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Mealtime Nonverbal Behaviors in Nursing Home Staff and Residents with Dementia: Behavioral Analyses of Videotaped Observations

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Abstract

This study characterized mealtime nonverbal behaviors of nursing home staff and residents with dementia and examined the relationships between individual characteristics and nonverbal behaviors. Videotaped observations (N=110) involving 25 residents and 29 staff (42 unique staff-resident dyads) in 9 nursing homes were coded using the refined Cue Utilization and Engagement in Dementia Mealtime Video-Coding Scheme. Wilcoxon rank-sum test or Kruskal-Wallis test were used for continuous characteristics, and Fisher's exact test for categorical characteristics. Residents primarily exhibited challenging behaviors including resistive behaviors (35.7%), chewing/swallowing difficulties (33.5%), and functional impairments (9.9%), followed by positive/neutral behaviors (20.9%). Staff primarily used person-centered behavioral strategies, including modifications of: 1) resident abilities (41.9%), 2) care approaches (35.1%), and 3) dining environment (13.6%), followed by task-centered behaviors (9.3%). Residents challenging behaviors were correlated with staff person-centered behavioral strategies. Dyadic nonverbal behaviors were correlated with multiple individual characteristics. Understanding dyadic nonverbal interactions facilitates use of person-centered, multilevel, behavioral strategies to optimize mealtime outcomes.

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Description of authors' roles

W. Liu contributed to study design, video screening and coding, data analysis and synthesis, and writing and revision of the manuscript. K. Williams is the Principal Investigator (PI) of the parent study from which videos used in this study were collected. M. Batchelor contributed to the original version of the CUED coding scheme. K. Williams and M. Batchelor also contributed to technical support for the Noldus Observer XT software, and revision of the manuscript. E. Perkhounkova contributed to data analysis, interpretation of findings, and manuscript draft and revision. M. Hein contributed to data cleaning and management, and manuscript revision. All authors meet the criteria for authorship and have approved the final draft submitted. All those entitled to authorship are listed as authors.

Conflict of interest statement

No conflict of interest has been declared by the authors.

Keywords

dementia; mealtime; communication; nonverbal behaviors; nursing home; video-coding; behavioral analysis; person-centered; task-centered; dyadic interaction

Introduction

The number of people living with dementia has been increasing dramatically worldwide. Mealtime is an important component of daily life to maintain function, hydration, nutrition, and social engagement. People with dementia in nursing home settings (residents) often demonstrate behavioral and psychosocial symptoms during mealtime that are perceived as challenging behavioral responses by staff. Based on the Consequences of Need-driven, Dementia-compromised Behavior (C-NDB) model [1, 2] and the Progressively Lowered Stress Threshold (PLST) model, [3] people living with dementia experience neurodegenerations that induce increased difficulties communicating their needs as well as increased vulnerability to stressors, which contribute to challenging behavioral responses in daily care situations. In addition, people living with dementia experience progressive changes in biological and motor function, taste and smell function, as well as the ability to tolerate the texture of regular food. [4] These changes further lead to poor appetite, changes in dietary habits, lack of alertness, decline in oral health and hygiene, and inability to plan and perform complex mealtime activities, and ultimately result in low food intake, negative functional and nutritional consequences, and increased medication use. [4–6]

In nursing homes (NH), direct care staff (staff) provide the most mealtime care and have the most opportunities to engage residents in eating. Optimal mealtime care is critical to engage residents in mealtime activities and social conversations and is associated with resident function and food intake. [7–9] Person-Centered Care is defined as a philosophy of care built around the needs of the individual and dependent upon knowing the individual through interpersonal relationships, [10] and is highly recommended as the fundamental principle for quality dementia care practice by Alzheimer's Association. [11]

Person-centered mealtime care features multifaceted and individual-oriented care and attends to "individualized abilities, likes, and dislikes; dignity, respect and choice; the dining process and environment; health and biological considerations; adaptations and functioning; and food, beverage and appetite". [11] Task-centered mealtime care prioritizes mealtime activities without appropriate consideration of individual needs and preferences, and focuses on completing the activities *for* the residents rather than *with* the resident in an engaging approach. [12, 13] Both person-centered mealtime care and Stopping Eating and Drinking by Advanced Directives (SED by AD) are resident-oriented, preference-based care principles. However, person-centered mealtime care focuses on optimizing care quality and resident outcomes, in contrast to SED by AD as a means of hastening death which was recommended against by the Ethics Committee of AMDA - The Society for Post-Acute and Long-Term Care Medicine. [14]

Mealtime is a complex, interactive, and dynamic process that involves intensive dyadic interactions, especially for residents who need verbal and/or physical assistance. [9, 12, 15]

Resident nonverbal behaviors during mealtime may not be accompanied with verbal behaviors and can be difficult to understand; therefore, these nonverbal behaviors should be interpreted cautiously. Staff perceive resident mealtime nonverbal behaviors to be important, but their interpretations have been heterogeneous and often at one extreme or the other: positive behaviors are often interpreted by staff as a “will to live” and challenging behaviors as a “will to die”.[16] More information on the patterns and characteristics of dyadic nonverbal behaviors is needed to better understand how staff and residents interact during mealtime and how the quality of dyadic nonverbal behaviors differs by individual characteristics of staff and residents.

The use of videotaped observations allows in-depth viewing and analyses of behaviors is an ideal approach to characterize staff and resident mealtime behaviors, but may be limited due to lack of quality video data and psychometrically sound tools. [17] Existing tools are primarily developed for real-time on-site observations, assess either staff or resident behaviors, focus on resident challenging rather than positive/neutral behaviors, and/or have limited psychometric evidence. [17]

It is critical to assess both resident positive, neutral, and challenging behaviors as well as staff person-centered and task-centered behaviors during mealtime care from verbal and nonverbal perspectives. To address this need, the refined Cue Utilization and Engagement in Dementia (CUED) Mealtime Video-Coding Scheme was developed and validated, and showed evidence of feasibility, ease of use, reliability, and validity. [17] Using the refined CUED and videotaped observations, our recent work characterized staff-resident (dyadic) mealtime verbal behaviors as well as their relationships with resident food intake. [15, 18] Findings show that staff spoke three times more frequently than residents, and verbal communication was predominately person-centered from staff (99.2%) and positive from residents (85.1%). [15] In addition, meal intake was associated with dyadic verbal behaviors. [18]

Dyadic verbal and nonverbal behaviors are important cues that impact the quality of mealtime care and resident food intake. Prior work on dyadic interactions during routine care is limited because it fails to separate verbal and nonverbal behaviors of staff and residents; [19–21] focuses on either verbal or nonverbal behaviors; [16] or focuses on resident challenging rather than positive/neutral behaviors. [22, 23] Many residents, especially those with advanced dementia, may experience decline or loss in their ability to communicate verbally, and therefore mostly rely on nonverbal behaviors to communicate their needs, preferences, and conditions.[24] While evidence on dyadic verbal interactions during mealtime is emerging, [15, 18] research on their nonverbal interactions is limited. Both staff person-centered and task-centered nonverbal behaviors as well as resident positive, neutral, and negative nonverbal behaviors are critical components of mealtime dyadic interactions and should be examined. Additionally, future research is needed to better understand how staff can facilitate the transition of neutral or challenging behaviors into positive behaviors, as well as to explore the factors at resident, staff, and facility levels that may influence the quality of mealtime care interactions. [19, 21]

Objectives

This descriptive study aimed to characterize: 1) mealtime dyadic nonverbal behaviors, 2) relationships among staff and resident nonverbal behaviors, and 3) relationships between individual characteristics and nonverbal behaviors of staff and residents. It is hypothesized that staff nonverbal behaviors and resident nonverbal behaviors are correlated, and that staff and resident nonverbal behaviors are correlated with individual characteristics. Findings of this study will guide development of research hypotheses for future research by identifying potential staff or resident nonverbal behaviors and individual characteristics that may explain mealtime dyadic interactions.

Material and methods

Design

This study was a secondary analysis of videotaped observations of mealtime interactions collected during a randomized controlled trial during 2011-2014. The parent study, a dementia communication training program (Changing Talk [CHAT]) was developed for NH staff to reduce their use of elderspeak with the primary outcome of subsequently reducing resident resistiveness to care.[25] Ethical approvals were obtained through Institutional Review Boards of the university where the parent study and this study were conducted.

Participants

In the parent study, a convenience sample of staff and residents were recruited. Residents who had a diagnosis of dementia, long-stay status, resistiveness to care based on staff-report, the capacity to hear staff communication, and a surrogate decision maker who provided informed consent were eligible.[25] Staff who were a permanent employee, over 18 years old, spoke in English, and provided direct care for a resident participant ≥2 times/week during the previous month were eligible. A total of 127 staff and 83 residents from 13 NHs in Kansas, United States, were recruited in the parent study. Video-taped observations were collected during morning care activities 2 days at three time points: before the training, after the training, and three-month follow-up. A total of 1,125 videos were recorded before the training and captured staff-resident interactions during select activities of daily living (including mealtimes) that represented most intensive communication between residents and staff.

For this secondary analysis, we screened videos collected in the parent study. Videos were included if they: 1) captured mealtime activities before staff training, 2) had a duration of ≥1 minute, 3) captured interactions between one primary staff and one resident, and 4) had adequate quality to capture verbal and nonverbal behaviors. Among the 1,125 videos that were screened, 110 were included in this study. Among the 110 videos, 102 were recorded in the dining room and 8 in resident's own room; 82 were recorded when residents were seated in a chair and 28 when residents were seated in a wheelchair.

