

ORIGINAL ARTICLE

Tagalog Sentence Repetition Test: Content validation and pilot testing with Metro Manila speakers aged 7-21

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ABSTRACT

Background: Speech sound disorders (SSD) refer to difficulties in perceiving, mentally representing, and/or articulating speech sounds. In 2018, the Tagalog Sentence Repetition Test (SRT) was developed due to the lack of a commercially available local assessment tool for children with suspected SSDs. The SRT had not been validated or piloted yet.

Objectives: This study aimed to determine the SRT's content validity (comprehensiveness, relevance, comprehensibility), ability to successfully elicit the target sounds, and logistical feasibility and flaws.

Methodology: All procedures were conducted online. Three linguists evaluated the comprehensiveness of the sounds covered, while 31 Manila Tagalog-speaking children (7 to 21 years old) participated in pilot testing. Post-testing, the children answered a questionnaire to evaluate their familiarity with the sentences' words (relevance) and the comprehensibility of the test instructions. Content validity was assessed by computing the Content Validity Index (CVI). To see how well the test elicits the target sounds, the number of participants who produced each sound were computed.

Results: A CVI of 1.0 was obtained for all aspects of content validity. All targets were produced by almost all the participants, except for the final glottal stop (18/31, 58%). The test administration seemed feasible as participants from all age groups successfully executed the task.

Conclusion: Although the SRT exhibited good content validity, some sentences need to be revised to address sound production issues noted during the pilot. This new version should be re-piloted to 7 to 11-year-olds in-person and via teleconferencing. A manual should also be created to facilitate administration.

Introduction

1.1 Speech Sound Disorders

Speech sound disorders (SSD) refer to difficulties in perceiving, producing, or mentally representing speech sounds [1]. The speech of individuals with SSD may be more difficult for listeners to understand [2]. Due to their poor speech intelligibility, preschool children with SSD likely face challenges in academic achievement, career choices [3,4], and social well-being [4]. Social well-being and popularity amongst peers are affected by their communicative competence [4]. Data from a scoping review show that children with speech and language disorders have a higher risk for mental health issues, behavioral issues, and psychiatric concerns [5]. In follow-up studies, these children were also found to be more at risk for social phobia, social anxiety, and psychiatric conditions in their adolescence and adulthood [6,7]. In terms of activities and participation, their speech impairments may lead to restrictions in thinking, calculating, self-care, mobility, and relationships with parents, siblings, peers, and persons in authority [8].

In the Philippines, around 287,196 children have “difficulty in communication,” and at least 50,862 have oral defects or speech impairment [9]. In addition, the prevalence of SSD in children ranges from 1.06%-14.8% in various parts of the world [10,11]. The numbers may be higher when direct assessment data are referenced instead of parental reports or school data [12]. This discrepancy emphasizes the importance of comprehensive and objective speech assessments. Comprehensive assessments allow children access to individualized goals and treatment strategies [13]. Through therapy, individuals with SSD can improve sound production and intelligibility [14], and gain access to academic or legal assistance [4]. Furthermore, with earlier intervention, long-term social, emotional, and mental health benefits are possible, as are decreases in the social and economic cost needed to potentially support them in the future [5].

1.2 Assessment of Tagalog Phonology

Despite the key role of comprehensive assessments in intervention, there is no publicly accessible validated articulation test that provides an adequate sample of the connected speech of Tagalog-speaking children from various age groups. The

closest are some picture articulation tests or reading tests [15-18], which, at the time of writing, are either unpublished or have only undergone preliminary development. Picture articulation tests only provide information on a child's speech skills at the word level [15], while reading tests cannot be used for non-readers. Aside from such limitations inherent to the test type, some of these developed tests either focused on a limited age range [15] or excluded diphthongs (vowel combinations; e.g., /aw, aj/) [16,18]. As a subgroup of vowels, diphthongs may help differentiate children with typical speech from those with speech sound disorders such as phonological disorders [19] or childhood apraxia of speech [20]. Due to the lack of available assessment tools, Filipino speech-language pathologists or SLPs may resort to using informal assessments or Western tools [21]. Although informal assessment is a low-cost means of obtaining useful information, it will not provide norm-referenced data [15]. On the other hand, Western tools may exclude sounds specific to the target language. As language is an essential consideration in culturally competent healthcare [22], speech sound assessments must be culturally and linguistically appropriate.

