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Evaluation of MealSense©: A Sensory Integration Based

Feeding Support Program for Parents

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Abstract

1 **Importance:** Children with autism often experience feeding challenges related to difficulties in
2 sensory integration.

3 **Objective:** Evaluate the content, acceptability, and usefulness of MealSense©, an online parent
4 education program for children with autism who have feeding challenges related to poor sensory
5 integration.

6 **Design:** A descriptive study in which experts reviewed and rated MealSense© content for
7 consistency with Ayres Sensory Integration® principles and evidence-based practices in feeding.

8 **Participants:** A convenience sample of expert reviewers (n = 5) and parents of children with
9 autism and feeding challenges (n = 5).

10 **Results:** Expert ratings (n = 5) met criteria, showing that MealSense© is consistent with Ayres
11 Sensory Integration® and evidence-based practices in feeding. Parent ratings (n = 5) met criteria
12 showing that MealSense© is acceptable and useful.

13 **Conclusion and Relevance:** MealSense© shows acceptability and usefulness for parents of
14 children with autism is consistent with Ayres Sensory Integration® and evidence-based practices
15 in feeding.

16 **What this Article Adds:** This article provides preliminary support for MealSense© as an
17 evidence-based tool to supplement direct intervention for children with autism and feeding
18 difficulties. Further research is needed to determine the efficacy of MealSense© for improving
19 the transfer of feeding skills into the home environment.

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23 Feeding is a fundamental occupation, needed for optimal health and an area frequently
24 addressed by pediatric occupational therapists. Feeding difficulties, such as selective eating,
25 negative mealtime behaviors, food refusal and reduced acceptance of textured foods (Cermak et
26 al., 2010; Kral et al., 2013; Kuschner et al., 2017; Marshall et al., 2014; Nadon et al., 2011;
27 Provost et al., 2010; Zimmer et al., 2011), are prevalent in 48 to 89% of children with autism
28 spectrum disorder (ASD), limiting successful participation in the essential daily occupation of
29 eating and impacting quality of life for many children and families (Ledford & Gast, 2006).
30 Parents of children with ASD report high stress levels and identify eating as one of the most
31 frustrating occupations for their child (DeMyer, 1979; Hayes & Watson, 2013).

32 Sensory integration is defined as “the neurological process that organizes sensations from
33 one’s body and from the environment and makes it possible to use the body effectively in the
34 environment” (Ayres, 1989). Multiple studies have shown a correlation between feeding
35 challenges and sensory integration difficulties for children with ASD (Ausdereau et al., 2018;
36 Cermak et al., 2010; Nadon et al., 2011; Schreck et al., 2004; Suarez et al., 2012). For example,
37 sensory sensitivity may be a factor in food selectivity for children with ASD, particularly tactile
38 sensitivity (Cermak et al., 2010; Nadon et al., 2011; Schreck et al., 2004; Suarez et al., 2012).
39 Thus, addressing the underlying sensory integration challenges related to feeding may lead to
40 improved mealtime behaviors.

41 Parent education, which refers to programs that are designed to teach parents skills or
42 provide them with information (Schultz et al., 2011), is an evidence-based component of feeding
43 intervention for children with ASD (Adamson & Morawska, 2013; Howe & Wang, 2013). Parent
44 education can provide natural learning opportunities in the home that extend intervention beyond

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45 the clinic environment (Steiner et al., 2012). Parent implemented intervention is also cost-
46 effective and can increase the rate of progress in therapy (Steiner et al., 2012).

47 Recent interest in online strategies and telehealth intervention for individuals with ASD
48 has been successful in meeting specific educational concerns of parents (Kobak et al., 2011;
49 Vismara et al., 2013.) Web-based parent education programs may address the identified barriers
50 for parents to attend educational programs outside of the home, such as travel time, cost, and
51 childcare as well as the additional time needed to schedule in real-time and costly equipment
52 required (Heitzman-Powell et al., 2013; Vismara et al., 2013). Furthermore, parent education
53 delivered virtually may be useful for times when in-person intervention is not possible, as seen
54 during the 2020 COVID-19 pandemic.

55 To address the need for an online program that educates parents of children with ASD
56 about the impact of sensory integration challenges on feeding and that provides a means of
57 carryover of feeding skills from the therapeutic environment into the home, we developed
58 MealSense©, a web-based, parent education program.

