

**TRANSLATION, ADAPTATION, AND VALIDATION OF THE
BRIEF AUTISM MEALTIME BEHAVIOR INVENTORY IN
MALAYALAM (BAMBI-M)**

Kripa Maria Tomson

Register Number: P01II21S0020

A Dissertation Submitted in Part Fulfilment for the
Degree of Masters of Science (Speech-Language Pathology)
University of Mysore, Mysuru



ALL INDIA INSTITUTE OF SPEECH AND HEARING

MANASAGANGOTRI, MYSURU- 570006

SEPTEMBER 2023

CERTIFICATE

This is to certify that this dissertation entitled “**Translation, Adaptation, and Validation of the Brief Autism Mealtime Behavior Inventory in Malayalam (BAMBI-M)**” is a bonafide work submitted in part fulfillment for the degree of Masters in Science (Speech–Language Pathology) of the student Registration Number P01II21S0020. This has been carried out under the guidance of the faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysuru

September 2023

Dr. M. Pushpavathi

Director

All India Institute of Speech and Hearing
Manasagangothri, Mysuru 570006

CERTIFICATE

This is to certify that this dissertation entitled “**Translation, Adaptation, and Validation of the Brief Autism Mealtime Behavior Inventory in Malayalam (BAMBI-M)**” is a bonafide work submitted in part fulfillment for the degree of Masters of Science (Speech–Language Pathology) of the student Registration Number P01II21S0020. This has been carried out under my supervision and guidance. It is also certified that this dissertation has not been submitted to any other University for the award of any other Diploma or Degree.

Mysuru

September 2023

Guide

Ms. Sindhusa Chandran

Assistant Professor of Speech Sciences
Department of Speech Language Sciences
All India Institute of Speech & Hearing,
Mysuru

DECLARATION

This is to certify that the dissertation entitled “**Translation, Adaptation, and Validation of the Brief Autism Mealtime Behavior Inventory in Malayalam (BAMBI-M)**” is the result of my own study under the guidance of Ms. Sindhusa Chandran, Assistant Professor of Speech Sciences, Department of Speech-Language Sciences, All India Institute of Speech & Hearing, Mysuru, has not been submitted earlier to any other University for another Diploma or Degree award.

Mysuru,

Registration number: P01II21S0020

September 2023

ACKNOWLEDGEMENT

*I can do all things through **Christ** who strengthens me(Philippians 4:13).*

*Firstly, I am so grateful to **God** for being with me always and loving me beyond limits.*

I am sure you are the constant source of strength guiding your children to climb high mountains and swim through deep waters.

I would like to extend my sincere gratitude to Dr.M Pushpavathi. Also, I feel so fortunate and grateful to have done this dissertation under my guide, Ms.Sindhusha Chandran. Mam your guidance helped me a lot and thank you mam for welcoming us always with your warm smile and patience. You never made us feel stressed and you showed that any difficult work can be done with such ease.

I want to extend my heartfelt gratitude to my parents. Papa and Mummy who was and will be with me, encouraging and always hoping for my best. I know that Papa, your support, and Mummy, your unconditional love, is the greatest treasure that can never be replaced.

I also thank Dr.Gayathri mam and Jesnu sir, for being ready to lend any help regarding this study and I am very grateful to both of you. I also thank Dr.Preethi, mam, and Akash sir for your valuable help. Thank you Shyametta, Your immense help at the right moment matters a lot to me.

Thank you, Shiva Ranjini Mam, for your care and your smile. One amazing staff I got during my externship period, Lincy Mam, thank you for your valuable time amidst your busy schedule. I especially thank Laisa Aunty and Sr. Rosily who helped me in this study. You guys are always my inspiration. My best Malayalam teacher, Bindu Miss, thank you for your time.

Also, I am so happy to have such a wonderful statistics staff, Vasantha Lakshmi mam, and Sreenivas sir, for your helping hands whenever required. Thank you, Vasanthalakshmi mam, for your encouraging words and help at the last moment.

I want to convey my gratitude towards all the participants of this study. Especially, I especially thank Faizan's mother for helping me to find participants and for your valuable care. I thank Anitha Aunty, for eagerly helping me in my study as always. You are the best. Also, thank you, jijichettai and deepachechi, for your eager participation in this study.

Kuttai, thank you for being that amazing brother I can always rely upon. Ammachi, thank you for all your prayers and blessings. Njunji, my crazy sister, thank you for being there for me always. Ponootaa, even though you give me mature advice, you are still my lil one. Royichaa, you always spread happy vibes, and thank you for being that funny, bro. Kunjamol, Shangari Chechii, Mariamol, Jessi,kutta, amala, and all my relatives out there, I am so lucky to have u guys in my life. Miles apart, but still always, we are united.

Swapnachechi,Shibuchetta,Nikhilchetta,Fr.Mary, your presence here in Mysore matters a lot.

The last seven years were a roller-coaster for me. I Am so grateful for the bunch of these best buddies who were a part of this journey. We made memories and shared happiness and fights. Without our knowledge, we became a family. Pathuu, we laughed, cried, and fought together through these years. You cheered me up and always reminded me about my dreams, even though I sometimes forgot them. Reshu, I will surely miss our morning walks, terrace talks, and your caring heart. We shared memories, and remembering the days spent with you is a lot of fun. Irfuuu one of the latest gems I got here. Just your presence brings lots of laughter and happiness and

your dedicated, kindest heart deserves the best in this world. Aaabi....thank you for being there like a homie. Urs was the most wonderful journey, and so happy to be a part of it. Hima, we went together for many crazy journeys and had many beautiful moments together to cherish for a lifetime. You are one of the people I have ever seen who never judged me and always listened to anything I said to you. Akhila, you and your vibes are always amazing. The reels,dances, talks, and your company was so refreshing.Unni.the one person whom I have mocked the most because you are so cute, and I have never seen a person cuter than you. Swathi, that artistic creative buddy, from roomies to MSc batchmates it was so lovely and fun to have you here all through these years. Sneha..your pinnentha question and the long talks once in a while added to our bond, and I am truly grateful for all your timely help and kind tokens of love through cute pieces of letters. Deepika, you are a wonderful friend and you really have a genuine heart and I am really happy to meet you. Your clinical knowledge and your helping nature truly will reach you to great heights. Nutan, my dear Joseph, you are so special. Sudhuu, my fighting partner, the time spent with you is really special.

Archana, Sathya, Manasa, Manasi, and Getcy, my dear posting partners, the postings were never boring because of you guys and I got the best posting partners. Siri, thank you for being that pure soul who always encouraged me. Divya V, Divya, Shigha, Nammu, Swalih, Angeline, Shwetha, Urvi, Simi, and all of my MSc SLP A Bunch. It was so entertaining and I had a good time with you all.

Febida, Nadba, Shalbiya, I will never forget the days we had together. I can't think of my ug life without you guys. Shreya, Preethi, Teenu, you guys mean a lot to me. Chelsa, Krishna, Nivu, Shahil, Noora, Sushmitha, ... and all my buddies thank you for everything. Bella, Milu, Joyson, Adeena, Angel, Jasmin, Tristan, Chethan, Aishwarya, Augusta, Jincy, Sandra, Elizabeth, Ashna, Shaun, Larzen, Anot, Jewl, Melvin, and

Angel. I had a good time with you guys. Minnu...you are a gem I got in AIISH. Also, I thank Mizba for your timely help.

Muskan, we were together most of the time on this dissertation journey and it was really nice. Anju chechi, Athirachechi, Ameeratha, Swathichechii, Jessica chechiii, Delna chechi, Chithra chechi, and all the seniors who have shown us love, care, and help, thanks a lot.

Also, so thankful to all the akkas here in our Kapila Ladies Hostel who considered us with their care and food. To the security akkas, thank you for your caring gestures.

I am so glad to be a part of this institution for these long years, even though it seems short. So grateful to all the wonderful staff for sharing your knowledge and motivating us to do better. Thank you, Dr.Gopishankar sir, our mentor, for constantly guiding us and helping us to gain more information in the vast area of Speech-Language Pathology.

Dilsha,Sandra, Abhiram, Suraj, Aparna, Arya, Husna, Aditya, Kavya, Summaya, Lahan, Ayisha, Diya, Ashwathy, Namitha, Shahana, Nandeepa, Meenutti, Anupama, Nazrin, Diya, Raheema and many more....it was so nice to meet all the juniors, here in Aiish even though the time which I may have spent with you guys will be short. I am sure that I may have missed someone very important to mention...So finally, I am so grateful that I got the best college and the best place, Mysuru, and the best ppl around me all through these years. Greatful for everything.

TABLE OF CONTENT

Chapter	Title	Page number
	List of Table	ii
	List of Figures	iii-iv
I	Introduction	1-6
II	Review of Literature	7-31
III	Method	32-38
IV	Results	39-64
V	Discussion	65-75
VI	Summary and Conclusion	76-79
	References	80-95
	Appendix A	96-97
	Appendix B	98-100

LIST OF TABLES

Table number	Title	Page Number
1.1	List of feeding questionnaires available for children with ASD	3
3.1	Gender Distribution Across Children With ASD and Typical Children	37
4.1	BAMBI-M Statements and their F1 and F2 Translated Versions(in IPA)	40
4.2	Modifications suggested by the Expert Panel Committee in Stage 4 onto the consolidated version in Step 2	43
4.3	Coordinates of the Curve	46
4.4	Overall Scores and Demographic Distribution of Two Groups	48
4.5	Frequency and Percentage of Occurrence of 11 th Statement in ASD Population	50
4.6	Frequency and Percentage of Occurrence of 11 th Statement in Neurotypical Population	51

LIST OF FIGURES

Figure no.	Title	Page No.
3.1	Flowchart Depicting Translation	36
4.1	ROC Curve obtained After Administration of BAMBI-M	47
4.2	Figure Depicting the Median BAMBI-M Scores Across Children with ASD and Neurotypical Children	49
4.3	Frequency of Occurrence of LVF 11 Statement Among Children with ASD	50
4.4	Frequency of Occurrence of LVF 11 Among neurotypical children	51
4.5	Food Neophobic Behaviour Frequency Distribution Among Children with ASD	52
4.6	Food Neophobic Behaviour Frequency Distribution Among Neurotypical Children	52
4.7	Frequency of Occurrence of LVF 14 Statement Among Children with ASD	53
4.8	Frequency of Occurrence of LVF 14 Statement Among Neurotypical Children	53
4.9	Frequency of Occurrence of LVF 15 Statement Among Children with ASD	54
4.10	Frequency of Occurrence of LVF 15 Statement Among Neurotypical Children	54
4.11	Frequency of Occurrence of LVF 19 Statement Among Children with ASD	55
4.12	Frequency of Occurrence of LVF 19 Statement Among Neurotypical Children	55
4.13	Graph Indicating distribution of LVF among children with ASD	56

4.14	Graph Indicating distribution of LVF among Neurotypical children	56
4.15	Frequency of Occurrence of FRF2 Statement Among Children with ASD	57
4.16	Frequency of Occurrence of FRF2 Statement Among Neurotypical Children	58
4.17	Frequency of Occurrence of FRF4 Statement Among Children with ASD	58
4.18	Frequency of Occurrence of FRF4 Statement Among Neurotypical Children	59
4.19	Graph Indicating Distribution of FRF Among Children with ASD	59
4.20	Graph Indicating Distribution of FRF Among Neurotypical Children	60
4.21	Frequency of Occurrence of CF3 Statement Among Children with ASD	61
4.22	Frequency of Occurrence of CF3 Statement Among Children with ASD	61
4.23	Graph Indicating Distribution of CF9 Among Children with ASD	62
4.24	Graph Indicating Distribution of CF9 Among Neurotypical Children	62
4.25	Graph Indicating distribution of CF among children with ASD	63
4.26	Graph Indicating Distribution of CF Among Neurotypical Children	63

CHAPTER I

INTRODUCTION

Infancy and early childhood are crucial periods for physical growth and neurodevelopment, making nutritional intake a significant concern that can have long-term effects if not addressed effectively at the right time.

A neurodevelopmental disease known as Autism Spectrum Disorder (ASD) is characterized by limitations on concurrent behavior patterns or interests and social communication difficulties (APA, 2013). Restricted interests and other sensory issues in this population predominantly lead to maladaptive behaviors while feeding (Rogers & Ozonoff, 2005). Children with ASD had a higher prevalence of feeding issues than the comparison group, with higher rates of food selectivity by texture (23.1% vs. 7.1%), food selectivity by type (24.4% vs. 11.8%), new food refusal (10.3% vs. 0%), and food overeating (14.1% vs. 3.5%) (Seiverling et al., 2018).

Feeding issues like compulsive eating, fear of trying new meals, and a preference for a particular food presentation are common in children with ASD (Baraskewich, 2021). The literature has identified three feeding issues in ASD kids: selective eating, food refusal, and disruptive eating behaviors (Rogers et al., 2012). Thus, they are restricted to a particular dietary variety, exhibit food neophobia, food refusal, limited texture, unordinary food preferences (such as particular food colors, shapes, textures, appearance, or a particular arrangement of food on feeding utensils), and insist on eating food served in certain utensils/dishes. Furthermore, they become awkward in social settings during meals and adopt odd postures (Ziviani & Dodrill, 2014). They frequently display oral defensiveness, tactile defensiveness, and sensory oversensitivity in the mouth, which leads to nutritional selectivity (Lane et al., 2010).

The investigations have identified these children's persistence, impulsivity, neophobia, sensory deficits, social disobedience, and biological food intolerance as the root causes of their feeding difficulties. Feeding issues in these children are made worse by other factors such as carer worries, feeding practices that reinforce lousy eating habits, and communication deficits (Shaw et al., 2003).

Therefore, feeding problems are common among children with ASD, irrespective of age or cognitive capacity (Vissoker et al., 2015). Mayes and Zickgraf (2019) found that atypical eating behaviors, such as limited food preferences and brand-specific preferences, happens more frequently in children with ASD (70.4%) compared to children with other disorders (13.1%) and typically developing children (4.8%). Rates of feeding problems in children with ASD are probably significantly greater when concerns about mealtime behaviors, fear of trying new foods and eating problems are linked to medical diseases. Their nutritional problems may be complex, vast, and varied.

Children with ASD have atypical and inappropriate feeding difficulties, and according to Kodack and Piazza (2008), mealtime difficulties are more common in children with ASD than other developmental disorders. Additionally, they are seen lingering into adulthood (Fodstad & Matson, 2008). Thus, assessing their feeding skills at an early age is crucial, along with assessing communication, neuromotor, and oral sensory skills.

Various tools have been used to evaluate feeding problems in this population, including direct mealtime observations and caregiver/parent-completed questionnaires (Matson & Fodstad, 2009). Most studies have relied on the latter to measure their feeding behaviours. The questionnaires are widely used since they are less time-consuming, can be administered irrespective of settings, are administered even by

untrained personnel, and enable to identify appropriate management strategies. Various feeding questionnaires are developed to determine problems in feeding and mealtime behaviors in children with neurodevelopmental disorders, as mentioned in Table 1.1.

Table 1.1

List of Feeding Questionnaires Available for Children with ASD

Sl.no.	Feeding questionnaire for children with ASD	Developed by	Validated languages
1.	Screening Tool for Feeding Problems (STEP)	Matson and Kuhn (2001)	English
2.	Behavioural Paediatrics Feeding Assessment Scale (BPFAS)	Crist and Napier (2001)	English, Greek, Korean, Turkish, Malay, Sinhala, German
3.	The Swedish Eating Assessment (SWEAA)	Karlsson et al. (2013)	Swedish
4.	Brief Autism Mealtime Behaviour Inventory (BAMBI)	Lukens and Linscheid (2008)	Brazilian Portuguese, Vietnam, Malay, Thai, Oman, Chinese
5.	Aut-Eat Questionnaire (AEQ)	Gal et al. (2022)	Arabic, English, Spanish, Hebrew
6.	Parent Mealtime Action Scale (PMAS-R)	Hendy et al. (2016)	English

The tool BAMBI is a widely used feeding questionnaire for children with ASD in clinical and research studies. According to Seiverling et al. (2010), this tool was a promising psychometric assessment of feeding functions in children with ASD.

BAMBI was developed by Lukens and Linscheid (2008) to standardize data collection on feeding patterns, specifically in ASD. This questionnaire covers several problematic behaviors commonly observed in this population, which has a great chance of being utilized in clinical practice for a quick and accurate diagnosis of feeding issues in children with ASD. Twenty questions were separated into three domains in the initial questionnaire (Lukens, 2002); however, the authors drew attention to its shortcomings and modified it after six years.

The revision comprised 18 items and rates the frequency of specific behaviors using a Likert scale (1 = Never/Rarely to 5 = At Almost Every Meal). The scale yields a total score, and the questionnaire consists of three domains. The three domains are the limited variety factor, food refusal factor, and ASD characteristic factor. Items 10, 11, 13, 14, 15, 16, 17, and 18 in the restricted variety factor measure the child's openness to experimenting with new foods and foods that differ in preparation, texture, and type. Five factors make up the food denial factor (items 1, 2, 4, 7, and 8), which describes the problematic behaviors shown when a kid rejects food offered to them. At last, the characteristic component of ASD (items 3, 5, 6, 9, and 12) includes elements that indicate the behavioral traits of ASD, such as self-aggressive and stereotyped actions during meals. The questionnaire is completed by the parents/caregivers (Castro et al., 2019). A frequency score is determined by calculating the sum of the Likert responses with the item numbers 3, 9, 10, and 15 reverse-scored.

However, there is currently an unavailability of a tool to address feeding problems in children with ASD in the Malayalam language, a south Indian language spoken in Kerala. The BAMBI questionnaire is found to be sensitive enough to understand feeding-related problems.

1.1 Need For the Study

To comprehend the issues linked to feeding in children with ASD, there is a necessity for a better parent report of feeding difficulties. Findings from the literature indicate that the BAMBI questionnaire is a valuable tool for analyzing feeding-related issues in children with ASD.

According to a meta-analysis, children with ASD are estimated to have a five-fold higher probability of experiencing feeding issues than their usual peers (Sharp et al., 2013). Other feeding-related tools are challenging because children with ASD are found to have specific feeding problems, such as sensory feeding issues, ritualistic and repetitive behaviours at mealtimes (Schreck et al., 2004), and sensory feeding problems (Chistol et al., 2018). Due to the shortcomings of existing measures insensitivity to the behaviors seen in children with ASD, the BAMBI questionnaire was created. The validation of this questionnaire makes it possible to incorporate a structured assessment of this population into therapeutic practice and to increase caregiver awareness of feeding disorders and their effects. This is essential since guardians more regularly report feeding-related difficulties, and up to 80% of children with ASD may have difficulty with their feeding behaviors (Castro et al., 2019).

The translation and validation of BAMBI are done in different languages like Brazilian Portuguese (Castro et al., 2019), Vietnam (Huong et al., 2021), Malay language (Nor et al., 2019), and Thai (Chunsuwan et al., 2021), indicating its sensitivity related with feeding problems in children with ASD. Hence, this well-established BAMBI questionnaire is preferred over others by SLPs (Speech Language Pathologists) to assess feeding-related problems. These questionnaires demand active participation from the parents and good observation of their child over a period of time in a natural context during meal times. Hence, it is mandatory to have this questionnaire in the

native language of the parents. Adapting a test for language and cultural differences involves more than just translating the content into the target language; field testing is also necessary to determine the validity and reliability. There is no sensitive questionnaire for assessing feeding behavior for children with ASD in any of the Indian languages. Any questionnaire developed and validated on a foreign population requires linguistic and cultural adaptations and improvisation to suit the needs of our population. Thus, a linguistically translated, culturally adapted, and validated tool is a requirement for assessing feeding issues in Indian children with ASD. Thus, there is the utmost need for a feeding tool validated for the Indian Population. Hence, the current study is a preliminary study attempting to validate the functional measures of the BAMBI questionnaire in Malayalam, a south Indian language spoken in Kerala.

1.2 Aim of the Study

To adapt, translate, and validate the Malayalam version of the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire in children with ASD.

1.3 Objectives of the Study

1. To translate and adapt the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire to suit the Indian population.
2. To validate the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire.

CHAPTER II

REVIEW OF LITERATURE

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by the inability to communicate and interact socially and the prevalence of limited, repetitive activities. Social communication deficiencies associated with this disorder can manifest in various ways, including issues with verbal and nonverbal social interactional skills and issues with social reciprocity and joint attention. Stereotyped, repetitive speech and physical movements, rigid constancy in following routines, narrow interests, and hypersensitivity and/or hypo-sensitivity to sensory input are indications of restricted, concurrent behaviors and interests seen in ASD individuals (APA, 2013).

Feeding Issues in Children with ASD

Social, communicative, and behavioural deficits are hallmarks of autism spectrum disorder, according to DSM-V criteria. Feeding disorders are also one of the most prevalent difficulties affecting this population (Vissocker et al., 2015). Feeding difficulties are characterized as a condition wherein one is unwilling to consume appropriate nutrition, hydration, or calories in the levels necessary to flourish, and has detrimental effects on one's health, development, relationships, and mental health (Babbitt et al., 1994). Issues with feeding frequently place the child's health in peril (Lazaro, 2018). It is well-known that feeding difficulties in people with ASD significantly affect everyday functioning and may even be perilous to that individual (Fodstad & Matson, 2008).

Children with ASD are found to have increased feeding issues than children who are typically developing (Allen et al., 2004). According to Seiverling et al. (2018),

Children with ASD had noticeably more feeding issues. Children with ASD with feeding issues were reported to have rules that seem unreasonable about what constitutes a proper meal (Dovey et al., 2019).

According to Mannion et al. (2013), feeding issues are co-existing issues in children with ASD. A supporting study by Nadon et al. (2011) found that 80% of children with ASD struggle with feeding. Many patients experience feeding difficulties due to their ASD symptoms and any corresponding behavioral, cognitive, psychological, or familial issues (Vissoker et al., 2015).

DSM-5 criteria pointed out that many feeding disorders, especially Pica (Rastam, 2008) and Avoidant/Restrictive Food Intake Disorder (Kenney & Walsh, 2013), were the most documented issues in Children with ASD. Food denial, a limited food repertoire, food selectivity, and disruptive mealtime behaviors are just a few of the issues these children face (Bandini et al., 2010).

In contrast with children without ASD, children with ASD have noticeably higher feeding issues (Seiverling et al., 2018). According to Sharp et al. (2013), persistent feeding issues can lead to various detrimental health and developmental outcomes, such as undernutrition, developmental restriction, social deficits, and subpar academic performance. Skills concerns, such as oral-motor impairments that limit the ability to chew, swallow, and suck, are also noted as prominent feeding problems (Twachtman, 2008).

Frequency of problematic eating and feeding behaviors is the primary thing differentiating children with ASD from average (Dovey et al., 2017). Feeding issues happen frequently and with more diversity in children with ASD compared to children with developmental disabilities and among typical (Schreck et al., 2004). Comparing to typically developing children, children with autism had higher feeding issues,

troublesome feeding patterns, and limitations in accepting particular food groups and novel foods (Sahan et al., 2021).