The 110 videos involved a total of 25 residents with moderately severe to severe dementia and 29 staff (42 unique staff-resident dyads) in 9 NHs. Among the 25 residents, 7 were captured in one video and 18 were captured in two or more videos. Among the 29 staff,

12 were captured in one video and 17 were captured in two or more videos. Among the 42 unique dyads, 22 were observed in one video and 20 were observed in two or more videos.

The 25 resident participants had a mean age of 84.6 years (range=64-96). All residents were white, with the majority being female (60%) and non-Hispanic (92%). Residents had moderate levels of functional disability in performing activities of daily living (range=12-39) as measured by Minimum Data Set 3.0 Section G (ADL self-performance and support provided) [26]. For eating function, 36% of residents were independent (initiated/completed 75% to 100% of food intake episodes), 40% were partially (in)dependent (initiated/completed greater than 25% but less than 75% of intake episodes), and 24% were dependent on staff assistance to eat (initiated/completed 0% to 25% of intake episodes).

The 29 staff participants had a mean age of 34.9 years (range=19-79), worked as a caregiver for a mean duration of 9 years (range=0.5-30), and worked at the current NH for a mean duration of 3.7 years (range=0.5-13). Most staff were female (83%), non-Hispanic (79%), and white (72%), and had completed or were attending college (72%). Two staff were RNs (6.9%) and 27 staff were Certified Nursing Assistants (CNAs, 93.1%), among whom 10 CNAs had additional roles (e.g., activity assistant, medication, or rehabilitation aide).

Data Collection

The Refined CUED—The refined CUED assesses the resident food intake process (Part I) and verbal (Part II) and nonverbal (Part III, focus of this study) behaviors of staff and residents.[17] The development of nonverbal codes and their definitions was guided by the philosophy of person-centered mealtime care, and the Social Ecological Model that addresses mealtime care-related factors and interventions from multilevel perspectives (i.e., resident, staff, environmental, and institutional). [8, 12, 27, 28] Nonverbal codes were identified from multiple sources, including: 1) established tools - the Person-Centered Behavior Inventory [29] and the Task-Centered Behavior Inventory, [30] 2) a qualitative study that examined staff perspectives of multilevel barriers to and facilitators of engaging residents in eating, [12] and 3) relevant syntheses of literature on measures that assess eating, feeding, and mealtime behaviors in residents with dementia [31], measures that assess mealtime caregiving behaviors, dyadic interactions, and physical/social dining environment,[32, 33] and resident mealtime challenging behaviors and targeted person-centered care strategies. [34]

Table 1 and Table 2 show the definitions of all codes representing resident and staff nonverbal behaviors (Part III) in the refined CUED. Codes for resident nonverbal behaviors included five positive/neutral behaviors (e.g., wiping away oral spillage/drool) and 22 challenging behaviors categorized as chewing/swallowing difficulties (n=4, e.g., prolonged or continuous chewing/sipping), functional impairments (n=6, e.g., difficulty using utensil properly), and resistive behaviors (n=12, e.g., pushing away help/food). Codes for staff nonverbal behaviors include 26 person-centered behaviors categorized as modifications of resident abilities (n=12, e.g., positioning resident appropriately), modifications of care approaches (n=7, e.g., adjusting proximity), and modifications of the dining environment (n=7, e.g., reducing clutter), as well as eight task-centered behaviors (e.g., outpacing).

Data Coding—Staff and resident nonverbal behaviors were coded second-by-second using Noldus Observer® 14.0 (Noldus Information Technology Inc., Leesburg, VA, USA) during 2019-2020. Four research assistants were trained by the first author following a standard coding manual developed based on the refined CUED. Inter-coder reliability was examined using the same subset of the video sample among the four trained coders and was re-examined periodically during the coding process. Part III of the refined CUED demonstrated feasibility and adequate inter-coder reliability (percent agreement range=93.63%-96.70%, all $p<.001$, ± 1s tolerance; Cohen's Kappa range=0.93-0.96, 95% CI=0.92-0.97, ±1s tolerance) through ratings of 22 randomly selected videos of the study sample across four trained coders.[17] It took an average of 4.13 hours to code all the staff and resident nonverbal behaviors in a one-hour video.[17]

After inter-coder reliability was established, the 110 videos were coded by one of the four trained coders. Resident nonverbal behaviors in all videos were coded first, followed by staff nonverbal behaviors in all videos. All nonverbal behaviors were coded in the order they were observed. The person who performed each behavior (i.e., staff, resident) and the actual time point each behavior occurred were also coded. When two or more nonverbal behaviors occurred at the same time, these behaviors were coded with the same time point. Trained coders were asked to keep coding logs, in which they described uncertainties and/or difficulties in assigning a code to a specific behavior, as well as their coding decisions and rationales. The first author and all trained coders discussed the coding logs and reached consensus on coding decisions during regular team meetings.

Variables—Data coded from videos representing staff and resident nonverbal behaviors were exported from Noldus Observer® to Excel worksheets, and then to SAS 9.4. [35] Eight variables were created to represent nonverbal behaviors of residents and staff. The decisions to represent these variables with two or three categories were made based on their distributions.

Resident Positive/Neutral Behaviors

- *Resident positive/neutral behaviors* were operationalized as whether the resident showed any positive or neutral nonverbal behaviors in the video and categorized as: 0 behaviors, and 1 or more behaviors.

Resident Challenging Behaviors

- *Resident chewing/swallowing difficulties/minute* were operationalized as the number of resident nonverbal behaviors that indicate difficulties with chewing and swallowing activities divided by video duration and categorized as: 0 behavior/minute, between 0 and 1 behavior/minute, and 1 or more behaviors/minute.
- *Resident functional impairments* were operationalized as whether the resident showed any functional difficulty in transporting food from plate/container/utensil to the mouth (e.g., difficulties using utensil, limited range of motion) in the video and categorized as: 0 behaviors and 1 or more behaviors.

- *Resident resistive behaviors/minute* were operationalized as the number of resident nonverbal behaviors that indicate refusal of care or other challenging behaviors divided by video duration and categorized as: 0 behavior/minute, between 0 and 1 behavior/minute, and 1 or more behaviors/minute.

Staff Person-centered Behaviors

- *Staff modifications of resident abilities/minute* were operationalized as the number of staff nonverbal behaviors that support resident functional or cognitive abilities divided by video duration and categorized as: 0 behavior/minute, between 0 and 1 behavior/minute, and 1 or more behaviors/minute.
- *Staff modifications of care approaches/minute* were operationalized as the number of staff nonverbal behaviors that support dyadic caregiving, engagement, and interaction approaches towards residents divided by video duration and categorized as: 0 behavior/minute, between 0 and 1 behavior/minute, and 1 or more behaviors/minute.
- *Staff modifications of dining environment/minute* were operationalized as the number of staff nonverbal behaviors that support physical and social dining environment divided by video duration and categorized as: 0 behavior/minute, between 0 and 1 behavior/minute, and 1 or more behaviors/minute.

Staff Task-centered Behaviors

- *Staff task-centered behaviors* were operationalized as whether staff negative or task-centered nonverbal behaviors were observed in the video and categorized as: 0 behaviors and 1 or more behaviors.

Data Analysis

Staff-resident nonverbal behaviors were summarized using descriptive statistics. Bivariate descriptive analysis was used to examine relationships: 1) between resident nonverbal behaviors and staff nonverbal behaviors, 2) among resident nonverbal behaviors; 3) among staff nonverbal behaviors, and 4) between nonverbal behaviors of residents and staff and characteristics of residents (age, comorbidity, gender, dementia stage, functional disability, eating function) and staff (age, years as caregivers, years worked in the current NH, education, gender, race). Wilcoxon rank-sum test or Kruskal-Wallis test were used for continuous individual characteristics (e.g., age), and Fisher's exact test was used for categorical characteristics (e.g., gender). Missing data were not imputed. Statistical analyses were performed in SAS 9.4. [35] The level of significance alpha=.05 was used.

Results

Characteristics of Resident and Staff Nonverbal Behaviors

A total of 929 resident nonverbal behaviors were coded (Table 3), among which 20.9% were positive or neutral behaviors and 79.1% were challenging behaviors. Among all the resident positive/neutral behaviors, "affirmative nodding" (n=70) was most frequently observed, followed by "using hands to eat or taking over attempts to eat/drink" (n=48) and

"leaning forward" (n=47). Among all the resident challenging behaviors, resistive behaviors (35.7%) and chewing/swallowing difficulties (33.5%) were observed more frequently than functional impairments (9.9%). Specifically, the most frequently observed behavior was related to chewing/swallowing difficulties (i.e., "prolonged/continuous chewing/sipping", n=265), which was nearly equal to the total frequency of the next top four behaviors (n=269): "disengaged/distracted from meal" (n=124), "non-affirmative nodding" (n=55), "turning head away or tilting head backwards" (n=47), and "does not open mouth when mouth is empty" (n=43).

A total of 1,777 staff nonverbal behaviors were coded (Table 4), among which 90.6% were person-centered behaviors and 9.4% were task-centered behaviors. Among all the staff person-centered behaviors, modifications of resident abilities (41.9%) and care approaches (35.1%) were observed more frequently than modifications of dining environment (13.6%). Among all staff person-centered nonverbal behaviors, the most frequently observed behavior was "giving a bite of appropriate size" (n=315), followed by "offering beverage" (n=174), "arranging/mixing edible items for easy access" (n=135), and "resident-directed gaze" (n=135). Staff task-centered behaviors were primarily "ignoring/lack of interactions" (n=69) and "leaving the table/resident" (n=56), followed by "physical controlling", "outpacing", "non-affirmative nodding", "discouraging/taking over resident attempt", and "inappropriate touch" (n=42).

