkusens et al., 2014; Reimer & Keller, 2009). These aspects were captured in a checklist of observable relational

care practices that demonstrated the promotion of choice, dignity, autonomy (e.g., asking permission to assist resident), and social inclusion. Seven items were specifically focused on how staff interacted with persons receiving eating assistance. Two questions were focused on meal clean up that demonstrated less institutional practices (e.g., not using a trolley to remove dishes). The checklist consists of positive and negative statements for the same observable practice; it was anticipated that both positive and negative behaviors could be observed during an entire meal. This was named the Mealtime Relational Care Checklist (M-RCC) as scores can be derived from these items alone. Positive items are provided in Supplementary Appendix Table 2. From all of this collected data, three summative scales were used to rate the physical, social, and person-centeredness of the environment. These summative scales were conceived as the primary variables that would be included in any subsequent analysis to differentiate the mealtime experience among observations, dining rooms, homes, etc. and as they address different aspects of the mealtime, are analyzed as stand alone variables. A numerical rating scale was desired for use in future analyses when comparing these aspects of mealtime experience to outcomes such as food intake or quality of life. The descriptors for points on these scales are provided in Supplementary Appendix Figure 1.

A pilot study focused on identifying determinants of food intake in LTC, provided the opportunity for the first author to test out various iterations of the tool. Co-authors and co-investigators on the Making the Most of Mealtimes project were intimately involved in this developmental phase, providing reviews, and suggestions for various iterations. A protocol for completion of the MTS was also developed for training and reference purposes. An assessor completes the MTS during a meal; they enter the environment before a meal service begins so that no observations are missed. The beginning of meal service is defined as at least one staff and one resident being present in the dining room with the intent of starting the meal. Seated in an area where the assessor can view much of the dining area, she/he observes the meal processes and interactions. If an area is not readily visible from this vantage point, the assessor may relocate during the meal. At the end of the meal, the MTS items are reviewed and the three summative scores for physical environment, social environment, and person-centered care are completed by providing a ranking from 1 (low) to 8 (high) based on the various MTS items (see Supplementary Appendix Table 1) associated with these aspects of the mealtime experience (Physical: 1 = unpleasant /unsupportive (e.g., temperature, noise, lighting), 8 = pleasant, supportive; Social: 1 = quiet, low engagement of residents, task focussed, 8 = appropriate level of interaction, residents engaged, mealtime is an event; Person-centered care: 1 = undignified, task focused practices, 8 = dignified, person-centered practices). Descriptors for points on these scales are provided to promote consistency in scoring (see Supplementary Appendix Figure 1).

## Inter-Rater Reliability Testing

Two assessors, one very familiar with mealtime environments and another relatively novice to LTC, were recruited and trained to conduct this reliability study. The inclusion of a less experienced assessor was desired to demonstrate that with training, assessors could be reliable in their completion of the MTS, even when their experience in residential care assessment is limited. The first and second authors trained the assessors using the protocol to ensure each item on the tool was clear.

A single for-profit residential care provider that had several LTC homes from which to choose for testing the MTS served as the context for reliability testing. Homes that had been constructed over the period of two decades were chosen to ensure some variety in the physical dining spaces. Key personnel in the corporate administration discussed the project with management and staff at the three homes chosen to participate; communications included in-person meetings at shift change and a description of the project for the communication book and resident newsletter. Each home had at least two LTC dining areas to include in the study and the most diverse areas (e.g., size, layout) were selected for observation. Data were collected over 11 days and all meals were represented. A notice was put up in each dining room on the day in which a scan would take place; personal consent from staff and residents was not deemed necessary from the ethics board. On the day of a scan, the assessors introduced themselves to the director of care and other key nursing personnel. They wore nametags that included their university affiliation. If residents or staff asked them why they were in the dining room the assessors introduced themselves and provided a standard response that they were testing a new form that helped to capture what went on in the dining area.

Ten dining rooms were selected to promote as much diversity as possible in terms of size and resident profile; each dining room was observed at a breakfast, lunch, and dinner for a total of 30 observations. Assessors sat beside each other for the duration of the mealtime observations. When changing locations, both researchers changed locations at the same time. An environmental meter (Shimada SHSEHY002) was used to determine luminescence (lumens), humidity (% relative humidity), temperature (Celsius), and sound (decibels) at a peripheral and central location in the dining area, at the beginning and half way through the meal (4 ratings per meal for each assessor). Meter readings were taken sequentially by each assessor at the level of the dining tables in the room. When assessors were unable to observe the entire dining room at once (i.e., the dining room was in a U configuration), researchers observed each half of the dining room together. Assessors left the dining area at the same time but did not compare their forms. Data were entered into individual databases when all data collection was completed; data were merged and checked by one assessor prior to analysis. Ethical clearance was provided by a University of Waterloo research ethics board (#20044).