1.3 Development of the Tagalog SRT

To address the limitations of existing articulation tests, the Tagalog Sentence Repetition Test for 2-to-100-year-old Tagalog speakers (Tagalog SRT) was created in 2018 [23]. The sentences provide three opportunities for each phoneme in each word position (i.e. initial - start of a word, medial - middle of the word, final - end of a word), so clinicians can get rich and reliable data on phoneme production, not only in different positions, but also in relation to different peripheral vowels, consonants, and blends. Instead of single words, the SRT used sentences because they may be a more accurate predictor of intelligibility in connected speech [24]. The SRT also utilized repetition rather than spontaneous speech to eliminate the possibility of speakers—particularly young children—avoiding words with phonemes they find difficult.

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Moreover, repetition tasks can be used to screen any underlying language issues [25] or be used for children who have not yet mastered reading.

The SRT included all Tagalog vowels (/a, e, i, o, u/) and consonants (/b, d, g, h, k, l, m, n, ŋ, p, r, s, t, w, j, ʔ/), as well as some diphthongs (/aw, iw, aj, oj/) and common loan sounds (/f, tʃ, dʒ/). Past literature shows a dispute on the number of diphthongs due to the influence of loan words over the years [26-30]. As such, out of the eight, only four were included, because the other diphthongs are just their alternants (i.e., /ow/ - /aw/; /ew/ - /iw/; /ej/ - /aj/; /uj/ - /oj/; 29). Out of the six loan sounds, only the more common /f/, /tʃ/, and /dʒ/ were included in the SRT because they were found to be acquired by 2 years old and mastered by 3 years old [31]. Out of the 35 Tagalog phonemes, 28 phonemes are included in the SRT.

1.4 Content Validation and Pilot Testing of the Tagalog SRT

To help ensure that the Tagalog SRT is a valid articulation test for Tagalog speakers, this study aimed to determine the test's content validity in terms of its comprehensiveness, relevance, and comprehensibility. It also aimed to determine how often the sentences will be able to elicit the target phonemes, and how feasible and appropriate the administration process is for children aged 7 to 21.

Content validation is a type of validity testing that is typically conducted through literature reviews and expert judgment [32]. For a tool to pass content validation, it must cover all the elements of the construct being measured (comprehensiveness), contain items that fit the construct in the context of the chosen population and use case (relevance), and have items that can be understood by the test takers (comprehensibility) [32]. In the case of the SRT, it must include all Tagalog phonemes (comprehensiveness), consist of words familiar to the target population regardless of age (relevance), and be understandable to potential users (comprehensibility) [32]. Word familiarity was used as a measure of the test's (i.e., the sentences') relevance to the test-takers, because it was assumed that a familiar word is more likely to be frequently used in conversational speech [33] among (or directed to) the members of their age group in their geographic region. As for comprehensibility, since the sentence repetition task does not require test takers to understand the sentences for the test to measure what it is supposed to, this aspect was assessed through the understandability of the test's instructions [32]. Pilot testing complements content validation as it aids in determining administration time frame, adequacy of responses, and feasibility [32]. Any identified weaknesses, ambiguities, and unnecessary questions are addressed through revisions [32]. Once the SRT is thoroughly validated as a criterion-referenced tool and piloted, it can contribute to making assessment, diagnosis, and intervention more culturally appropriate for Filipinos with SSD.

Methodology

2.1 Research Design

Content validation was done using a descriptive quantitative research design. The Content Validity Index (CVI) is a measure used in different medical fields to quantify the consensus of various experts [34] on a tool's content validity. Comprehensiveness was determined by judgment quantification through consultations with three linguists, while relevance or "word familiarity" of the test items and comprehensibility of the instrument were determined by the judgment quantification of pediatric participants [35]. For pilot testing, the frequency of the elicited target sounds in all intended word positions were perceptually determined by the investigator and another certified SLP. Both have 5-10 years of clinical experience and speak "Metro Manila Tagalog" as their first language.

2.2 Ethical Considerations

The study protocol was approved by the University of the Philippines Manila Research Ethics Board prior to data collection (See Appendix A). Measures were taken to ensure autonomy (e.g., children's assent, parents' written consent), maintain confidentiality (e.g., associating code numbers to audio recordings), minimize risks (e.g., allowing breaks), and maximize benefits (e.g., handout on speech sound development for parents).

2.3 Participants

2.3.1 Linguist Experts (comprehensiveness)

A linguist was considered an "expert" if they have publications on the Tagalog language or are involved in teaching linguistics courses related to the language. Three experts were consulted to determine the content validity of the SRT [35].