Children with ASD may exhibit atypical feeding behaviours compared to their peers (Sharp et al., 2013), exhibiting issues like food denial, interest in particular tastes or smells, and a limited variety (Zimmer et al., 2012). The feeding issues connected to ASD, according to Vissoker et al. (2015), are complex and have behavioural, physiological, and emotional roots. Adulthood can be affected by these problems (Fodstad & Matson, 2008). The findings emphasize the value of nutritional clinical practices, including assessments of nutritional status and feeding issues in children with ASD (Rouphae et al., 2023).

Food Selectivity

Food selectivity has been the most frequently mentioned feeding problem in children with ASD (Cermak et al., 2010). There is broad consensus in the academic literature that food selectivity is the most common aspect of feeding difficulties in children with ASD. Food selectivity may be apparent at a very early age in children with ASD and may continue throughout life. It is characterized by a restricted variety of foods, consuming certain foods in greater quantity, and selective consumption of particular foods. (Cermak et al., 2010).

Extremely picky eaters with ASD may occasionally also meet the criteria for food refusal as they are not consuming enough food to sustain proper development and have a limited variety as well as volume of consumption. Numerous children with ASD experience food selectivity or "picky eating," which can be detrimental to a child's health and nutritional status (Cermak et al., 2010). According to the reports of parents of children with ASD, they practiced both dietary restriction and refusal and only ate around half of the foods on the list (Schreck & Williams, 2006). The main issue with

the ASD population is food selectivity, which is displayed as food denial, eating too quickly, issues with chewing, stealing food from peers, and vomiting (Leader et al., 2020).

The limited variety of foods consumed by children with ASD is one of the most commonly mentioned feeding issues (Matson & Fodstad., 2009) and can be considered a diagnostic criterion. The habit, such as eating only a specific range of foods is more common and prevalent among them. Preference for carbohydrates, snacks, processed foods, and a dislike of produce, protein foods, fruits, and veggies (Castro et al., 2019). Food rejection and limited food variety consumption frequently coexist. Food rejection factors may include things like texture, colour, appearance, Odor, and temperature (Ledford et al., 2006). Numerous studies have shown that food selectivity behaviour is much more frequent among children with ASD than among their typically developing peers (Raspini et al., 2021).

The DSM 5 criteria highlight food selection as a defining trait of ASD, even though it is not a reliable diagnostic criterion. The feeding habit that appears to be most frequently linked to ASD is food selectivity, and it is reported that more than 70% of the pediatric population has ASD (Sharp et al., 2018). Food refusal, having a small selection of approved meals, and consuming a single food frequently are all examples of the wide range of eating situations or behaviours that are described by the phrase "food selectivity" during mealtimes (Vissoker et al., 2015).

Children with ASD have particular dietary preferences. They appreciate junk food, fruits, veggies, and soft foods like rice and bread more than robust ones. They prefer to use any electronic device or watch TV during meals. The results indicate that children with ASD have limited food acceptability and dietary preferences (Rashid et al., 2021).

Lack of Flexibility During Feeding

A variety of restrictive and inflexible feeding behaviours was shown by 89% of children, according to a study (Ledford & Gast, 2006). Children with ASD frequently exhibit stereotyped food preferences and are unwilling to try new tastes (Raspini et al., 2021). Children with ASD are also less adaptable and exhibit less flexibility in mealtime routines (Williams et al., 2000). Reliance on specific, nonfunctional mealtime routines is seen in children with ASD. According to the study of Lane et al. (2014), most rated feeding-related problematic behaviour seen in children with ASD include rigidity regarding mealtime routines, aggression and self-injurious behaviour during at mealtime. Variety of restrictive and inflexible feeding behaviours was shown by 89 % of children, according to a study (Ledford & Gast, 2006). Children with ASD frequently exhibit stereotyped food preferences and resistance to new taste experiences (Stafford et al., 2017). Also, studies have found that Children with ASD show more mealtime disruptive behavior in contrast with typical peer groups (Gentry & Luiselli, 2008) with more disruptive behaviors when new foods are introduced. Problematic mealtime behaviour was indicated by rigidity in eating routines, a refusal to try new foods, or an inability to sit down until the meal was finished. There were obvious indications of high rates of food rejection, especially of protein-rich foods, and a lack of variety resulting in insufficient nutrient intake (Attlee, 2015).

ASD is characterized by repetitive and constrained behaviours, which include ritualized eating patterns and rigorous feeding schedules, according to Matson and Fodstad (2009). They claimed that cognitive obsessions and behavioural rituals might contribute to the overlap between problematic mealtime habits and feeding issues. There are numerous ways to account for this link. Examples of symptoms of cognitive rigidity include severe dietary restrictions and a fixation with food. The rigidity and

fixation with food/eating that characterize these behaviors could lead to disordered feeding (APA, 2013).

Olfaction and Textural Sensitivity in Children with ASD During Feeding

The texture of food matters, and it is essential to the eating process and can influence whether a food is accepted or rejected (Pellegrino et al., 2020). Introducing new meals to young children is preceded by exploration through touching. Children exhibiting sensory defense may be less likely to use their hands during meals (Ernsperger & Hanson, 2004). Children with ASD exhibit sensory aversions (Schreck et al., 2004). Most children also faced issues with tactile sensitivity, and almost 60 % disliked their hands/face being dirty (Emmons et al., 2005).

According to studies, the response of children with ASD to olfactory stimuli seems atypical (Muratori et al., 2013). Issues in identifying basic smells and difficulty discriminating different smells can result in food selectivity issues and lead to consuming a narrower range of foods (Bennetto et al., 2007). Olfactory dysfunctions could also indicate a biomarker for autism (Dudova et al., 2011). They are also precise about rejecting food based on its texture, particularly with mushy and slimy items. Food texture and taste influence food acceptability and drive food choices (Proserpio et al., 2017).

Effective behavioral methods must target sensory sensitivities, such as colour, taste, and texture, according to Baraskewich et al. (2010). 78 to 90% of kids with ASD struggle with sensory processing (Leekam et al., 2007). According to Laud et al. (2009), high prevalence rates of feeding issues in ASD are commonly attributed to sensory impairment/defensiveness in the literature.

Observing a link between feeding issues and sensory defensiveness, Cermack et al. (2010) concluded that sensory sensitivity is thus a phenomenon to understand food

selectivity. According to Nadon et al. (2011), there is a connection between sensory processing issues and the frequency of eating issues in children with ASD actually, sensory sensitivity may lead children with ASD to restrict their meal choices in favor of foods whose textures they prefer, regulate, and accept (Peretti et al., 2019).

Children with ASD show a more severe and pervasive sensory processing impairment than children without ASD, and many sensory inputs influence their eating habits in addition to taste and smell. Subgroups of children with ASD and those without ASD displayed a Hyporesponsive profile. Children with ASD had more severe impairments in Under-responsive/Seeking sensation and Auditory Filtering than children without ASD. Only those with ASD had severely impaired taste and smell sensitivity. Additionally, a subgroup of children with ASD had a more severe impairment in tactile sensitivity (Panerai, 2020).

Effective behavioural methods must target sensory responsiveness, such as colour, taste, and texture (Emond et al., 2010). According to Twachtman et al. (2008), sensory modulation is the technique that enables a person to appropriately filter the vast amount of sensory information that continuously floods the neurological structure.

Cermack et al. (2010) came to the idea that sensory sensitivity can be seen as a mechanism to explain food selectivity after noticing a connection between feeding issues and sensory defensiveness. Nadon et al. (2011) found a link between sensory processing impairments and how frequently eating problems occur in children with ASD. It was shown that there was a substantial correlation between eating problems and visual and aural sensitivity in children with ASD. Rigid and repetitive behaviour patterns characterize ASD, and rigid insistence on the routine may cause significant dietary restrictions. Regarding the insistence on consuming a limited selection of meals, a youngster often chooses a food item based on sensory aspects such as taste, color,

temperature, or texture (Vissocker et al., 2015). Due to their sensory issues, they will not try new meals (Rashid et al., 2021).

Children with autism often scored more on the oral sensory processing portion in the current study, showing enhanced atypical oral sensory processing. In contrast to other oral sensory difficulties, the majority of the kids had selective feeding habits, especially when it came to food textures. Additionally, earlier studies revealed that children with ASD had more severe oral sensory issues (Hazen et al., 2014).

Rapid Eating

Rapid eating is a less common feeding issue in this demographic, but it is starting to gain scientific attention. Rapid eating is finishing a meal quickly, which can cause social stigma, aspiration, and vomiting (Anglesea et al., 2008).

Food Neophobia

Children with ASD were discovered to exhibit poor self-feeding abilities and to be prone to deny foods and also they are more likely to consume new foods (Ahearn et al., 2001). Food neophobia (FN) is commonly seen in ASD children, which consequently cause issues in health quality (Serra et al., 2022). Kral et al. (2015) found that among children with ASD, the ones with oral sensitivity issues were found to report more food neophobia difficulties. According to Ismail et al. (2020), problems with sensory processing, taste perception, irrational fear of unfamiliar objects, environmental factors, parental and peer modeling, and feeding habits may contribute to difficulties consuming new foods. Children with ASD were found to be more food-neophobic than their peers without ASD who were the same age (Miller et al., 2018). Numerous feeding problems and intake of limited foods were reported in Children with ASD (Seiverling et al., 2018).

It has been hypothesized that sensory preferences may cause children with ASD to limit their diet to foods with desirable, palatable, and manageable textures. Significant links between food issues and specific sensory processing deficiencies in children with ASD have also been found. These relationships have previously been observed in kids with developmental impairments.

Restricted Variety of Food Intake

Children with ASD consume more processed foods, while their intake of fruits and vegetables is significantly less (Ranjan et al., 2015); children with ASD exhibited clear preferences for crunchy or dry foods (Huxham et al., 2021). Frequent problem mealtime behaviors of children with ASD were a preference for ‘crunchy’ food, food neophobia, and problems remaining seated at the table during meals (Catino et al., 2019). Most of the children with ASD showed less preference to a wide variety of foods compared to controls. Children with ASD eat a significantly narrower range of foods when compared with neurotypical children (Schreck et al., 2004). Food rejection and limited food variety are common issues seen in children with ASD (García et al., 2019). Dietary intake in children with ASD is narrower (Lane et al., 2014). The limited variety of foods is one of the areas frequently reported regarding feeding difficulties in children with ASD (Grimaldi et al., 8). In addition to the findings that they only consume a limited variety of foods, they also strongly prefer processed foods, snacks, and carbs, and are more reluctant to consume fruits, vegetables, and proteins (Ledford & Gast, 2006).

Children with ASD only eat narrow range of daily portions of fruits and vegetables and a lot more sugary drinks and snacks. However, feeding difficulties do not always equate to a greater risk of stunted growth (Vissoker et al., 2015). We urge

physicians to take into account sensory profile, social communication abilities, and eating when diagnosing ASD (Suarez et al., 2022).

Disruptive Feeding Behaviours

Disruptive eating behaviors such as rejection, spitting out food, hitting spoons, fleeing the food environment, sobbing, and yelling are other issues frequently found in children with ASD (Sahan et al., 2021). Chewing and spitting is increasing in prevalence among Australian adolescents with ASD (Gilmartin et al., 2023). Feeding issues in Children with ASD have been connected to behavioural issues during meals, such as aggression, temper tantrums, and throwing food (Herndon et al., 2009). Also, studies have found that Children with ASD show more mealtime disruptive behavior than typical peer groups (Gentry & Luiselli, 2008).

Additionally, Children with ASD showed greater issues with their behaviour during meals than TD kids. Indeed, they acted more aggressively during meals, gagging and spitting food, which was consistent with the study by Rouphael et al. (2023). Children with ASD were shown to behave differently depending on their gender when eating, including spitting food and not sitting at the table. The pragmatic challenges and food difficulties that are present in Children with ASD can be linked, and the child's deficits in social interaction may have an impact on how the child learns to behave during meals. Additionally, they had more problems concerning chewing. They display behaviours like refusing to eat and throwing food when they are eating (Rashid et al., 2021). According to a study, children with ASD performed worse throughout meals and with their chewing than usually developing kids. The parents also thought that their children's behaviour during mealtime was more problematic (Sahan, 2021).

Children with ASD may exhibit disruptive mealtime behaviors such as insisting on specific utensils or preparation methods due to executive function issues such as

lack of planning (e.g., washing hands, coordinating eating and drinking, and cleaning up after the meal). Even though challenging behaviour and feeding issues frequently coexist, little is known about the causes of these behaviours in the literature (Nadon et al., 2013).

Other Feeding Related Issues in Children with ASD

Associated conditions that occurs along with ASD include gastrointestinal (GI) symptoms, insomnia, seizures, behavior issues, attention-deficit hyperactivity disorder, stress and anxiety, and toileting issues (Mannion et al., 2017). Children with ASD have also been noted to have various feeding issues, such as avoiding liquids and eating quickly (Williams & Seiverling, 2010). Lack of fluid intake, also known as adipsia or liquid avoidance, is also found in them (Elsabbagh et al., 2001), even though solid food intake is the topic that receives the most attention. Children not drinking enough liquids sometimes behave disruptively when offered unfamiliar or non-preferred liquids, similar to food refusal and selectivity.

According to Sharp et al. (2013), the social demands of feeding circumstances can have an impact on challenging mealtime behaviour and social skills and relationships. According to Nadon et al. (2011), socialization issues may negatively affect how much fun it is to eat with others and lead to problematic behaviours. All ages and cognitive levels of children with ASD experience common issues with feeding and eating (Vissocker,2015).

Prominent prevalence of malocclusion and changed Community Periodontal Index scores were linked to food rejection and a lack of variety in meals in children with ASD. In contrast to children with typical development of the same age, children with ASD showed more prevalence of malocclusions, changed Community Periodontal Index scores, and bruxism. There was also a link between limited food diversity and

food rejection. Children with ASD have feeding and mealtime issues more frequently. These challenges include delayed self-feeding abilities, food selectivity or aversions, and increased meal duration. Deficits in consumption of several essential vitamins and minerals have also been linked to ASD in children (Lafferty, 2020).

A neurodevelopmental condition like autism probably increases the risk of developing eating disorders, but it is not obvious how the two are connected (Mayes et al., 2018). According to other studies (Clarke et al., 2016), disordered feeding may result from a shared genetic predisposition. A different possibility is that there is a common underlying problem with cognitive, social, and emotional functioning. A model of autism-specific features that may affect the onset and maintenance of restricted feeding issues was put up by Brede et al. (2020). These traits included sensory sensitivity, trouble forming and maintaining relationships with others, issues with one's sense of self and identity, emotional challenges, autistic thinking patterns, and a need for predictability and control. These characteristics influence different restricted eating presentations either directly or indirectly.

Medical-Related and Oro motor Skill-Related Issues

There is evidence to support the idea that children with ASD may have more chance to experience medical issues if they also have concurrent feeding problems. The predominance of long-term feeding problems may result in a variety of physical and developmental effects, like undernutrition, growth restriction, social interaction issues, and poor academic performance (Sharp et al., 2013).

Skills deficiencies, like those that impede the ability of the child to chew, swallow, and suck, were also identified as significant problems with feeding (Ahearn,

2001). Schreck et al. (2004) made a statement. Children with ASD are more prone to develop dietary-related diseases like rickets or weak bones than other children (Clark et al., 1993). According to Sharp et al. (2013), feeding issues in children with ASD can lead to severe malnutrition and intrusive medical procedures, including the insertion of feeding tubes (Kerwin, 1999). Children with ASD who present with feeding problems have higher rates of vitamin and mineral deficiencies, including lower calcium intakes (Sharp et al., 2013), iron deficiencies (Latif et al., 2002), and lower vitamin C intake (Emond et al., 2010). Cornish (1998) discovered that children with ASD showed a predilection for diets intense in sugar or fat, which supports the growing evidence indicating they have excellent rates of obesity (Egan et al., 2013).

In research on GI symptoms and feeding behaviour in a sample of children with ASD, Kerwin et al. (2005) found that more than 60% of the kids reported having strong food preferences. Reports state that several children experienced at least one GI symptom each week, and bowel problems appeared to be linked to feeding (Kerwin et al., 2005). It was discovered that children with ASD are most typically affected by the problematic feeding issue known as food rejection. It was shown that 14 out of 20 children with ASD who showed dietary selectivity experienced diarrhoea or constipation (Field et al., 2003).

Children with co-occurring food issues and ASD are more likely to experience medical conditions connected to nutrition, such as rickets (Clark et al., 1993) or poor bone health (Hediger et al., 2007). According to Sharp et al. (2013), feeding issues in children with ASD can lead to nutritional deficiencies and invasive surgeries like the placement of feeding tubes (Kerwin, 1999). According to Bandini et al. (2010), children with ASD who present with feeding issues have poor vitamin and mineral intake. Children with ASD preferred foods high in sugar or fat, consistent with the mounting

proof that these individuals are at higher risk for obesity (Egan et al., 2013). Additionally, digestive issues like constipation, vomiting, and food allergies are common in children with ASD (Vissoker et al., 2015).

Tools Available for Assessing Feeding Skills

Typically, questionnaires are filled out by parents or caregivers to assess feeding problems. Researchers have employed questionnaires to gain additional knowledge about the occurrence of feeding problems and the factors leading to its perpetuation. These questionnaire modes of surveys have several benefits, such as ease of gathering data, affordability, good representation, fair statistical significance, and accurate results (Sincero,2012). Therefore, questionnaires are frequently an excellent place to start in the evaluation of feeding issues due to their practicality.

Numerous questionnaires have been developed as indirect behavioral assessment techniques to test the feeding issues of children with ASD. Children's feeding and lunchtime habits are measured using questionnaires to evaluate feeding issues in children, and more recently, caregiver behaviors during mealtimes have also begun to be evaluated (Lukens & Linscheid,2008). The below-mentioned tools are a few of the most popular feeding evaluations used with children with ASD as well as other clinical populations.

Children's Eating Behavior Inventory (CEBI)

This test was devised by Archer et al. (1991) to evaluate child, parent, and family members' attitudes and behavior during mealtime for children of all ages with various developmental and medical issues. The tool consists of 28 items related to the child's dietary preferences, motor development, and behavioural compliance. Twelve questions deal with parent conduct and the family structure about parent's thoughts and feelings about feeding their child and relationships among family members. This

questionnaire assesses the rate of occurrence of 40 feeding and mealtime behaviors. Parents rate each behaviour using a 5-point Likert scale and circle "Yes" or "No" for each item if they believe it is an issue or not. The tool is validated and has acceptable psychometric properties. It is helpful because it questions children and parents attitudes during mealtimes. However, most of the questions do not address the eating patterns frequently seen specifically in children with ASD.

Screening Tool of Feeding Problems (STEP)

STEP was devised by Matson and Kuhn (2001) to determine whether individuals with ID-experience feeding issues. The tool consists of 23 components based on research on evaluating and managing feeding issues in people with ID. The general five areas tested are aspiration risk, selection, feeding skills, food refusal and nutritional concerns. Aspiration risk is associated to inquiries about vomiting (i.e., regurgitation of consumed food). In selectivity questions, food selectivity is assessed in relation to food type, texture, temperature, feeder, and meal setting. Questions about feeding capacities consist of the capacity to swallow, chew, feed oneself independently, and the need for adaptive feeding devices. Food refusal items include behaviors like spitting out food, injuring oneself while eating, and acting aggressively around meals. Questions about nutrition-related issues deal with overeating and undereating, pica, and food theft. This tool is not validated in children with ASD, despite the fact that it does include a variety of food and mealtime behaviors. Given that ASD and ID are frequently co-occurring conditions, it was developed based on research on feeding issues in people with ID makes it potentially useful for many children with ASD.

Parent Mealtime Action Scale (PMAS)

The Parent Mealtime Action Scale (PMAS) was developed by Hendy et al. (2009) for evaluating feeding issues in children with and without developmental disabilities and ASD. Age range of children ranges from ages of 2 and 12. The authors prioritized parental views toward feeding their children over their behavior while eating. They argued that gathering information on parents' actions during meals will give them more helpful data if they intend to make changes to enhance child's eating habits. This tool consists of 31 items and Nine subscales made up the PMAS, including ones for snack restrictions, positive persuasion, daily access to fruits and vegetables, use of rewards, insisting on eating, snack modelling, special meals, fat reduction, and a wide variety of foods. Additionally, the parents are asked to rate each issue on a three-point frequency Likert scale. The PMAS tool was not explicitly designed to address the eating needs of children with ASD, however, it provided crucial information to SLPs about the caregiver attitudes and conduct that may be contribute to the child feeding issues and informed parents regarding changes that they could make to improve their child's behavior during meals by cross checking parent behavior and feeding difficulties.

The Swedish Eating Assessment (SWEAA)

This questionnaire was devised by Karlsson et al.(2013). This tool consisted of 81-item multidimensional self-reported structured questionnaire to evaluate eating disorders for ASD. This questionnaire consists of 60 questions and it is divided into 8 subdomains. The items were rated using a 5-point Likert scale where one indicated never, and five indicated always. Internal consistency of this test is found to be high.

Behavioral Paediatrics Feeding Assessment Scale (BPFAS)

BPFAS was devised by Crist and Napier (2001) consisting of 35 items that are standardized and validated to assess feeding behavior in children between 9 months and

seven years. Parents also mention whether they found the specific behavior to be problematic. It produces four scores: frequency of the child behavior, child behavior issues, parent approaches and attitudes, and issues with parent strategies and feelings.

BPFAS was popular used tool to evaluate feeding issues in children. The tool consists of 35 items: the first 25 of which concentrate on the child's feeding behavior, and the latter 10 offer an assessment of the parent's views and coping mechanisms regarding eating habits, including mealtime and eating difficulties. Scored using a five-point Likert scale, in which 1 is never and 5 indicates always, the parents indicated the frequency of behaviors. As behavioural issues increase score also increases.

This questionnaire is a thorough and often employed index of behavioral and skill-based feeding issues. It is a reliable and valid measure that successfully distinguishes kids with clinically severe feeding issues in both normative and clinical populations. (Crist & Napier-Phillips, 2001).

Apart from these there are also other questionnaires used for assessing ASD specific feeding behaviours like Child Eating Behavior Questionnaire, Child Feeding Assessment Questionnaire, Comprehensive Feeding Practices Questionnaire, Eating in the Absence of Hunger for Children and Adolescents, Eating Behaviors Questionnaire, Feeding Strategies Questionnaire, Mealtime Behavior Questionnaire, Meals in Our Household etc. There are direct ways of assessing using The ABC Mealtime Coding System, Dyadic Interaction Nomenclature for Eating, Family Mealtime Q-Sort, The Feeding Scale, The Feeding Resistance Scale, Mealtime Interaction Coding System and Mealtime Observation Schedule(Katrina et al., 2015).

Relevance of BAMBI

Lukens and Linscheid (2008) developed a standardised test called the Brief Autism Mealtime Behaviour Inventory (BAMBI) to investigate mealtime issues in Children with ASD between the ages of 3 and 11.

