

## Enhancing Tooth Brushing Skills for Children with ASD Using Video Modeling based on Social Story: Face and Content Validity

Nurul Khairani Ismail<sup>1</sup>, Hasrul Hosshan<sup>1,2,3</sup>, Nurbietta Abd Aziz<sup>1,2</sup>, Abdul Halim Masnan<sup>1</sup>, Mohd Muslim Md Zali<sup>1,2</sup>, Mohd Syaubari Othman<sup>1,2</sup>, Norsayyidatina Che Rozubi<sup>1</sup>, & Loy Chee Luen<sup>1</sup>

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<sup>1</sup> Faculty of Human Development, Sultan Idris Education University, Tanjong Malim, Perak, Malaysia

<sup>2</sup> Centre on Disability & Community Inclusion, Sultan Idris Education University, Tanjong Malim, Perak, Malaysia;

<sup>3</sup>Centre for Disability Policy and Research, The University of Sydney, New South Wales, Australia.

Correspondence author: hasrul.hosshan@fpm.upsi.edu.my

### Abstract

**Introduction:** Tooth brushing has an essential role in oral health maintenance and is one of the basic self-care skills. However, children with autism spectrum disorders (ASD) are at higher risk of developing chronic oral health conditions. Thus, to improve tooth brushing practice for children with ASD, special education and intervention methods are needed. The most common method is visual pedagogy, which relies on children's ability to understand pictures better than words, including pictured books, social stories, video modelling and picture-based apps.

**Objectives:** Research aims to look into the face and content validity of video modelling and social stories on tooth brushing skills in children with ASD

**Methods:** The semi-structured interview was used to assess face validity, whereas the content validity index (relevancy, clarity, simplicity, and ambiguity) was employed based on input from experts and practitioners in related fields.

**Results:** Results show that face validity resulted in feedback on the suitability of videos for tooth brushing activities, video quality and clarity, video instructions suitability, task analysis arrangement, and "other" recommendations. Furthermore, the content validity from all task analyses acquired a minimum level of 0.78 reading to qualify as an accepted task analysis for the entire video.

**Conclusions:** Video modelling with the social story can maximise the strengths of children with ASD, mainly when teaching tooth brushing skills but requires examining the face and content validity and refining the developed module as needed to ensure it remains reasonable and practical.

**Keywords:** Children with ASD; social story; tooth brushing skills; video modelling; face and content validity.

### 1. Introduction

Autism spectrum disorder (ASD) is one of the most severe neuropsychiatric disorders affecting people. Autism spectrum disorder is characterised by impairments in social interactions, repetitive activities, and limited interests and abilities (Happé, 2011). Due to poor food preferences, behaviours, and specific aversions, children with ASD have a higher chance of acquiring chronic non-communicable oral health disorders (Feucht & Ogata, 2010; Jaber, 2011). The rising incidence of ASD has sparked a global interest in the oral health of affected children. Moreover, this fits with one of the global oral health objectives to improve the dental health of this population (Gandhi &

Klein, 2014). Tooth brushing is a type of preventative intervention that is critical for children with ASD since they are at a greater risk of acquiring caries (Marshall et al., 2010).

Brushing challenges were significantly connected to ASD severity characteristics in the children. Brushing was also significantly more difficult to manage in younger children. Furthermore, children with more severe behavioural challenges and sensitivities may take more time to learn (Teste et al., 2021). According to Teste et al. (2021), parents of autistic children were looking for expert assistance and resources to assist them in brushing their child's teeth. According to Weil and Inglehart (2012), more than 80% of parents felt poorly educated and requested training in the complexities of oral care for children with behaviour problems. Another study showed that 48% of children of all ages did not brush their teeth independently (Teste et al., 2021). As a result, parental support is essential for successful tooth brushing in young children, particularly those with behavioural challenges, sensory responsiveness, and motor abilities (Gandhi & Klein, 2014).