2.3.2 Pediatric Participants (relevance, comprehensibility, pilot testing)

The test was individually piloted to 31 individuals aged 7 to 21, as at least 30 is recommended when testing a new instrument [36]. This age group was chosen to ensure that participants already have the capability to produce all phonemes, do not present with any phonological processes [37], can recognize familiar words, and are capable of repetition [Brown, 1973 as cited in 37]. Moreover, since this age group is immersed in technological advancements [38], which may have potential effects on language, it is imperative to determine if the sentences are still familiar to them. Due to possible differences in language use brought about by socioemotional and environmental contexts [38], participants were selected through "quota sampling," wherein the target sample was divided into three subgroups: primary education (7 - 11 years old; n = 10), junior high school (12-15 years old; n = 11), and senior high school/college (16 -21 years old; n = 10).

Participants were all Filipino citizens, have acquired Metro Manila Tagalog as their first language, have come from middle-income families, are reported to be in good health and have typical development, and have received passing marks in their age-appropriate K-12 level. Participants were recruited via social media platforms or personal connections. The screening process required participants to pass the Ling 6 sound check, a test of one's ability to hear phonemes representing the lowest to the highest frequencies [39], and to repeat the trial sentences. Participants were excluded if they had any history of developmental conditions, traumatic brain injury, speech sound disorders or delays, any hearing problems, and any symptoms of voice and fluency disorders. Additionally, they needed access to a laptop/computer with a headset, microphone, and camera. In case of disconnection or frequent internet connection issues at the time of data collection, participants were given the option to reschedule or withdraw from the study.

2.4 Materials

2.4.1 Tagalog Sentence Repetition Test

The Tagalog SRT was initially developed in 2018. The sentence list was created using high frequency words [40,41] so that unfamiliarity with target words would not affect the participant's capacity for immediate repetition [42]. Using familiar words ensures that the sentences still sound natural [43]. Speech naturalness is the extent to which an utterance sounds natural to the listener, and is a concept that encompasses both syntax and semantics [44]. It is probabilistic rather than absolute, because it looks at the grammaticality of an utterance and the "probability" that a native speaker would say an utterance that way. As it is not absolute, the perception of speech naturalness also differs per person. In 2018, an expert linguist was consulted to check if the sentences were grammatical and likely to be natural sounding to a Tagalog speaker. Recommended revisions included putting the target phonemes in the stressed position of the words and using common names for loan sounds to reduce inconsistencies in productions. Five sentences were also added to target four Tagalog diphthongs (i.e. /aw/, /iw/, /aj/ and /oj/).

For this study, the revised version of the SRT (v.2 March 2022) has a total of 38 sentences, including three trial sentences. Each sentence has four to five words each to ensure young children can repeat them [42]. In the 35 test sentences, there are 101 words targeting a total of 210 phonemes in various positions. These sentences target the 28 Tagalog phonemes at the initial, medial, and final positions. The sentences were audio-recorded to ensure consistency in the presentation during pilot testing. They were recorded by an adult female aged 22 to 39 years old, with a similar background as the participants and has no history of smoking or symptoms of dysphonia.

2.4.2 Post-test Survey

The comprehensibility and relevance of the SRT were evaluated by the participants using a Google survey (see Appendix B) with a 4-point Likert scale. Comprehensibility was rated by judging the ease of understanding instructions, while relevance was rated by the familiarity of the words in the sentences.

2.5 Data Collection

2.5.1 Consultation for Comprehensiveness

The revised list of sentences was emailed to the three linguists, together with a Target Phoneme Tracking sheet. This tracking sheet shows the word used and the corresponding sentence number for each target phoneme in each position. To determine comprehensiveness, the linguists were asked to

comment on whether the 28 phonemes in the SRT adequately represented Tagalog phonology and whether each target phoneme was, in principle, present in the assigned word. To reach the minimum validity index for new instruments [34], the three experts must all be in agreement.

2.5.2 Sentence Repetition Proper

Informed consent from parents and/or legal guardians was obtained prior to data collection. Additionally, supplemental consent or assent was taken during the actual session. The entire process (Figure 1) was administered and recorded via Zoom.