59 **MealSense© Program Development**

60 MealSense© is a self-paced, online educational program for parents of children with
61 ASD who have feeding difficulties related to challenges in sensory integration. The MealSense©
62 program was developed by the authors, utilizing current evidence in ASI and feeding, alongside
63 feedback from experts in sensory integration, feeding, knowledge translation, and online
64 instruction. While primarily a sensory-based feeding program, MealSense© acknowledges that
65 feeding is a multifaceted occupation that may be impacted by factors related to motor, behavior,
66 and social functioning. Designed as a supplement to direct intervention, MealSense© targets the
67 transfer of feeding skills from the clinic into the home environment through incorporation of

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68 knowledge translation (KT) strategies and emphasizes education about sensory integration
69 factors that may contribute to feeding difficulties. A detailed outline of MealSense© content is
70 described in Table 1.

71 ASI is an evidence-based practice for children with autism that is frequently requested
72 and utilized (Schoen et al., 2019). Given the correlation between feeding challenges and sensory
73 integration difficulties principles from ASI (Ayres, 1979; Schaaf & Mailloux, 2015) were a key
74 perspective included in the MealSense© program. MealSense© includes sensory-rich
75 experiences, encouraging active engagement of the child, and offering activities at the just-right
76 challenge (Parham, et al., 2011).

77 The Knowledge to Action (KTA) framework (Field et al., 2014) and knowledge
78 translation strategies were also included in the MealSense© program. KTA is a complex and
79 dynamic process of knowledge creation and application that facilitates knowledge use by guiding
80 the translation of knowledge into sustainable and evidence-based interventions (Field et al.,
81 2014). KTA strategies utilized in MealSense© included adding parent reflections, tips for
82 completing the modules, and modification of parent worksheets to allow monitoring of progress.

83 The purpose of this project was to answer the following research questions: 1) Do expert
84 reviewers consider MealSense© consistent with principles of Ayres Sensory Integration® (ASI)?
85 2) Do expert reviewers view MealSense© as adhering to best practices in feeding? and 3) Do
86 parents of children with ASD and feeding difficulties rate MealSense© as acceptable and useful?

87 **Methods**

88 In this descriptive study, we distributed electronic surveys (Qualtrics) and a MealSense©
89 program link to expert reviewers and parents of children with ASD and feeding difficulties to
90 obtain feedback about content, acceptability, and usefulness.

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91 **Participants**

92 Expert reviewers (n=5), recruited via convenience sampling by emailing local pediatric
93 clinicians who had experience in both sensory integration and feeding, were pediatric
94 occupational therapists who met the following inclusion criteria: 1) a minimum of 4 years of
95 clinical experience in occupational therapy, 2) advanced training and education (certification) in
96 sensory integration, 3) a minimum of three years of experience working with children who have
97 feeding difficulties, and 4) a minimum of three pediatric feeding continuing education courses.
98 Parent participants (n=5) were a convenience sampling from the first author's place of
99 employment, a large therapy clinic devoted to treatment of children with developmental and
100 learning disorders. Eligibility criteria included: being fluent in English and having a child
101 between two to eight years of age with a diagnosis of ASD (no other medical diagnosis) and who
102 had at least one feeding goal related to sensory integration difficulties on a current treatment
103 plan.

104 Five parents of children with ASD reviewed the program. Mothers comprised 80% of the
105 sample and fathers were 20%. They ranged in age from 35-39 years (80%) and over 45 years
106 (20%), 40% were white/Caucasian, 40% Hispanic, and 20% Asian. Eighty percent of
107 participants reported having two dependents (80%) and 20% having more than 5 dependents in
108 the home. Twenty percent completed high school, 60% college, and 20% graduate school.

109 **Data Collection**

110 This study was by the Thomas Jefferson Institutional Review Board and determined to be
111 exempt from review.

112 **Instruments**

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113 Program-specific surveys were developed and reviewed by a survey expert, for clarity and to
114 ensure that the items were clear and relevant to the research area. Survey questions used Likert
115 scoring, with 4=strongly agree, 3=agree, 2=disagree, and 1=strongly disagree and were
116 distributed via Qualtrics. The expert survey was designed to evaluate program consistency with
117 ASI (12 questions) and best practices in feeding (7 questions). The parent survey was designed to
118 evaluate program acceptability, defined as adherence, reasonable time to complete, usability,
119 clarity, and satisfaction and program usefulness (applicability and transferability) (Cooper et al.,
120 2007; Kushner et al., 2017; Burchett et al., 2013). We also emailed a program link to parents for
121 access to MealSense© content and an anonymous survey link (13 questions) to evaluate
122 acceptability and usefulness of MealSense©. A table of revisions was developed to summarize
123 expert and parent feedback and identify revisions.