Currently, BAMBI is the only validated questionnaire created particularly for parents of children with ASD (Lukens & Linscheid, 2008). This parent self-report questionnaire enables one to rate the behavior of children during meals (DeMand et al., 2015). It uses a Likert scale where caregivers are instructed to score 1 to indicate never/rarely and 5 to indicate always. Other assessment tools such as CEBI do not include questions that address issues with feeding such aggression at mealtimes, ritualistic behaviour surrounding meals, and food selectivity which are commonly seen in children with ASD.

Parents are instructed to rate the items analysing the eating behaviour of child during the last 6 months. Similar to CEBI, parents were also instructed to rate an item as "YES" or "NO" depending on whether they believed it to be a problem behaviour (Lukens & Linscheid, 2008).

In clinical feeding assessment, BAMBI is a helpful tool to collect data for clinically understanding the various aspects of the child's feeding issue and related information like developmental disabilities or medical conditions that could affect feeding. This will further help the clinician decide on additional examination requirement and plan for appropriate intervention. Direct evaluations, like the assessment of bite size and texture by Sharp and Jaquess (2009), might be helpful in the planning of interventions since they can lead to more efficient and minimally invasive treatments. Children with ASD were found to consume less food than children

without ASD and to behave more inappropriately during meals (Twachtman et al., 2008).

According to Lukens and Linscheid (2008), the BAMBI was created with the aim of standardizing data on nutrition and feeding habits specific to children with ASD. This questionnaire assesses a number of problematic behaviours prevalent in this population that other questionnaire failed to evaluate, due to which BAMBI is highly utilized in clinical practice for a quick and accurate evaluation of eating issues in children with ASD.

The initial BAMBI questionnaire consisted of 20 questions categorized into three domains (Lukens, 2002). However the authors drew attention to its shortcomings and modified it six years later (Lukens & Linscheid, 2008). The new version included 18 questions and employed a Likert scale for mentioning the occurrence of behaviors (ranging from 1 = Never to 5 = At Almost Every Meal). This inventory consisted of three domain-specific scores in addition to a total score. The three domains are the limited variety factor, refusal factor, and ASD characteristic factor. Limited variety factor (items 10, 11, 13, 14, 15, 16, 17, and 18) assesses the child's openness to trying new foods and his readiness towards food varieties of different textures and kind. The food refusal factor (items 1, 2, 4, 7, and 8) consists of five items that explores children's behavioural issues (crying, spitting, and pushing) when they reject food. Lastly, the ASD characteristic factor (items 3, 5, 6, 9, and 12) includes items that identify the behavioral traits of ASD, such as self-aggressive and stereotyped behaviors during eating. Parents or caregivers fill out the questionnaire. A frequency score is determined by calculating the sum of the Likert responses with the item numbers 3, 9, 10, and 15 reverse-scored.

Thus, BAMBI is the first instrument designed to evaluate feeding challenges in children with ASD. The tool highlighted the significance of feeding-related issues in the paediatric population.

BAMBI also allowed us to assess characteristics of ASD through some of its questions (3, 5, 6, 9, 12). Compared to controls, children with ASD were more combative during mealtimes and had trouble remaining seated until the meal was done. Additionally, these children showed less flexibility in feeding behaviors (Sharp et al., 2013).

BAMBI is used in standard clinic procedures to promote the evaluation of children with ASD's dining behavior (Lukens & Linshield, 2008). The validation of this questionnaire incorporated a formal evaluation of this population into clinical practice and supported parental dietary management measures. BAMBI was the best test as it contains three specific domains (Limited Variety, Food Refusal, and Autism Characteristics). As a result, this is not only used in clinical assessments but also aids in targeting direct and indirect interventions for eating problems and potential implications.

According to Viviers et al. (2020), BAMBI is a very effective inventory to be utilized as a second clinical tool to encourage an in-depth parental report. The tool helps SLP learn more about how feeding disorders in children are linked to poor food and weight outcomes, and it could also aid parents and children to adopt mealtime practices linked to healthy outcomes.

Studies on Other Language Validations of BAMBI.

Italian Version of BAMBI

Following international standards, a research group of Italian rehabilitation and healthcare professionals translated the BAMBI's original English version into Italian. Equivalence between the BAMBI in Italian and the original was looked into on a semantical level. Changes were made in some of the items, like item 8 and 18, in translation phase to better adapt to the Italian culture. Participant observation was used to acquire cross-cultural validity and was closely related to the intended meaning of the original items. When internal consistency was analysed, significant values were obtained, and good test-retest reliability was also obtained in this Italian study (Lamboglia,2023).

Turkish Version of BAMBI

After translation, adaptation, and validation, only the final questionnaire in the Turkish version consisted of 14 questions. Confirmatory factor analysis results revealed that the scale had a reasonable goodness of fit. The internal consistency coefficient and values of the split-half reliability were high. Item-total correlations of the scale were also found to be acceptable. The findings suggested that the scale is a valid and trustworthy to assess the behavior of children with ASD during meals in Turkey (Meral, 2014).

Vietnamese Version of BAMBI

Foremost pioneer behind this Vietnamese-translated questionnaire is Nguyen Minh Huong. All 18 questions of the tool were found to have Cronbach's alpha > 0.7 , which indicated an excellent internal consistency. Four questions were eliminated after the exploratory factor analysis (EFA). The confirmatory factor analysis showed that the

tool is considered quite close to the fit model ($CFI < 0.9$), proving the Vietnamese BAMBI to be a reliable and accurate measuring tool for assessing mealtime and feeding challenges in children with ASD (Huong,2021).

Portuguese Version of BAMBI (BRCEA-TEA)

Developed by Castro et al. in the year 2019, this questionnaire also had similar results for the overall scores for children with ASD and lower scores for controls when compared with the original BAMBI (Castro et al., 2019). Compared to Lukens and Linscheid, the retest results showed lower scores for controls and higher scores for ASD. The cut-off value obtained for the BRCA-TEA questionnaire (translated BAMBI questionnaire) is ≥ 47 .

This study shows that these characteristics might be routinely evaluated in clinical settings in addition to providing the first Brazilian questionnaire to assess feeding challenges in children with ASD. This tool, now accessible in Brazilian Portuguese, makes it simple to assess feeding issues in children with ASD and hence contribute to the development of effective interventions that work in conjunction with drugs or other treatments.

Importance of Feeding Questionnaire in India.

According to a study conducted concerning the Asian population, the prevalence of ASD is higher in Asia than it is in Western countries. However, majority of the studies on feeding behavior and difficulties come from Western countries. Due to the cultural differences in eating habits, findings in the Western population may not accurately reflect the food-related issues of the Asian ASD group.

Different feeding methods may result from many circumstances. Thus, addressing the feeding issues with these children may be easier by understanding

factors responsible for the lower ingesting outcomes. In order to research and investigate feeding behaviors specific to ASD, the questionnaires should be adapted to that particular region. Therefore, the BAMBI questionnaire, which is adopted in western countries, should also be adapted to the specific population which is considered (Kang, 2022).

According to a study done about Feeding Problems (FP) in Children with Autism in a Clinical Population in India, it found out that 60 % of children with autism had at least one feeding problem, consistent with existing literature. Compared to children with ID, Children with ASD were reported to have severe feeding-related issues. Scientists found that children with autism and those with intellectual disabilities have distinct patterns of dietary difficulties. According to previous research in the literature, children with autism exhibited greater disruptive eating behavior and food over selectivity in the index study. Executive function issues in children with autism, such as a lack of planning (e.g., washing hands, coordinating eating and drinking, and cleaning up after the meal) and a lack of mental flexibility (e.g., insisting on a specific utensil method of preparation), may also be related to disruptive mealtime behaviors. Additionally, it has been discovered in the past that children with autism show more food over-selectivity than children with ID, cerebral palsy, or usual development. It has been hypothesized that sensory preferences will cause children with ASD to have a narrower range of dietary items and therefore, it will lead to foods with desirable, palatable, and manageable textures. Food rejection has been the subject of inconsistent reports in this demographic, with some research claiming that children with ASD are more likely to exhibit it than regular children. Significant links between food issues and specific sensory processing deficiencies in children with ASD have also been found. These relationships have previously been observed in children with developmental

impairments. This is in addition to their finding that oral sensory processing dysfunction is associated with feeding problems, which is consistent with the literature.(Craato et al., 2019).

As many feeding issues are noted in this study in Indian population, a tool well adapted to Indian culture should be explored to assess and intervene in these specific autism-related feeding issues. Given how important it is for children and adolescents with ASD to pay attention to nutritional components (nutritional status, food intake, and behavior), this test could be used to assess some of these behaviors. Even before an official diagnosis, it could be used to inform friends, family, and specialists about feeding issues. This tool, which is now accessible in Brazilian Portuguese, Italian, Vietnamese, and Malay language makes it simple to assess feeding issues in children with ASD in that particular region and may hence contribute to the development of effective interventions that work in conjunction with drugs (Castro et al., 2019).

BAMBI enables us to examine approved food and texture while measuring particular aspects of dysfunctional habits at mealtimes (Stafford et al., 2017). This tool is demonstrated to be a trustworthy, fast, and simple-to-use instrument that may be utilized for clinical and research reasons. Based on the goal and participants, the scale identified in this study can be employed in other diverse clinical and research settings due to its flexibility and specificity (Lamboglia,2023).

It is crucial to consider typical development while evaluating feeding issues in ASD. Hence, studies comparing typical and disordered populations will be critical in understanding feeding-related issues(Peverill et al., 2019). Hence, the BAMBI questionnaire, this brief test which is developed based on contrasting behaviours seen in individuals with and without ASD, will be helpful in assessment.

Need of Wide-Spread Research in feeding assessments for children with ASD

Comprehensive research is required to establish reliability and validity in the current feeding assessments in children with ASD. Parents of Children with ASD show a greater intensity of feeding behavior based on feeding pressure, and these children have more difficulty with their eating behaviors than children without this diagnosis. Thus feeding issues in children with ASD are substantial, and it is worthwhile to conduct further research in this area (Kozak, 2023).

CHAPTER 3

METHOD

Ethical Consideration: The study was carried out after receiving approval from "The Ethical Guidelines of Bio-Behavioural Research including Human Subjects" (Basavaraj & Venkatesh, 2009, AIISH, Mysuru). The caregivers of the participants were explained regarding the study procedure. They will also be ensured the safety and confidentiality of the participant details.

Participants

A total of 60 participants of the age group 3-11 years were enrolled into two groups. Group 1 will consist of 30 primary caregivers of children with ASD and Group 2 include 30 primary caregivers of age-matched typically developing children. The participants were considered via convenience sampling (i.e., Parents of children undergoing speech-language and/ or occupational therapy services at the Department of Clinical Services (DCS) and Department of Preschool Education at AIISH, Mysuru). They were further grouped into three age groups: 3.0-6.0, 6.0-9.00, and 9.0-11.00 years.

Participant Selection Criteria

Inclusion Criteria

The following inclusion criteria were used.

- 12th grade as the minimum educational qualification of the parents.
- Malayalam as the native language of the primary caregiver.
- The caregiver/ guardian of child with ASD who spends more time, especially meal time.
- All the children were diagnosed as having ASD at DCS, AIISH.

Exclusion Criteria

- Parents of children with other associated problems such as sensory, neurological, and psychological problems were excluded from the study.
- Parents of children with ASD undergoing feeding therapy were excluded from the study.

Procedure

Consent from the authors of BAMBI (Lukens and Linschied, 2008) was obtained through mail. The study aimed to adapt, translate and validate the Malayalam version of Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire language in children with ASD. The study was initiated only after obtaining consent from the author of BAMBI. The method included the following stages.

Stage 1: To translate and adapt the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire to suit the Indian population.

Stage 2: To validate the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire.

3.1 Stage 1: Translation and Adaptation of Brief Autism Mealtime Behavioural Inventory (BAMBI)

The translation-adaptation process was done using the following five steps of American Association of Orthopaedic Surgeons (AAOS) guidelines.

- 3.1.1 Forward translation
- 3.1.2 Synthesizing common translation
- 3.1.3 Backward translation

3.1.4 Expert Committee Review

3.1.5 Pre- final testing

3.1.1 *Forward Translation*

Firstly, English version of BAMBI questionnaire was translated to Malayalam by two bilingual individuals. One among them was a professional translator (school teacher with an M.A degree in Malayalam with more than 15 years of experience in teaching Malayalam) and the other was an SLP (with >10 years of experience in feeding and swallowing disorders at the dept of Dysphagia and feeding disorders at AIISH). Both of their first language was Malayalam. The translators were prior instructed to translate a term or phrase logically rather than literally, to consider the original term's definition into account without translating it word-for-word, to focus on the comprehensibility of the statements by an ordinary layman respondent rather than professional audiences and to incorporate cultural variations during the translation process. They produced individual translations (F1 and F2).

3.1.2 *Synthesizing Common Translation*

A third independent team member addressed disparities between the 2 independent translations (F1 and F2) to produce a single consolidated translation. The simpler, clearer, and more colloquial of the two versions was chosen. The common synthesis process was summarised. There was an effort to reach agreement on topics. Each problem was discussed in detail, along with how it might be resolved.

3.1.3 *Backward Translation*

Subsequently, two bilingual adults from a non-medical background individually translated the common synthesised translation back into English (B1 and B2). The bilingual adults enrolled in the study were an English school

teacher and an English professor whose native language was Malayalam. The main goal in this stage was to provide a translation with the same linguistic sophistication as the source. The backward translation also emphasized intellectual and cultural parity more than language equivalency.

3.1.4 *Expert Committee Review*

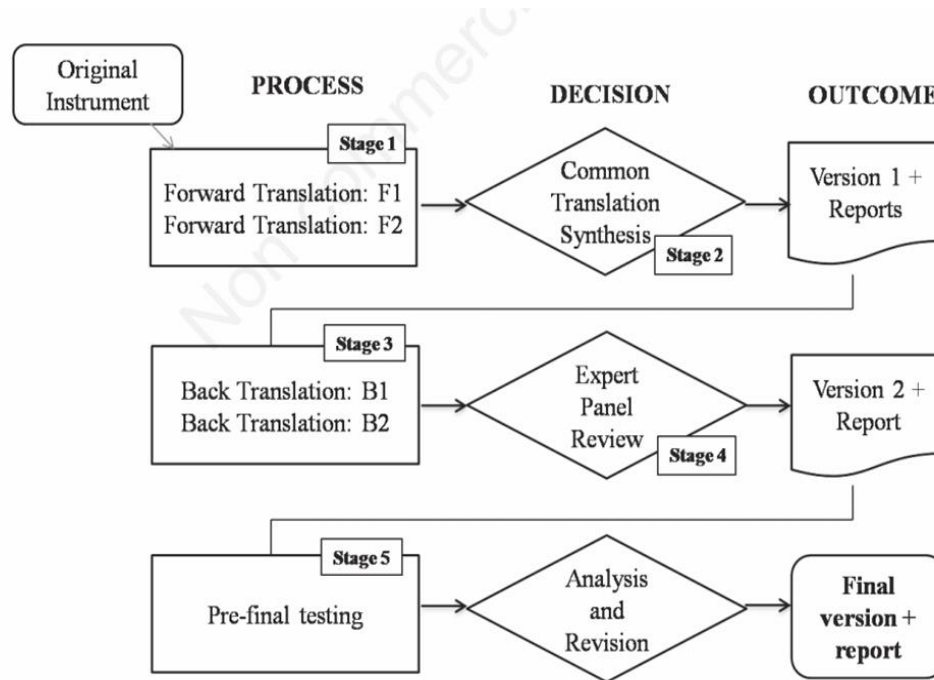
The expert panel committee included all the people involved in the previous three stages. This panel only consisted of bilingual Malayalam-English speakers. The committee examined all of the translations, spotted mistakes, and then made a report outlining the stages that were followed to achieve equivalency. Thus, the pre-finalized Malayalam version of BAMBI was ready.

3.1.5 *Field Testing of Pre-Final Version*

Finally, the prefinal version of the questionnaire was administered on 15 primary caregivers of children with ASD. This was the last stage before creating the translated questionnaire's final form. Using the preliminary questionnaire form, participants were chosen for interviewing purposes. Along with their answers to the questions, each participant's perspective on how he or she perceives the question was gathered. Participants were also queried whether any questions or items made them feel uncomfortable or irrelevant to them. The opinions and responses were reviewed to make sure that the translation was accurate, and any modifications that were required was made before the questionnaire is ready. All the revisions mentioned above will lead to the final BAMBI version of the Malayalam questionnaire. The flowchart below, taken from Thimmaiah et al., (2016) with permission, summarises the translation-adaptation process (2016) used in the present study.

Figure 3.1

Flowchart Depicting Translation process in stage 1



Note. Process of adaptation in accordance with American Association of Orthopaedic Surgeons (AAOS) principles from Thammaiah et al. (2016) with permission.

3.2 Stage 2: Validation of Translated Questionnaire

Stage 2 was carried out in the following steps. The first stage was administration of BAMBI-M and the second stage was assessing psychometric properties of BAMBI-M.

3.2.1 Administration of BAMBI-M

BAMBI-M was administered on children with feeding problems secondary to ASD. BAMBI is a questionnaire that assesses autism-specific feeding issues, which is originally in the English language. BAMBI-M was introduced in order to introduce the Malayalam translated version of this questionnaire, which culturally suits this

population. The original BAMBI consists of 18 questions. After the field study, two more questions added to the questionnaire. So, the Malayalam version of BAMBI (BAMBI-M) has 20 questions. In the original BAMBI, Items 10, 11, 13, 14, 15, 16, 17, and 18 in the restricted variety factor measure the child's openness to experimenting with new foods and foods that differ in preparation, texture, and type. Five factors make up the food denial factor (items 1, 2, 4, 7, and 8), which describes the problematic behaviors shown when a kid rejects food offered to them. At last, the characteristic component of ASD (items 3, 5, 6, 9, and 12) includes elements that indicate the behavioral traits of ASD, such as self-aggressive and stereotyped actions during meals. The two other added questions include smelling food and rubbing the hands after touching foods with a watery texture while mixing food.

The parents were explained about the objectives of the study. BAMBI-M was given to both groups of parents to individually self-administer the questionnaire. Sixty participants of the age group 3-11 years were enrolled into two groups. Group 1 consisted of 30 primary caregivers of children with ASD and Group 2 consisted of 30 primary caregivers of age matched typically developing children. They were further grouped into three groups as 3.0-6, 6.0-9.0 and 9.0-11.0 years.

Table 3.1

Gender Distribution Across Children With ASD and Typical Children

Gender	Group 1 (Children with ASD) (n=30)	Group 2 (Neurotypical children) (n=30)
Male	23	15
Female	7	15

3.2.2 Assessing Psychometric properties of BAMBI-M

The maximum score of BAMBI-M would be 100 and the minimum would be 20. The total scores were compared between the 2 groups using appropriate statistical tools.

Test-retest reliability. BAMBI-M was re-administered on 10 % of participants in both groups after a gap of 1 week of their initial response. This was established through the Spermans-Rho correlation coefficient.

Internal Consistency of BAMBI-M. Consistency of different items of BAMBI-M was found out among children with ASD and typical children. Cronbachs alpha was found out to check the value of significance.

Cut-off Score. It was found out using the ROC(Reciever Operating Characteritic) curve.The sensitivity and specificity of the tool were also found out using this.

Correlation Across Age Groups. To find whether there is any significant difference in BAMBI-M scores across age groups, Kruskal Wallis test was done. The results would indicate if there is any correlation between feeding behvaiours and age among children with ASD and typical population.

CHAPTER IV

RESULTS

The aim of this study was to translate, adapt, and validate the English version of the Brief Autism Mealtime Behavioural Inventory questionnaire to Malayalam. The primary objective was to translate and adapt the questionnaire to Malayalam. The secondary objective was to validate the Malayalam version of BAMBI. These two objectives of the study were carried out in two phases. Phase I included translation and adaptation of the English version of the BAMBI questionnaire to Malayalam and in Phase II, the developed BAMBI-M was administered in 30 children with ASD in the age range of 3-11 years for validation.

4.1 Phase I: Translation and Adaptation of the English version of the BAMBI Questionnaire in Malayalam

The BAMBI questionnaire was translated and cross-culturally adapted into Malayalam following guidelines of the adaptation process in accordance with American Association of Orthopaedic Surgeons (AAOS) principles from Thammaiah et al. (2016). The translation-adaptation process was carried out in sequential steps of forward translation, synthesizing common translation, backward translation, expert committee review and pre-final testing.

4.1.1 Forward Translation

Two Malayalam-English bilingual forward translators, one with >10 years of experience in evaluating and managing feeding and swallowing disorders and the other, a professional translator (school teacher with an M.A degree in Malayalam with more than 15 years of experience in teaching Malayalam) translated the original English

version of BAMBI into Malayalam including the cultural appropriateness of the statements. The translators provided their individual translations F1 and F2.

Details of F1 and F2 translations: All the statements were translated with similar words and phrases except for the following statements.

Table 4.1

BAMBI-M Statements and their F1 and F2 Translated Versions(in IPA)

S.N	BAMBI statements	F1	F2
1.	My child cries or screams during mealtimes.	/ente kuʈʈi b ^h akʂaŋasamajattə karəŋnu ŋilaviʎikkaruŋə /	/ente kuʈʈi b ^h akʂaŋasamajattə otʃʈʃa vekkunnu /
5.	My child is aggressive during mealtimes.	/ente kuʈʈi b ^h akʂaŋasamajattə akramasaktana:karuŋə/	/ente kuʈʈi b ^h akʂaŋasamajattə matulavare upadravikarund/
7.	My child is disruptive during mealtimes.	/ente kuʈʈi b ^h akʂaŋasamajattə asvasʈ ^h a:nakaruŋə /	/ente kuʈʈi b ^h akʂaŋasamajattə ʈadasam sriʂʈi karund/
9.	My child is flexible about mealtime routines.	/ente kuʈʈi b ^h akʂaŋavum aʈuma:ji baŋd ^h appettə ʈajaredupukalilum kadumpiduttam kanikarilla/	/ente kuʈʈi bhakʎanaʎilaŋalil vitvizʈk ʈayaran/

11. My child dislikes certain foods and won't eat them.	/ente kuttik chila bak anaqlod talparyami a,ava kazhikan visama Ikarund/	/ente kuttik chila bak anaqlod talparyami a,ava kazhikaru illaa/
15. My child accepts or prefers a variety of foods.	/ente kutti b ^h ak sana kar jatil putumajum vaivi djavum istapedunu/	/vet jast fari lulla aharasadana al kazhikan ente kutti agrahiku nu/
17. My child prefers only sweet foods.	/ente kuttIk madurapa darta nalodu matrame falparjam ullu/	/ente kutti madurapalahara nalk munganana nalku nu/
18. My child prefers food prepared in a particular way.	/ente kuttIk Ila prat jeka faram bak ana Inodan talparjam/	/prat jekari Ijil pakapedu tuna bak anasadana al matram ente kuttI itapedunu/

4.1.2 Synthesizing Common Translation

The third independent team member consolidated the two forward translations F1 (Forward translation by SLP) and F2 (Forward translation by a professional translator) version into one copy in this stage. All the differences in

the 18 items were analyzed and a single consolidated accepted version was created.