During the sentence repetition test proper, a script containing the instructions (see Appendix C) was used as a guide. Instead of being read verbatim, instructions were relayed using more casual language to allow the participants to understand them more easily. Any form of testing already has a level of “unnaturalness” [25], so providing instructions in a more casual and naturalistic manner could engage the participants more. One repetition per recorded sentence was allowed upon the participant’s request. Occasionally, when there were signs of confusion or hesitation (e.g., looking at their parents), younger participants were reminded that repeating the recorded stimuli was allowed. Additionally, instructions to repeat the trial sentences immediately were also provided for younger participants who seemed to be waiting for the “go” signal during the trial sentences. During data collection, there were instances when the audio signal was interrupted due to connectivity or gadget issues, which resulted in either replaying the audio recording or asking the participant to repeat their response. The entire test took approximately 5 to 10 minutes to complete.

2.5.3 Post-test Evaluation

Immediately after the sentence repetition test, participants synchronously answered a post-test evaluation form, except for one participant from the 7 to 11 age bracket, who requested to answer the form at another time. Following the evaluation, a closing interview was conducted for comments, questions, and recommendations.

2.6 Data Analysis

Data analysis was done by calculating the Content Validity Index (CVI) for each measure of content validity: completeness of the target phonemes covered (comprehensiveness), familiarity of the words in individual sentences (relevance), and the understandability of the test instructions (comprehensibility). The CVI is widely used as a measure of expert agreement due to its intuitiveness, easy computation, and item-level and scale-level formula [45]. Specifically, the number of participants who gave high ratings (3 or 4) in every question was divided by the total number of participants who answered the corresponding question.

2.6.1 Content Validation for Comprehensiveness

Comprehensiveness was determined by calculating the consensus of the three expert linguists. To reach an acceptable validity index, they must all agree that all Tagalog phonemes were covered by the target words in the test. Problematic phonemes were revised according to their recommendations.

2.6.2 Content Validation for Relevance

Relevance was assessed by computing the CVI of each sentence (i.e., item-level CVI or I-CVI) and the CVI of the entire test (i.e., scale-level CVI or S-CVI). The I-CVI has been shown to be a reasonable measure of item-level content validity, especially when ten or more raters are involved, when the probability of chance agreements becomes negligible [45]. To compute the I-CVI, the number of participants who gave the sentence a rating of 3 (one unfamiliar word) or 4 (all words are familiar) was divided by the total number of participants who rated the sentence. Sentences obtaining an I-CVI of 0.78 or higher were deemed relevant [34]. Additionally, the S-CVI was calculated by getting the average of all I-CVI ratings [32]. Obtaining an S-CVI value of 0.90 or higher would mean that the tagalog SRT was relevant. Lastly, differences among the responses of the three age groups were described by identifying the number of participants in each group who gave ratings of 1 or 2. This was done to check if there were participants in any age group who found some words to be unfamiliar even if the sentence was deemed valid (i.e., obtained an I-CVI of 0.78 or higher).

2.6.3 Content Validation for Comprehensibility

For comprehensibility, the CVI was determined by calculating the consensus of the pediatric participants on how understandable the test

instructions were. The number of participants who gave the instructions a rating of 3 (I had a little difficulty understanding the instructions) or 4 (I understood the instructions immediately) was divided by the total number of participants who rated the [34]. Similar to the relevance analysis, differences among the three age groups were described by identifying the number of participants per group who gave ratings of 1 or 2.

2.6.4 Pilot Testing

To determine if a target word indeed elicits the target phoneme, the frequency each phoneme was elicited from the 31 participants was counted. The I-CVI validity index was used as a guide to determine the minimum number of participants who should produce the phoneme for a target word to be acceptable. The phonemes in each target word should be produced by at least 25 out of 31 participants. Otherwise, the target word would be changed.

To avoid bias, the investigator and the consultant SLP independently listened to the depersonalized audio recordings of the participants’ responses. The SLPs recorded the presence or absence of the target phonemes in the record forms by placing a (+) or (-) respectively. A Google spreadsheet was created to summarize all ratings, and a separate sheet was used to record any disagreements in ratings for each target phoneme. All disagreements were resolved by listening to the recordings and agreeing on a (+) or (-) rating. Afterwards, the investigator transcribed the participants’ recorded responses in their record forms for documentation purposes. Figure 2 shows a sample of a filled out record form.

Any modifications such as repairs, pauses, word order switching, or omission of sounds were also noted. Distortions not counted as alternative productions were not considered correct.

Field notes were also taken to determine the feasibility and flaws of the administration process. These notes included any observations on the provision of instructions, mode of data collection, or interruptions caused by teleconferencing.