Toothbrushing is an essential part of maintaining oral health and is one of the fundamental self-care activities. However, data shows that children with ASD have difficulty cleaning their teeth daily (Du et al., 2014). Preventive educational treatments emphasising the teaching of an easy, appropriate, and successful toothbrushing method may enhance oral health, particularly in children with ASD (Piraneh et al., 2022; Lopez Cazaux et al., 2019). As a result, good toothbrushing training can enhance these children's self-care while reducing the stress and weariness of their parents (Zhou et al., 2019). To enhance toothbrushing practices in people with ASD, special teaching methods and intervention approaches are necessary.

Video technology rapidly offers modeling intervention and gives individuals specific and consistent exemplars of the particular behaviour being executed (Hong et al. (2016). This strategy encourages children to respond to visuals and images instead of conceptual words, especially for children with ASD (Knight et al. (2015). It appears to be a beneficial home and school instructional approach for children with ASD (Knight et al., 2015; Bäckman & Pilebro, 1999). Moreover, visual pedagogy has been employed to develop various instructional strategies and tools, such as illustrated books, social stories, video modelling, picture-containing applications, and so on (Piraneh et al., 2022). Social stories are typical for children with ASD when they are designed to be brief and rely on a ratio of descriptive, viewpoint, positive phrases, and visual cues (Gandhi & Klein, 2014; Styles, 2011). In children with ASD, video modelling combined with incorporating social stories for tooth brushing can enhance oral hygiene status more often than traditional social stories (Piraneh et al., 2022).

Several studies have been undertaken to determine if tooth brushing is effective using various instructional strategies for children with autism. However, more information needs to be gained about what happens during the development process before the module is completed. Thus, a study is needed to evaluate the validity of video modelling with social story educational interventions on oral hygiene status for parents of children with ASD. This study was designed to fill the current gap by assessing the face and content of the module before it is administered to the target group.

## 2. Methods

### 2.1 Experts

The validation process included gathering quantitative (content validity) and qualitative (face validity) feedback from 14 experts in special education, early childhood education, educational technology, experienced teachers, occupational therapists, and rehabilitation centre managers. There are eight university lecturers, three occupational therapists, two experienced teachers, and one rehabilitation centre manager. The summary of experts is listed in Table 1

**Table 1:** Summary of Experts

Expert	Total (n)	Highest Qualification
Lecturer (ECCE)	3	Doctorate Degree
Lecturer (SEN)	3	Doctorate Degree

Lecturer (ET)	2	Doctorate Degree
Occupational Therapy	3	Bachelor Degree
School Teacher	2	Bachelor Degree

Note: ECCE: Early Childhood Care Education; SEN: Special Education Needs; ET: Educational Technology

## 2.2 Video Development

The video was divided into three segments introduction, content, and conclusion. Before creating the video, two researchers from the study area did an extensive literature analysis, and 14 experts assessed the validity. The video was created in several stages:

1. Development of storyboards and scripts
2. Procedures for capturing video in UPSI
3. Video editing with Adobe Premiere CC and Adobe Flash software
4. Making the content more relevant by including scenes
5. Evaluation for media enhancement by material and media specialists

## 2.3 Testing and Validity

### 2.3.1 Face Validity

Face validity is a procedure that examines if an event properly represents its intention (Zamanzadeh et al., 2015; Yoong et al., 2022). A semi-structured interview was conducted to acquire input and consensus on enhancing clarity, understandability, and congruence. Video clips were provided to the experts prior to the session. Then, during the session, the experts provided comments and recommendations on the video. The focus group discussion (FGD) session was recorded and transcribed verbatim.