## Statistics

Descriptive analyses (e.g., average frequency, mean, standard deviation) were completed for each item and the summed scales on MTS using the first rater's data and observations. Inter-rater reliability was assessed on five scalable items of the MTS; background noise level rating, the M-RCC (summed positive and negative and the ratio of positive to negative), and the three summative scales with ratings from 1 to 8 for physical and social environments and person-centeredness. Intraclass correlation coefficient (ICC) using a two-way random model of absolute agreement was used to determine reliability for all scales. An ICC value greater than 0.75 was considered "excellent", 0.60–0.74 "good", 0.40–0.59 "fair", and <0.4 considered "poor" (Cicchetti & Sparrow, 1981; Shrout & Fleiss, 1979).

## Results

Of the 10 dining rooms observed, 70% were in dementia care units. Table 1 provides descriptive results of mealtime characteristics assessed by MTS. Most residents had meals with others in the dining room (mean  $n = 24.1$   $SD 3.7$ ), and relatively few residents ate in an adjacent dining area ( $n = 0.8$   $SD 1.2$ ). Relatively few residents required total eating assistance, ( $n = 4.0$   $SD 2.2$ ), and on average, 3.1 ( $SD 1.4$ ) staff were involved in assisting at the meals observed. There were on average 3.5 cues ( $SD 1.5$ ) that it was mealtime (e.g., aroma, table settings). No residents were observed to be participating in mealtime activities (e.g., setting table, clearing table), and there was no television present in the dining areas. Ten meals had music playing during the meal; six had contemporary music, three had cohort specific, and one had music with lyrics.

Descriptive statistics for scales and scores and inter-rater reliability statistics are provided in Table 2. The average rating of positive to negative practices on the M-RCC was relatively low at 1.3 ( $SD 0.35$ ) and the social environment scale had the lowest rating of 3.7 ( $SD 2.2$ ) out of a potential 8. The physical environment summative score was highest (mean 4.9  $SD 2.2$ ) with the person-centered care scale having a mean score of 3.9 ( $SD 2.1$ ). Overall, the inter-rater reliability for MTS scales/scores was very good with the lowest being for background noise level (ICC = 0.65) and the highest being for the summed negative practices on the M-RCC (ICC = 0.85).

## Implications

Mealtime experience and ambiance in LTC are thought to be important contributors to residents' quality of life, satisfaction, and food intake. Yet, lack of a reliable and valid measure to assess the mealtime experience has resulted in limited research in this area. Other measures have been developed to track social interactions at mealtimes in care environments (Dubé et al., 2007; Keller, Laurie, McLeod & Ridgeway, 2013); however, these tools are focused on interactions between tablemates/staff at the table level, and do

**Table 1.** Descriptive Characteristics of Dining Areas Assessed by MTS ( $n = 30$ )

Characteristic	Mean (SD)	Min/Max
Light (lux)	432.0 (237.2)	135.3/1318.8
Temp (°C)	23.5 (1.9)	19.4/27.4
Humidity (RH)	33.4 (6.4)	23.8/49.0
Sound (db)	66.6 (3.7)	61.0/73.5
Total persons in dining area	24.0 (3.7)	17/29
Residents alone at a table	1.8 (1.7)	0/7
Residents eating with others	22.4 (4.4)	11/29
Residents requiring total physical assistance	4.0 (2.2)	0/9
Staff involved in eating assistance	3.1 (1.4)	0/6
Staff only involved in plating, passing food	2.2 (0.9)	0/4
Family/volunteers	0.4 (0.6)	0/2
Other persons	1.2 (0.6)	0/3
Residents eating in adjacent area	0.8 (1.2)	0/4
Family members in adjacent area	0.2 (0.9)	0/5
Staff in adjacent area	0.0 (0.0)	—
Sum of orientation cues present (max score: 7)	3.5 (1.5)	0.0/ 6.0
Residents participating in mealtime activities	0	0
Television present in dining room (# of meals)	0	0
Music playing during meal (# of meals)	10	—
Ratio of M-RCC (SUM +ve: SUM -ve interactions)	1.3 (0.4)	1.0/ 2.0

Note: M-RCC = Mealtime Relational Care Checklist; MTS, Mealtime Scan.

**Table 2.** Inter-Rater Reliability of Key Features of MTS ( $n = 30$ )

MTS component	Description of component	Inter-rater agreement (ICC)	F statistic and p value	Mean (SD)
Background noise level	Sum of 11 items ranked	0.65	$F = 2.88$ (29) $p = .003$	6.7 (7.7)
M-RCC	Sum of NEGATIVE practices	0.85	$F = 6.68$ (29) $p < .001$	15.6 (3.4)
	Sum of POSITIVE practices	0.73	$F = 3.65$ (29) $p < .001$	18.8 (2.4)
Summative scales	Physical environment	0.73	$F = 3.66$ (29) $p < .001$	4.9 (2.5)
	Social environment	0.81	$F = 5.12$ (29) $p < .001$	3.7 (2.2)
	Person-centered care	0.82	$F = 5.545$ (29) $p < .001$	3.9 (2.1)

Note: ICC, intraclass correlation; M-RCC = Mealtime Relational Care Checklist; MTS, Mealtime Scan.

not capture the overarching mealtime experience or ambiance of dining rooms. This article describes the development of the first standardized measure of the mealtime experience, the MTS. This instrument measures social, person-centered care, and physical environment features believed to impact the mealtime experience for residents. Subscales were found to have good to excellent reliability. The three summative scales, anticipated to be used to describe the mealtime experience in future analyses, were rated as excellent; all of their ICC were close to or above 0.75 (Cicchetti & Sparrow, 1981; Shrout & Fleiss, 1979).