Characteristics of Variables Representing Nonverbal Behaviors

The 110 videos had a mean duration of 4.4 minutes (SD=3.9, range=1.0-23.8). As shown in Table 5, resident positive/neutral behaviors were observed in 50.9% of the videos, chewing or swallowing difficulties in 69.1% of the videos, resistive behaviors in 62.7% of the videos, and functional impairments in 31.8% of the videos. Staff modifications of resident abilities were observed in 89.1% of the videos, modifications of care approaches in 77.3% of the videos, modifications of dining environment in 74.5% of the videos, and task-centered behaviors in 70.9% of the videos.

Relationships among Resident and Staff Nonverbal Behaviors

As shown in Table 6, resident positive/neutral behaviors were not associated with any staff nonverbal behaviors. Staff modifications of resident abilities were correlated with resident chewing/swallowing difficulties (p=.007). Among videos with 1 or more chewing/swallowing difficulties/minute, almost 84% included 1 or more modifications of resident abilities/minute; while among videos with fewer than 1 chewing/swallowing difficulties/minute, about 56% included 1 or more modifications of resident abilities/minute.

Resident functional impairments were correlated with staff modifications of care approaches (p=.005). Among videos with 1 or more functional impairments, 23% included 1 or more modifications of care approaches/minute; while among videos with no functional impairments, almost 55% included 1 or more modifications of care approaches/minute.

Resident resistive behaviors were correlated with staff modifications of resident abilities (p=.018) and modifications of dining environment (p=.006). Among videos with resistive behaviors, close to three-quarters included 1 or more modifications of resident abilities/

minute, and about 15% included 1 or more modifications of dining environment/minute. Whereas among videos with no resistive behaviors, about 46% included 1 or more modifications of resident abilities/minute and 42% included 1 or more modifications of dining environment/minute.

No significant correlations were found among different types of resident nonverbal behaviors (p values range=.15-.90). No significant correlations were found among different types of staff nonverbal behaviors (p values range=.10-.82).

Relationships between Resident Nonverbal Behaviors and Characteristics of Staff and Residents

As shown in Table 7, resident positive/neutral behaviors were correlated with resident age (p=.004), dementia stage (p=.002), and eating function (p<.001), and with staff race (p=.005). Residents were older in videos with observed positive/neutral behaviors, compared to videos with no observed positive/neutral behaviors (Mean=85.9, SD=6.5, vs. Mean=81.4, SD=8.0). Resident positive/neutral behaviors were more likely to be observed in videos with residents who had moderately severe dementia (66.7%) vs. severe dementia (30.3%) and were either independent (63.6%) or partially (in)dependent (63.5%) on meal assistance vs. dependent residents (25.0%), and in videos with white (64.8%) vs. black staff (37.5%).

Resident chewing/swallowing difficulties were correlated with resident eating function (p=.046). One or more chewing/swallowing difficulties/minute were more likely to be observed in videos with residents who were dependent on meal assistance (41.7%) vs. partially (in)dependent (21.2%) and independent (22.7%) residents.

Resident functional impairments were correlated with resident age (p=.013), gender (p=.013), dementia stage (p=.003), and eating function (p=.006), and with staff education (p=.026). Residents were younger in videos with observed functional impairments, compared to videos with no observed functional impairments (Mean=80.6, SD=8.2, vs. Mean=85.1, SD=7.0). Resident functional impairments were more likely to be observed in videos with male (40.9%) vs. female (18.2%) residents, severe dementia (42.4%) vs. moderately severe dementia (11.8%) residents, and college-educated staff (37.2%) vs. high school graduates (12.5%). Resident functional impairments were more likely to be observed in videos with residents who were either independent (40.9%) or dependent (47.2%) on meal assistance vs. partially (in)dependent (17.3%) residents.

Resident resistive behaviors were correlated with resident comorbidity (p=.003) and dementia stage (p=.049). In videos with 1 or more resistive behaviors/minute, residents had more comorbidities (Mean=30.1, SD=4.1), compared to videos with fewer than 1 resistive behavior/minute or no resistive behaviors (Mean=27.4, SD=4.2, and Mean=25.8, SD=4.7, respectively). One or more resistive behaviors/minute were more likely to be observed in videos with residents who had severe dementia (33.3%) vs. moderately severe dementia (13.7%).

Relationships between Staff Nonverbal Behaviors and Characteristics of Staff and Residents

As shown in Table 8, staff modifications related to resident abilities were correlated with resident eating function (p=.005). One or more modifications of resident abilities/minute were more likely to be observed in videos with residents who were dependent on meal assistance (86.1%) vs. partially (in)dependent (57.7%) and independent (40.9%) residents.

Staff modifications of care approaches were correlated with resident gender (p=.003), staff race (p<.001), and years working in current NH (p<.001). One or more modifications of care approaches/minute were more likely to be observed in videos with female (63.6%) vs. male (31.8%) residents and white (63.0%) vs. black (26.8%) staff. Staff who were observed in videos with 1 or more modifications of care approaches/minute worked fewer years in the current NH (Mean=3.4, SD=3.6), compared to videos with fewer than 1/minute or no modifications of care approaches (Mean= 5.3, SD=4.4, and Mean=7.2, SD=4.9, respectively).

Staff modifications of dining environment were correlated with resident dementia stage (p=.008) and eating function (p=.014), and staff gender (p=.017) and years working in current NH (p=.046). One or more modifications of dining environment/minute were more likely to be observed in videos with residents who had moderately severe dementia (33.3%) vs. severe dementia (6.1%) and were independent on meal assistance (45.5%) vs. partially (in)dependent (26.9%) and dependent (8.3%) residents, and in videos with male (43.3%) vs. female staff (17.5%). Staff who were observed in videos with 1 or more modifications of dining approaches/minute worked more years in the current NH (Mean=6.1, SD=5.3), compared to videos with fewer than 1 per minute or no modifications of dining environment (Mean=5.2, SD=4.3, and Mean=3.1, SD=3.1, respectively).

Staff negative behaviors were correlated with resident comorbidities (p=.008). Residents had more comorbidities in videos with staff negative behaviors compared to videos with no negative behaviors (Mean=28.2, SD=4.2, vs. Mean=25.5, SD=5.1).

Discussion

These findings are consistent with prior research that characterized staff-resident verbal behaviors, [15] supporting the dynamic and complex nature of dementia mealtime care interactions. This study focused on characterizing nonverbal behaviors of nursing home staff and residents with dementia during mealtime care using the refined CUED, further examining the relationships among individual characteristics and staff-resident nonverbal behaviors. Findings indicate that residents show a variety of positive/neutral and negative behaviors and staff show both person-centered and task-centered behaviors nonverbally.

Resident and Staff Nonverbal Behaviors

Prior work that characterized mealtime verbal behaviors show that residents made a total of 658 utterances in the same 110 videos, of which most were positive (85.1% vs. 14.9% being negative). [15] Findings of this study show that residents had more nonverbal behaviors (n=929), of which most were challenging (79.1%). This comparison supports the notion

that residents with advanced dementia communicate nonverbally more often than verbally during mealtime. Also, while most resident verbal behaviors are perceived as positive, most of their challenging nonverbal behaviors convey functional or behavioral challenges that they experience during mealtime. These behaviors include chewing/swallowing difficulties, functional impairments such as range-of-motion limitations, and resistive behaviors. More importantly, these challenging behaviors were prevalent in one third to two thirds of mealtime observations (i.e., 31.8%-69.1%), indicating the need of individualized mealtime care.

Staff nonverbal behaviors (n=1,777) were observed almost two times more frequently than residents (n=929), consistent with prior work that staff verbal behaviors were observed three times more frequently than residents. [15] This information indicates that while staff dominate dyadic mealtime interactions both verbally and nonverbally, residents primarily use nonverbal behaviors to communicate with staff. In this study, most staff nonverbal behaviors were person-centered (90.6%), which is comparable to previously reported staff positive verbal behaviors (99.2%). [15] This information shows that while staff play important roles in engaging residents in mealtime both verbally and nonverbally, task-centered or challenging communication is more often nonverbal compared to verbal. Moreover, staff task-centered nonverbal behaviors were observed in more than two-thirds of mealtime observations (i.e., 70.9%), indicating the need for increasing awareness and training among staff.

This study and recent work on mealtime dyadic behaviors show that staff-resident verbal behaviors and staff nonverbal behaviors were primarily positive (85.1%-99.2%), consistent with prior reports of 72%-96% of dyadic behaviors being positive, 4.3%-6.4% being negative, and 10.8%-21.6% being neutral during mealtime and other care activities. [19–21, 36] Different from prior work, this study shows that resident nonverbal behaviors were mostly challenging (79.1%) rather than positive/neutral (20.9%). This comparison indicates the need to characterize verbal and nonverbal behaviors of staff and residents separately, which may provide more insights about dyadic interactions and provide potential areas for care optimization.