124 **Data Analysis**

125 Data were analyzed by determining the mean score for each question. Since responses of 3.0
126 and 4.0 indicated agreement, a mean score of 3.0 or above was considered acceptable.

127 **Results**

128 **Findings from expert review of content for consistency with ASI**

129 Results from expert reviewers (n=5) indicated a mean score of 3.0 or above on each of
130 the 12 questions related to adherence to ASI principles, indicating that MealSense© content was
131 consistent with the principles of ASI. As shown in Figure 1, experts indicated that MealSense©
132 content addresses sensory exploration during mealtime (mean score 4.0), provides mealtime
133 tasks at the “just-right” level for the child (mean score 4.0), factors the child’s interests into
134 mealtime-related experiences (mean 4.0), addresses mealtime factors related to posture (mean
135 score 3.8), encourages parent-child collaboration during mealtime (mean score 3.8), and provides

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136 strategies that support the child's ability to be successful during mealtime (mean score 3.8).
137 Survey items with the lowest mean score (3.0), but which still met criteria were related to
138 MealSense® addressing ocular skills and bilateral motor control.

139 **Findings from expert review of content for inclusion of best practices in feeding**

140 Results from expert reviewers indicated a mean score of 3.0 or above on each of the 7
141 questions related to best practices in feeding. As shown in Figure 2, the highest ratings were as
142 follows: the modules teach feeding as a multifaceted occupation (mean score 4.0), parent
143 education is used to support the child's feeding (mean score 4.0), and environmental barriers to
144 mealtime participation are considered (mean score 3.8). Survey items with the lowest mean
145 score, but which still met criteria included that MealSense© incorporates behavioral strategies as
146 appropriate (3.4), addresses acquisition of feeding in a sequential way (3.4), and directs parents
147 to consider environmental strengths (3.4).

148 **Findings from parent review of acceptability and usefulness**

149 Results from parent participants (n=5) indicated a mean score of 3.0 or above on each
150 question. As shown in Figure 3, the highest survey responses were that the modules could be
151 completed in a reasonable amount of time (mean score 4.0), information is presented in a logical
152 way (mean score 4.0) and modules were easy to understand (mean score 4.0). High survey
153 responses were also obtained on the following questions: each module was easy to navigate
154 (mean score 3.8), entire website is easy to navigate (mean score 3.8), satisfaction with
155 information (mean score 3.8), I would recommend the program (mean score 3.8), and
156 information applies to feeding needs (mean score 3.8). The survey item with the lowest mean
157 score (3.0), but which still met criteria included that MealSense© parent activities were
158 perceived to be completed in a reasonable amount of time.

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159 **Discussion**

160 Findings from this study suggest that MealSense©, demonstrates consistency with ASI
161 and best practices in feeding and that parents perceive it as acceptable and useful. To our
162 knowledge, this is the first evidence-based, online parent feeding support program for children
163 with ASD that emphasize education about the sensory integration factors that can contribute to
164 feeding difficulties.

165 Feeding is an important occupation that contributes to a child's growth and development
166 (American Occupational Therapy Association [AOTA], 2017) and successful mealtime
167 participation can enhance a family's quality of life (Ausderau et al., 2019; Henton, 2018; Meral
168 & Fidan, 2015). Family-centered feeding interventions that address feeding and mealtime
169 behaviors for children with ASD, such as for the MealSense© program presented here, are
170 needed (Henton, 2018) and findings from this study lend support for the MealSense© program.

171 As a parent education program, Mealsense© is not intended to provide direct intervention
172 which adheres to principles of ASI as designated by ASI Fidelity Measure (Parham et al., 2007).
173 However, the findings of this study suggest that ASI principles were readily operationalized into
174 the MealSense© program, showing that these principles may be utilized outside of the traditional
175 direct intervention, in an online parent education program.