### 2.3.2 Content Validity

Content validity relates to how well an instrument or module conveys an idea (Heale & Twycross, 2015; ). This study assessed the video's CVI by four aspects: relevance (Lynn, 1986), simplicity, clarity, and ambiguity (Yaghmale, 1999). A 4-point Likert scale was utilised to score all aspects. The relevance, clarity, simplicity, and ambiguity were rated as one if the item requires a comprehensive modification; two for substantial modifications; three for moderate modifications; and four for the item is good (Yaghmale, 1999). E-mail was used to provide content validity evaluation forms (see Appendix 1) and guidelines for evaluating the study's content validity to the experts. The expert scores were then gathered, and the videos were enhanced based on their recommendations.

The proportion of each task analysis, I-CVI, and video as a whole, S-CVI, was used to calculate the data (Lynn, 1986). The rating must be 1 (on a scale of 3 or 4) or 0 (on a scale of 1 or 2). The I-CVI was computed by dividing the expert agreement scores by the number of experts and the S-CVI/Ave by the proportion of items on the scale that attained a relevance scale of 3 or 4 by all experts. For 14 experts, appropriate I-CVI and S-CVI/AV values were determined as a proportion of rater scores ranging between 0.78 and 1.00 (Lynn, 1986). Table 2 provides the definition and formula for I-CVI and S-CVI/Ave.

**Table 2:** The definition and formula of I-CVI, S-CVI/Ave and S-CVI/UA

Term	Definition	Formula
I-CVI (item-level content validity index)	The proportion of content experts giving the item a relevance rating of 3 or 4	$I-CVI = \frac{\text{agreed item}}{\text{number of experts}}$
S-CVI/Ave (scale-level content validity index based on the average method)	The average of the I-CVI scores for all items on the scale or the average proportion relevance judged by all experts. The proportion relevant is the average of relevance rating by an individual expert	$S-CVI/Ave = \frac{\text{sum of I-CVI scores}}{\text{number of items}}$ $S-CVI/Ave = \frac{\text{sum of proportion relevance rating}}{\text{number of experts}}$

### 3. Results

#### 3.1 Face Validity

Based on Table 3, face validation analysis revealed five themes as comments or recommendations based on the suitability of videos for activities (4 comments); video quality and clarity (1 comment); suitability of the instruction in the video (2 comments); task analysis arrangement (2 comments), and "other" recommendations (3 recommendations).

Generally, under the theme of the suitability of videos for activities, the expert suggests that one of the main ways to improve the video is to include simple activities for children with ASD and to avoid complex task analysis with no additional sub-skills. Furthermore, the experts also suggested safety issues concerning materials handling. The video can be improved by adding background music to engage the children's attention. The video should have also featured meals with complete nutritional value. The issues of safety were also raised, especially in handling the forks. For the second theme, the quality and clarity of the video were highlighted, especially when dealing with shooting angles. The experts further noted that avoiding excessive movement during the recording is essential. The third theme concerns the suitability of the instructions in the video.

According to experts, it is a good idea to avoid length and wordiness; shorter instructions with simple captions should be used to assist the children in understanding the video content. One of the experts' main concerns is securing children's attention throughout the session using reinforcement after completing task analysis. Besides that, they raised several other concerns under the theme of "others", such as the absence of cleaning after meal aspects following the completion of the activities. Pre- and post-video production issues, such as consent, must be addressed at the beginning of the process, and guidelines should be outlined following wards. Moreover, the manual of using should also stipulate that the children with ASD had to have already acquired imitation skills before their guardians administered the eating skills video.

**Table 3:** Summary of Face Validity Result

Themes	Comment	Recommendations
Suitability of videos for activities	Dull video	Incorporate background music into the video to keep children engaged.
	No rewards after completing a task analysis	Providing simple reinforcement (clapping, well done)
	Too much task analysis	Nineteen steps are too much. Discard unnecessary steps that can prepare prior to the session (e.g., step 3)
Video quality and clarity	The shooting angle is not appropriate.	Avoid excessive movement by placing the model in front of the camera.
Suitability of the instructions in the video	Lengthy and wordy instruction	Instructions should be short and clear, with a simple caption.
	No introductory part on materials will be used	A brief introduction to the materials Incorporate pictures in the introduction
Others		Guardian consent is required. Videos and modules should come with a clear manual. It is better to include pre-imitation skills before tooth brushing skills (such as splitting )