Staff-Resident Mealtime Nonverbal Interactions

This study showed preliminary evidence of the relationship between nonverbal behaviors of residents and staff. Staff provided more nonverbal care strategies to support resident abilities while assisting residents with chewing/swallowing difficulties and residents with resistive behaviors. Staff provided more nonverbal social and interpersonal care strategies while assisting residents who did not show functional impairments and provided more nonverbal strategies to support dining environment while assisting residents who don’t show resistive behaviors. It seems that staff use more intrapersonal-specific strategies (e.g., supporting resident abilities) when they assist residents who have functional impairments or resistive behaviors, and use more interpersonal- and environment-specific strategies (e.g., supporting social interactions and dining environment) when they assist residents who do not have functional or behavioral challenges. Findings indicate that staff use of nonverbal care strategies vary based on presence of resident functional impairments and/or behavioral

symptoms. Findings of this study are consistent with prior reports that positive and negative verbal behaviors of staff and residents were inter-correlated. [15]

Resident and Staff Nonverbal Behaviors by Individual Characteristics

This study identified multiple individual characteristics that were associated with resident and staff nonverbal behaviors. Residents who were dependent in eating function (vs. partially independent and independent) showed more chewing/swallowing difficulties, supporting the convergent validity of the new operational measure for eating function. Residents who were male, younger, diagnosed with severe dementia (vs. moderately severe dementia), assisted by staff with college education (vs. high school), and independent or dependent on meal assistance (vs. partially (in)dependent) were more likely to show functional impairments. Residents with more comorbidities and severe dementia (vs. moderately severe dementia) showed more resistive behaviors. Prior work shows that resident challenging verbal behaviors were associated with only resident dementia stage. [15] This study examined resident challenging nonverbal behaviors from both functional and behavioral aspects and identified a broader list of individual characteristics as potential factors. Also, residents who were older, assisted by white (vs. black) staff, diagnosed with moderately severe dementia (vs. severe dementia), and independent or partially (in)dependent (vs. dependent) were more likely to show positive/neutral behaviors. Findings of this study were partially consistent with prior reports that resident positive utterances were correlated with resident age and dementia stage and years staff worked in the NH. [15]

Staff provided more nonverbal strategies to support resident abilities while assisting residents who were completely dependent on meal assistance (vs. partially (in)dependent and dependent). Staff who were white (vs. black), female (vs. male), and worked for fewer years in the current NH performed more nonverbal behaviors supporting social and interpersonal care. Staff who were male (vs. female), worked for more years in the current NH, and assisted residents with moderately severe dementia (vs. severe dementia) and independent on meal assistance (vs. partially (in)dependent and dependent) performed more nonverbal modifications of dining environment. Findings of this study were in part consistent with prior report that staff positive utterances were associated with staff race and resident age, dementia stage, and eating function. [15] In addition, staff were more likely to show task-centered behaviors while assisting residents with more comorbidities. Prior work did not identify any individual characteristics associated with staff negative utterances. [15] Prior work that examined the role of resident characteristics found that both positive and negative/neutral interactions were associated with interaction location (private or not), interpersonal distance, and resident participation (active vs. passive), and were not associated with resident age, gender, race, marital status, cognition, interaction situation (care-related or not), or staff roles (nursing staff or not). [19] This study is the first that described resident positive/neutral and challenging nonverbal behaviors and staff person-centered and task-centered behaviors by individual characteristics. Further investigation is needed using larger, diverse samples.

Findings of this study on characteristics of resident and staff nonverbal interactions suggested three areas that require increasing attention and awareness in dementia mealtime

care practice. First, both residents and staff communicated more often and more negatively or task-centered through nonverbal rather than verbal behaviors. Staff should be aware that while their verbal behaviors were predominantly positive, their nonverbal behaviors toward residents could be interpreted as negative or task-centered. This is especially noticeable when staff assist residents with more comorbidities. In addition, staff should be aware that resident nonverbal behaviors are the primary form of communication during mealtime interactions. While resident verbal behaviors toward staff were mostly positive, their nonverbal behaviors were largely negative or challenging, indicating a need for appropriate assessment and management. Resident nonverbal behaviors communicate important needs of mealtime care related to chewing/swallowing difficulties, range-of-motion limitations, and resistiveness to or dissatisfaction with care or food. When mealtime assistance and staffing are limited, staff may focus on the most common challenging behaviors that indicate chewing or swallowing difficulties or resistiveness to care or food. These challenging behaviors include prolonged chewing/sipping, distraction from meal, non-affirmative nodding, turning head away or tilting head backwards, and not opening mouth when mouth is empty. Rather than interpreting these challenging behaviors as simply food refusal or distress, staff should be trained to understand the reasons for these challenging behaviors and provide appropriate meal access and assistance to those residents who still accept food and drinks. [14] Staff training on the assessment and management of these challenging behaviors is critical to optimize care quality and meal intake. For example, when staff notice specific challenging behaviors from the resident during mealtime care, staff may observe and/or communicate with the resident verbally and/or nonverbally to understand the reasons for such behaviors (e.g., functional impairments or disabilities, unmet individual needs, dissatisfaction with food or care interaction, under- or over-stimulating dining environment). Following an understanding of the reasons, staff may use certain person-centered nonverbal strategies that focus on modifying resident abilities, dyadic interactions, and/or dining environment, and evaluate the usefulness of the strategies and the need for additional assessment and management.

Second, residents who were male, younger, diagnosed with severe dementia, more comorbid, and dependent on meal assistance were more likely to demonstrate swallowing/chewing difficulties, range-of-motion limitations, and/or resistive behaviors compared to their counterparts, and therefore may need more assistance from staff to initiate and/or continue with a meal. Interestingly, this suggestion was consistent with our findings that residents completely dependent on meal assistance received more staff nonverbal modifications of interpersonal care approaches than their counterparts. However, we also found that residents with moderately severe dementia who did not depend on meal assistance received more nonverbal modifications of dining environment, which was inconsistent with the suggestion of targeting at-risk residents. This information indicates that there is room for increasing awareness among NH managers and staff to better allocate staffing and staff time during mealtime to at-risk residents. Third, this study shows that staff-resident verbal and nonverbal interactions are inter-related and dynamic, indicating all behaviors from the staff-resident dyad should be interpreted in the context and flow of a meal, rather than being viewed as separate parties or across dyads or meals.

The study findings have important implications for dementia mealtime care research. While the refined CUED was validated with feasibility, ease of use, inter-rater reliability, and content validity, findings of this study as well as prior work that characterized the impact of staff-resident verbal and nonverbal behaviors on intake add psychometric evidence. This study shows there were no associations among the four types of staff nonverbal behaviors as well as among the four types of resident nonverbal behaviors. This finding indicates that the categorization of nonverbal behaviors of staff and residents is conceptually appropriate and distinct, supporting divergent validity of the tool. Second, this study and prior work on verbal behaviors show that verbal and nonverbal mealtime behaviors of staff and residents are correlated, supporting convergent validity of the tool. [13, 15] Third, resident eating performance characteristics (i.e., whether staff or resident initiated/completed the intake, type of food being consumed, duration of the intake) as well as staff-resident verbal and nonverbal behaviors, all of which were coded using the refined CUED, were associated with intake, supporting its predictive validity. [9, 18] Lastly, resident mealtime behaviors and intake were associated with resident dementia stage (moderately severe vs severe) and eating function (dependent, partially (in)dependent, vs. independent), providing evidence of construct validity, specifically known group difference. [9, 15, 18] The refined CUED has been appraised as the only instrument with moderate psychometric quality among a total of 26 existing tools that assess dyadic mealtime interactions. [32] While the use of the refined CUED and videotaped observations may be time intensive compared to real-time on-site observations, it generates an enormous amount of data to illuminate the complexity and dynamics of the food intake process and dyadic interactions as well as facilitate advanced sequential analysis to address specific research questions such as temporal relationships among dyadic interactions and resident intake.

While the refined CUED shows adequate reliability and validity to assess nonverbal behaviors of staff and residents, this tool currently includes fewer resident positive/neutral behaviors (n=5) compared to challenging behaviors (n=22), and fewer staff task-centered behaviors (n=8) compared to person-centered behaviors (n=26). This is mostly because prior mealtime research focuses on characterizing and evaluating positive or person-centered care strategies to manage resident challenging or negative behaviors, resulting in limited literature on resident positive/neutral behaviors and staff task-centered behaviors. While the proportions of resident positive and challenging behaviors and staff person-centered and task-centered behaviors in this study may reflect the nature of dyadic mealtime interactions, it is possible that the information may be due to the unbalanced number of codes representing staff and resident nonverbal behaviors. Future work should continue to refine this tool by including more mealtime-specific resident positive/neutral behaviors (e.g., eye gazes initiated by the resident, positive/neutral facial expressions by the resident) and staff task-centered behaviors (e.g., not asking resident preferences, providing full assistance without assessment of resident functional ability) to advance the understanding of the dynamic and complex dyadic mealtime interactions and the food intake process. Future testing of the tool is also needed on additional psychometric properties (e.g., internal consistency, intra-rater reliability, concurrent validity, and structural validity).

This study focused only on characterizing staff-resident nonverbal behaviors during mealtime. Future work will examine relationships among verbal and nonverbal behaviors

by staff and residents, as well as the role of staff-resident verbal and nonverbal interactions on meal intake. In addition to verbal and nonverbal behaviors of residents and staff, the time each behavior occurred in the videos were also coded. This data will allow for sequential analysis to examine temporal relationships between staff and resident behaviors, as well as between staff-resident behaviors and resident food intake. Such information on temporal relationships will inform the use of specific verbal and nonverbal behaviors by staff to manage resident behaviors and improve food intake. While staff race was examined and correlated with both resident positive/neutral behaviors and staff modifications of care approaches, the role of resident race was not examined due to lack of variations (i.e., all residents were white). Because mealtime interactions represent a dynamic and complex process of communication between staff and the resident, race or cultural difference within the dyad may raise the question of potential racism and further impact the quality of care interactions. Future work needs to examine the role of staff and resident characteristics on dyadic interactions using a larger, more diverse staff-resident sample.