Results and Discussion

3.1 Content Validation

3.1.1 Comprehensiveness

All three linguists agreed that the sounds embedded in the sentences represented all Tagalog phonemes. However, 17 out of 101 words did not get a

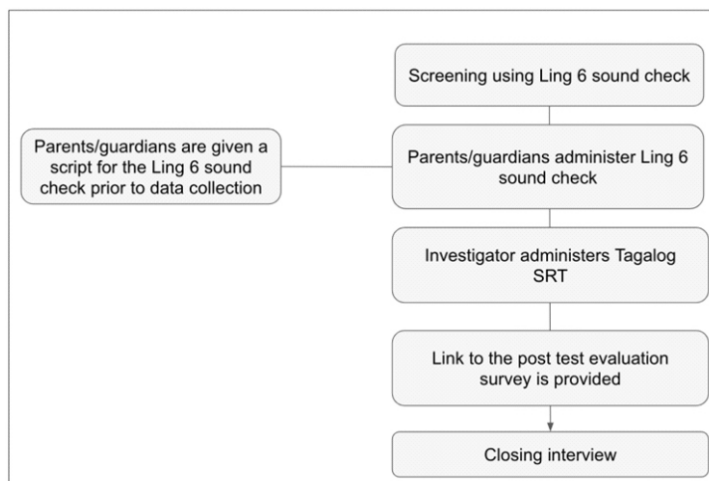


Figure 1. Data collection process from participants

B a s a? ang s i s i w at b a b o y.	“Basa ang sisiw at baboy”
[+] [+] [++][+]	[+] [++]
C u s t o ni d a d d y m a t u l o g.	“To ni daddy matulog”
[-][-] [++][+]	[+] [++]
H i n d i ng u m i t i si M a t t	“Di ngumiti si Matt”
[-][-] [+] [++]	[+] [++]

Figure 2. Sample of a filled out record form

unanimous consensus on the presence of their supposed component sounds. One expert noted that the 15 vowel-initial words (e.g., “ahas” [snake]) cannot occur since all seemingly vowel-initial words have a preceding glottal stop (i.e., /ʔahas/ and not /ahas/). This sound is produced by blocking the flow of air from the lungs by tightly pressing the vocal folds together [46]. Currently, linguists still dispute about whether glottal stops occur in all vowel-initial word positions [16,27,29]. However, since the presence or absence of a glottal stop before a vowel does not affect the meaning of a word [46], keeping the vowel-initial targets would be more practical. Testing vowel initial sounds is also useful in determining phonological awareness, letter-sound association, and speech production [47]. To address this, word-initial glottal stops and word-initial vowels were assigned the same target word (e.g., “ahas” [snake] for both initial /a/ and initial /ʔ/). Aside from maintaining the vowel initial targets, this double assignment would prompt the clinician to keenly observe for the production of a pre-vowel glottal stop without marking its omission (i.e., an unproduced or a “potential glottal stop” [46] as an error.

Next, another expert noted that the word “yoyo” and the word “ngumiti” (smiled) had final glottal stops, so they cannot be used for final /o/ and final /i/, respectively. To solve this, these words were replaced with pre-existing words elsewhere in the test: “yoyo” with “sarado” (closed; sentence 7 and “ngumiti” with “Charlie” (smiled; sentence 27).

Although all the other words received unanimous approval, additional changes were made to address supplementary comments and suggestions. To better target initial /j/, the sentence “Kailangan ni Jacob mag-shorts” (Jacob needs to wear shorts) was changed to “Kailangan ni Jacob ng shorts” (Jacob needs shorts) because the /j/ in the former sentence is not in the initial position but in the medial one since 'mag-shorts' is considered one word. Next, for word initial /a/, the sentence “Ay, bawal sa Jollibee” (Oh, it is not allowed in Jollibee) was changed to “Alam mo, bawal sa Jollibee” (You know, it is not allowed in Jollibee) because of the difficulty in distinguishing whether “Ay” (oh) is part of a diphthong (i.e., /ai/ as one sound) or not. Similarly, since a vowel followed by a glide (i.e., /j/ or /w/) in the same syllable may be considered a diphthong [30], glides were no longer targeted in the final position. Lastly, to better target final /ŋ/, the word “walang” (no more) in sentence #18 was also replaced with the word “saging” (banana) in sentence #22. The word “walang” is the combination of “wala” (none) and the linker “-ng” [30]. If only the root word “wala” (none) is produced, the final /ŋ/ may be omitted. Lastly, due to the interchangeable use of /i/ and /e/, and /o/ and /u/ [30], a rating of “ALT” (alternative production) was added to the record form to account for these potential occurrences. The use of “ALT” can also apply to words containing loan sounds. For example, the Tagalog /sy/, which is a palatalized allophone of /s/, can replace both /j/ and /tʃ/ in borrowed words [30]. The need to differentiate between acceptable alternative productions and actual errors has been highlighted by a study on sound variations and changes in Hong Kong Cantonese and their implications on speech sound assessment [48]. Acknowledging alternative productions is particularly relevant for multilingual children, who may produce sounds slightly differently (i.e., allophonic variation) due to the influence of their other language(s) [48]. After applying these revisions, a summary of all the changes were sent to the linguists for checking. All three experts approved of the revised target words.

