Data Article

The Test of Masticating and Swallowing Solids (TOMASS): Normative data for the adult Indian population

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ARTICLE INFO

ABSTRACT

This data article accompanies the manuscript titled 'The Test of Masticating and Swallowing Solids (TOMASS): reliability, validity and normative data for the adult Indian population.' TOMASS is a widely used procedure to assess the effectiveness of solid bolus ingestion. Previous studies have established normative values for 4 to 80+ years across a range of commercially available crackers and countries. In this data set we report normative TOMASS data for the adult Indian population. Data was recorded from 300 typical individuals in the age range of 21 to 80 years grouped by age and sex. Participants were instructed to eat a commercially (locally) available biscuit 'as quickly and comfortably as possible,' and the task was video recorded. The recorded video samples were analyzed to obtain measures of the number of bites, number of masticatory cycles, number of swallows, and total time taken to complete the ingestion of biscuit.

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Specifications Table

Subject	Health and medical sciences – Nursing and health professions
Specific subject area	Dysphagia (swallowing disorders)
Type of data	Table
	Graph
How data were acquired	Participants were instructed to eat a commercially (locally) available biscuit 'as quickly and comfortably as possible,' and the task was video recorded. The recorded video samples were analyzed to obtain measures of the number of bites, number of masticatory cycles, number of swallows, and total time taken to complete the ingestion of biscuit.
Data format	Raw data – Provided within this article.
	Analyzed – Graphs and tables.
Parameters for data collection	The recorded video samples were analyzed to obtain the following base measures; number of bites, number of masticatory cycles, number of swallows per biscuit (cracker), and total time taken to complete the ingestion of biscuit.
Description of data collection	Participants were instructed to sit comfortably during the testing procedure. They were instructed to eat the biscuit 'as quickly and comfortably as possible' and say their name out loud to indicate the end of the testing procedure. The task was recorded using a hand-held video recorder. Upon completion of the task, a visual inspection of the oral cavity was done to ensure that there was no food residue or pocketing. A stopwatch was used to measure the total time taken by the individual to ingest the complete biscuit, starting when the first bite of biscuit touched the lips and ending with voice onset when the participant stated their name.
Data source location	Institution: Kasturba Medical College, Mangalore
	City/Town/Region: Mangalore, Dakshina Kannada, KarnatakaCountry:India
Data accessibility	The data can be found in the link below:
	TOMASS Indian normative data
Related research article	Kothari, S., Krishnamurthy, R., Balasubramanium, R. K., & Huckabee, M. L. (2021). The Test of Masticating and Swallowing Solids (TOMASS): Reliability, Validity and Normative Data for the Adult Indian Population. *Indian Journal of Otolaryngology and Head & Neck Surgery*, 1-6. doi.org/10.1007/s12070-021-02429-8 [5]

Value of the Data

- Little is known about the assessment of swallowing using a solid bolus, and there is limited research for the same. The Test of Masticating and Swallowing Solids (TOMASS) was developed to provide quantitative measures for the ingestion of a solid bolus. Realizing the importance of a clinically valid and reliable procedure to evaluate the ingestion of solid bolus, country specific reference data has been established to serve as clinical benchmark.
- Normative data reported in the present study serves as clinical benchmark for assessment of mastication and solid bolus ingestion in the Indian population. Practicing clinician (Speech Language Pathologists) can benefit from such reference normative data.
- The data reported in the present study could be used by prospective studies evaluating the psychometric properties of TOMASS.

1. Data Description

Observation of oral intake (trial swallows) is an important component of the clinical swallowing examination. Although a variety of bolus textures are used by clinicians, research sup-

Table 1

Normative data represented as mean and standard deviation by age and gender for different parameters of TOMASS.