The video sample in this study included mealtime interactions that occurred in dining rooms and resident rooms. In the parent study, prior to the first recording session, a sham recording session was done to allow residents and staff to be familiar with the existence of the camera and the videographer as well as to allow the videographer to become familiar with daily care routine. [25] It is possible that dyads in different locations (dining room, own room) may interact differently from their routine mealtime care interactions due to privacy concerns and/or the influence of the public, and the physical and social dining environments. For example, dyads captured in the dining room (vs. resident room) may be more likely to show routine care interactions because other residents and staff they were surrounded with were having routine interactions, or the dyads may be less likely to show routine care interactions due to attention to and awareness of people surrounding them. Future research may examine the role of dining locations on dyadic mealtime interactions.

Limitations

The video sample captured primarily one-on-one rather than more complex interactions, and portions of the meal rather than the whole meal. Varied staff-resident dyads were involved in the videos which may influence the dynamics of mealtime interactions. Bivariate descriptive analyses were used in the study, and potential effects of clustering of videos within staff, residents, or dyads were not controlled for. The study findings may only generalize to NH direct care staff and residents with moderately severe to severe dementia and resistiveness to care in the United States, rather than care providers and individuals in other care settings in the US (e.g., community, assisted living, hospitals) or different care settings in other countries. While most recordings captured morning care activities, the type of meal (breakfast, lunch, dinner, snack) was not described due to lack of data from the parent study. Therefore, findings may not generalize to a specific type of meal or a meal during a specific period of time.

Conclusions

Mealtime dyadic nonverbal interactions were dynamic, complex, and correlated with multiple characteristics of residents and staff. Findings profiled staff-resident nonverbal behaviors, emphasized areas for attention in mealtime care practice, and exemplified the use of individualized, person-centered, multifaceted care strategies to optimize resident behaviors. Findings also accumulate psychometric evidence of the refined CUED and provide directions for future refinement and validation.

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Submission declaration and verification

The work described has not been published previously, that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

Highlights

- The refined Cue Utilization and Engagement in Dementia (CUED) Mealtime Video-Coding Scheme was used to code both staff person-centered and task-centered care approaches as well as resident positive and challenging behaviors during mealtime care interactions using 110 video-taped observations.
- Residents primarily exhibited challenging behaviors including resistive behaviors (35.7%), chewing/swallowing difficulties (33.5%), and functional impairments (9.9%), followed by positive/neutral behaviors (20.9%).
- Staff primarily used person-centered behavioral strategies, including modifications of resident abilities (41.9%), care approaches (35.1%), and dining environment (13.6%), followed by task-centered behaviors (9.3%).
- Mealtime dyadic nonverbal interactions were dynamic, inter-related, and correlated with multiple individual characteristics.

Table 1.

Codes of Resident Nonverbal behaviors in Part III of CUED

Codes		Definitions
Resident Positive/Neutral Behaviors		
1.	Using hands to eat or taking over attempts to eat or drink	Resident uses hands to eat or to take over the eating/drinking activity which was initiated/dominated by staff. This includes eating food without a utensil with or without staff's assistance; and code every time you see its occurrence. This code can be used if resident picks up food item from tray or from their bib.
2.	Leaning forward	Resident's upper body moves toward or closer to the table and/or feeding assistant.
3.	Affirmative nodding	Resident nods head as a sign of approval, encouragement, interest, or indicating "Yes" to staff's assistance, request, or question.
4.	Wiping away oral spillage or drool	Resident cleans any oral spillage or drool from his/her mouth, face, hand, body, bib, or clothes.
5.	Indicating end of meal	Resident informs staff of the unwillingness to continue the meal and indicates the status of "done with the meal/food" (e.g., waving hand "no", non-affirmative nodding, taking off bib, standing up trying to leave the dining table/chair).
Resident Challenging Behaviors		
A.	**Chewing/Swallowing Difficulties**	
1.	Leaving mouth open allowing food falls out of mouth (passive)	Staff has placed food/drinks in the resident's mouth, but resident does not swallow food/drinks but rather, allows the food/drinks to fall out of his/her mouth.
2.	Prolonged/continuous chewing/sipping	Resident chews food or sips drinks for ≥ 10 continuous seconds without swallowing. Start counting in your head when food goes into the resident's mouth (e.g., count as "1, one thousand; 2, one thousand; 3, one thousand; 4"; and so on). If they are still chewing by the time you get to 10, use this code.
3.	Doesn't chew/swallow (holds food in mouth)	Staff has placed food/drinks in the resident's mouth, yet resident does not appear to be chewing or swallowing the food/drinks. Start counting in your head when food is in the mouth. If resident is still holding food in the mouth without chewing and/or swallowing by the time you get to 10, use this code.
4.	Coughing, choking, or gaging on food	Resident coughs or has difficulty in breathing and speaking after taking a bite of food or drinks. This is usually because of a constricted or obstructed throat with food or a lack of air.
B.	**Functional Impairments**	
1.	Difficulty using utensil properly	Resident holds or tries to use a regular/adapted utensil to handle food on the plate (e.g., holding utensil, using utensil to locate and scoop food), and is having trouble to get food from plate to utensil (preloading food), before moving to mouth.
2.	Difficulty transporting food to mouth	Resident has problem with moving food/preloaded utensil through to mouth area and/or putting food into the mouth. This may occur during the process of getting food (in hand or preloaded utensil) to mouth.
3.	Contracture/Limited Range of Motion	Resident has an obvious hand or arm contracture, or when staff is met with some resistance to moving resident's hand/arm through an intake cycle due to limitation in range of motion.
4.	Taking empty utensil/ container to mouth	Resident moves empty utensil/container/hand to mouth, acted as food/drinks was in there.
5.	Spillage	Resident is holding utensil or food/drink item. Food unintentionally falls off the hand/utensil due to resident's inability to maintain food in the hand/utensil, or resident spills part of or their entire drinks.
6.	Drooling	Resident's saliva or food falls out from the mouth. This is not necessarily associated with food.
C.	**Resistive Behaviors**	
1.	Doesn't open mouth (when mouth is empty)	Staff is offering food or drinks, and the resident doesn't open mouth to receive the food/drinks (e.g., food or beverage item is very close to resident's mouth, and resident does not open to receive).
2.	Biting the utensil (when food is offered)	Resident holds the utensil tight between teeth and does not let the utensil get into or out of the mouth.
3.	Turning head away/tilting head backward	Resident turns head away or moves head upward facing upper level or the ceiling when food/drinks offered.
4.	Leaning backward	Resident's upper body moves away from the table and/or feeding assistant.
5.	Pushing away help/food	Resident is engaged in this movement. Resident does not intend to do any harm, just pushes away assistance or the tray to signify they do not want what is being offered at that time. This could also be that

Codes		Definitions
		the staff is offering a food/drinks item, and resident is engaged in the action but is preventing staff from moving the food/drinks item towards their mouth.
6.	Spitting out food	Resident purposefully ejects food or drinks from the mouth into their own hand, into a napkin, or into the utensil, or at the staff due to the following reasons: ◦ Doesn't seem to like food/texture – (passive) ◦ Intentionally spits food–(aggressive)
7.	Non-affirmative nodding	Resident is nodding head from side to side to indicate "No" non-verbally.
8.	Disengaging from meal	Resident stops chewing or eating due to the following reasons. Only use this code if any of the following behavior lasted for ≥ 5 seconds: ◦ Closing eyes – Resident seems alert but closes his/her eyes. ◦ Distraction – Resident has difficulty maintaining attention to the meal due to a distraction. Resident is looking around, being attracted by some noise/object/activity/people, and not attending to the meal. ◦ Falling asleep/become drowsy – Resident has difficulty maintaining alertness and/or falls asleep during the meal ◦ Lack of response – resident does not respond to staff assistance, or the food/drinks being offered
9.	Playing with food/utensil	Resident does something with food/utensil rather than eating food or using utensil for eating
10.	Taking food from others	Resident grasps food/drinks from other resident's plate or tray at the table using hand or utensil. This include the occasions that the resident takes others' food intentionally (i.e., resident purposively take other's food/drink items to consume) or unintentionally (i.e., resident does not know which food/drinks is his/hers, and just takes whatever she/he can reach out to).
11.	Attempting to eat inedible object	Resident tries to grasp non-food items and put to mouth to taste and/or eat.
12.	Attempting to leaves the table	Resident gets up and leaves the table before meal is done.

Table 2.