#### 3.2 Content Validity

The experts assigned each video on the CVI form with 5, 5 and 6 for the task analysis along with qualitative feedback. All videos were scored on the following criteria: relevancy, clarity, simplicity, and ambiguity, with the S-CVI/AVE for all videos having to exceed or equal 0.78. Based on the study's results, only one round of expert evaluations was necessary (see Table 4) since all the I-CVI's for all task analyses and S-CVI/AVE for all video scores exceeded the criterion of 0.78 [29]. The I-CVI for relevancy, clarity, simplicity, and ambiguity scores for video 1: Eat using a spoon scored 0.93. Relevancy, clarity, simplicity and ambiguity also scored 0.93 for the second video 2: Eat using a fork. The third video, about eating using one hand, earned an I-CVI score of 0.93 for

relevance, simplicity, and ambiguity but only 0.86 for clarity (for steps 3 and 6). The level of SCVI/AVE for relevancy, clarity, simplicity, and ambiguity was rated 0.93 for videos 1 and 2. In contrast, S-CVI/ AVE for video 3: Eating using one hand scored 0.93 for relevancy, 0.91 for clarity, 0.93 for simplicity and 0.93 for ambiguity. A summary of I-CVI and S-CVI/AVE levels, as rated by 14 experts, is shown in Table 4.

**Table 4:** Summary of I-CVI and S-CVI/AVE by 14 experts for Video 1: Eating using a spoon, Video 2: Eating Using a fork and Video 3: Eating Using one hand

Task analysis	Relevancy		Clarity		Simplicity		Ambiguity		
	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	
Video 1: Eating using a spoon	1) I hold the spoon in one hand	13	0.93	13	0.93	13	0.93	13	0.93
	2) I scooped the food off the plate	13	0.93	13	0.93	13	0.93	13	0.93
	3) I brought the spoon to my mouth and put the food in my mouth	13	0.93	13	0.93	13	0.93	13	0.93
	4) I chew the food until it crumbles and swallow it	13	0.93	13	0.93	13	0.93	13	0.93
	5) I repeat the same steps until the food runs out	13	0.93	13	0.93	13	0.93	13	0.93
	SCVI/AVE	0.93		0.93		0.93		0.93	
Task analysis	Relevancy		Clarity		Simplicity		Ambiguity		
	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	
Video 2: Eating using a fork	1) I use a fork with one hand	13	0.93	13	0.93	13	0.93	13	0.93
	2) I pressed the tines of the fork toward the food	13	0.93	13	0.93	13	0.93	13	0.93
	3) I brought the fork to my mouth and put the food in my mouth	13	0.93	13	0.93	13	0.93	13	0.93
	4) I chewed the food until it crumbled and swallowed it	13	0.93	13	0.93	13	0.93	13	0.93
	5) I repeat the same steps until the food runs out	13	0.93	13	0.93	13	0.93	13	0.93
	SCVI/AVE	0.93		0.93		0.93		0.93	
Task analysis	Relevancy		Clarity		Simplicity		Ambiguity		
	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	No. of Expert Agreement	I-CVI	
Video 3: Eating Using one hand									

1) I made sure my right hand was clean	13	0.93	13	0.93	13	0.93	13	0.93
2) I pinched a small chicken	13	0.93	13	0.93	13	0.93	13	0.93
3) I mix chicken with rice	13	0.93	13	0.86	13	0.86	13	0.93
4) I took some rice with my fingers	13	0.93	13	0.93	13	0.93	13	0.93
5) I put rice in my mouth	13	0.93	13	0.93	12	0.93	13	0.93
6) I chewed the rice until it crumbled and swallowed it	13	0.93	12	0.86	13	0.86	13	0.93
7) I will do the same steps until the rice runs out	13	0.93	13	0.93	13	0.93	13	0.93
SCVI/AVE	0.93		0.91		0.91		0.93	