176 One important aspect of the MealSense© program is that it is an online parent education
177 tool that supports the occupation of feeding in the home environment. Implementation of virtual
178 interventions can become unexpectedly important, as was the case during the 2020 COVID-19
179 pandemic. Since families were not able to participate in face-to-face intervention during that
180 time, the necessity for innovative program delivery models in a virtual environment were even
181 more salient (Jang et al., 2012; Steiner et al., 2012).

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182 Potential benefits of implementing a program such as MealSense© in this format is its
183 cost-effectiveness and accessibility. Challenges may include the lack of ability to answer
184 questions for parents in real time and parent completion of modules in a timely manner. Utilizing
185 MealSense as a supplement to direct intervention may help address these potential downsides of
186 the program.

187 Descriptive feedback and quantitative data from expert reviewers identified principles of
188 ASI that may benefit from further development, including addressing oral motor skills and
189 bilateral motor control. Similarly, best practices in feeding that may benefit from further
190 emphasis include addressing behavioral strategies, sequential development of feeding skills, and
191 considering environmental strengths. Future iterations of MealSense© may benefit from more
192 emphasis on these specific areas.

193 **Limitations**

194 Although the MealSense© program showed strong adherence to Ayres Sensory
195 Integration® and best practices in feeding, more research is needed to evaluate the efficacy of
196 MealSense©. Next steps will include pilot testing with parents to provide initial data about the
197 efficacy of MealSense© related to changing feeding behaviors and participation in mealtime in
198 the home setting.

199 Limitations of this study include that both participant groups were convenience samples,
200 which may limit our ability to generalize findings. In addition, the sample size was small (n=5)
201 for both experts and parents, and response bias may have influenced reviewer feedback.

202 **Implications for Occupational Therapy**

203 The results of the study have the following implications for occupational therapy practice:

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- 204 • KT strategies may facilitate the usefulness of parent education programs related to
205 sensory integration and feeding.
- 206 • MealSense© provides an example of an online educational tool for parents of
207 children with ASD and may be especially useful for times when in-person visits are
208 not possible.

209 **Conclusion**

210 There is a need for parent education feeding programs for children with ASD that address
211 the sensory integration factors that can impact feeding behaviors and that facilitate the transfer of
212 skills into the home. This study provides preliminary support for MealSense©, a web-based
213 program designed to educate parents about their child’s sensory integration related to addressing
214 feeding needs for children with ASD and for supporting the carryover of skills into home.

215 **Acknowledgments**

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217 MealSense© and providing feedback related to feeding content. We would also like to thank Dr.
218 Amy Carroll, for contributions in knowledge translation, and Dr. Mary Cohen, for feedback
219 related to online instruction.

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361 Figure 1 Expert data related to consistency with ASI. Likert scoring with strongly agree = 4,
362 agree = 3, disagree = 2, and strongly disagree = 1.

363 *Note.* *n=3.

364 Figure 2 Expert data related to best practices in feeding. Likert scoring with strongly agree = 4,
365 agree = 3, disagree = 2, and strongly disagree = 1.

366 Figure 3 Parent data related to acceptability and usefulness. Likert scoring with strongly agree =
367 4, agree = 3, disagree = 2, and strongly disagree = 1.

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384 Table 1

Table 1 MealSense© Content Outline

Module Page	Content	Parent Activity
Welcome Page and Video	Program format PowerPoint video Knowledge checks Parent observation/activity Guiding principles	N/A
Introduction	ASD and feeding Common ASD characteristics Common health problems	MealSense© Initial Reflection MealSense© Goal List
What is Feeding	Defining feeding terms Complexity of feeding Primary priorities of feeding	MealSense© Observation Log
Sensory Systems and Feeding	What is ASI Sensory systems and impact on feeding Tactile system Proprioceptive system Vestibular system Visual system Auditory system Gustatory system Olfactory system Interoception	MealSense© Sensory Systems Log
The Mealtime Environment	General mealtime strategies Develop mealtime routines Optimal mealtime seating Creating a calm environment and supporting attention	MealSense© Environment Action Plan
Parent and Child Mealtime Interaction	Setting realistic mealtime expectations Building upon child's strengths and interests Reading your child's cues Making mealtime positive	MealSense© Communication Checklist
Play and the Just-Right Challenge with Food Exploration	What is play Elements of play Play language Play and feeding The just-right challenge Exploring foods	Play Exploration and the Just-Right Challenge Log

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