Codes of Staff Nonverbal behaviors in Part III of CUED

Codes		Definitions
Staff Person-centered Behaviors		
A.	**Modifications of Resident Abilities**	
1.	Positioning resident appropriately	Staff helps the resident to sit in an appropriate position or re-positions the resident to facilitate eating. For example, staff positions residents upright in the chair, wheelchair, or from the bed (i.e., sitting upright is when the resident's mouth is higher than the swallowing system).
2.	Adjusting to resident's pace	Staff adjusts to the resident's pace physically prior to next intake attempt, rather than hurrying the resident along (e.g., staff loaded the spoon with next bite, and sits and waits for resident to get ready).
3.	Offering a different type of food	When the resident has refused to eat one food/drink item being offered or eaten up one type of item, staff offers another food/drink to encourage intake (e.g., offering a vegetable once the resident refuses to eat the meat or eats up all the meat on the plate).
4.	Offering beverage	Drinks is offered by staff to promote swallowing or moving meal forward (especially when resident was not swallowing food or had prolonged chewing), or if a food item was refused.
5.	Offering finger food	Staff offers food that can be picked up by hand by the resident (e.g., peanut butter and jelly sandwich, chicken strips, french fries, hamburger, bacon, toast, fruit, cookie).
6.	Offering condiments	Staff offers the resident condiments (e.g., mustard, ketchup, sugar, pepper, salt, jelly).
7.	Putting item in container/ utensil resident can manage	Staff puts item in container or utensil that resident can manage (e.g., preloading utensil with food)
8.	Giving a bite of appropriate size	Staff provides portions of food in appropriate bite size to ease the process of chewing and/or swallowing (e.g., 1/3 to 1/2 of spoon). Size should not be too big that part of the portion of food cannot get into the mouth and/or falls out of mouth.
9.	Guiding resident's hand to pick up food	Staff holds resident's hand to pick up food, or empty utensil to preload food, or preloaded utensil/container with food/drinks.
10.	Putting food/utensil into resident hand	Staff puts food, empty utensil (for the resident to preload food), or preloaded utensil/container with food/ drink into resident's hand. Following that, resident starts to eat with or without assistance.
11.	Holding resident's hand to get food into the mouth	Staff holds resident's hand to move food/drinks in the mouth in the following scenarios: ◦ When the resident is holding the food/drinks/utensils but cannot move food/drinks/utensils to mouth. ◦ When staff is holding the food/drinks/utensils and wants to involve resident in the intake attempt.
12.	Wiping away oral spillage or drool	Staff cleans any oral spillage or drool from the resident's mouth, face, hand, body, or clothes.
B.	**Modifications of (social/interpersonal) Care Approaches**	
1.	Adjusting proximity	Staff understands and respects the resident's needs related to proximity by moving closer to or further from the resident or moves into a different position to better face and help resident (e.g., moves to other side of bed; moves from resident's non-dominant side to dominant side; Staff stands up or sits down to better assist resident who is in bed). An appropriate distance between staff and resident during mealtime care is about an-arm length away from the food and the resident, so that caregiver does not lean over the resident or food.
2.	Attempting to gain attention	Resident is not engaged in the meal, in response, a non-verbal behavior is initiated and used by the staff to redirect/gain resident's attention to the meal (e.g., tactile cue – touches resident's arms, shoulder, eye contact with resident)
3.	Positive gestures/facial expressions	Staff uses positive gestures and facial expressions (e.g., laughter, waving, blowing a kiss, smiling).
4.	Appropriate use of affectionate touch	This is physical touch that is not necessary for the completion of a task (e.g., a pat on the back, a hug).
5.	Assessing comfort	When staff notices that the resident is experiencing discomfort and, without verbally telling the resident, takes steps to make the resident more comfortable. These tasks are not necessary for the safety of the resident. ◦ Physical comfort - Staff shows awareness of the resident's physical needs, condition, and/or discomfort (e.g., resident's facial expression, pain, cold, comfort in position) by observing the resident. ◦ Emotional comfort - Staff shows awareness of the resident's or social/emotional needs by observing the resident (e.g., staff observes a change in social interaction or emotional expression, such as crying or long silence).
6.	Affirmative nodding	Staff nods head as a sign of approval, encouragement, or interest in the resident.

Codes		Definitions
7.	Resident-directed eye gaze	This includes any attempts made to make eye contact with the resident through kneeling down, leaning over, or sitting next to a resident to be at the eye level.
C.	**Modifications of Dining Environment**	
1.	Modifying traffic	Staff indicates other people who are walking in and out of the room or walking through/around the resident/ dining table to stop.
2.	Modifying noise level	Staff intervenes to reduce background noise in the dining room (e.g., turning down the TV/radio to reduce the noise level. Asking other resident, staff, families) to talk more quietly.
3.	Reducing clutter	This could be staff removing food or drinks leftover, uneaten items, and/or other items that resident has not engaged in from the immediate meal environment (e.g., resident's tray table or dining area).
4.	Limiting distractions	staff removes objects that resident is paying attention to or playing with but that interferes with meal intake.
5.	Arranging/mixing edible items for easy access	Staff moves food/drinks or other meal-related items (utensils or napkins) around in a way that's easy for the resident to reach or puts the preferred food/dink item in front of resident, or mix some food (e.g., potato and cheese) or drinks (e.g., water and juice) that is regularly mixed up in a container for resident easy access of different drinks.
6.	Cutting food into manageable size	Staff cuts big chunk of food items into smaller pieces, so they are easier to pick up and eat.
7.	Adjusting, providing, or taking *away assistive devices/items*	Staff offers the use of assistive devices (e.g., *hearing aid, glasses*), meal-related items (e.g., *bib, napkins*), or other resident personal items (e.g., coat, protection), or adjust or take off/away the devices/items based on resident needs. The purpose is to facilitate the process of the mealtime.
Staff Task-centered Behaviors		
1.	Ignoring/lack of interactions	Staff disregards/declines a request or question from the resident without response. This could also include statements/requests the resident makes and the FA does not acknowledge/respond. For example, staff is silent, or turns back to the resident, or leaves the resident alone, or talks to other residents or staff when the resident still needs staff's attention (e.g., resident asks if he/she can return to his/her room and the care provider does not respond).
2.	Physically controlling	Staff physically forces the resident to do something, or performs care in a controlling manner (e.g., staff manages the eating pace and does not allow the resident some control in eating process, or force/order the resident to eat specific food/drinks items, or food/drinks in general).
3.	Inappropriate touch	Staff continues touching the resident in a manner that clearly makes the resident appear uneasy (e.g., staff continuously pats the resident's shoulder or rubs the resident's leg while the resident recoils or pulls away).
4.	Outpacing	Staff provides information or choices to the resident in a rushed manner that is too fast for the resident to understand, tolerate, or follow.
5.	Discouraging/taking over resident's self-eating attempt	Staff discourages the resident's attempt to eat by self and tries to provide complete assistance to the resident instead of trying to engage resident and encourage independence (e.g., takes utensil away from the resident and starts feeding the resident regardless of resident eating ability).
6.	Mixing ALL food up	Staff mixes all or most of the food items up without asking the resident's preference to prepare the food for the resident. This applies to mixing different items that were served in separate containers or packages for the purpose of easily serving the resident everything in one spoon (e.g., mix up bacon, eggs, and/or oatmeal). This does not apply to food that is regularly mixed up (e.g., potato and cheese) does not count.
7.	Leaving the table/resident	Staff stands up and leaves the resident. This applies to different scenarios: staff has other duties/tasks, leaves to throw away some items, or get some items for the resident.
8.	Non-affirmative nodding	Staff nods head from side to side to non-verbally indicate "No".

Table 3.

Resident Nonverbal Behaviors

Behaviors	n	%
Resident Positive/Neutral Behaviors	**194**	**20.9**
Using hands to eat or taking over attempts to eat/drink	48	24.7
Leaning forward	47	24.2
Affirmative nodding	70	36.1
Wiping away oral spillage or drool	22	11.3
Indicating end of meal	7	3.6
Resident Challenging Behaviors		
A. Chewing/swallowing difficulties	**311**	**33.5**
Leaving mouth open allowing food to fall out (passive)	6	1.9
Prolonged/continuous chewing/sipping	265	85.2
Does not chew/swallow	13	4.2
Coughing, choking, or gaging on food	27	8.7
B. Functional impairments	**92**	**9.9**
Difficulty using utensil properly	29	31.5
Difficulty transporting food to mouth	15	16.3
Contracture/limited range of motion	2	2.2
Taking empty utensil/container to mouth	11	12.0
Spillage	23	25.0
Drooling	12	13.0
C. Resistive behaviors	**332**	**35.7**
Does not open mouth (when mouth is empty)	43	13.0
Biting the utensil (when food is offered)	2	0.6
Turning head away/tilting head backwards	47	14.2
Leaning backwards	19	5.7
Pushing away help/food	11	3.3
Spitting out food	3	0.9
Non-affirmative nodding	55	16.6
Disengaged/distracted from meal	124	37.3
Playing with food/utensil	15	4.5
Taking food from others	8	2.4
Attempting to eat inedible object	0	0.0
Attempting to/leaves the table	5	1.5

Note. Total number of resident nonverbal behaviors = 929.

Table 4.