F1 of BAMBI statements 1,5,6,7,8,13,15,16,17 and F2 of BAMBI statements 2,3,4,9,10,11,12,14,18 was most preferred while making the common translation. Other minute changes were accommodated during this stage for better comprehensibility.

4.1.3 *Backward Translation*

This consolidated version was again translated back to English by two bilingual backward translators (An English school teacher and an English professor whose native language was Malayalam), respectively as B1 and B2. Both translations were provided to check for the linguistic appropriateness of the original version of BAMBI.

4.1.4 *Expert Committee Review*

The expert panel committee included all the people who were involved in the previous three stages. They compared all the versions with the original version of BAMBI. They reviewed the translated and consolidated versions and a list of modifications was suggested through consensus. The investigator accommodated all the modifications in the consolidated version and the prefinal version of BAMBI-M was produced.

Table 4.2

Modifications suggested by the Expert Panel Committee in Stage 4 onto the Consolidated Version in Step 2

S. N	BAMBI	Statement from consolidated version (Step 2)	Modification suggested by the expert committee (Step 4)
1.	My child cries or screams during mealtimes.	/entekuṭṭi b ^h akṣaṇasamajattə karajukajo nilavilikukajo tḷejarund/	/entekuṭṭi b ^h akṣaṇasamajattə karajarund/
2.	My child turns his/her face or body away from food.	/entekuṭṭi b ^h akṣaṇam kanumbol mugam ṭḷIrIkuṇu/	/ente kuṭḷI bakḷanaṭod mugam ṭḷIrikuṇu/
7.	My child is disruptive during mealtimes.	/entekuṭṭi b ^h akṣaṇa samayaṭ asvaṣṭanakarund/	/entekuṭṭi b ^h akṣaṇa samayaṭ ṭadasam sruṭṭikarund/
12.	My child refuses to eat foods that require a lot of chewing.	/ente kuṭḷI ṭḷavaṭḷaraṭḷ kazhikanuḷa bhakḷanasadḷanaṇal ozhivakunṇu/	/ente kuṭḷI ṭḷavaṭḷaraṭḷ kazhikanuḷa bhakḷanasadḷhanaṇal ozhivakarund/

13.	My child prefers the same foods at each meal.	/ente kuṭṭi ella ṇeravum ore bhakḷanam kazhikan Iṭṭapeduṇṇu/	/ente kuṭṭi ela ṇeravum ore bhakḷanam kazhikan ṭalparjapeduṇṇu/
16.	My child prefers to have food served in a particular way.	/oru praṭṭeka riṭṭiḷḷ bhakḷanam kazhikuṇṇaṭṭInodan ente kuttik ṭalparjam/	/oru praṭṭeka riṭṭiḷḷ bhakḷanam kodukuṇṇaṭṭan ente kuttik ṭalparjam/
18.	My child prefers food prepared in a particular way.	/praṭṭekariṭṭiḷḷ pakapeduṭṭuṇṇa bakḷanasadhanaṇḷal maṭṭram ente kutti iṭṭapeduṇṇu/	/oru praṭṭekariṭṭiḷḷ pakapeduṭṭiḷḷa bakḷanaṇḷalodaṇṇu ente kuttik ṭalparjam/.

4.1.5 Field Testing of Pre-Final Version

Fifteen parents of children with ASD were enrolled from the Department of Special Education and Department of Clinical Services in the final stage of translation and adaptation of the questionnaire. They were asked for opinions about the comprehensibility of the BAMBI-M statements. Four parents opined that the term /akramasakṭanakarund/ (meaning aggressive behaviour in English) to be modified to /ṣaṭjam piḷḷkarund/. They suggested the addition of two statements to 18 statements. The two extra statements included were relating to the smelling the food that is given to the child and the other was the aversion or hesitation towards wet texture (Holding or touching mixed rice and curry in hand). These two statements were included in the questionnaire.

Hence, Phase I (Translation and adaptation of the BAMBI questionnaire) was completed with the final version of BAMBI-M (Appendix II). Twenty statements make up this BAMBI-M, of which statements 10, 11, 13, 14, 15, 16, 17, 18, and 19 fall under the limited variety factor domain, statements 1, 2, 4, 7, and 8 fall under the food refusal factor domain, and statements 3, 5, 6, 9, and 20 fall under the Children with ASD characteristic component.

4.2 Phase 2: Validation of BAMBI-M

The results are discussed under the following subsections.

- 4.2.1. Test-retest reliability of BAMBI-M
- 4.2.2. Internal consistency of BAMBI-M
- 4.2.3. Cut-off score using ROC curve
- 4.2.4. BAMBI-M score across children with ASD and Neurotypical children
- 4.2.5. Most frequently rated item across the domains
- 4.2.6. BAMBI-M scores across age groups

4.2.1 *Test-Retest reliability of BAMBI-M*

Test-retest reliability was assessed by readministering BAMBI-M questionnaire on 10 % of total population(6 participants) within a gap of two weeks. The Spearman's rank correlation coefficient was used to assess the consistency or stability of BAMBI-M over time. The Spermans-rho (ρ) value obtained was found to be 0.956 indicating a strong positive correlation. Therefore, the test-retest reliability of BAMBI-M is high i.e., the tool produces consistent results over time.

4.2.2 Internal Consistency of BAMBI-M

The internal consistency of items was assessed among children with ASD using Cronbach's coefficient alpha. The Cronbach's Alpha value obtained was 0.710 indicating that there was acceptable correlation between the BAMBI-M statements. But internal consistency among items in the neurotypical group was found to be 0.6.

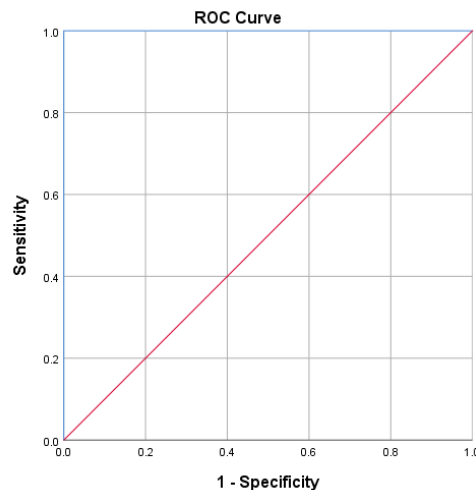
4.2.3 Cut Off Score using ROC Curve

A Receiver Operating Characteristic (ROC) curve was created by plotting true positive rate i.e., sensitivity against false positive rates i.e., specificity for BAMBI-M scores between groups 1 and 2 at various threshold setting as shown in the Figure 4.1 and Table 4.3 shows its coordinates.

Table 4.3

Coordinates of the Curve

Cut-off(\geq)	Sensitivity	1-Specificity
26.5000	1.000	.100
27.5000	1.000	.067
28.5000	1.000	.033
31.0000	1.000	.000
34.5000	.967	.000
36.5000	.933	.000
37.5000	.833	.000

Figure 4.1***ROC Curve obtained After Administration of BAMBI-M***

As the Figure suggests, sensitivity and specificity were found to be one at the cut-off point of 31, indicating that the test is very sensitive to identify feeding problems specific to children with ASD. The specificity and sensitivity of this particular BAMBI-M questionnaire is one, which was found to be so accurate that a perfect ROC curve is obtained as indicated in Figure 4.1. According to the ROC curve, BAMBI-M score 31 is considered to be the cut-off score. a score equal to or above 31 indicated children with feeding problems. The area under the curve (AUC-ROC) obtained was 1 indicating very high discriminatory power between the two groups.

4.2.4 BAMBI-M score across children with ASD and Neurotypical children

20 statements of BAMBI-M were filled by a total of 60 parents (38 males, 22 females). Table 4.4 depicts the demographic distribution and the overall scores of group1 (Children with ASD) and group 2 (Neurotypical children). A clear-cut distinction between the BAMBI-M scores between the two groups was found. Group 1 (children with ASD) scored higher compared to group 2 (neurotypical children). Among 30 participants, the highest and lowest score in the Group 1 obtained was 73

and 33 respectively. The highest and lowest score in the group 2 obtained was 29 and 21 respectively. There was no overlap between the ranges of scores of both the group. The BAMBI-M scores in group 1 was found to be wider in range and higher compared to group 2. The average score for BAMBI-M in group 1 was 46.6 and for group 2 was 24.3. The overall scores and demographic distribution of group 1 and 2 are given in the Table 4.4.

Table 4.4

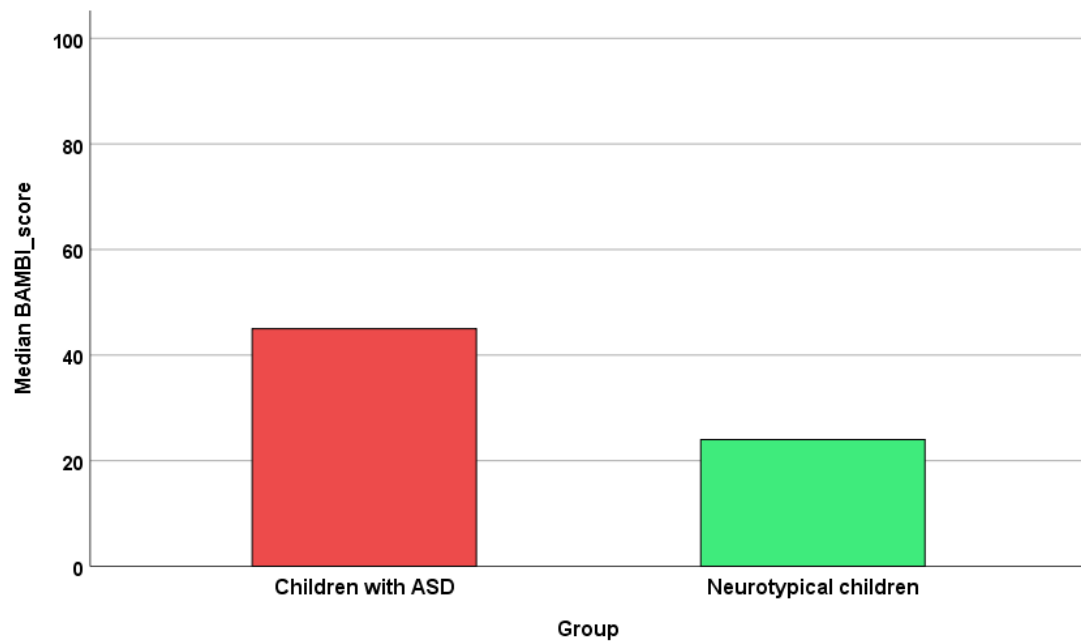
Overall Scores and Demographic Distribution of Two Groups

Overall, score	BAMBI-M Group 1 (Children with ASD) (n=30)	Group 2 (Neurotypical children) (n=30)
Mean	46.6	24.3
SD	9.68	1.93
SE	1.76	0.352
Median	45	24
Minimum score	33	21
Maximum score	73	29
Range	40 (33-73)	8(21-29)
Mean age	6.45	7.43
SD (age)	2.09	2.14
Minimum age	3.11	4.00
Maximum age	10.00	10.9
Males	23	15
Females	7	15

Note. SD-Standard Deviation, SE-Standard Error

Figure 4.2

Figure Depicting the Median BAMBI-M Scores Across children with ASD and Neurotypical children



Note. The median BAMBI-M score obtained across children with ASD is 45 and for neurotypical children is 24.

4.2.5 Most frequently rated item across the domains

Across Limited Variety Factor Domain. On reviewing items in the limited variety factor (LVF), statement 11 “My child dislikes certain items and won’t eat them.” was found to be the most frequently scored item in group 1. 70% of parents of children with ASD rated it as falling under often and almost as shown in Table 4.5. Item 11 assess the aversion towards certain foods by the child or eating only narrower range of food, measuring the food selectivity. But while analysing item11 in neurotypical population,

96.6% of the responses were falling in never and seldom category as seen in Table 4.6 and Figure 4.4.

Table 4.5

Frequency and Percentage of Occurrence of 11th Statement in children with ASD

Likert Scale Rating	Frequency	Percent
Seldom	1	3.3
Occasionally	8	26.7
Often	18	60.0
Almost	3	10.0
Total	30	100.0

Figure 4.3

Frequency of Occurrence of LVF 11 Statement Among Children with ASD

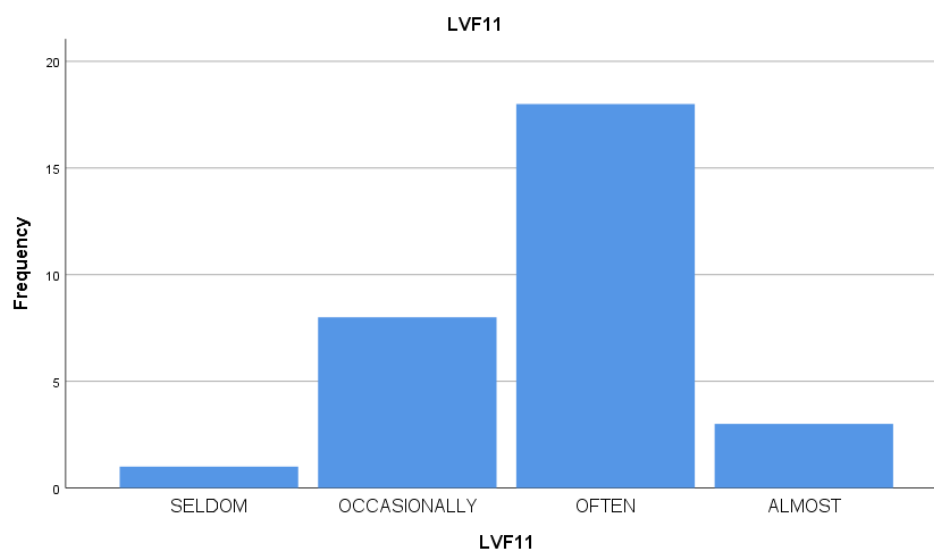


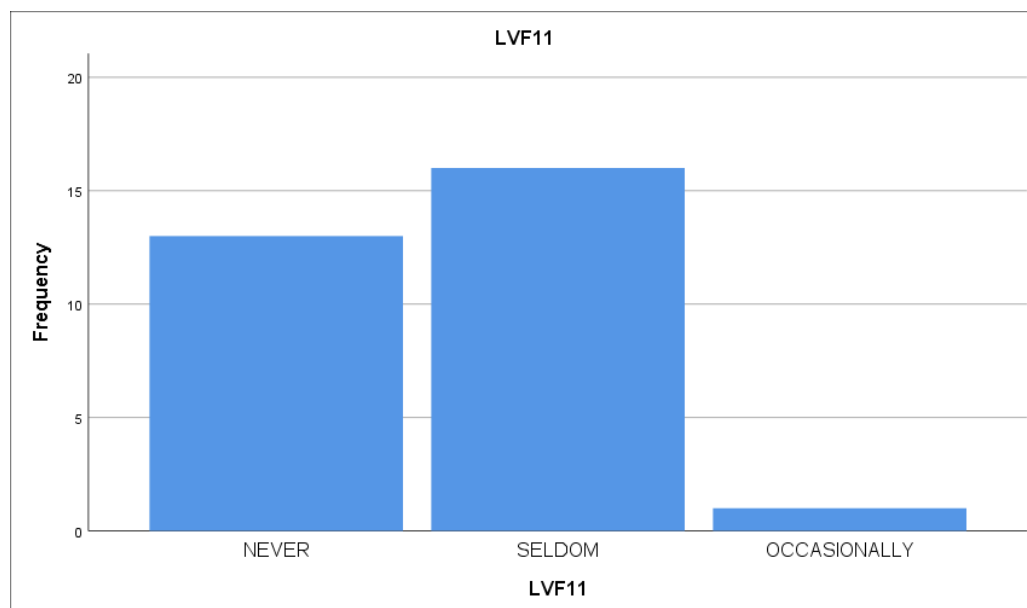
Table 4.6

Frequency and Percentage of Occurrence of 11th Statement in Neurotypical children

Likert Scale Rating	Frequency	Percent
Never	13	43.3
Seldom	16	53.3
Occasionally	1	3.3
Total	30	100

Figure 4.4

Frequency of Occurrence of LVF 11 Among Neurotypical children



In decreasing order of frequency after statement 11, the most frequently occurring problematic issues were statements 10, 14 and 15. Food neophobic behaviour is stated in the 10th statement and the pie chart demonstration among children with ASD and neurotypical children is depicted in Figure 4.5 and Figure 4.6.

Figure 4.5

Food Neophobic Behaviour Frequency Distribution Among Children with ASD

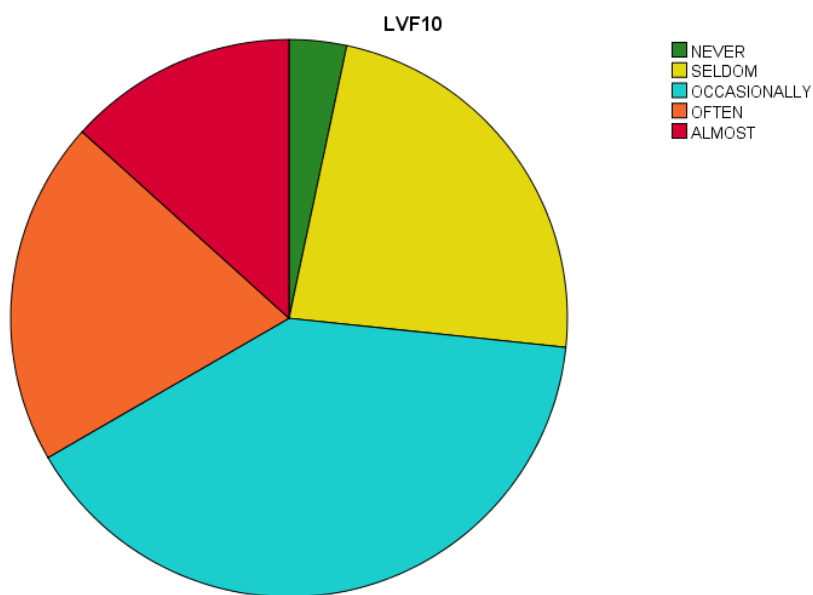
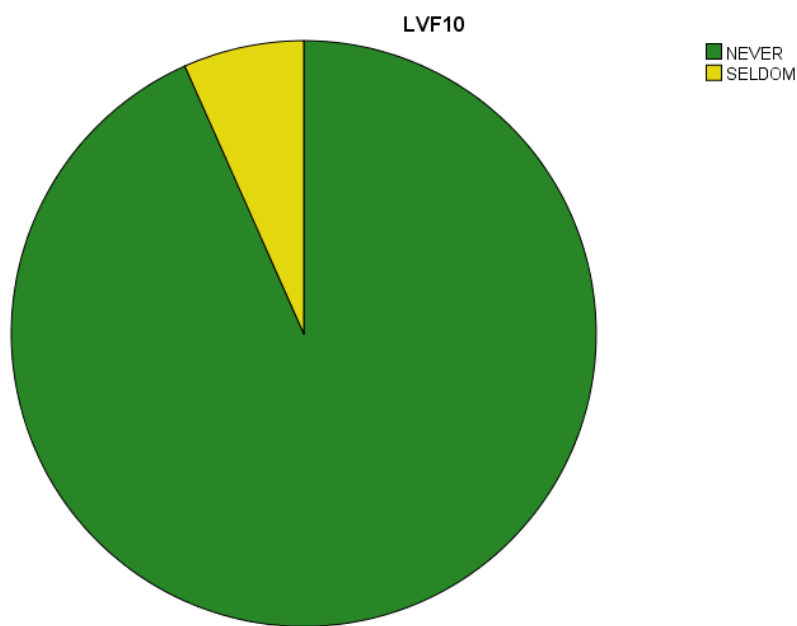


Figure 4.6

Food Neophobic Behaviour Frequency Distribution Among Neurotypical Children



Statement 14 is about the preference of children towards crunchy foods. The frequency of occurrence of LVF 14 among children with ASD and neurotypical children is depicted in Figure 4.7 and Figure 4.8 respectively. 40% of participants of neurotypical children rated it under occasionally.

Figure 4.7

Frequency of Occurrence of LVF 14 Statement Among Children with ASD

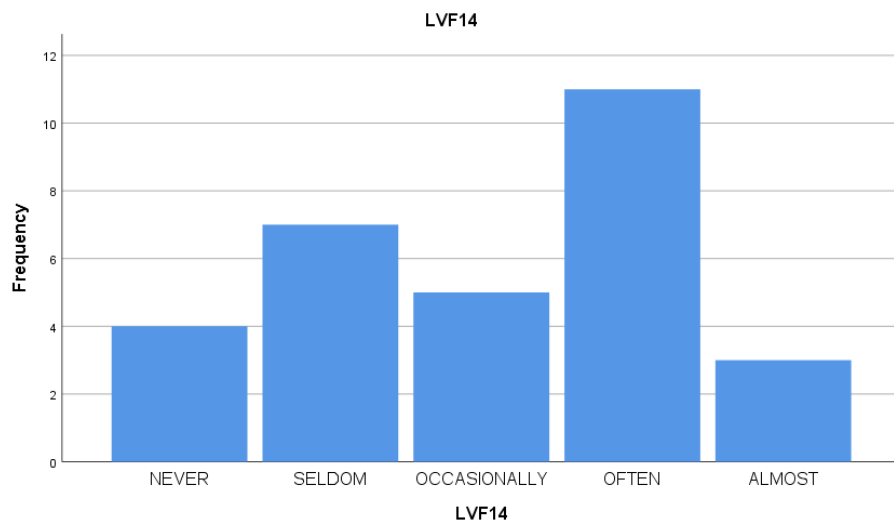
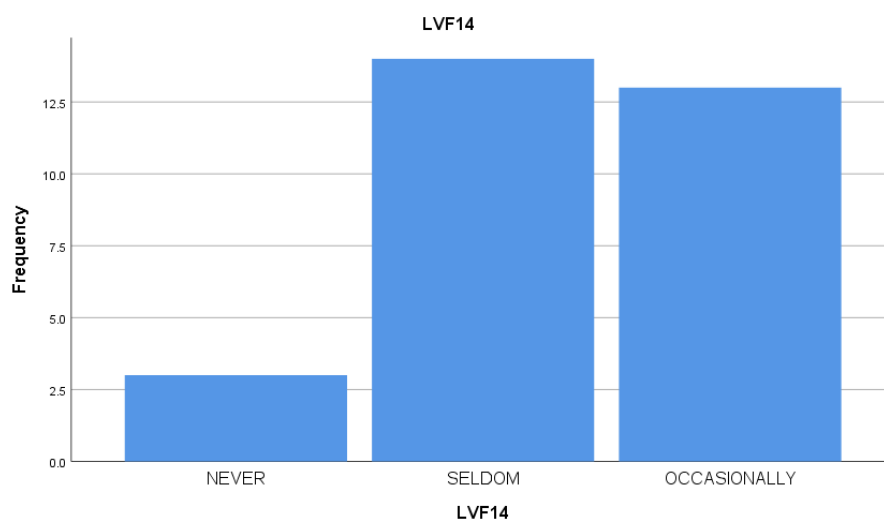


Figure 4.8

Frequency of Occurrence of LVF 14 Statement Among Neurotypical Children



The Statement number 15 is measured the acceptance and preference of children towards a variety of foods. The frequency of occurrence of this particular behaviour among children with ASD and the neurotypical population is illustrated in Figure 4.9 and Figure 4.10 , respectively.