3.1.2 Relevance

All sentences received an I-CVI of 1.0, or “excellent” relevance [45]. All 31 participants gave the sentences ratings of 3 or 4, with six sentences receiving a rating of “3” due to one word being unfamiliar: sentence #7 (“ocean”, n = 1), #27 (“nabaliw” [went crazy], n = 1), #26 (“Rejoice”, n = 2), #4 (“empanada”, n = 3), #29 (“naaliw” [entertained], n = 4), #34 (“bakod” [fence], n = 5). These six sentences still received a validity index of at least 0.84, because 26 or more participants rated the aforementioned words as familiar. It is important to ensure that the words making up the sentences are part of the individual’s vocabulary, as it can directly affect the ability to repeat something [42]. In a study involving a sentence repetition task, having two or more unfamiliar words in a sentence affected the children’s willingness to imitate the sentence, but one unfamiliar word did not, as long as the sentence was not long or complex [42]. These findings suggest that the sentences in the SRT are relevant and suitable for this target population even if a few words may not be familiar to some. In the post-test survey given through Google forms, all the participants’ comments were not about word familiarity but on the sentences in the survey being reportedly difficult to read.

For the S-CVI, the average of all I-CVI ratings for relevance was 1.0. This indicates that the SRT is a valid tool, despite some words being rated as unfamiliar.

3.1.3 Comprehensibility

A CVI of 1.0 was obtained, with 29 out of the 31 participants giving the sentence repetition instructions a rating of 4.0 (I understood what to do immediately), and two participants, both from the 7–11-year-old group, giving it a rating of 3 (I had a little difficulty understanding what to do). During the closing interview, these two participants only commented on the slight difficulties they encountered during the pilot test or during the post-test survey, and not the instructions.

In instrument development, comprehensibility is tested to ensure that any potential errors are due to inability to perform the task, and not confusion or misunderstanding of what to do [32]. The prepared script was used as a guide for consistency of the instructions’ content. The word “sentence” instead of the formal Tagalog counterpart “pangungusap” was also used since code mixing of English and Tagalog into Taglish is spoken by many Filipinos, especially in Metro Manila [Cada, n.d. in 26]. A CVI of 1.0 for comprehensibility suggests that the participants understood the instructions, the task, and the required response. The presence of trial sentences also allowed participants time to adjust to the task. While some younger participants seemed to wait for the “go” signal prior to repeating the first trial sentence, they were able to proceed with the task with no issues after being informed that they did not need to wait.

3.1.4 Overall Content Validity

It is imperative to check the content validity of new instruments to guarantee their thoroughness, applicability, and understandability to their potential target audience. Establishing validity tells us if the instrument indeed tests what it intends to [32]. Overall, the data show that the Tagalog SRT has content validity in terms of comprehensiveness, relevance, and comprehensibility. Additionally, no participant in any age group rated a sentence poorly for relevance and comprehensibility. This suggests that despite exposure to variations in culture, language, and socio-economic demands, the Tagalog SRT is likely to be suitable to individuals aged 7 to 21.

Furthermore, as vocabulary accumulates over time until an individual turns 65 years old, when it remains as is or dips slightly [49], the familiarity of the words in the SRT to 7- to 21-year-olds suggests that the test is likely to be relevant to older participants (22 to 100) too. Meanwhile, further research is needed to check the relevance and comprehensibility of the test to younger children (2 to 6 years old). In an Italian study, 2-year-olds had difficulty repeating sentences in full because they could repeat only around two words per sentence [50]. They omitted some words (e.g., articles, prepositions, modifiers) during repetition, a phenomenon that was also observed in their spontaneous speech samples. These omissions decreased slightly at 2½ years old and generally disappeared at 3 years old, but these data on Italian 2-year-olds suggest potential difficulties in administering the Tagalog SRT with similarly young children.