Staff Nonverbal Behaviors

Behaviors	n	%
Staff Person-centered Behaviors		
A. Modifications of resident abilities	**745**	**41.9**
Positioning resident appropriately	20	2.7
Adjusting to resident's pace	38	5.1
Offering different type of food	18	2.4
Offering beverage	174	23.4
Offering finger food	4	0.5
Offering condiments	8	1.1
Putting item in container/utensil resident can manage	25	3.4
Giving a bite of appropriate size	315	42.3
Guiding resident's hand to pick up food	11	1.5
Putting food/utensil in resident's hand	44	5.9
Holding resident hand to get food into mouth	19	2.6
Wiping away oral spillage or drool	69	9.3
B. Modifications of (social/interpersonal) care approaches	**623**	**35.1**
Adjusting proximity	22	3.5
Attempting to gain attention	124	19.9
Positive gestures/facial expressions	112	18.0
Appropriate use of affectionate touch	131	21.0
Assessing comfort	31	5.0
Affirmative nodding	68	10.9
Resident-directed gaze	135	21.6
C. Modifications of dining environment	**242**	**13.6**
Modifying traffic	0	0.0
Modifying noise level	0	0.0
Reducing clutter	44	18.2
Limiting distractions	11	4.5
Arranging/mixing edible items for easy access	135	55.8
Cutting food into manageable size	31	12.8
Providing/adjusting/taking away assistive devices/items	21	8.7
Staff Task-centered Behaviors	**167**	**9.4**
Ignoring/lack of interaction	69	41.3
Physically controlling	15	9.0
Inappropriate touch	4	2.4
Outpacing	12	7.2
Discouraging/taking over resident self-eating attempt	5	3.0
Leaving the table/resident	56	33.5
Non-affirmative nodding	6	3.6

Note. Total number of staff nonverbal behaviors = 1,777.

Table 5.

Characteristics of Resident and Staff Nonverbal Behaviors

Variable	n	%
Resident Positive/Neutral Behaviors		
Resident positive/neutral behaviors		
0	54	49.1
1 – 17	56	50.9
Resident Challenging Behaviors		
Resident chewing/swallowing difficulties/minute		
0	34	30.9
Between 0 and 1	45	40.9
1 – 2.8	31	28.2
Resident functional impairments		
0	75	68.2
1 – 10	35	31.8
Resident resistive behaviors/minute		
0	41	37.3
Between 0 and 1	44	40.0
1 – 3.5	25	22.7
Staff Person-Centered Behaviors		
Staff modifications of resident abilities/minute		
0	12	10.9
Between 0 and 1	28	25.5
1 – 5.5	70	63.6
Staff modifications of care approaches/minute		
0	25	22.7
Between 0 and 1	36	32.7
1 – 10.2	49	44.6
Staff modifications of dining environments/minute		
0	28	25.5
Between 0 and 1	55	50.0
1 – 4.5	27	24.6
Staff Task-Centered Behaviors		
Staff task-centered behaviors		
0	32	29.1
1 – 9	78	70.9

Note. The number of videos = 110. Percentages may sum up to less or more than 100% due to rounding. Categories for variables operationalized as the number of behaviors per minute are: 0, between 0 and 1, and 1 or more behaviors per minute. Categories for variables indicating presence of the behavior in a video are: 0 and 1 or more behaviors.

Table 6.

Relationships Between Resident Nonverbal Behaviors and Staff Nonverbal Behaviors

	Staff modifications of resident abilities/minute				Staff modifications of care approaches/minute				Staff modifications of dining environment/minute				Staff challenging behaviors		
	0	<1	1+		0	<1	1+		0	<1	1+		0	1+	
Resident behavior	n (%)	n (%)	n (%)	p [a]	n (%)	n (%)	n (%)	p [a]	n (%)	n (%)	n (%)	p [a]	n (%)	n (%)	p [a]
Positive/ neutral resident behaviors				.681				.106				.680			.297
0	7(13.0)	12(22.2)	35(64.8)		17(31.5)	16(29.6)	21(38.9)		14(25.9)	25(46.3)	15(27.8)		13(24.1)	41(75.9)	
1+	5(8.9)	16(28.6)	35(62.5)		8(14.3)	20(35.7)	28(50.0)		14(25.0)	30(53.6)	12(21.4)		19(33.9)	37(66.1)	
Chewing/ swallowing difficulties/ minute				**.007**				.088				.097			.186
0	**8(23.5)**	**7(20.6)**	**19(55.9)**		12(35.3)	10(29.4)	12(35.3)		9(26.5)	12(35.3)	13(38.2)		11(32.4)	23(67.7)	
<1	**3(6.7)**	**17(37.8)**	**25(55.6)**		7(15.6)	12(26.7)	26(57.8)		13(28.9)	26(57.8)	6(13.3)		9(20.0)	36(80.0)	
1+	**1(3.2)**	**4(12.9)**	**26(83.9)**		6(19.4)	14(45.2)	11(35.5)		6(19.4)	17(54.8)	8(25.8)		12(38.7)	19(61.3)	
Functional impairments				.248				**.005**				.895			.500
0	10(13.3)	16(21.3)	49(65.3)		**15(20.0)**	**19(25.3)**	**41(54.7)**		18(24.0)	38(50.7)	19(25.3)		20(26.7)	55(73.3)	
1+	2(5.7)	12(34.3)	21(60.0)		**10(28.6)**	**17(48.6)**	**8(22.9)**		10(28.6)	17(48.6)	8(22.9)		12(34.3)	23(65.7)	
Resistive behaviors/ minute				**.018**				.197				**.006**			.268
0	**9(22.0)**	**13(31.7)**	**19(46.3)**		12(29.3)	9(22.0)	20(48.8)		**8(19.5)**	**16(39.0)**	**17(41.5)**		14(34.2)	27(65.9)	
<1	**3(6.8)**	**9(20.5)**	**32(72.7)**		8(18.2)	20(45.5)	16(36.4)		**9(20.5)**	**29(65.9)**	**6(13.6)**		9(20.5)	35(79.6)	
1+	**0(0.0)**	**6(24.0)**	**19(76.0)**		5(20.0)	7(28.0)	13(52.0)		**11(44.0)**	**10(40.0)**	**4(16.0)**		9(36.0)	16(64.0)	

Note. Categories for variables operationalized as the number of behaviors per minute are: 0, between 0 and 1, and 1 or more behaviors per minute. Categories for variables indicating presence of the behavior in a video are: 0 and 1 or more behaviors. Values significant at $p < .05$ are in bold.

[a] p-values for Fisher's exact test.

Table 7.

Relationships between Resident Nonverbal Behaviors and Characteristics of Staff and Residents

	Positive/neutral behaviors			Chewing/swallowing difficulties/minute				Functional impairments			Resistive behaviors/minute			
	0	1+		0	<1	1+		0	1+		0	<1	1+	
Variable	**M (SD)**	**M (SD)**	**p** [b]	**M (SD)**	**M (SD)**	**M (SD)**	**p** [a]	**M (SD)**	**M (SD)**	**p** [b]	**M (SD)**	**M (SD)**	**M (SD)**	**p** [a]
Staff age, years (n=110)	31.9(7.2)	33.2(9.5)	.500	33.1(8.9)	31.6(6.7)	33.4(10.3)	.860	32.5(7.8)	32.8(9.9)	.949	32.9(7.7)	33.3(9.5)	30.8(7.7)	.426
Staff years as caregiver (n=110)	8.5(6.5)	9.1(5.7)	.497	8.8(6.7)	9.5(6.1)	7.9(5.5)	.453	9.2(5.8)	8.0(6.7)	.204	7.9(5.8)	9.7(6.6)	8.5(5.7)	.402
Staff years in current NH (n=110)	4.4(4.1)	5.3(4.7)	.465	5.0(4.9)	4.2(4.5)	5.7(3.7)	.095	5.1(4.6)	4.5(4.0)	.725	5.2(4.6)	5.2(4.8)	3.8(3.1)	.713
Resident age, years (n=105)	**81.4(8.0)**	**85.9(6.5)**	**.004**	84.2(7.0)	82.4(9.6)	85.3(4.0)	.820	**85.1(7.0)**	**80.6(8.2)**	**.013**	84.2(7.2)	83.7(7.9)	83.0(7.9)	.815
Resident comorbidity (n=93)	28.1(4.0)	26.9(5.0)	.366	26.7(4.5)	27.7(5.0)	27.9(4.4)	.411	27.0(4.4)	28.8(4.9)	.102	**25.8(4.7)**	**27.4(4.2)**	**30.1(4.1)**	**.003**
Functional status (n=98)	24.3(5.3)	23.2(4.7)	.113	24.8(6.0)	24.4(5.0)	21.8(3.3)	.128	23.4(4.9)	24.8(5.3)	.152	22.5(4.2)	23.8(4.5)	26.3(6.7)	.051
	n (%)	n (%)	p [c]	n (%)	n (%)	n (%)	p [c]	n (%)	n (%)	p [c]	n (%)	n (%)	n (%)	p [c]
Staff gender			.524				.488			.262				.350
Male (n=30)	13(43.3)	17(56.7)		11(36.7)	13(43.3)	6(20.0)		18(60.0)	12(40.0)		12(40.0)	14(46.7)	4(13.3)	
Female (n=80)	41(51.3)	39(48.8)		23(28.8)	32(40.0)	25(31.3)		57(71.3)	23(28.8)		29(36.3)	30(37.5)	21(26.3)	
Staff race			**.005**				.786			.838				.192
White(n=54)	**19(35.2)**	**35(64.8)**		16(29.6)	24(44.4)	14(25.9)		36(66.7)	18(33.3)		20(37.0)	18(33.3)	16(29.6)	
Black(n=56)	**35(62.5)**	**21(37.5)**		18(32.1)	21(37.5)	17(30.4)		39(69.6)	17(30.4)		21(37.5)	26(46.4)	9(16.1)	
Staff education			.107				.705			**.026**				.798
High school(n=24)	8(33.3)	16(66.7)		8(33.3)	11(45.8)	5(20.8)		**21(87.5)**	**3(12.5)**		10(41.7)	8(33.3)	6(25.0)	
College(n=86)	46(53.5)	40(46.5)		26(30.2)	34(39.5)	26(30.2)		**54(62.8)**	**32(37.2)**		31(36.1)	36(41.9)	19(22.1)	
Resident gender			.178				.314			**.013**				.599
Male(n=66)	36(54.6)	30(45.5)		20(30.3)	24(36.4)	22(33.3)		**39(59.1)**	**27(40.9)**		22(33.3)	28(42.4)	16(24.2)	
Female(n=44)	18(40.9)	26(59.1)		14(31.8)	21(47.7)	9(20.5)		**36(81.8)**	**8(18.2)**		19(43.2)	16(36.4)	9(20.5)	
Resident dementia stage			**.002**				.261			**.003**				**.049**
Moderately severe (n=51)	**17(33.3)**	**34(66.7)**		18(35.3)	20(39.2)	13(25.5)		**45(88.2)**	**6(11.8)**		**24(47.1)**	**20(39.2)**	**7(13.7)**	
Severe (n=33)	**23(69.7)**	**10(30.3)**		8(24.2)	11(33.3)	14(42.4)		**19(57.6)**	**14(42.4)**		**8(24.2)**	**14(42.4)**	**11(33.3)**	