Figure 4.9

Frequency of Occurrence of LVF 15 Statement Among Children with ASD

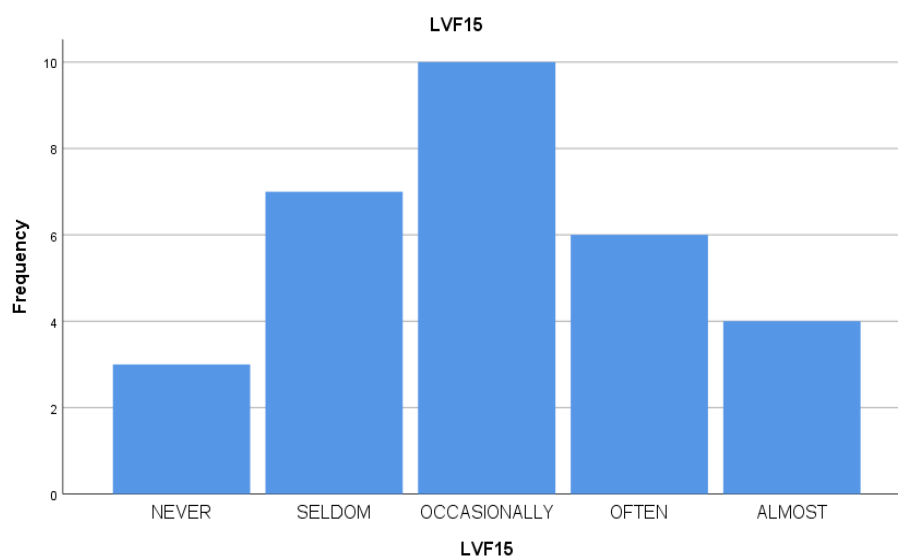
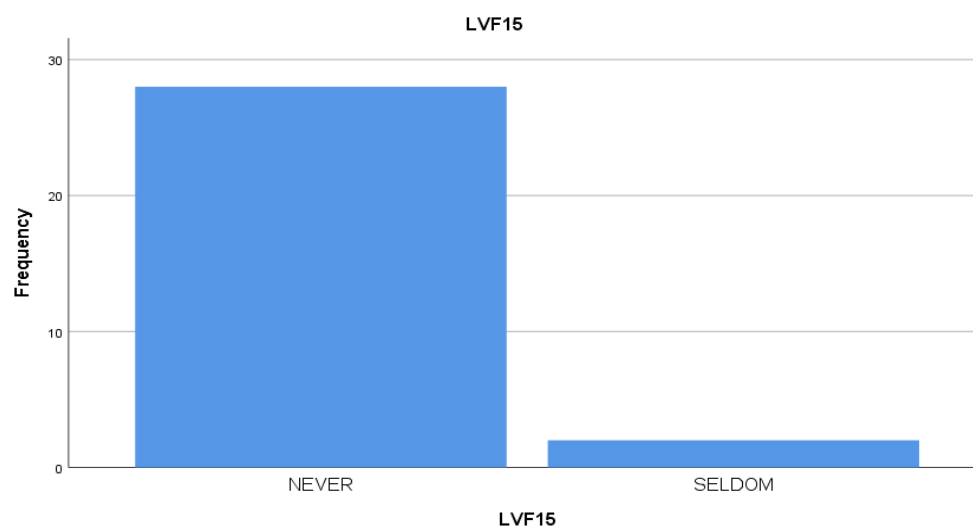


Figure 4.10

Frequency of Occurrence of LVF 15 Statement Among Neurotypical Children



Findings indicated that feeding behaviours of statements 13,16,17 and 18 were less exhibited by children with ASD in the LVF domain.

Statement 19 was added in phase 1 of the study, that measured the child's acceptance of specific textures like slimy and wet. The scores indicated that there was difference among this behaviour in both the groups as seen in Figure 4.11 and 4.12.

Figure 4.11

Frequency of Occurrence of LVF 19 Statement Among Children with ASD

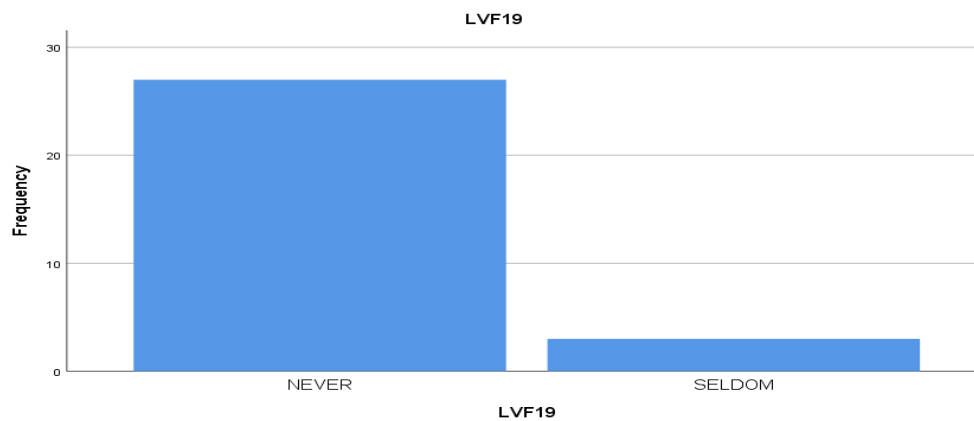


Figure 4.12

Frequency of Occurrence of LVF 19 Statement Among Nuerotypical Children

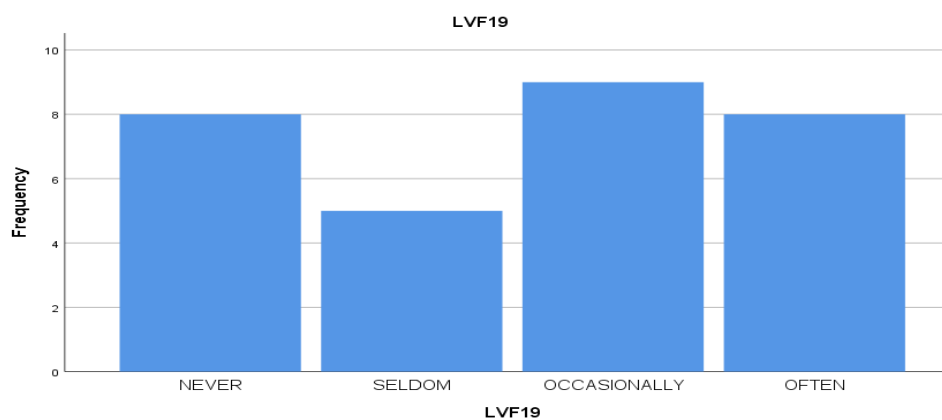


Figure 4.13

Graph Indicating Distribution of LVF Among Children with ASD

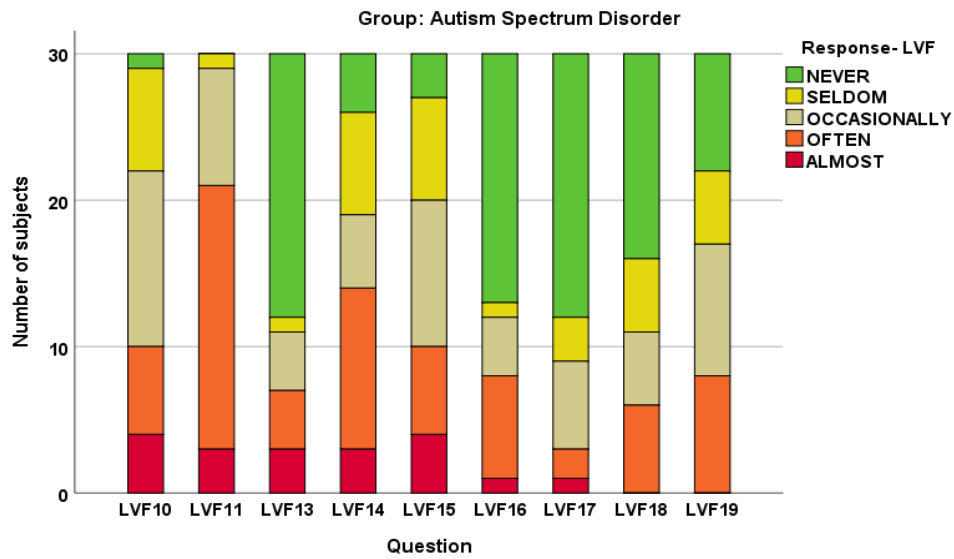
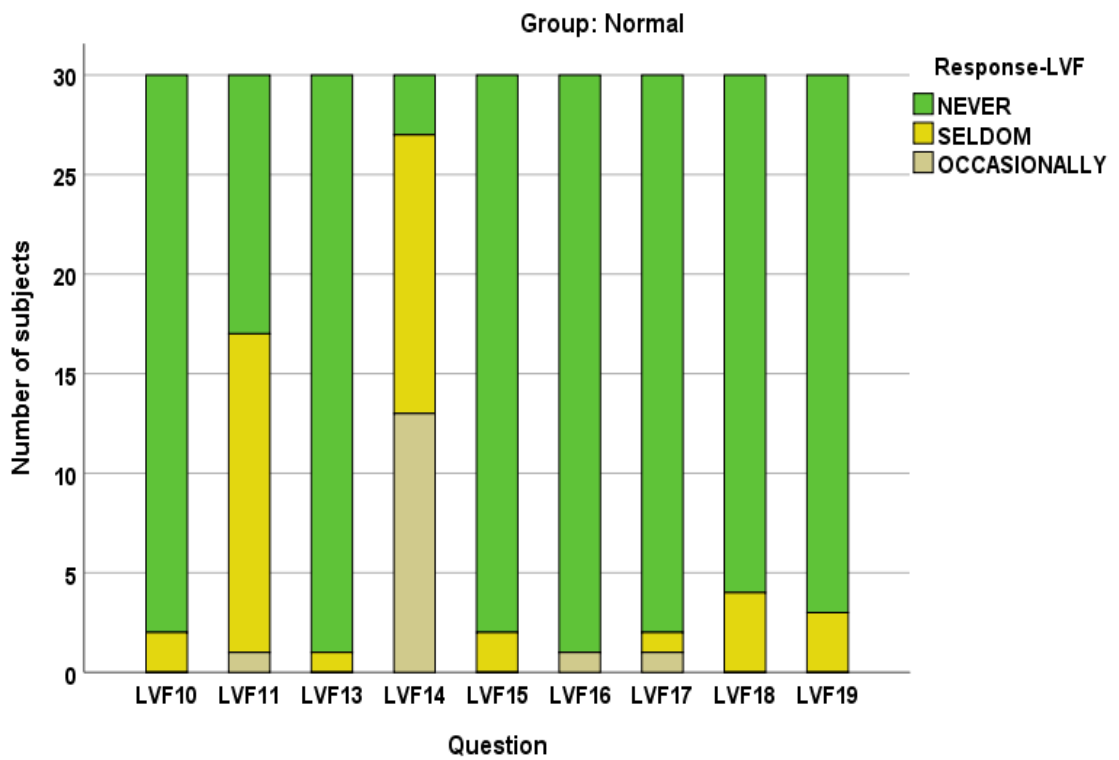


Figure 4.14

Graph Indicating Distribution of LVF Among Neurotypical Children



Across Food Refusal Domain. While critically evaluating the food refusal domain(FRD), statements 2 and 4 were found to be most frequently occurring as depicted in Figure 4.15 and 4.17 among children with ASD. However the frequency of these behaviour exhibited is less when compared to the LVF domain. “My child turns his/her face or body away from food” and “My child expels (spits out) food that she/he has eaten are item number 2 and 4 respectively of the BAMBI-M questionnaire.

Also, as Figure 4.16 and 4.18 indicate the frequency of problematic issues towards these statements (Item number 2 and 4) and other items under this category is much less among Neurotypical children. More than 90% of responses fall under the never or seldom category.

Figure 4.15

Frequency of Occurrence of FRF 2 Statement Among Children with ASD

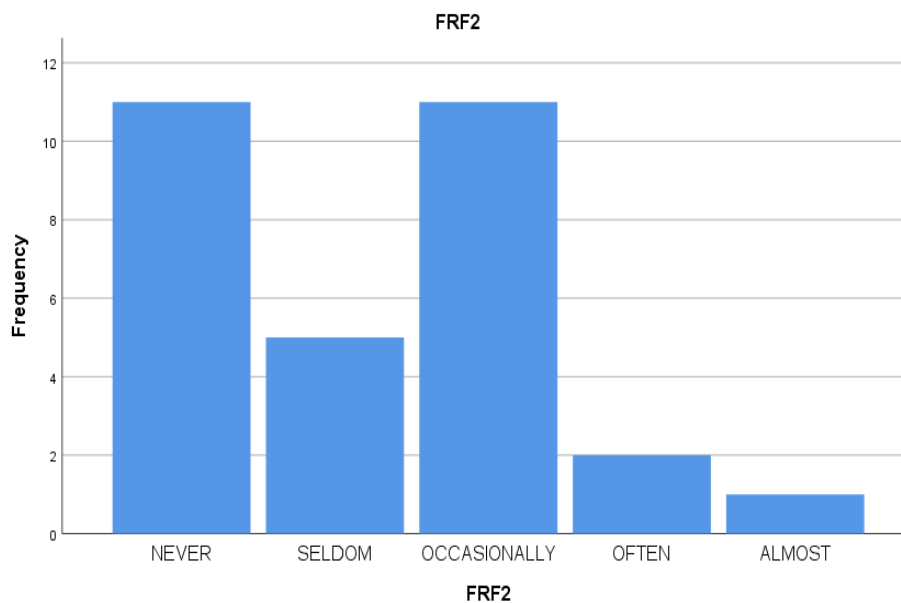
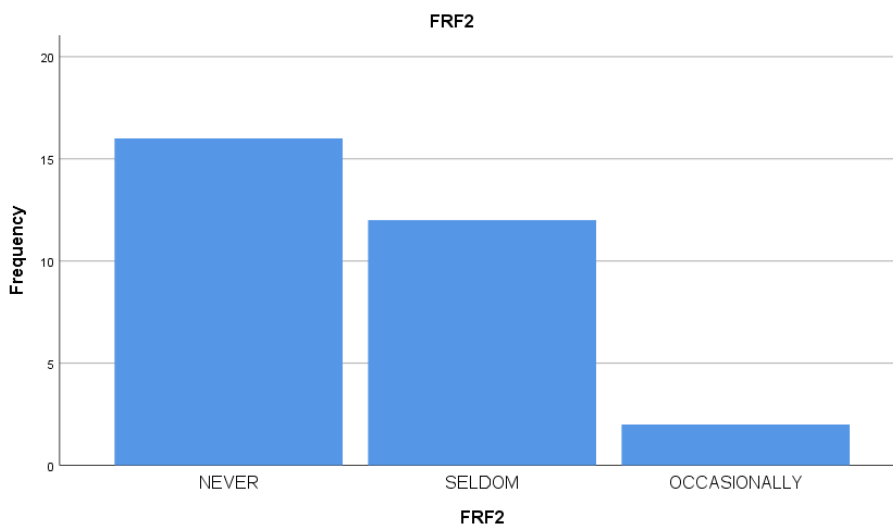


Figure 4.16

Frequency of Occurrence of FRF2 Statement Among Neurotypical Children

**Figure 4.17**

Frequency of Occurrence of FRF4 Statement Among Children with ASD

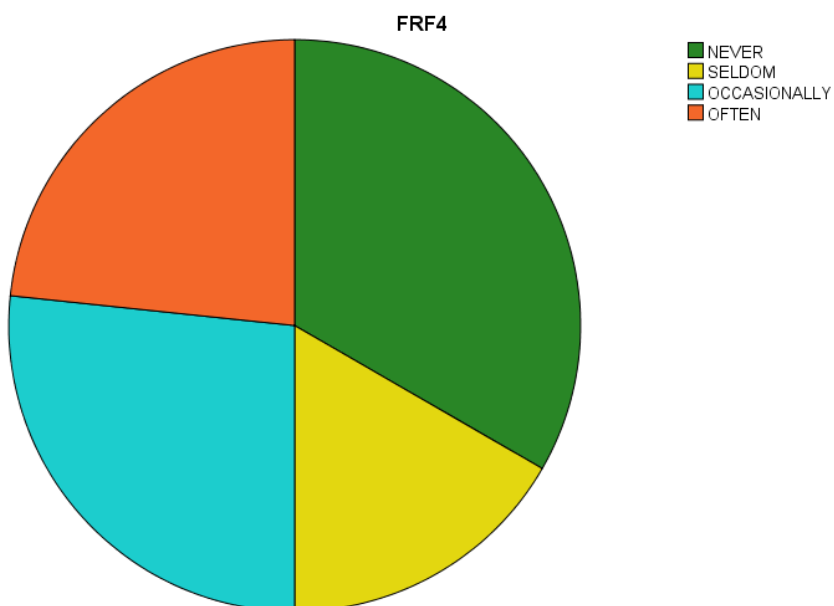


Figure 4.18

Frequency of Occurrence of FRF4 Statement Among Neurotypical Children

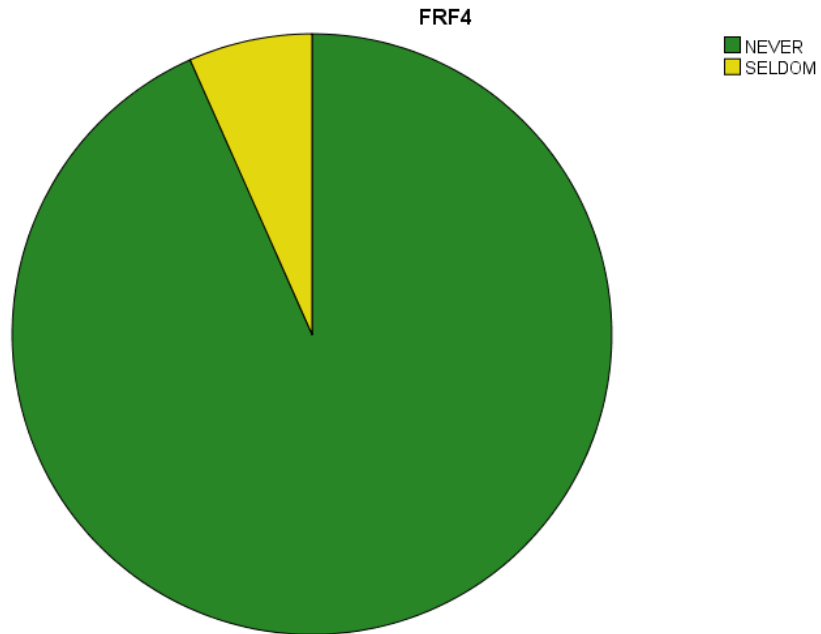


Figure 4.19

Graph Indicating Distribution of FRF Among Children with ASD

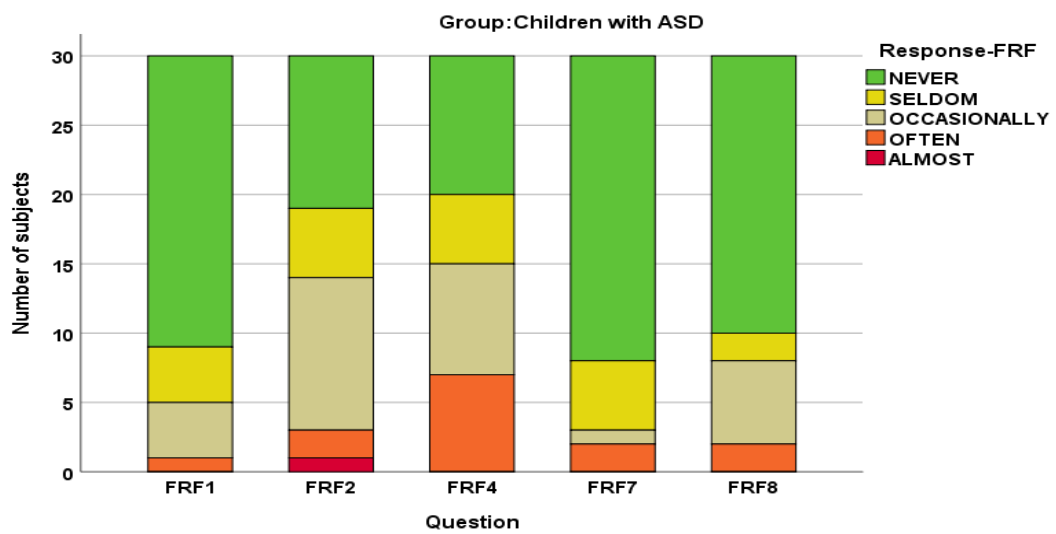
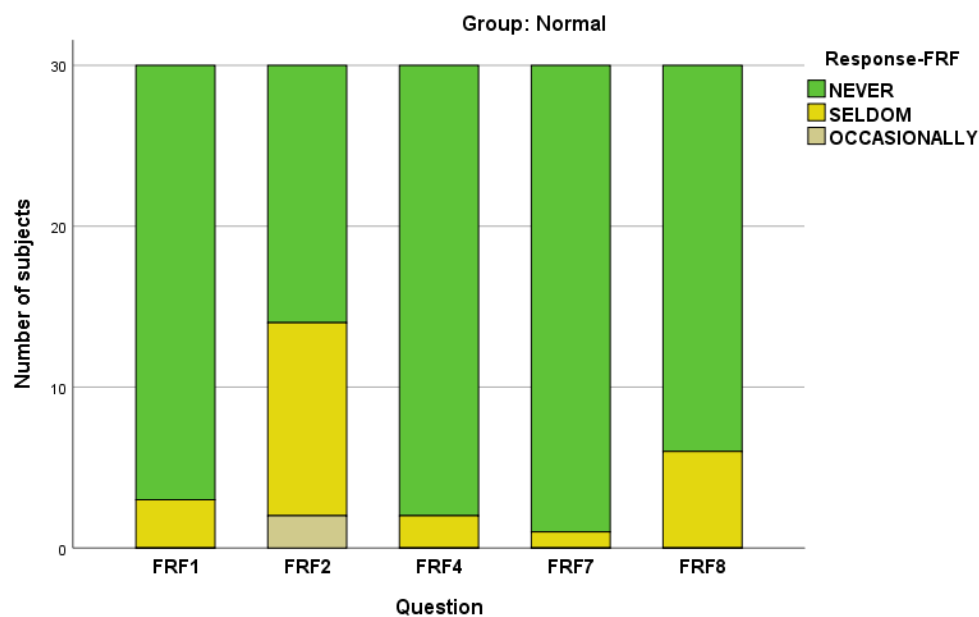


Figure 4.20

Graph Indicating Distribution of FRF Among Neurotypical Children



Across Characteristic Feature Domain. The findings revealed that in the characteristic Children with ASD domain (CAD), statements 3 and 9 were the most frequently occurring behaviours across children with ASD as shown in Figure 4.21 and Figure 4.23. Statement 3 analyses the seating behaviour of child during mealtimes and statement 9 explores the flexibility of mealtime routines. Item 3 as indicated in Figure 4.22 was found to be the most frequent among the neurotypical population in this domain. Therefore, item number 9 is the most distinctive feature that distinguishes Children with ASD and Neurotypical children in characteristic feature domain.