The MTS was created for research purposes, but could be used by individual LTC homes to identify areas for quality improvement. Specifically, the M-RCC checklist could

be used as a self-monitoring tool on positive practices consistent with relational meals (Ducak et al., 2015; Reimer & Keller, 2009). Further work could involve formatting and revising the M-RCC to promote ease of use with a focus on educating staff and management. A detailed manual supports the training of assessors on the key aspects of MTS. In this study, the mealtimes were rated more positively for the physical environment, but less so for the social and person-centered care aspects of the mealtime experience. The average score for these latter summative scales was below 4 on a scale of 1 to 8, indicating that improvements are needed in these homes to promote these aspects of the mealtime experience. As well, there were only 30% more positive than negative interactions observed with the M-RCC

checklist. Future research should also consider if these summative scales are predictive of resident food intake, satisfaction, and quality of life. If there were significant associations, this would reinforce the importance of home and staff self-assessment and engaging in improvement efforts to promote these aspects of the mealtime experience.

Considering all aspects on the MTS, the environmental meter used to measure luminescence, sound, humidity, and temperature, was likely the least convenient to complete. Although the meter was hand held, it is not inconspicuous and the protocol required the assessor to use the meter at the first and second course at two locations in the dining room. This required movement (including to the center of the dining area for a measurement) was potentially disrupting to the mealtime environment. The summative physical environment rating considered these aspects collected with the environmental meter as well as orientation cues, television/radio use, and level of background noise to identify a pleasant/supportive and unpleasant/unsupportive environment. The assessor's perception of sufficient lighting and temperature might have been sufficient. Further, the background noise level subjectively rated throughout the meal was likely more representative of excess sound than the measures taken only twice with the environmental meter. Thus, this aspect of the MTS is potentially optional for those who would like to use MTS, but do not have access to such a meter. The DEAP measure also captures aspects of adequate lighting and glare in dining rooms and how temperature is controlled (Chaudhury et al., 2016).

Although the MTS is reliable, further testing on a wider range of mealtime experiences with varied sizes of dining spaces and configurations is needed. The MTS resulting from this work was used in the Making the Most of Mealtimes prevalence study (Keller et al., 2016). A total of 82 different dining rooms in 32 LTC homes across four Canadian provinces were assessed with MTS. Each dining room was assessed four to six times with the MTS. This research will provide the opportunity to examine individual features of MTS, which are most influential for the summative scales, as well as conducting construct validity of these summative scales and the M-RCC. Specifically, it will provide the opportunity to determine if the environmental meter readings were influential for the overall physical environment rating, or if it could be considered optional. Other suggested improvements to the MTS could include the addition of further social interaction items; currently, the observable social interactions embedded within the M-RCC checklist are not inclusive of all potential interactions that could occur (Curle & Keller 2010). Finally, the M-RCC scoring could be improved. Currently, a sum of positive or negative interactions, as well as a ratio based on these two sums can be used in analyses. This form of analyzing the M-RCC items is likely sufficient for a prevalence study to describe variation. However, for an intervention study where improvements in practice might be gradual, some form of scoring for each item (e.g., 0 low/absent, to 4 high/frequent) would be required to demonstrate change.

This first study developing and testing reliability of the MTS is not without limitations. Specifically, only 2 assessors, 10 dining rooms, and 30 meals were used. Although this was sufficient to demonstrate good to excellent inter-rater reliability on MTS scales, greater diversity in the dining rooms would have been beneficial. The three homes participating in the study, which were part of the same corporation, had relatively consistent physical features. Future research should include more than two assessors, more diverse dining rooms and types of LTC homes. Finally, it cannot be neglected that having assessors in the dining room likely changed the psychosocial environment in some way. Although this would not affect the inter-rater reliability results presented here, considerations in how to overcome these observer effects are required for future research and practice. Assessors were instructed to not discuss and share results from their observations; there is the potential however that one assessor saw another's form as they were in close proximity. Future testing of reliability should consider placing assessors at different vantage points.

The Meal Time Scan is a face valid and reliable measure for assessing mealtime experience in LTC residents; the three summative scales of physical and social environments, and person-centered care, can be used with confidence in research. This observational measure requires minimal training to be used with accuracy and a manual supports this training. Abstraction of key concepts from the Mealtime Relational Care checklist could be used to support practice change among staff.

## Supplementary Material

Supplementary data are available at *The Gerontologist* online.

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## Conflicts of Interest

All authors declare no conflicts of interest.

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