	Positive/neutral behaviors			Chewing/swallowing difficulties/minute				Functional impairments			Resistive behaviors/minute			
	0	1+		0	<1	1+		0	1+		0	<1	1+	
Variable	**M (SD)**	**M (SD)**	**p** [b]	**M (SD)**	**M (SD)**	**M (SD)**	**p** [a]	**M (SD)**	**M (SD)**	**p** [b]	**M (SD)**	**M (SD)**	**M (SD)**	**p** [a]
Resident eating function			**<.001**				**.046**			**.006**				.272
Independent (n=22)	**8(36.4)**	**14(63.6)**		**7(31.8)**	**10(45.5)**	**5(22.7)**		**13(59.1)**	**9(40.9)**		12(54.6)	7(31.8)	3(13.6)	
Partially (in)dependent (n=52)	**19(36.5)**	**33(63.5)**		**22(42.3)**	**19(36.5)**	**11(21.2)**		**43(82.7)**	**9(17.3)**		20(38.5)	20(38.5)	12(23.1)	
Dependent (n=36)	**27(75.0)**	**9(25.0)**		**5(13.9)**	**16(44.4)**	**15(41.7)**		**19(52.8)**	**17(47.2)**		9(25.0)	17(47.2)	10(27.8)	

Note. Categories for variables operationalized as the number of behaviors per minute are: 0, between 0 and 1, and 1 or more behaviors per minute. Categories for variables indicating presence of the behavior in a video are: 0 and 1 or more behaviors. Values significant at $p < .05$ are in bold. Resident functional status was determined using the MDS-ADL. Resident dementia stage was determined using the Functional Assessment Staging in Alzheimer's Disease (FAST): moderately severe = FAST score 6 to <7, severe = FAST score ≥7. Resident eating function was defined as a proportion of food intake episodes initiated by resident: independent = 75% – 100%, partially (in)dependent = between 25% and 75%, dependent = 0% – 25%.

[a] p-values for Kruskal-Wallis test;

[b] p-values for Wilcoxon rank-sum test;

[c] p-values for Fisher's exact test.

Table 8.

Relationships between Staff Nonverbal Behaviors and Characteristics of Staff and Residents

	Modifications of resident abilities/ minute				Modifications of care approaches/ minute				Modifications of dining environments/ minute				Challeng
	0	<1	1+		0	<1	1+		0	<1	1+		0
Variable	**M (SD)**	**M (SD)**	**M (SD)**	**p [a]**	**M (SD)**	**M (SD)**	**M (SD)**	**p [a]**	**M (SD)**	**M (SD)**	**M (SD)**	**p [a]**	**M (SD)**
Staff age, years (n=110)	33.7(7.6)	32.4(7.2)	32.4(9.2)	.691	34.1(6.3)	32.8(9.9)	31.6(8.4)	.102	32.0(7.6)	33.0(9.1)	32.2(8.2)	.799	32.0(4.9)
Staff years as caregiver (n=110)	9.3(8.0)	8.3(5.7)	8.9(6.0)	.949	9.6(6.6)	8.8(6.1)	8.4(6.0)	.696	8.0(5.2)	9.8(6.9)	7.6(5.2)	.405	8.5(4.7)
Staff years in current NH (n=110)	4.7(5.0)	5.3(4.6)	4.7(4.3)	.750	**7.2(4.9)**	**5.3(4.4)**	**3.4(3.6)**	**<.001**	**3.1(3.1)**	**5.2(4.3)**	**6.1(5.3)**	**.046**	5.6(4.8)
Resident age, years (n=105)	85.3(8.0)	84.1(7.2)	83.3(7.8)	.667	83.8(7.3)	83.4(7.0)	84.0(8.2)	.502	85.6(5.3)	82.2(8.6)	84.9(7.1)	.205	85.2(6.2)
Resident comorbidities (n=93)	26.6(3.2)	28.3(4.8)	27.2(4.8)	.468	28.4(2.2)	28.7(4.8)	25.7(5.1)	.055	26.9(4.8)	27.8(5.1)	27.2(3.0)	.682	**25.5(5.1)**
Functional status (n=98)	22.6(6.3)	24.2(5.2)	23.8(4.7)	.646	24.0(5.7)	22.9(4.6)	24.2(5.0)	.695	25.1(5.5)	23.7(5.6)	22.4(2.1)	.351	22.3(3.6)
	n (%)	n (%)	n (%)	p [c]	n (%)	n (%)	n (%)	p [c]	n (%)	n (%)	n (%)	p [c]	n (%)
Staff gender				1.000				.473				**.017**	
Male (n=30)	3(10.0)	8(26.7)	19(63.3)		9(30.0)	8(26.7)	13(43.3)		**4(13.3)**	**13(43.3)**	**13(43.3)**		12(40.0)
Female (n=80)	9(11.3)	20(25.0)	51(63.8)		16(20.0)	28(35.0)	36(45.0)		**24(30.0)**	**42(52.5)**	**14(17.5)**		20(25.0)
Staff race				.551				<.001				.334	
White (n=54)	4(7.4)	14(25.9)	36(66.7)		**4(7.4)**	**16(29.6)**	**34(63.0)**		17(31.5)	26(48.2)	11(20.4)		14(25.9)
Black (n=56)	8(14.3)	14(25.0)	34(60.7)		**21(37.5)**	**20(35.7)**	**15(26.8)**		11(19.6)	29(51.8)	16(28.6)		18(32.1)
Staff education				.942				.146				.628	
High school (n=24)	3(12.5)	6(25.0)	15(62.5)		3(12.5)	6(25.0)	15(62.5)		8(33.3)	11(45.8)	5(20.8)		6(25.0)
College (n=86)	9(10.5)	22(25.6)	55(64.0)		22(25.6)	30(34.9)	34(39.5)		20(23.3)	44(51.2)	22(25.6)		26(30.2)
Resident gender				.839				**.003**				.084	
Male (n=66)	7(10.6)	18(27.3)	41(62.1)		**20(30.3)**	**25(37.9)**	**21(31.8)**		14(21.2)	31(47.0)	21(31.8)		21(31.8)
Female (n=44)	5(11.4)	10(22.7)	29(65.9)		**5(11.4)**	**11(25.0)**	**28(63.6)**		14(31.8)	24(54.6)	6(13.6)		11(25.0)
Resident dementia stage				.265				.051				**.008**	
Moderately severe (n=51)	9(17.7)	13(25.5)	29(56.9)		12(23.5)	13(25.5)	26(51.0)		**12(23.5)**	**22(43.1)**	**17(33.3)**		14(27.5)
Severe (n=33)	2(6.1)	7(21.2)	24(72.7)		11(33.3)	14(42.4)	8(24.2)		**13(39.4)**	**18(54.6)**	**2(6.1)**		8(24.2)
Resident eating function				**.005**				.327				**.014**	
Independent (n=22)	**4(18.2)**	**9(40.9)**	**9(40.9)**		2(9.1)	7(31.8)	13(59.1)		**5(22.7)**	**7(31.8)**	**10(45.5)**		6(27.3)
Partially(in)dependent (n=52)	**7(13.5)**	**15(28.9)**	**30(57.7)**		15(28.9)	15(28.9)	22(42.3)		**10(19.2)**	**28(53.9)**	**14(26.9)**		15(28.9)
Dependent (n=36)	**1(2.8)**	**4(11.1)**	**31(86.1)**		8(22.2)	14(38.9)	14(38.9)		**13(36.1)**	**20(55.6)**	**3(8.3)**		11(30.6)

Note. Categories for variables operationalized as the number of behaviors per minute are: 0, between 0 and 1, and 1 or more behaviors per minute. Categories for variables indicating presence of the behavior in a video are: 0 and 1 or more behaviors. Values significant at p < .05 are in bold. Residential functional status was determined using the MDS-ADL. Resident dementia stage was determined using the Functional Assessment

Staging in Alzheimer's Disease (FAST): moderately severe = FAST score 6 to <7, severe = FAST score ≥7. Resident eating function was defined as a proportion of food intake episodes initiated by resident: independent = 75% – 100%, partially (in)dependent = between 25% and 75%, dependent = 0% – 25%.

[a] p-values for Kruskal-Wallis test;

[b] p-values for Wilcoxon rank-sum test;

[c] p-values for Fisher's exact test.