Further, statements 5,6,9 and 20 in the CFD domain was found to have all the responses under the category “never” indicating the issues not seen in the Neurotypical population. Statement 3 occurred frequently in both groups but comparatively greater in children with ASD. This statement explores the sitting tolerance of children during mealtime. Statements 5 and 6 explore aggressive behaviour towards others and self-

injurious behaviour respectively. Results indicated that 10 percent of children with ASD exhibited this behaviour frequently according to this study.

Figure 4.21

Frequency of Occurrence of CF3 Statement Among Children with ASD

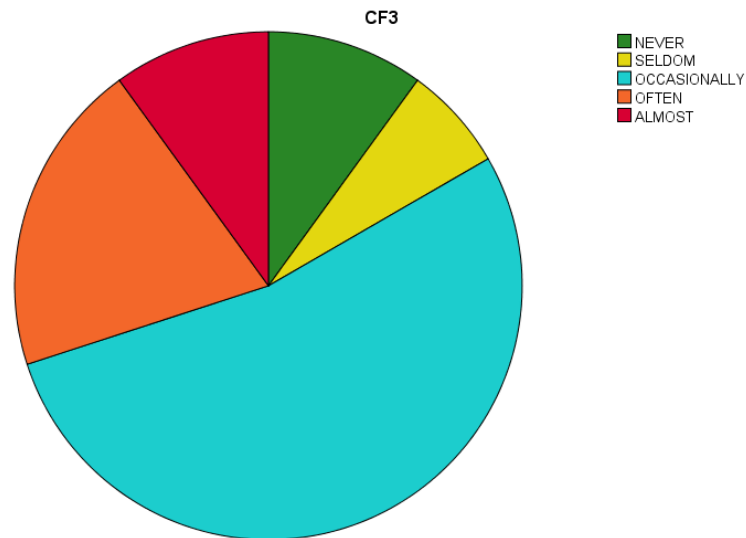


Figure 4.22

Frequency of Occurrence of CF3 Statement Among Neurotypical Children

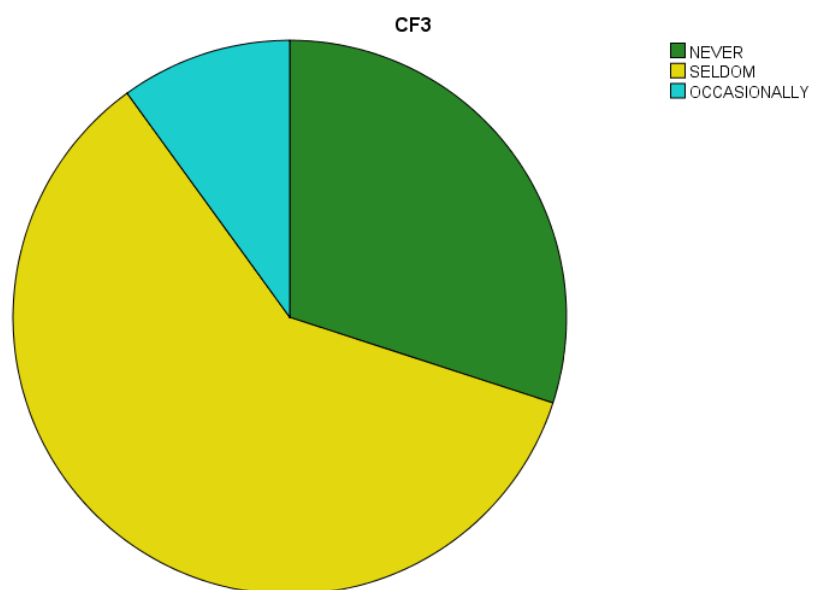


Figure 4.23

Frequency of Occurrence of CF9 Statement Among Children with ASD

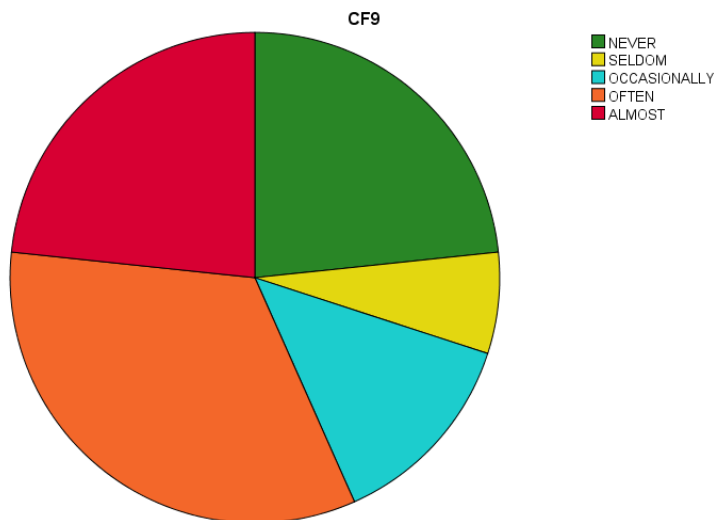


Figure 4.24

Frequency of Occurrence of CF9 Statement Among Neurotypical Children

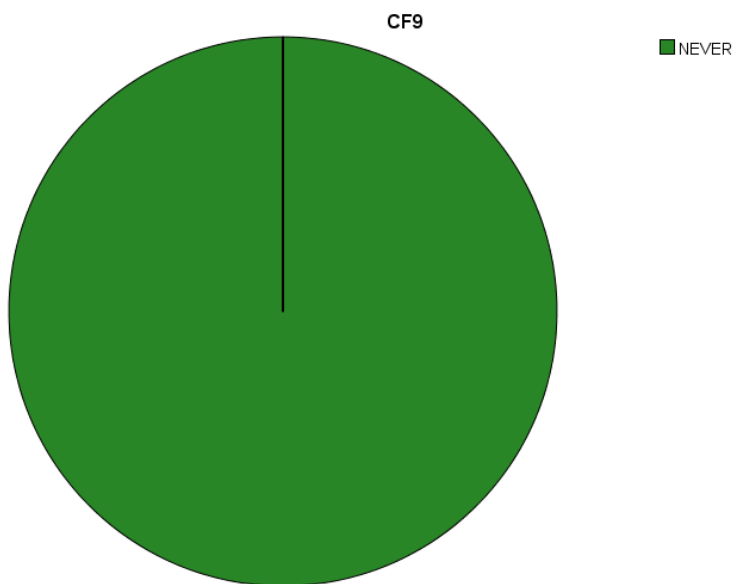
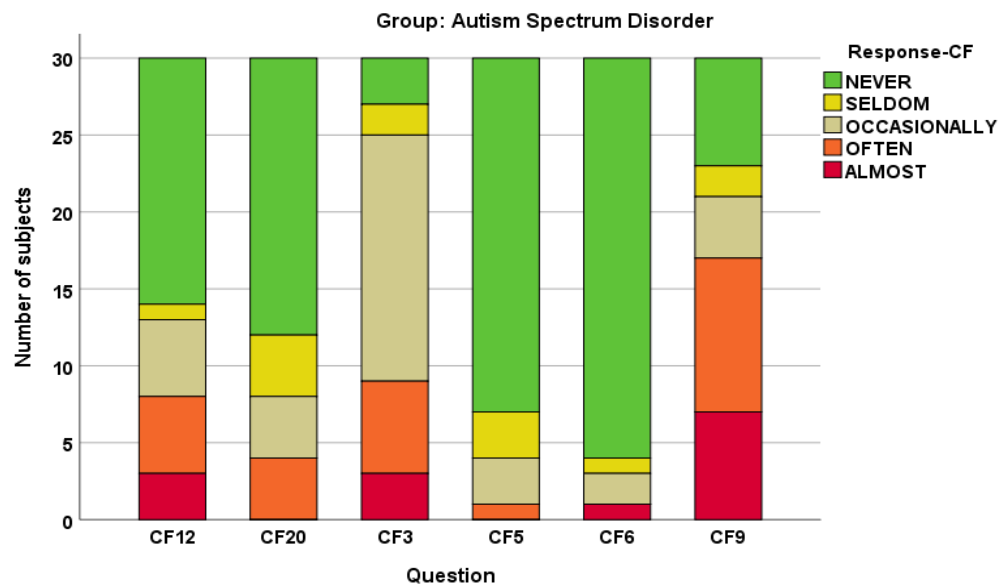
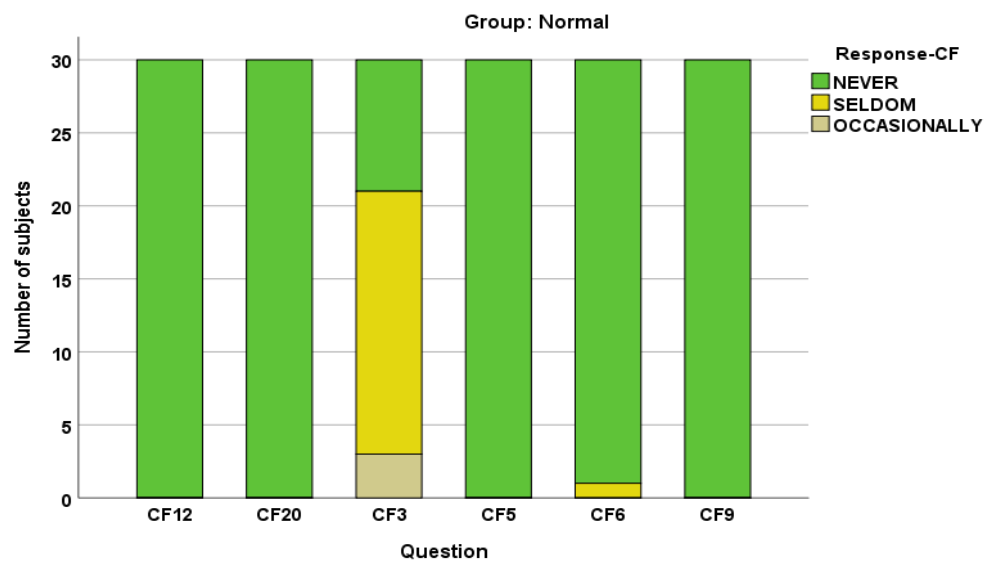


Figure 4.25*Graph Indicating Distribution of CF Among Children with ASD***Figure 4.26***Graph Indicating Distribution of CF Among Neurotypical Children*

4.2.6 *BAMBI-M Scores Across Age Groups*

The data were subjected to test of normality using Shapiro-Wilks test of normality and the results showed that the data follows non-normal distribution. Hence non-parametric tests were carried out. Kruskal Wallis test was done but for both Neurotypical and children with ASD but there was no significant difference found. For both ,values of significance(p value) were $>.05$.0.270 and 0.236 were the p value of Children with ASD and Neurotypical population respectively.

Both this statistical analysis suggests that there is no significant difference in BAMBI scores across age groups in the neurotypical and children with ASD population.

CHAPTER V

DISCUSSION

Brief Autism Mealtime Behavioural Inventory (BAMBI) is the first parental tool primarily developed to assess feeding issues specifically in children with ASD (Luckens & Linscheild, 2008). It was developed with the aim of standardizing data on nutrition and feeding habits specific to children with ASD. This questionnaire assesses many problematic behaviours prevalent in this population that other questionnaires do not evaluate, making it a quick and accurate clinical assessment tool for feeding issues in children with ASD.

The original BAMBI in English comprised 18 statements under three specific domains (Limited Variety, Food Refusal, and Features of Autism) and also, they employed a five-point Likert rating scale for frequency of feeding behaviours ranging from 1 for never or rarely to 5 for almost every meal (Lukens & Linschield., 2008). A frequency score is determined by calculating the sum of the Likert responses with the item numbers 3, 9, 10, and 15 reverse-scored. Given the proportion of complaints and concerns from parents about problematic mealtimes, this questionnaire is of paramount significance. Due to the manifestation of their ASD symptoms and accompanying behavioral, cognitive, psychological, or familial issues, many children with ASD experience feeding difficulties (Adams et al., 2022). This questionnaire is clinically very relevant as up to 80% of children with ASD have issues with their food behaviours (Vissoker et al., 2015).

To our knowledge, to this date, this is the first questionnaire translated, adapted, and validated in Malayalam that evaluates feeding problems in children with ASD. The validation of this questionnaire enables the integration of a structured examination for

this population into clinical practice and parent interventions regarding eating disorders and their repercussions. The original English BAMBI was initially translated and adapted to Malayalam (BAMBI-M) following the adaptation process in accordance with American Association of Orthopaedic Surgeons (AAOS) principles from Thammaiah et al.(2016) guidelines. The pre-testing phase enabled cross-cultural validity and proved to be strictly in agreement to the meaning of the original words. The tool was finally validated on 30 parents of children with ASD. This study analyzed the scores of BAMBI-M in children with and without ASD and the findings suggested that children with ASD predominantly exhibited feeding related difficulties in all the domains, and the rate of occurrence of such behaviours was also higher compared to neurotypical children.

The study's first phase aimed to translate and adapt the BAMBI questionnaire to Malayalam. The second objective was to validate the Brief Autism Mealtime Behaviour Inventory- Malayalam (BAMBI-M) questionnaire and was carried out as Phase 2 in the study.

5.1 Translation and Adaptation of BAMBI.

The primary stage of the first objective was forward translation. Two different Malayalam versions of the questionnaire were obtained during this stage. In the second stage, an appropriate consolidated version was obtained. To ensure the accuracy of this questionnaire, it was backward translated by two individuals. After the expert review and field study administered on 15 participants who are caregivers of children with autism, the final version of BAMBI-M was obtained. During these simultaneous revisions, corrections and substitutions of words were made, and a culturally adaptable tool was created, which was found to be adequate in its simplicity, familiarity, applicability, complexity, clarity and cultural appropriateness. Opinions and

perspectives of judges were collected during four stages of translation and field study. According to the participant, two more questions were added based on their opinion.

So, the Final BAMBI-M contains 20 questions falling under three domains. The three domains included in this questionnaire are the limited variety factor (Items 10, 11, 13, 14, 15, 16, 17,18 and19), food refusal factor (items 1, 2, 4, 7, and 8), Children with ASD characteristic factor (items 3, 5, 6, 9, 12 and 20) where item 19 and 20 are the extra added questions based on a field study on participants which was the final stage during the translation process. One of the questions added to the BAMBI-M questionnaire was under the limited variety factor, which is about children's aversion to certain textures like difficulty mixing rice and curry, difficulty touching slimy foods, etc. One sense that is essential to the eating process and can influence whether a food is accepted or rejected is texture (Pellegrino et al., 2020). Introducing new meals to young children is preceded by exploration through touching. Children exhibiting sensory defense may be less likely to use their hands during meals (L. Ernspenger & T. Stegen-Hanson, 2004).

Children with ASD exhibit sensory aversions (Schreck et al., 2004). Most children had tactile sensitivity, and 60 % of children disliked having their hands/faces dirty (Huxham et al., 2021). The final question, added to the questionnaire, falls under the children with ASD characteristic domain, i.e., smelling of foods. According to studies, children with ASD has atypical responses to olfactory stimuli (Schecklmann et al., 2013). Sense of smell is essential due to its involvement in feeding, from food selection to appreciation and recognition (Luisier et al., 2015). Issues in identifying basic smells and difficulty discriminating different smells may contribute to high rates of food refusal and selectivity reported in children with autism (Bennetto et al., 2007). Olfactory dysfunctions could also indicate a biomarker for autism (Hrdlicka et al.,

2011).

BAMBI contains a Likert scale where parents are instructed to self-administer the questionnaire and round the particular Likert scale rating. For BAMBI there are 5 ratings (1-Never, 2-Seldom, 3-occasionally, 4-often, and 5-almost). However, while rating items 3, 9, 10, and 15, these items should be reversely scored. As per the first objective, the questionnaire was translated and adapted to Malayalam. Simplicity, familiarity, applicability, complexity, clarity, and cultural appropriateness were considered in all translation stages.

5.2 Test-Retest Reliability

Test-retest reliability found using Spearman's rho coefficient, ρ was found to be 0.956. The present study indicated an excellent test-retest reliability. Similar consensus was seen in Lamboglia et al. (2023)'s study where their test-retest reliability of each item ranged between 0.83 to 1.00. In Turkish version of BAMBI they reports about the split half reliability value of 0.83 (Meral & Fidan, 2014). Malay version of BAMBI also reports that they got excellent values for test retest reliability which is consistent with our study (Zaiaami & Aqila, 2020). Since test-retest reliability is an essential psychometric property for determining the suitability of the tool, BAMBI-M was found to be reliable over time.

5.3 Internal Consistency

Internal consistency of items of BAMBI-M statements among children with ASD was found to be acceptable (Cronbach's Alpha value obtained was 0.710). The present study is in agreement with the findings of Meral and Fidan (2014), Hyong et al. (2011), Castro et al. (2019) and Lamboglia et al. (2023) which are regarding the validation of Turkish, Vietnamese, Brazilian Portuguese and Italian version of BAMBI. Meral and Fidan (2014) reported α 0.79 in their Turkish version of BAMBI, Huong et

al. (2011) found α 0.78, Castro et al. (2019) found α 0.70 and Lamboglia et al. (2023) reported α 0.71 . Thus, the present study reported an acceptable correlation in BAMBI-M statements among children with ASD.

5.4 Cut-Off Score of BAMBI-M Questionnaire

The cut-off score was found using the Receiver Operating Curve (ROC) curve, and a sensitivity and specificity of one were obtained in this cut-off score. 31 was the cut-off point obtained. Therefore, as per this study, a score of 31 or above can indicate feeding related issues in children. A good discriminant validity is therefore achieved. Cut-off for English and Portuguese versions in BAMBI were also found. The cut-off for BRCA-TEA questionnaire (translated BAMBI questionnaire in Portuguese) was found to be ≥ 47 (Castro et al., 2019). The original BAMBI did not mention the cut-off score (Demand et al., 2015).

5.5 Range of Values Obtained After Administration of BAMBI-M

The second objective of this study was to validate this questionnaire. For this purpose, it was administered on 30 parents of children with ASD and another 30 parents whose children fall under the typical category.

After administering BAMBI-M on 60 participants, a clear-cut distinction between the scores among the typical and disordered populations was found. Among 30 participants in the Children with ASD, the highest BAMBI-M score is 73, and the lowest is 33. The highest BAMBI-M score in the typical population is 29, and the lowest is 21. The range of value that got here for these two groups is similar to what was obtained in BAMBI -the Portuguese study (Castro et al., 2019), which resulted in the creation of a BRCA-TEA inventory. Children with ASD have more feeding problems in every feeding area assessed than controls (Vissocker et al., 2019). The frequency of problematic eating and feeding behaviors is the primary thing that differentiates

children with ASD from typical children (Martins et al., 2008). Compared to typically developing children, children with ASD had higher feeding issues, troublesome feeding patterns, and limitations in accepting particular food groups and novel foods (Sahan et al., 2021).

When comparing the results of the study between the original BAMBI and BRCA-TEA inventory, which was the Portuguese-translated version of BAMBI, both had similar results for the total scores for ASD patients and lower scores for controls (Castro et al., 2019). The administration of BAMBI-M also indicated similar results. Problem eating behaviors are reported in more than 75% of children with ASD (Lane et al., 2014).

The rate of occurrence of problematic eating and feeding behaviors is the primary thing that differentiates Children with ASD from typical children (Martins et al., 2008). In contrast to children with other developmental disorders and among typical children, children with ASD experience feeding issues more frequently and in a more diverse way (Schreck et al., 2004).

5.6 Analyzing the Statements Across Different Factors

When we analyze the statements in the different factors, the frequency of the exhibition of items varies.

5.3.1 Analyzing the Statements Across Limited Variety Factor

While reviewing items in the limited variety factor, we can see that item number 11 occurs widely in the Children with ASD population; more than 70% of caregivers of Children with ASD children rated it as falling under often and almost. This indicates that item 11 occurs more in Children with ASD children. Item 11 assesses the aversion towards certain foods by the child or eating only a narrower range of food; overall, it measures the food selectivity. Children with ASD exhibit food refusal and limited

acceptance of a variety and texture of food items than typically developing children (Schreck et al., 2004). Food selectivity is the reported feeding issue documented among children with ASD. Additionally, we discovered that compared to typically developing children, children with autism had higher feeding issues, troublesome feeding patterns, and limitations in accepting particular food groups and novel foods (Sahan et al., 2021). Food selectivity is characterized by a limited variety of foods, an excessive intake of only certain foods, and selective consumption of particular foods, such as those high in carbs (Cermak et al., 2010). According to the reports of parents of children with ASD, they practiced dietary restriction and refusal and only ate around half of the foods on the list. (Schreck & Williams, 2006).

Numerous studies have shown that children with ASD often exhibit more food selection than their typically developing peers (Plaza-Diaz et al., 2021). However, while analyzing item 11 in the typical population, more than 90% of the responses fall in the never and seldom category, which indicates this behavior is significantly less in the typical population.

The main issue of children with ASD is food selectivity, which is displayed as food refusal, eating too quickly, issues with chewing, stealing food from peers, and vomiting (Leader et al., 2020).

In decreasing order of frequency after statement 11, the most frequently occurring problematic issues were statements 10, 14 and 15. Item number 10 assesses food neophobia in children. Children with ASD were discovered to have poorer self-feeding abilities, be prone to deny foods, and displays food neophobia. (Schreck et al., 2004). Food neophobia (FN) is commonly seen in children with ASD, which consequently causes issues in health quality (Almeida et al., 2022). Kral et al. (2015) found that among children with ASD, those one with oral sensitivity issues were found

to report more regarding food neophobia difficulties. According to Martins et al. (2008), children with ASD showed slightly poorer self-feeding ability, and the frequency of food-neophobic behaviors was more likely to be seen in this population. Difficulty accepting new food may be due to sensory processes, perception of taste, irrational fear of strange things, environmental factors, parental and peer modeling, and feeding practices (Blissett et al., 2013). Children with ASD frequently exhibit stereotyped food preferences and resistance to new taste experiences (Stafford et al., 2017). Also, studies have found that children with ASD show more mealtime disruptive behavior than typical peer groups (Gentry & Luiselli, 2008) with more disruptive behaviors when new foods are given.