		Number of bites		Total time (s)		Number of swallows		Number of masticatory cycles	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Gender	Age group								
Males	Young adults	1.14	0.35	24.93	10	2.75	0.92	30.2	11.59
	Middle aged adults	1.46	0.92	26.8	10.33	2.73	1.2	32.6	12.46
	Older adults	1.47	0.82	32.61	11.86	3.61	1.75	37.76	14.49
Females	Young adults	1.65	0.84	28.76	11.11	3.12	1.22	30.1	8.53
	Middle aged adults	1.77	1.47	33.9	12.02	3.11	1.23	37.85	12.78
	Older adults	1.87	1.24	41.85	12.46	3.5	1.69	41.65	11.06
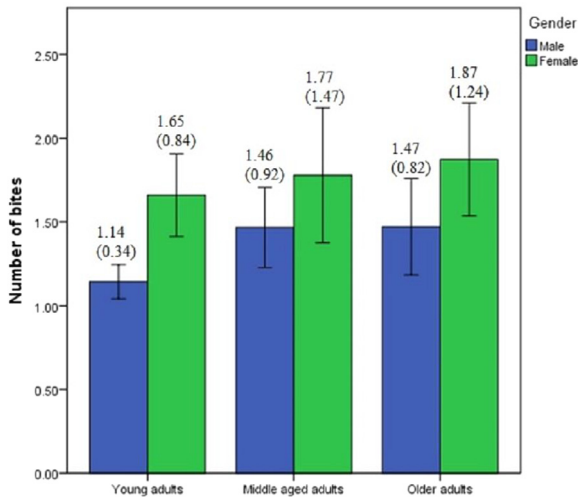
Fig. 1. Number of bites taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).

port is available only for the inclusion of liquids [6] (McCullough, Wertz, Rosenbek, & Dinneen, 1999). However, the practice of using thin to thick liquids fails to adequately address the oral phase of swallowing, particularly mastication and bolus preparation. To address this, the "Test of Masticating and Swallowing Solids" (TOMASS) [1] was developed as an assessment method to evaluate oral pharyngeal efficiency for solid bolus intake.

The TOMASS allows a quantifiable measure, which is inclusive of the oral preparatory phase of swallowing that is not challenged by liquid (water) swallowing tests. Procedurally, TOMASS involves, a participant (patient) being asked to eat a biscuit/ cracker 'as quickly as is comfortably as possible.' Also, the participant is asked to state his/her name upon completion of the task, suggesting that the participant has ingested the cracker/biscuit completely. Upon completion, the number of bites, number of masticatory cycles, number of swallows, and the total time taken to complete this task are recorded. Since it was first reported by Athukorala et al., [1], several research reports [2,3] have reported strong psychometric properties for TOMASS. The current study presents the normative data for the TOMASS across age (21 to 80 years) and gender groups for a commercially available biscuit (cracker) for the adult Indian population.

Table 1: Reports normative data for the measures of number of bites, total time taken, number of swallows, and number of masticatory cycles. The data has been represented as mean and standard deviation by age and gender for different parameters of TOMASS.

Fig. 1. Shows the number of bites taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).
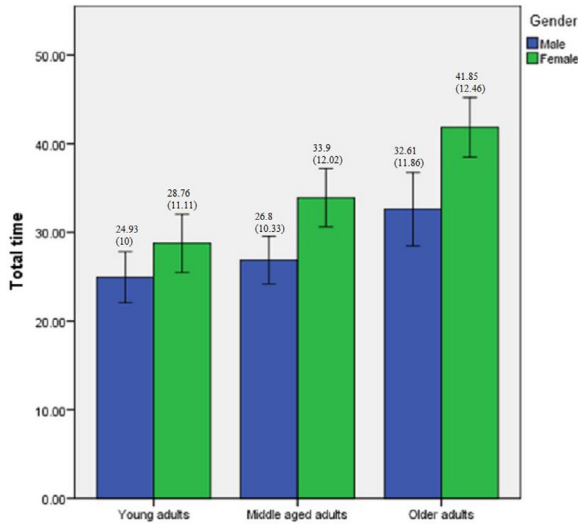
Fig. 2. Total time taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE). * $p < 0.05$.
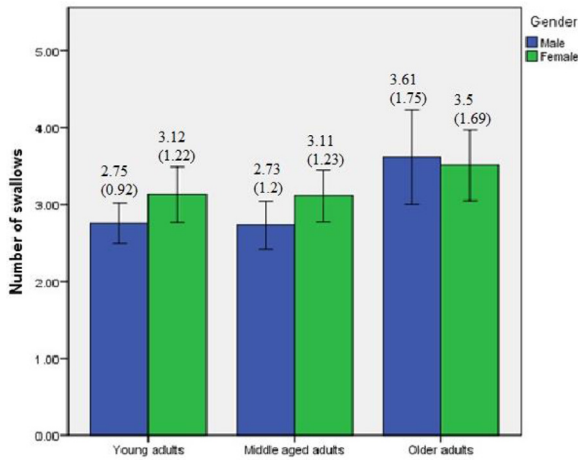

Fig. 3. Number of swallows taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).