#### 4. Discussion

This study assessed the face and content validity of video modelling to teach eating skills to children with ASD. Face validity is the apparent relationship between the module and the construct under investigation. In face validity, appearance and attractiveness affect the acceptability of an instrument (Zamanzadeh et al., 2015). Incorporating music components such as music background in the video for children with ASD is a main source of concern about the suitability of videos for activities. In order to enhance the quality and effectiveness of the video, incorporating music as a soundtrack can add an element of excitement. Research studies have consistently shown that children with ASD respond positively to music and can perform at similar levels to their typically developing peers (Simpson & Keen, 2011; Bhatara et al., 2009). It is important to note that materials and activities that engage multiple senses can enhance children's attention and facilitate subsequent learning (Deris & Di Carlo, 2013). Interestingly, many individuals with ASD engage in music without experiencing stress or distress (Papagiannopoulou, 2015), and sound-based interventions have been reported to be effective in alleviating certain symptoms of ASD (Wigram & Gold, 2006).

The experts also suggested that simple reinforcement in the video, such as clapping hands or saying "great work," might motivate children to continue executing the task. Per Bandura (1977), video modeling involves four essential components: attention, memory, motor reproduction, and reinforcement. Bandura proposed that individuals learn behaviors by observing others rather than solely responding to environmental stimuli. These processes can occur in real time when a child directly observes a model or through video footage of a model engaging in the desired behavior, which can be later imitated and replicated. Fryling et al. (2011) suggest that children repeat or avoid behaviors based on the positive or negative consequences they observe in others' actions. According to Jones et al. (2013), children with ASD benefit from immediate and tangible rewards such as access to toys or food items. However, more abstract rewards, such as points or symbols indicating correctness, are found to be more effective in older children and adults, as the effectiveness of rewards of different levels of abstraction can vary over time. Furthermore, the experts advised that the number of task analyses for this type of child should be manageable.

The second theme addressed the video's quality and clarity, notably when dealing with shooting angles. The experts emphasised the importance of an appropriate shooting angle to avoid excessive movement during shooting. It is critical to present children with autism with videos or authentic pictures at their eye level that they can look to frequently in an easy way to understand what is coming up next, which also lessens their anxiety (Deris & Di Carlo, 2013). Ignoring this effort may result in missed learning opportunities and have a detrimental influence on social-cognitive development (Trevisan et al., 2017).

The third theme is the suitability of the video's instruction. Experts recommended avoiding lengthy and wordy instructions, instead opting for brief and concise instructions with simple subtitles to enhance comprehension. The instructions should be short and precise since the module combines video modeling and social stories to teach tooth brushing skills. There is no consensus on the number of steps to be used in video modeling for children with ASD, as each skill differs. However, it is discouraged to have lengthy instructions as it can interfere with the learning process, requiring assistance for organizing and understanding ideas (Sanlı Bozkurt & Vuran, 2014). Gandhi & Klein (2014) and Styles (2011) recommend a basic social story ratio of two to five descriptive, perspective, and positive sentences for each directive phrase. According to Camilleri et al. (2022), the video's title should accurately represent its content, using appropriate words and descriptive phrases to portray the essential idea. This technique can benefit children with ASD by increasing their attention levels and facilitating comprehension of stories accompanied by pictures and related narratives (Graetz et al., 2009).

Furthermore, the expert stressed the necessity of introducing the materials utilised throughout the video at the beginning or in the introduction segment, using graphics to highlight the tasks they would include. Deris and Di Carlo (2013) suggest that providing predictable circumstances and clear expectations of what will happen next can help minimize anxiety in children with ASD. It is also recommended to incorporate visual aids, such as pictures depicting the activities, during transitions between events. This visual support ensures that children are aware of the upcoming events. By offering comprehensive descriptions of the sequence of events, including when, how, and why they occur, this approach helps children with ASD manage their actions (Golzari et al., 2015). Additionally, video communication employing multiple sensory approaches, rather than relying solely on auditory input, is believed to enhance children's understanding of the message (Deris & Di Carlo, 2013).