Item 14 is about the preference of the child towards crunchy foods. Current study results concerning children with ASD suggested that 37 % rated it under often and 10% rated it under almost. Children with ASD also prefer certain textures, incredibly crunchy textures, and consume more processed foods while intake of fruits and vegetables is significantly less (Ranjan et al., 2015). Children with ASD clearly preferred crunchy or dry foods (Huxham et al., 2021). Frequent mealtime problem behaviors of children with ASD were preference for 'crunchy' food, food neophobia, and problems remaining seated at the table during meals (Catino et al., 2019). 43% of neurotypicals rated statement number 14 under occasionally. One of the most frequent behaviours exhibited by neurotypical children under this domain is regarding LVF 14.

Statement 15 is about the acceptance and preference of children towards a variety of foods. In this study, 20% and 13% of children with ASD rated this item under often and almost respectively. Most of the Children with ASD children showed less preference for a wide variety of foods compared to controls. Children with ASD eat a significantly narrower range of foods when compared with typical (Schreck et al.,

2004). Food rejection and limited food variety are common issues seen in Children with ASD children (Leiva-García et al., 2019). A variety of restrictive and inflexible feeding behaviors were shown by 89 % of children, according to a study (Ledford & Gast, 2006). Dietary intake in children with ASD has been found to be narrower (Lane et al., 2014). The limited variety of foods is one of the areas frequently reported regarding feeding difficulties in children with ASD (Castro et al., 2016). In addition to the observations that they only eat a narrow range of foods, they also have a great preference for starches, snacks, and processed foods and a bias against fruits, vegetables, and proteins (Ledford & Gast, 2006).

Also, while analyzing statements 13,16,17 and 18, it is found that the occurrence of these particular feeding behaviors is less than 40%. The response of participants regarding the extra added question, i.e., statement which is about the acceptance of specific textures like slimy texture and wet texture, indicated that there is a difference among this behavior in children with ASD when compared with typical children. 56% of participants of children with ASD rated statement 19 under occasionally and often whereas 90 % of responses were under never category among typical children. Because of their heightened sensitivity to textures, children with ASD may limit the foods they eat, adhering to only those that they crave for(Peretti et al., 2019). They are also highly fussy about rejecting foods especially foods with extremely slippery or mushy texture (Chatoor et al., 2020).

5.3.2 Analyzing the Statements Across Food Refusal Factor

While critically evaluating the next factor, i.e., food refusal factor, item 2 and item 4 are most frequently occurring. More than 40% of children with ASD rated it as occasionally, often, and almost. However, the frequency of these behaviours exhibited by children with ASD is less when compared to the most rated problematic issue in the

limited variety factor domain. There have been reports of food refusal in children with ASD based on temperature, foods contacting other foods, or color, but not on texture, taste, smell, combinations, or shape (Hubbard et al., 2014). Item number two states, “My child turns his/her face or body away from food. Item 4 explores the spitting behavior of a child during mealtime. Chewing and spitting are increasing in prevalence among children with ASD spectrum disorder (Vissoker et al., 2015). Disruptive eating behaviors such as food rejection, spitting out food, hitting spoon, fleeing the food environment, sobbing, and yelling are another issue that is frequently found in children with ASD (Sahan et al., 2021).

Also, the response of the typical population indicates that the frequency of problematic issues towards these items (Item number 2 and 4) and other items under this category is significantly less. More than 90% of responses fall under the never or seldom category in typical children across this domain.

5.3.3 Analyzing the Statements Across Features of Autism Factor

While analyzing this factor in this questionnaire, it is understood that items 3 and 9 are the most frequently occurring behaviors. Item 9 explores the flexibility of mealtime routines. More than 80% of children with ASD respond to the Likert scale's occasional, often, or almost rating. Children with ASD are also less adaptable and exhibit less flexibility in mealtime routines (Williams et al., 2000). Therefore, item 9 is the most distinctive feature distinguishing Children with ASD from typical children. Item 9 assesses the flexibility of mealtime routines. Schreck et al. (2004) also reported that 'Ritualistic eating practices' were more prevalent in children with ASD. Inflexibility and rigidity in Autism Spectrum Disorders (ASD) apply to all adaptive behavior domains, such as play, conversation, and eating (Baker, 2000). According to the study of Lane et al. (2014), most rated feeding-related problematic behaviour seen in children

with ASD includes no flexibility about mealtime routines, aggression and self-injury at mealtime, and sitting at the meal table.

Items number 5 and 6 explore aggressive behavior towards others and self-injurious behavior, respectively. According to this study, about 10 percent of children with ASD exhibit this behavior frequently.

Also, items 5,6,9 and 20 across typical is found to have all the responses under the never category, indicating these issues are not present in the typical population. Item 3 under this domain is the most frequent among the typical population, i.e., 10% of children exhibit it frequently, and 60% under the seldom category. It explores the sitting tolerance of children during mealtime.

5.7 BAMBI-M Score Compared Across Age Groups

No significant difference in BAMBI-M scores across age groups was found in this study. Three age groups, 3-6 years, 6-9 years, and 9-11 years, were compared concerning the BAMBI -M score obtained. So, as per this study, there is no correlation between feeding issues and age among children with ASD.

According to Beighley et al. (2013), age was not a significant predictor of food selectivity among children with ASD. However, studies have shown that age also impacted feeding habits, with toddlers consuming larger variety than young children (Vissoke et al., 2019). Age had no overall impact on eating disorders; the only area where there was a difference was in ritualistic behavior during meals, which young children exhibited more of than toddlers (Schertz et al., 2016). Both children with ASD and typically developing children were observed to consume fewer nutritious meals as they grew older, indicating that age significantly impacted both groups' dietary behaviors (Vissoke et al., 2019). The present study did not show significant age effects may be due to inadequate sample considered in each age range.

CHAPTER VI

SUMMARY AND CONCLUSION

Autism spectrum disorder (ASD) is a neurodevelopmental condition that is characterized by the inability to communicate and interact socially, as well as the prevalence of limited, repetitive activities (DSM V, 2013). Despite substantial literature on feeding impairments among children with ASD, very few translational research studies to understand feeding issues have been carried out in the Indian context. The use of a standardized questionnaire to assess the feeding behaviors of children with ASD is of utmost need.

Among the various globally available parent administered questionnaires to assess feeding behaviors and problems, the Brief Autism Mealtime Behaviour Inventory (BAMBI) developed by Lukens and Linscheid (2008) is a validated questionnaire to evaluate mealtime issues in children with ASD between the ages of 3 and 11.

The present study aims to translate and adapt the Brief Autism Mealtime Behavior Inventory to Malayalam language (BAMBI-M) and also to validate the tool by administering it on caregivers of children with ASD. The original BAMBI was translated and cross-culturally adapted following guidelines of the Process of adaptation in accordance with American Association of Orthopaedic Surgeons (AAOS) principles from Thimmaiah et al. (2016). The questionnaire underwent five stages of adaptation: forward translation, common translation synthesis, backward translation, expert committee review, and field testing. Fifteen caregivers of children with ASD participated and checked the simplicity, familiarity, applicability, complexity, clarity, and cultural appropriateness of the questions in the field study. As per the caregiver's

opinion, two more questions were included. Hence, the final BAMBI-M consisted of 20 questions in three domain areas: limited variety factor, food refusal factor, and characteristic feature factor. After the translation and adaptation, the questionnaire was validated, administering it on 30 caregivers of children with ASD and 30 caregivers of typical children.

Test-retest reliability assessed using Spearman's rho correlation coefficient was found to be high ($\rho = 0.956$). Internal consistency revealed acceptable consistency among different items in children with ASD, with a Cronbach's Alpha of 0.710, but for the typical population, the value is reduced (Cronbach's alpha-0.6). A clear-cut distinction between children with ASD and neurotypical population be made from these values using the Receiver Operating Characteristic (ROC) curve. A cut-off score of 31 was obtained. This indicated that those who scored equal to or above 31 were found to have feeding-related issues. The sensitivity and specificity of this tool were one.

The range of BAMBI scores obtained for the typical population ranged from 21 to 29, whereas in the ASD group, it ranged from 33 to 73. Statement 11, which explores the child's behavior in terms of food selectivity which is under the domain of limited variety factor, was the most rated problem behavior in children with ASD. The sensitivity and specificity of this test were found to be very high, and the cut-off value obtained is 31. As cut-off value increases, the frequency of problem behaviors increases. As this significance value is more than 0.05 ($p > 0.05$), there is no significant difference between the BAMBI score among different age groups. The age groups considered in this study were 3-6, 6-9, and 9-11 years.

BAMBI-M is found to be a very sensitive tool for identifying feeding-related issues in children with ASD. The clear-cut distinction between the scores of children with ASD and typical populations raises concerns regarding the early identification and

management of feeding-related issues in children with ASD. In conclusion, BAMBI-M showed good test–retest reliability, sensitivity, and specificity and it can be used for clinical and research purposes.

6.1 Limitations of the Present Study

- The study results were established on a small sample size.
- The developed tool BAMBI-M can be used only on Malayalam-speaking children with ASD restricted to three to eleven years of age.
- The majority of participants among children with ASD were male.
- The severity of ASD was not considered in this study.
- This study did not examine the criterion validity since there is lack of a gold standard tool or instrument that can be utilized specifically for feeding assessment.
- The YES/NO part of this tool that assessed parental issues regarding child's feeding difficulty was not assessed due to time constraints.
- The sample size considered for test-retest reliability was also small.

6.2 Clinical implications of the present study.

- BAMBI-M is proven to be reliable, simple and a quick tool that can be used by parents of children with ASD, the scores of which can be utilised for clinical and research purposes.
- The present study developed a self-assessment tool for Malayalam-speaking caregivers of children with ASD with feeding difficulties.
- This questionnaire can be used to emphasize the need to address feeding-related sensory and selectivity issues in children with ASD.

- This tool is the only available tool in Malayalam to help sensitively identify ASD-related feeding problems in children.
- Using the BAMBI-M in conjunction with other techniques, such as direct observation, would be helpful in developing the most thorough evaluation for comprehending feeding-related challenges in ASD and aiding in suitable intervention measures.

6.3 Future Directions

- The most affected factors of feeding issues in children with ASD were found in this study. Further research directed in exploring these areas could provide valuable information about the factors that can act as potential diagnostic indicators in children with ASD.
- Further study on feeding issues in children with ASD is needed, including direct observations and studies with larger samples.
- Proper intervention methods corresponding to the factors most affected in children with ASD should be established to improve the overall health of children with ASD and to reduce the parental pressure concerning feeding in children with ASD.
- The tool, if administered in a large sample, will improve the reliability and accuracy and provide more support to the findings obtained in this current study.

REFERENCES

- Adams, K. L., Murphy, J., Catmur, C., & Bird, G. (2022). The role of interoception in the overlap between eating disorders and autism: Methodological considerations. *European Eating Disorders Review*, *30*(5), 501-509.
- Ahearn, W. H., Castine, T., Nault, K., & Green, G. (2001). An assessment of food acceptance in children with autism or pervasive developmental disorder-not otherwise specified. *Journal of autism and developmental disorders*, *31*, 505-511.
- Allen, S. L., Smith, I. M., Duku, E., Vaillancourt, T., Szatmari, P., Bryson, S. & Georgiades, S. (2015). Behavioral pediatrics feeding assessment scale in young children with autism spectrum disorder: Psychometrics and associations with child and parent variables. *Journal of pediatric psychology*, *40*(6), 581-590.
- Anglesea, M. M., Hoch, H., & Taylor, B. A. (2008). Reducing rapid eating in teenagers with autism: Use of a pager prompt. *Journal of applied behavior analysis*, *41*(1), 107-111.
- Archer, L. A., Rosenbaum, P. L., & Streiner, D. L. (1991). The children's eating behavior inventory: reliability and validity results. *Journal of Pediatric Psychology*, *16*(5), 629-642.
- Attlee, A., Kassem, H., Hashim, M., & Obaid, R. S. (2015). Physical status and feeding behavior of children with autism. *The Indian Journal of Pediatrics*, *82*, 682-687.
- Babbitt, R. L., Hoch, T. A., Coe, D. A., Cataldo, M. F., Kelly, K. J., Stackhouse, C., & Perman, J. A. (1994). Behavioral assessment and treatment of pediatric feeding disorders. *Journal of Developmental & Behavioral Pediatrics*, *15*(4), 278-291.

- Bandini, L. G., Anderson, S. E., Curtin, C., Cermak, S., Evans, E. W., Scampini, R., ... & Must, A. (2010). Food selectivity in children with autism spectrum disorders and typically developing children. *The Journal of pediatrics*, *157*(2), 259-264.
- Baraskewich, J., von Ranson, K. M., McCrimmon, A., & McMorris, C. A. (2021). Feeding and eating problems in children and adolescents with autism: A scoping review. *Autism : the international journal of research and practice*, *25*(6), 1505–1519. <https://doi.org/10.1177/1362361321995631>
- Barker, D. J., Godfrey, K. M., Gluckman, P. D., Harding, J. E., Owens, J. A., & Robinson, J. S. (1993). Fetal nutrition and cardiovascular disease in adult life. *The Lancet*, *341*(8850), 938-941.
- Bennetto, L., Kushner, E. S., & Hyman, S. L. (2007). Olfaction and taste processing in autism. *Biological psychiatry*, *62*(9), 1015-1021.
- Ben-Sasson, A., Carter, A. S., & Briggs-Gowan, M. J. (2009). Sensory over-responsivity in elementary school: Prevalence and social-emotional correlates. *Journal of abnormal child psychology*, *37*, 705-716.
- Bonfante, M. C., Raspini, J. P., Fernandes, I. B., Fernandes, S., Campos, L. M., & Alarcon, O. E. (2021). Achieving Sustainable Development Goals in rare earth magnets production: A review on state of the art and SWOT analysis. *Renewable and Sustainable Energy Reviews*, *137*, 110616.
- Brede, J., Babb, C., Jones, C., Elliott, M., Zanker, C., Tchanturia, K., ... & Mandy, W. (2020). “For me, the anorexia is just a symptom, and the cause is the autism”: Investigating restrictive eating disorders in autistic women. *Journal of Autism and Developmental Disorders*, *50*, 4280-4296.

- Castro, K., Perry, I. S., Ferreira, G. P., Marchezan, J., Becker, M., & Riesgo, R. (2019). Validation of the Brief Autism Mealtime Behavior Inventory (BAMBI) Questionnaire. *Journal of autism and developmental disorders, 49*, 2536-2544.
- Catino, E., Perroni, G., Di Trani, M., Alfonsi, C., Chiarotti, F., & Cardona, F. (2019). Application of the scale for the assessment of feeding interaction (SVIA) to children with autism spectrum disorder. *Frontiers in psychiatry, 10*, 529.
- Chatoor Khoc, I., & Lucarelli, L. (2020). Feeding development and disorders. In *Encyclopedia of infant and early childhood development* (pp. 621-632). Elsevier.
- Chistol, L. T., Bandini, L. G., Must, A., Phillips, S., Cermak, S. A., & Curtin, C. (2018). Sensory sensitivity and food selectivity in children with autism spectrum disorder. *Journal of autism and developmental disorders, 48*, 583-591.
- Chunsuwan, I., Ma-eime, W., Hansakunachai, T., Kulalert, P., & Lerthattsilp, T. (2021). Feeding Problems of Preschool-Age Children With Autism Spectrum Disorder in Pathum Thani Province, Thailand. *Asian Medical Journal and Alternative Medicine, 21*(3), 199-209.
- Clarke, T. K., Lupton, M. K., Fernandez-Pujals, A. M., Starr, J., Davies, G., Cox, S., ... & McIntosh, A. M. (2016). Common polygenic risk for autism spectrum disorder (ASD) is associated with cognitive ability in the general population. *Molecular psychiatry, 21*(3), 419-425.
- Cornish, E. (2002). Gluten and casein free diets in autism: a study of the effects on food choice and nutrition. *Journal of human nutrition and dietetics, 15*(4), 261-269.

- Crasta, J. E., Benjamin, T. E., Suresh, A. P. C., Alwinesh, M. T. J., Kanniappan, G., Padankatti, S. M., ... & Nair, M. K. C. (2014). Feeding problems among children with autism in a clinical population in India. *The Indian Journal of Pediatrics*, *81*, 169-172.
- Crist, W., & Napier-Phillips, A. (2001). Mealtime behaviors of young children: a comparison of normative and clinical data. *Journal of Developmental & Behavioral Pediatrics*, *22*(5), 279-286.
- Dovey, T. M., & Martin, C. (2017). Developmental, cognitive and regulatory aspects of feeding disorders. In *Feeding problems in children* (pp. 94-110). CRC Press.
- Dovey, T. M., Kumari, V., & Blissett, J. (2019). Eating behaviour, behavioural problems and sensory profiles of children with avoidant/restrictive food intake disorder (ARFID), autistic spectrum disorders or picky eating: Same or different?. *European Psychiatry*, *61*, 56-62.
- Dudova, I., Vodicka, J., Havlovicova, M., Sedlacek, Z., Urbanek, T., & Hrdlicka, M. (2011). Odor detection threshold, but not odor identification, is impaired in children with autism. *European Child & Adolescent Psychiatry*, *20*, 333-340.
- Egan, A. M., Dreyer, M. L., Odar, C. C., Beckwith, M., & Garrison, C. B. (2013). Obesity in young children with autism spectrum disorders: prevalence and associated factors. *Childhood Obesity*, *9*(2), 125-131.
- Elsabbagh, M., Divan, G., Koh, Y. J., Kim, Y. S., Kauchali, S., Marcín, C., ... & Fombonne, E. (2012). Global prevalence of autism and other pervasive developmental disorders. *Autism research*, *5*(3), 160-179.

- Emmons, P., & Anderson, L. (2005). *Understanding sensory dysfunction: learning, development and sensory dysfunction in autism spectrum disorders, ADHD, learning disabilities and bipolar disorder*. Jessica Kingsley Publishers.
- Emond, A., Emmett, P., Steer, C., & Golding, J. (2010). Feeding symptoms, dietary patterns, and growth in young children with autism spectrum disorders. *Pediatrics*, *126*(2), e337-e342.
- Ernsperger, L., & Stegen-Hanson, T. (2004). *Just Take a Bite: Easy, Effective Answers to Food Aversions and Eating Challenges!*. Future Horizons.
- Field, D., Garland, M., & Williams, K. (2003). Correlates of specific childhood feeding problems. *Journal of paediatrics and child health*, *39*(4), 299-304.
- Fodstad, J. C., & Matson, J. L. (2008). A comparison of feeding and mealtime problems in adults with intellectual disabilities with and without autism. *Journal of Developmental and Physical Disabilities*, *20*, 541-550.
- Gal, E., Gal-Mishael, R., Vissoker, R. E., Hedley, D., Bury, S. M., & Stolar, O. (2022). Eating challenges in children with autism spectrum disorder: Development and validation of the “Aut-Eat” questionnaire (AEQ). *Journal of Autism and Developmental Disorders*, 1-12.
- Gardner, F., & Shaw, D. S. (2008). Behavioral problems of infancy and preschool children (0–5). *Rutter's child and adolescent psychiatry*, 882-893.
- Gentry, J. A., & Luiselli, J. K. (2008). Treating a child’s selective eating through parent implemented feeding intervention in the home setting. *Journal of Developmental and Physical Disabilities*, *20*, 63-70.

- Gilmartin, T., Gurvich, C., Dipnall, J. F., & Sharp, G. (2023). One size does not fit all: Exploring how the five-factor model facets predict disordered eating behaviours among adolescent and young adult males and females. *British Journal of Psychology, 114*(1), 132-158.
- Greer, A. J., Gulotta, C. S., Masler, E. A., & Laud, R. B. (2008). Caregiver stress and outcomes of children with pediatric feeding disorders treated in an intensive interdisciplinary program. *Journal of pediatric psychology, 33*(6), 612-620.
- Grimaldi, R., Gibson, G. R., Vulevic, J., Giallourou, N., Castro-Mejía, J. L., Hansen, L. H., ... & Costabile, A. (2018). A prebiotic intervention study in children with autism spectrum disorders (ASDs). *Microbiome, 6*(1), 1-13.
- Hall, D. A., Zaragoza Domingo, S., Hamdache, L. Z., Manchaiah, V., Thammaiah, S., Evans, C., ... & International Collegium of Rehabilitative Audiology and TINnitus Research NETwork. (2018). A good practice guide for translating and adapting hearing-related questionnaires for different languages and cultures. *International Journal of Audiology, 57*(3), 161-175.
- Hazen, B. T., Boone, C. A., Ezell, J. D., & Jones-Farmer, L. A. (2014). Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. *International Journal of Production Economics, 154*, 72-80.
- Hediger, M. L., England, L. J., Molloy, C. A., Yu, K. F., Manning-Courtney, P., & Mills, J. L. (2008). Reduced bone cortical thickness in boys with autism or autism spectrum disorder. *Journal of autism and developmental disorders, 38*, 848-856.

- Hendy, H. M., Williams, K. E., Camise, T. S., Eckman, N., & Hedemann, A. (2009). The Parent Mealtime Action Scale (PMAS). Development and association with children's diet and weight. *Appetite, 52*(2), 328-339.
- Hendy, H., Harclerode, W., & Williams, K. E. (2016). The Parent Mealtime Action Scale revised (PMAS-R): Psychometric characteristics and associations with variables of clinical interest. *Appetite, 105*, 283-290.
- Herndon, A. C., DiGuseppi, C., Johnson, S. L., Leiferman, J., & Reynolds, A. (2009). Does nutritional intake differ between children with autism spectrum disorders and children with typical development?. *Journal of autism and developmental disorders, 39*, 212-222.
- Hrdlicka, M., Vodicka, J., Havlovicova, M., Urbanek, T., Blatny, M., & Dudova, I. (2011). Brief report: significant differences in perceived odor pleasantness found in children with ASD. *Journal of autism and developmental disorders, 41*, 524-527.
- Hubbard, K. L., Anderson, S. E., Curtin, C., Must, A., & Bandini, L. G. (2014). A comparison of food refusal related to characteristics of food in children with autism spectrum disorder and typically developing children. *Journal of the Academy of Nutrition and Dietetics, 114*(12), 1981-1987.
- Huong, N. M., Thao, N. P., Nhi, V. H., Binh, N. T. T., Nhi, T. T. Y., Thanh, N. T. M., ... & Hung, N. T. (2022). Validation of brief autism mealtime behavior inventory (BAMBI) questionnaire in Vietnam in 2021. *Tạp chí Y học Dự phòng, 32*(4), 32-38.
- Huxham, L., Marais, M., & van Niekerk, E. (2021). Idiosyncratic food preferences of children with autism spectrum disorder in England. *South African Journal of Clinical Nutrition, 34*(3), 90-96.