3.2 Pilot Testing

3.2.1 Frequency of Target Phonemes

Pilot testing is done throughout the process of test development to look for possible weaknesses in the instrument, the process of gathering the data, and its overall feasibility. This information will help pinpoint areas for improvement. The pilot test showed that 209 out of the 210 target sounds were elicited. Only the final glottal stop in the word “ginawa” (did) in the sentence “Walang ginawa? si Junior” (Junior did not do anything) did not reach the minimum requirement of being elicited from 25 or more participants. Tagalog speakers commonly replace word final glottal stops with /h/ or omit it altogether when it is positioned in the middle of the sentence [30]. Both word final /h/ and /ʔ/ can also easily be interchanged or omitted [15]. It is ideal to choose an existing word in the sentence list to replace “ginawa” (did) so that the replacement is already part of the list approved by the linguists and supported by the familiarity ratings of the participants. The transcriptions of the participants’ responses show 13 incidental elicitations of final glottal stops in “kutchara” (spoon) in sentence #32 “Mahal ang kutchara” (The spoon is expensive). The sound was not presented in the audio recording because there was no intention to elicit it through this word. Thirteen is less than the minimum (25 participants), but the word is still a possible replacement, especially if the sentence is recorded again with a final /ʔ/. Since it is already in the phrase-final position, participants may be less likely to replace or omit it. After reassigning /ʔ/, marking the non-production of glottal stops as “ALT” instead of “absent” should also be considered, because this will not change the meaning of the word [30].

Out of the 6510 individual ratings (i.e., 210 phonemes x 31 participants), the investigator and consultant SLP had a total of 15 (0.23%) disagreements. Specifically, there were disagreements on whether the target phoneme was present (+), produced either in the original or its alternative form (i.e. acceptable interchange of certain vowels; *empanada-impanada*), or absent (-). However, all of these disagreements were resolved.

These disagreements stemmed from the participants producing the target word differently, thus creating the need to discuss whether the word produced by the participant still elicits the phoneme in the targeted word position. An example would be producing the word “lumangoy” (swam) as “lumungoy.” Despite the different production, the initial /l/ phoneme was still produced in the correct position, thus meriting a (+) rating. On the other hand, the word “nginuya” (chewed), which targeted /ŋ/, was produced as “ninguya,” failing to elicit the phoneme at the initial position. Out of the 31 participants, 13 participants had difficulty with the word. Five participants produced it incorrectly (e.g., /nijuja/ instead of /ŋijuja/). Furthermore, for all five responses, there was an error in the form and placement of the infix “-in-”, which is typically placed after the first consonant to indicate past perfect tense in the patient voice [26]. This infix only becomes a prefix (ni-) when the root word starts with an /l/ [27; e.g., “linis” [clean] → “nilinis” [cleaned]]. However, during the pilot, two participants incorrectly produced “nginuya” (chewed) as “ninguya” even if the root word “nguya” (to chew) does not start with an /l/. Aside from this error, some participants substituted -in- with an inappropriate affix (e.g. the prefix “na-), as in “nanguya” (unintentionally chewed; *nginuya* → *ninguya* → *nanguya*). These morphological errors are commonly observed in children, who tend to overgeneralize certain language rules [51]. The other three participants committed errors possibly due to the influence of the neighbouring sounds /n/ and /j/: “niluya” (/n/ and /l/ have the same place of articulation), “nilaya,” and “niyunguya” (all non-words). Aside from these five participants, other participants produced /ŋ/ correctly but exhibited errors or repairs in completing the word. In addition, two participants asked for a repetition of the stimuli, and eight participants repeated the sentence slowly. These instances indicate that even though the term is familiar to all participants, the word may be infrequently used or just difficult to produce. Out of the 13 participants who experienced difficulties, seven came from the 7 to 11 age group, four from the 12 to 15 age group, and two from the 16 to 21 age group. This suggests that although these participants are expected to have acquired all phonemes [52] and be able to repeat them [Brown, 1973 as cited in 37], multisyllabic and less frequently used words [42] may still be difficult.

There were also audio-related concerns that required the investigator and the consultant SLP to revisit the recordings to determine if the participant produced a word completely. For example, one utterance was completely cut (i.e., /maʔajɔs juŋ bak--/), causing the syllable with the final /d/ to be omitted. In another instance, a participant had a tendency to speak with a fading voice towards the end, so the investigator and consultant SLP had to revisit the amplified audio recording to confirm the presence of final /ŋ/ in “saging” (banana).