Aside from that, they raised several other concerns under the theme "others," including the need to address pre-video production issues such as consent from the beginning of the process. The experts have also discussed the need for guidelines or manuals to keep the video's usefulness at its maximum level. These guidelines and manuals should be offered as a guide upon completion of video production for the parents since ASD is a complex disorder that requires a tailored approach to teaching children with autism. Due to various sub-categories within autism, each child presents unique symptoms and characteristics. Consequently, a standardized training method can only be applied sometimes. Specialized education guides are essential in providing parents with a manual to adapt and manage the learning environment systematically, according to their child's specific needs. This personalized approach is crucial for promoting effective growth and development in children with autism.

The manual should indicate that children with ASD must have imitation abilities before their parents can use the video. Understanding the concepts of imitation and copying behaviors is crucial before exploring the potential benefits of VBI research in this population. While VBI has generally shown positive outcomes for individuals with autism, there have been variations in results across different contexts and participants. This variability has led to studies examining the characteristics of successful participants and the prerequisites for VBI success (Rayner et al., 2009). Research suggests that higher imitation abilities as prerequisites may enhance the likelihood of effective VBI (Rayner, 2011). Lindsay et al. (2013) also found that children with autism may perform better on prompted imitation tasks, where they are instructed when to imitate rather than spontaneous imitation tasks.

Content validity, also known as validity and logical validity, can be defined as the ability of the selected items to reflect the variables of the construct in the measure (Newman et al., 2013). It can provide information on the representativeness and clarity of items and help improve an instrument by achieving recommendations from a group of experts (Polit & Beck, 2006). The research involves 14 experts who provided feedback on the task analysis and video. The experts in the study were knowledgeable and experienced about the special needs of children with ASD. Escobar-Pérez & Cuervo-Martínez (2008) say that expert judgment and opinions should come from experts who are acknowledged as qualified experts by others and capable of providing information, evidence, judgment, and evaluations. Overall, the experts rated the video highly for relevancy, simplicity, clarity, and ambiguity from this study. At least 11 experts said almost all task analyses were excellent and acceptable. It signifies that the video's stated objective has been met. Most of the steps have I-CVIs of 0.93, with only three steps having the lowest I-CVI of 0.86 but still in the acceptable range (Lynn, 1986). The CVI should fulfill minimal agreement for outstanding content validity of 0.78 for more than nine experts (Lynn, 1986; Polit & Beck, 2016). This video's S-CVI/AVE also surpassed the reading minimum agreement by 0.78 for relevance (0.93),

clarity (0.92), simplicity (0.92), and ambiguity (0.92). The outcome shows that the video satisfies all the aspects of content validity.

Further, the results indicate no need for more than one round of expert evaluations. For steps 6 and 7, the I-CVI/AVE findings for clarity, simplicity, and ambiguity were slightly lower than for relevancy. Although the steps are significant, there needed to be more clarification and need to be modified for step enhancement. Those two task analyses are still in the video, and improvements will be made according to expert feedback on the content or technical concerns, such as instructions.

## 5. Conclusion

Video modelling and social storytelling is considered evidence-based practice that takes advantage of the strengths of children with autism. Nonetheless, an evaluation process is strongly recommended to ensure that the video is valid. This study used expert feedback on the face and content validity to determine the relevance, clarity, simplicity, and ambiguity of the designed module on brushing skills using video modelling. A group of experts answered affirmatively a number of research questions aiming to assess this module's face and content validity. All the task analyses for all videos obtained a minimum level of 0.78 reading to be accepted as a task analysis per se or for the whole video itself.

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