- Ismail, N. A. S., Ramli, N. S., Hamzaid, N. H., & Hassan, N. I. (2020). Exploring eating and nutritional challenges for children with autism spectrum disorder: Parents' and special educators' perceptions. *Nutrients*, *12*(9), 2530.
- Kang, Y. Q., Teo, C. M., Tan, M. L., Aw, M. M., Chan, Y. H., & Chong, S. C. (2022). Feeding difficulties in Asian children with autism spectrum disorder. *Pediatrics & Neonatology*, *63*(1), 48-56.
- Karlsson, L., Råstam, M., & Wentz, E. (2013). The Swedish Eating Assessment for Autism spectrum disorders (SWEAA)—validation of a self-report questionnaire targeting eating disturbances within the autism spectrum. *Research in Developmental Disabilities*, *34*(7), 2224-2233.
- Kenney, L., & Walsh, T. (2013). Avoidant/Restrictive Food Intake Disorder (ARFID). Defining ARFID. *Eating Disorders Review*, *24*(3), 1-4.
- Kerwin, M. E. (1999). Empirically supported treatments in pediatric psychology: severe feeding problems. *Journal of Pediatric Psychology*, *24*(3), 193-214.
- Kerwin, M. E., Eicher, P. S., & Gelsinger, J. (2005). Parental report of eating problems and gastrointestinal symptoms in children with pervasive developmental disorders. *Children's Health Care*, *34*(3), 217-234.
- Kodak, T., & Piazza, C. C. (2008). Assessment and behavioral treatment of feeding and sleeping disorders in children with autism spectrum disorders. *Child and adolescent psychiatric clinics of North America*, *17*(4), 887-905.
- Kozak, A., Czepczor-Bernat, K., Modrzejewska, J., Modrzejewska, A., Matusik, E., & Matusik, P. (2023). Avoidant/Restrictive Food Disorder (ARFID), Food Neophobia, Other Eating-Related Behaviours and Feeding Practices among

- Children with Autism Spectrum Disorder and in Non-Clinical Sample: A Preliminary Study. *International Journal of Environmental Research and Public Health*, 20(10), 5822.
- Kral, T. V., Souders, M. C., Tompkins, V. H., Remiker, A. M., Eriksen, W. T., & Pinto-Martin, J. A. (2015). Child eating behaviors and caregiver feeding practices in children with autism spectrum disorders. *Public Health Nursing*, 32(5), 488-497.
- Lafferty, J. L. (2020). *Nutrient intake and meal-time behavior of children with autism spectrum disorder*. University of Delaware.
- Lamboglia, A., Romano, R., Valente, D., Berardi, A., Cavalli, G., Giovannone, F., ... & Galeoto, G. (2023). Brief Autism Mealtime Behavior Inventory (BAMBI): Italian Translation and Validation. *Children*, 10(7), 1201.
- Lane, A. E., Dennis, S. J., & Geraghty, M. E. (2011). Brief report: further evidence of sensory subtypes in autism. *Journal of autism and developmental disorders*, 41, 826-831.
- Latif, A., Heinz, P., & Cook, R. (2002). Iron deficiency in autism and Asperger syndrome. *Autism*, 6(1), 103-114.
- Laud, R. B., Girolami, P. A., Boscoe, J. H., & Gulotta, C. S. (2009). Treatment outcomes for severe feeding problems in children with autism spectrum disorder. *Behavior modification*, 33(5), 520-536.
- Leader, G., Molina Bonilla, P., Naughton, K., Maher, L., Casburn, M., Arndt, S., & Mannion, A. (2021). Complex comorbid presentations are associated with harmful behavior problems among children and adolescents with cerebral palsy. *Developmental neurorehabilitation*, 24(1), 25-34.

- Ledford, J. R., & Gast, D. L. (2006). Feeding problems in children with autism spectrum disorders: A review. *Focus on Autism and Other Developmental Disabilities, 21*(3), 153-166.
- Leekam, S. R., Nieto, C., Libby, S. J., Wing, L., & Gould, J. (2007). Describing the sensory abnormalities of children and adults with autism. *Journal of autism and developmental disorders, 37*, 894-910.
- Leiva-García, B., Planells, E., Planells del Pozo, P., & Molina-López, J. (2019). Association between feeding problems and oral health status in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 49*, 4997-5008.
- Luisier, A. C., Petitpierre, G., Ferdenzi, C., Clerc Béro, A., Giboreau, A., Rouby, C., & Bensafi, M. (2015). Odor perception in children with autism spectrum disorder and its relationship to food neophobia. *Frontiers in Psychology, 6*, 1830.
- Lukens, C. T., & Linscheid, T. R. (2008). Development and validation of an inventory to assess mealtime behavior problems in children with autism. *Journal of autism and developmental disorders, 38*(2), 342–352. <https://doi.org/10.1007/s10803-007-0401-5>
- Luong, H. V. (2023). The State, Local Sociocultural Landscape, and Global Neoliberal Ideology in Vietnam: A Dialogic Process. *The Journal of Asian Studies, 10471941*.
- Mannion, A., & Leader, G. (2013). Comorbidity in autism spectrum disorder: A literature review. *Research in Autism Spectrum Disorders, 7*(12), 1595-1616.
- Marshall, J., Hill, R. J., Ziviani, J., & Dodrill, P. (2014). Features of feeding difficulty in children with Autism Spectrum Disorder. *International journal of speech-*

language pathology, 16(2), 151–158.

<https://doi.org/10.3109/17549507.2013.808700>

- Matson, J. L., & Fodstad, J. C. (2009). The treatment of food selectivity and other feeding problems in children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 3(2), 455-461.
- Matson, J. L., & Kuhn, D. E. (2001). Identifying feeding problems in mentally retarded persons: Development and reliability of the screening tool of feeding problems (STEP). *Research in developmental disabilities*, 22(2), 165-172.
- Mayes, S. D., & Zickgraf, H. (2019). Atypical eating behaviors in children and adolescents with autism, ADHD, other disorders, and typical development. *Research in Autism Spectrum Disorders*, 64, 76-83.
- Meral, B. F., & Fidan, A. (2014). A study on Turkish adaptation, validity and reliability of the brief autism mealtime behavior inventory (BAMBI). *Procedia-Social and Behavioral Sciences*, 116, 403-408.
- Miller, M. A., Kruisbrink, M., Wallace, J., Ji, C., & Cappuccio, F. P. (2018). Sleep duration and incidence of obesity in infants, children, and adolescents: a systematic review and meta-analysis of prospective studies. *Sleep*, 41(4), zsy018.
- Muratori, F., Tonacci, A., Billeci, L., Catalucci, T., Iglizzi, R., Calderoni, S., & Narzisi, A. (2017). Olfactory processing in male children with autism: atypical odor threshold and identification. *Journal of autism and developmental disorders*, 47, 3243-3251.

- Nadon, G., Feldman, D. E., Dunn, W., & Gisel, E. (2011). Association of sensory processing and eating problems in children with autism spectrum disorders. *Autism research and treatment, 2011*.
- Panerai, S., Ferri, R., Catania, V., Zingale, M., Ruccella, D., Gelardi, D., ... & Elia, M. (2020). Sensory profiles of children with autism spectrum disorder with and without feeding problems: A comparative study in sicilian subjects. *Brain Sciences, 10*(6), 336.
- Pellegrino, R., & Lockett, C. R. (2020). Aversive textures and their role in food rejection. *Journal of Texture Studies, 51*(5), 733-741.
- Peretti, S., Mariano, M., Mazzocchetti, C., Mazza, M., Pino, M. C., Verrotti Di Pianella, A., & Valenti, M. (2019). Diet: the keystone of autism spectrum disorder?. *Nutritional neuroscience, 22*(12), 825-839.
- Peverill, S., Smith, I. M., Duku, E., Szatmari, P., Mirenda, P., Vaillancourt, T., ... & Ungar, W. J. (2019). Developmental trajectories of feeding problems in children with autism spectrum disorder. *Journal of pediatric psychology, 44*(8), 988-998.
- Proserpio, C., Laureati, M., Invitti, C., Cattaneo, C., & Pagliarini, E. (2017). BMI and gender related differences in cross-modal interaction and liking of sensory stimuli. *Food Quality and Preference, 56*, 49-54.
- Ranjan, S., & Nasser, J. A. (2015). Nutritional status of individuals with autism spectrum disorders: do we know enough?. *Advances in Nutrition, 6*(4), 397-407.
- Rashid, B. O., & Taha, P. H. (2021). Knowledge, attitudes, and practices of primary health care physicians, junior doctors, and medical college students towards autism in

- Duhok, Iraq. *Zanco Journal of Medical Sciences (Zanco J Med Sci)*, 25(2), 503-512.
- Raspini, B., Prosperi, M., Guiducci, L., Santocchi, E., Tancredi, R., Calderoni, S., ... & Cena, H. (2021). Dietary patterns and weight status in Italian preschoolers with autism spectrum disorder and typically developing children. *Nutrients*, 13(11), 4039.
- Rastam, M. (2008). Eating disturbances in autism spectrum disorders with focus on adolescent and adult years. *Clinical Neuropsychiatry*, 5(1), 31-42.
- Rogers, L. G., Magill-Evans, J., & Rempel, G. R. (2012). Mothers' challenges in feeding their children with autism spectrum disorder—Managing more than just picky eating. *Journal of Developmental and Physical Disabilities*, 24, 19-33.
- Rogers, S. J., & Ozonoff, S. (2005). Annotation: what do we know about sensory dysfunction in autism? A critical review of the empirical evidence. *Journal of child psychology and psychiatry, and allied disciplines*, 46(12), 1255–1268. <https://doi.org/10.1111/j.1469-7610.2005.01431.x>
- Rouphael, M., Hojeij, B., Ezzedine, D., Mortada, H., Sacre, Y., Bitar, T., ... & Hoteit, M. (2023). Assessment of Feeding Behaviors and Parents' Frustrations of Children with Autism Spectrum Disorder in Lebanon: A Case-Control Study. *Children*, 10(1), 117.
- Şahan, A. K., Öztürk, N., Demir, N., Karaduman, A. A., & Serel Arslan, S. (2021). A comparative analysis of chewing function and feeding behaviors in children with autism. *Dysphagia*, 1-6.

- Schertz, H. H., Odom, S. L., Baggett, K. M., & Sideris, J. H. (2016). Parent-reported repetitive behavior in toddlers on the autism spectrum. *Journal of Autism and Developmental Disorders, 46*, 3308-3316.
- Schreck, K. A., Williams, K., & Smith, A. F. (2004). A comparison of eating behaviors between children with and without autism. *Journal of autism and developmental disorders, 34*, 433-438.
- Seiverling, L., Towle, P., Hendy, H. M., & Pantelides, J. (2018). Prevalence of feeding problems in young children with and without autism spectrum disorder: A chart review study. *Journal of Early Intervention, 40*(4), 335-346.
- Serra, D., Henriques, J. F., Sousa, F. J., Laranjo, M., Resende, R., Ferreira-Marques, M., ... & Almeida, L. M. (2022). Attenuation of Autism-like Behaviors by an Anthocyanin-Rich Extract from Portuguese Blueberries via Microbiota–Gut–Brain Axis Modulation in a Valproic Acid Mouse Model. *International Journal of Molecular Sciences, 23*(16), 9259.
- Sharp, W. G., & Jaquess, D. L. (2009). Bite size and texture assessments to prescribe treatment for severe food selectivity in autism. *Behavioral Interventions: Theory & Practice in Residential & Community-Based Clinical Programs, 24*(3), 157-170.
- Sharp, W. G., Berry, R. C., McCracken, C., Nuhu, N. N., Marvel, E., Saulnier, C. A., ... & Jaquess, D. L. (2013). Feeding problems and nutrient intake in children with autism spectrum disorders: a meta-analysis and comprehensive review of the literature. *Journal of autism and developmental disorders, 43*, 2159-2173.
- Sharp, W. G., Jaquess, D. L., & Lukens, C. T. (2013). Multi-method assessment of feeding problems among children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 7*(1), 56-65.

- Shmaya, Y., Eilat-Adar, S., Leitner, Y., Reif, S., & Gabis, L. (2015). Nutritional deficiencies and overweight prevalence among children with autism spectrum disorder. *Research in developmental disabilities, 38*, 1-6.
- Sincero, S. M. (2012). Advantages and disadvantages of surveys. *Retrieved from*.
- Stafford, L. D., Tsang, I., López, B., Severini, M., & Iacomini, S. (2017). Autistic traits associated with food neophobia but not olfactory sensitivity. *Appetite, 116*, 584-588.
- Suarez, V. D., Najdowski, A. C., Tarbox, J., Moon, E., St. Clair, M., & Farag, P. (2022). Teaching individuals with autism problem-solving skills for resolving social conflicts. *Behavior Analysis in Practice, 15*(3), 768-781.
- Twachtman-Reilly, J., Amaral, S. C., & Zebrowski, P. P. (2008). Addressing feeding disorders in children on the autism spectrum in school-based settings: Physiological and behavioral issues.
- Vissocker, R. E., Latzer, Y., & Gal, E. (2015). Eating and feeding problems and gastrointestinal dysfunction in Autism Spectrum Disorders. *Research in Autism Spectrum Disorders, 12*, 10-21.
- Viviers, M., Jongh, M., Dickonson, L., Malan, R., & Pike, T. (2020). Parent-reported feeding and swallowing difficulties of children with Autism Spectrum Disorders (aged 3 to 5 years) compared to typically developing peers: a South African study. *African Health Sciences, 20*(1), 524-532.
- Williams, K. E., Field, D. G., & Seiverling, L. (2010). Food refusal in children: A review of the literature. *Research in developmental disabilities, 31*(3), 625-633.

- Zaiaami, A. A. (2020). *Mealtime behavior among children with autism spectrum disorder* (Doctoral dissertation, Universiti Teknologi MARA).
- Zimmer, M. H., Hart, L. C., Manning-Courtney, P., Murray, D. S., Bing, N. M., & Summer, S. (2012). Food variety as a predictor of nutritional status among children with autism. *Journal of autism and developmental disorders, 42*, 549-556.
- Zlomke, K. R., & Jeter, K. (2020). Comparative effectiveness of parent–child interaction therapy for children with and without autism spectrum disorder. *Journal of autism and developmental disorders, 50*, 2041-2052.

Appendix A

BAMBI

Think about mealtimes with your child over the past 6 months. Rate the following items according to how often each occurs, using the following scale:

Never/Rarely	Seldom	Occasionally	Often	At Almost Every Meal
1	2	3	4	5

Circle YES if you think an item is a problem for you or NO if you think it is not a problem.

- | | | | | | | | |
|---|---|---|---|---|---|-----|----|
| 1. My child cries or screams during mealtimes. | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 2. My child turns his/her face or body away from food. | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 3. My child remains seated at the table until the meal is finished. | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 4. My child expels (spits out) food that he/she has eaten. | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 5. My child is aggressive during mealtimes (hitting, kicking, scratching others). | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 6. My child displays self-injurious behavior during mealtimes (hitting self, biting self). | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 7. My child is disruptive during mealtimes (pushing/throwing utensils, food). | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 8. My child closes his/her mouth tightly when food is presented. | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 9. My child is flexible about mealtime routines. (e.g., times for meals, seating arrangements, place settings). | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |
| 10. My child is willing to try new foods. | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | YES | NO |

11. My child dislikes certain foods and won't eat them. 1 2 3 4 5
YES NO
12. My child refuses to eat foods that require a lot of chewing.
(e.g., eats only soft or pureed foods). 1 2 3 4 5
YES NO
13. My child prefers the same foods at each meal. 1 2 3 4 5
YES NO
14. My child prefers "crunchy" foods (e.g., snacks, crackers). 1 2 3 4 5
YES NO
15. My child accepts or prefers a variety of foods. 1 2 3 4 5
YES NO
16. My child prefers to have food served in a particular way. 1 2 3 4 5
YES NO
17. My child prefers only sweet foods (e.g, candy, sugary cereals). 1 2 3 4 5
YES NO
18. My child prefers food prepared in a particular way.
(e.g., eats mostly fried foods, cold cereals, raw vegetables). 1 2 3 4 5
YES NO

APPENDIX B

MALAYALAM VERSION OF BAMBI(BAMBI-M)

കഴിഞ്ഞ ആറു മാസക്കാലത്തെ നിങ്ങളുടെ കുട്ടിയുടെ ഭക്ഷണ ശീലത്തെപ്പറ്റി വിലയിരുത്തുക. താഴെ തന്നിരിക്കുന്ന ലൈക്കർട്ട് സ്കെയിൽ മാനദണ്ഡമാക്കി നിങ്ങളുടെ കുട്ടി എന്ത് തോതിൽ അവ പ്രകടമാക്കുന്നു എന്ന നിരക്ക് അടയാളപ്പെടുത്തുക.

ഒരിക്കലുമില്ല	അപൂർവ്വമായി	ഇടയ്ക്കിടെ
1	2	3
മിക്കപ്പോഴും		എല്ലായ്പ്പോഴും
4		5

താഴെ പറഞ്ഞിരിക്കുന്ന വസ്തുതകളിൽ ഏതെങ്കിലും നിങ്ങൾക്ക് ഒരു പ്രശ്നമായി തോന്നുന്നുവെങ്കിൽ "അതെ" എന്നും ഇല്ലെങ്കിൽ "ഇല്ല" എന്നും വൃത്തം വരച്ചു അടയാളപ്പെടുത്തുക.

- | | | | | |
|----|--|-----------|-------|------|
| 1. | എന്റെ കുട്ടി ഭക്ഷണ സമയത്ത് കരയാറുണ്ട് | 1 2 3 4 5 | ഉണ്ട് | ഇല്ല |
| 2. | എന്റെ കുട്ടി ഭക്ഷണത്തോട് മുഖംതിരിക്കുന്നു | 1 2 3 4 5 | ഉണ്ട് | ഇല്ല |
| 3. | എന്റെ കുട്ടി ഭക്ഷണം കഴിച്ചു തീരുന്നതുവരെ തീൻ മേശയ്ക്കരികിൽ തന്നെ ഇരിക്കും | 1 2 3 4 5 | ഉണ്ട് | ഇല്ല |
| 4. | എന്റെ കുട്ടി കഴിച്ചു കൊണ്ടിരിക്കെ ഭക്ഷണം തുപ്പിക്കളയാറുണ്ട്. | 1 2 3 4 5 | ഉണ്ട് | ഇല്ല |
| 5. | എന്റെ കുട്ടി ഭക്ഷണ സമയത്ത് ശാഠ്യം പിടിക്കാറുണ്ട് (ചവിട്ടുക, അടിക്കുക, മാനതുക തുടങ്ങിയവ). | 1 2 3 4 5 | ഉണ്ട് | ഇല്ല |
| 6. | എന്റെ കുട്ടി ഭക്ഷണ സമയത്ത് സ്വയം | 1 2 3 4 5 | ഉണ്ട് | ഇല്ല |

മുറിവേൽപ്പിക്കുന്ന സ്വഭാവ പ്രവണത കാണിക്കാറുണ്ട് (സ്വയം അടിക്കുക, സ്വയം കടിക്കുക മുതലായവ).

7. എന്റെ കുട്ടി ഭക്ഷണ സമയത്ത് തടസ്സം സൃഷ്ടിക്കാറുണ്ട് (ഭക്ഷണം/പാത്രങ്ങൾ, വലിച്ചെറിയുക തട്ടിക്കയറുക മുതലായവ). 1 2 3 4 5 ഉണ്ട് ഇല്ല

8. ഭക്ഷണം കൊടുക്കുമ്പോൾ എന്റെ കുട്ടി വായ മുറുക്കിയടച്ച് പിടിക്കാറുണ്ട്. 1 2 3 4 5 ഉണ്ട് ഇല്ല

9. എന്റെ കുട്ടി ഭക്ഷണ ശീലങ്ങളിൽ വിട്ടുവീഴ്ച തയ്യാറാണ്. 1 2 3 4 5 ഉണ്ട് ഇല്ല

10. എന്റെ കുട്ടി പുതിയ ഭക്ഷണങ്ങൾ കഴിക്കാൻ തയ്യാറാണ്. 1 2 3 4 5 ഉണ്ട് ഇല്ല

11. എന്റെ കുട്ടി ചില ഭക്ഷണങ്ങളോട് താൽപര്യം കാണിക്കാറില്ല. അവ കഴിക്കാറുമില്ല. 1 2 3 4 5 ഉണ്ട് ഇല്ല

12. എന്റെ കുട്ടി ചവച്ചു കഴിക്കാനുള്ള ഭക്ഷണസാധനങ്ങൾ ഒഴിവാക്കാറുണ്ട് (മുദുവായ/അരച്ച ഭക്ഷണങ്ങൾ മാത്രമേ കഴിക്കാറുള്ളൂ). 1 2 3 4 5 ഉണ്ട് ഇല്ല

13. എന്റെ കുട്ടി എല്ലാ നേരവും ഒരേ ഭക്ഷണപദാർത്ഥങ്ങൾ കഴിക്കാൻ താൽപര്യപ്പെടുന്നു 1 2 3 4 5 ഉണ്ട് ഇല്ല

14. എന്റെ കുട്ടിക്ക് കുറുമുറ തരത്തിലുള്ള ആഹാരങ്ങളോടാണ് താൽപര്യം. 1 2 3 4 5 ഉണ്ട് ഇല്ല

- 15. എന്റെ കുട്ടി വൈവിധ്യമേറിയ
 ആഹാര സാധനങ്ങൾ
 അംഗീകരിക്കുകയും
 താൽപര്യപ്പെടുകയും ചെയ്യുന്നു.

1 2 3 4 5 ഉണ്ട് ഇല്ല

- 16. ഒരു പ്രത്യേക രീതിയിൽ
 ഭക്ഷണം കൊടുക്കുന്നതാണ്
 എന്റെ കുട്ടിക്ക് താൽപര്യം.

1 2 3 4 5 ഉണ്ട് ഇല്ല

- 17. എന്റെ കുട്ടിക്ക് മധുര
 പലഹാരങ്ങളോട് മാത്രമേ
 താൽപര്യമുള്ളൂ (ഉദാ:മിഠായി,
 ജിലേബി മുതലായവ)

1 2 3 4 5 ഉണ്ട് ഇല്ല

- 18. ഒരു പ്രത്യേക രീതിയിൽ
 പാകപ്പെടുത്തിയ
 ഭക്ഷണങ്ങളോടാണ് എന്റെ കുട്ടിക്ക്
 താൽപര്യം(വറുത്തത്, വേവിച്ചത്,
 ചൂടുള്ളത് ..).

1 2 3 4 5 ഉണ്ട് ഇല്ല

- 19. എന്റെ കുട്ടി ഭക്ഷണം കാണുമ്പോൾ
 അത് മണത്ത് നോക്കുന്ന സ്വഭാവം
 പ്രകടമാക്കാറുണ്ട്.

1 2 3 4 5 ഉണ്ട് ഇല്ല

- 20. എന്റെ കുട്ടി ചില ഘടനയിലുള്ള
 ഭക്ഷണ
 പദാർത്ഥങ്ങൾ ഒഴിവാക്കാറുണ്ട് .
 (നന്നവുള്ള /ഒട്ടല്ലുള്ള
 ഭക്ഷണപദാർത്ഥങ്ങൾ
 ഒഴിവാക്കുക, ചോറും കറിയും
 ഒന്നിച്ചു
 തൊടാൻ വിമുഖത കാണിക്കുക
 തുടങ്ങിയവ)

1 2 3 4 5 ഉണ്ട് ഇല്ല