Fig. 2. Shows the total time taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).

Fig. 3. Shows the number of swallows taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).

Fig. 4. Shows the number of masticatory cycles taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).

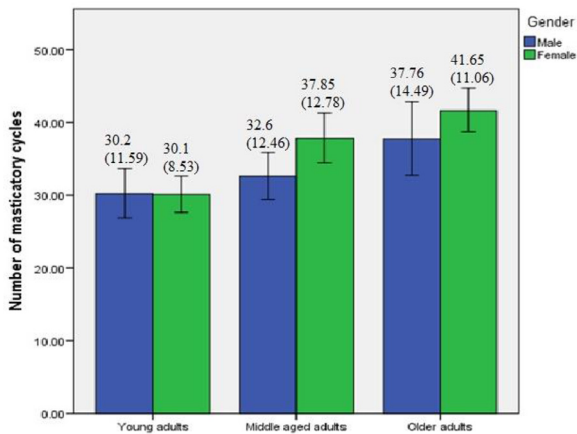Supplementary data: Age and sex wise distribution of data from each participant.

Fig. 4. Number of masticatory cycles taken by males and females represented across age groups as mean (standard deviation). Error bars indicate standard error (SE).

2. Experimental Design, Materials and Methods

2.1. Study design

We adopted a cross-sectional design with nonrandomized convenience sampling. The study was carried out at the Department of Audiology and Speech-Language Pathology, Kasturba Medical College, Mangalore, between 2017 to 2019.

2.2. Participants

Before the recruitment of participants, ethical approval (IEC KMC MLR 11-18/467) for the study was obtained from the Institutional Ethics Committee of the Kasturba Medical College, Mangalore. A total of 300 typical subjects in the age range of 21 to 80 years were recruited for the study based on the sample size formula $2(Z(1 - \alpha/2) + Z (1 - \beta) 2) \sigma2 / d2$, $Z(1 - \alpha/2) = 1.96$ and $Z(1 - \beta) = 0.84$ at 95% confidence intervals. Group 1 consisted of 96 young adults (49 males and 47 females) in the age range of 21-40 years. Group 2 consisted of 114 middle-aged (60 males and 54 females) adults in the age range of 41-60 years. Group 3 consisted of 89 older adults (34 males and 55 females) in the age range of 61-80 years recruited from the community.

All the participants self-reported no speech, language, and/or neurological problems. Only those participants who obtained a score of < 3 on the Kannada version of Eating Assessment Tool 10 (EAT 10 K) [4] were considered for the study. The exclusion criteria for the participants were poor auditory verbal comprehension and physical impairment (paralysis, quadriplegia, diplegia).

2.3. Materials

A commercially available cracker (biscuit), Parle Monaco[TM], was used for the current study. Each biscuit weigh 6.67gms with a total fat content of 121gms and are identical in size, shape, and appearance. The constituent ingredients of the biscuit are wheat flour, edible vegetable oils, sugar, raising agents, invert sugar syrup, common edible salt, yeast, acidity regulators, emulsifiers, dough conditioner, improver amylase, and other enzymes.

2.4. Procedure

Participants were instructed to sit comfortably during the testing procedure. They were instructed to eat the biscuit 'as quickly and comfortably as possible' and say their name out loud to indicate the end of the testing procedure. The task was recorded using a hand-held video recorder. Upon completion of the task, a visual inspection of the oral cavity was done to ensure that there was no food residue or pocketing. A stopwatch was used to measure the total time taken by the individual to ingest the complete biscuit, starting when the first bite of biscuit touched the lips and ending with voice onset when the participant stated their name.

2.5. Measures

The recorded video samples were analyzed to obtain the following base measures; number of bites, number of masticatory cycles, number of swallows per biscuit (cracker), and total time taken to complete the ingestion of biscuit.

Ethics Statement

Ethical approval (IEC KMC MLR 11-18/467) for the study was obtained from the Institutional Ethics Committee of the Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India. All the participants signed an informed consent form.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.dib.2021.106958.

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