As for initial glottal stops, since the pilot showed that seemingly vowel-initial words can be preceded by glottal stops, the Target Phoneme Tracking Sheet can be edited to present the two phonemes as a consonant-vowel combination (i.e. /ʔa/).

3.2.2 Administration Process

The task seemed simple enough for participants from all age groups to do. However, the instructions provided did not account for the possible shyness of some younger participants. Although all of them understood that they may request a repetition, occasional reminders still had to be given when a participant did not do so even when they were visibly confused or hesitant. Some participants who did not request a repetition and did not show signs of confusion might have actually needed one. As a result, some target sounds marked as (-) could have been produced correctly. Field notes also showed that using audio-recorded stimuli via teleconferencing was easy enough to administer, provided that there were no hardware or internet connectivity issues. These interruptions led to some audio breaks, which lengthened the data collection time.

3.3 Limitations

There are certain limitations in this study. First, for participants who rated the instructions “3,” there could have been more probing done during the

closing interview to shed light on the difficulties they encountered. The results may also be limited in its temporal and geographic applicability. Due to the continuous evolution of Tagalog, it is unknown if the SRT will remain valid over time. History shows how new sounds were eventually included in Tagalog's sound system due to the influence of foreign languages [29,30]. Furthermore, there are many variations of Tagalog spoken in the different regions of the Philippines. This SRT may be applicable to other Tagalog speakers with some modifications, maybe in word choices or allowable alternative productions.

3.4 Recommendations

For the next step of this research, it is recommended to repeat content validation and pilot testing of the revised SRT to the 7 to 11 age group with the new audio-recorded stimuli (e.g., “kutsara” [spoon] with the final glottal stop) and an administration manual which includes all the additional provisions. For one, instructions should be reiterated after the 18th sentence to remind and assure participants that they are allowed to request for a repetition. This provision can be added to the recording of the stimuli to ensure that it will be presented to the participants. Additionally, administrators should offer to repeat the stimuli when signs of confusion are observed during future pilot testing. In case participants omit entire words or alter the word order of a sentence, they should be given another chance to hear and repeat the stimuli. Such occurrences should also be documented. It is also recommended that the next stages of this research be administered both face-to-face and/or via teleconferencing to determine the feasibility and issues of each administration mode. Regarding the study's method per se, probing questions should also be asked during the closing interview to get more information on any difficulties encountered.

After the revised version undergoes content validation and pilot testing, the reliability and construct validity of the test can be assessed. In the far future, the applicability of the SRT to speakers of other Tagalog dialects can also be explored. The test can be adapted for the speakers of other Philippine languages as well. Lastly, in order to clearly differentiate acceptable variations from speech sound errors, future studies can investigate current sound variations in Tagalog and other languages.

Conclusion

This study found that the Tagalog SRT has good overall content validity. It covers the entirety of Tagalog phonology, contains items relevant to Tagalog speakers aged 7 to 21, and includes understandable instructions. The pilot test also showed that the SRT elicited all the sounds targeted in various positions, except for the final glottal stop. These results indicate that the SRT can be used to assess the speech sound repertoire of Metro Manila Tagalog speakers after further validation, reliability testing, and pilot testing. It must be noted that any future revisions (e.g., word list, sentence word orders) may affect the content validity established in this study. Such revisions call for a repetition of aspects of the validation process.

Acknowledgments

We would like to acknowledge Ms. Lloeden Lois Cabacuñgan, who helped in the initial development of the SRT in 2018. We would also like to thank these colleagues for their invaluable input before and after the study's implementation: Ms. Rozelle Francesca Bentulan, Ms. Barbara Munar, Ms. Krysta Ellieza Perez, and Ms. Ma. Concepcion Laurencio.


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Appendix A
Certification of Approval from the University of the Philippines Research Ethics Board



UPMREB FORM 4B(2012)-CERTIFICATION OF APPROVAL
05/11/2021


CERTIFICATION OF APPROVAL

This certifies that the University of the Philippines Manila Research Ethics Board (UPMREB) Review Panel 2 which is constituted and established, and functions in accordance with the requirements set by the University of the Philippines Manila, the Philippine Health Research Ethics Board (PHREB); and in compliance with the WHO Standards and Operational Guidance for Ethics Review of Health-related Research with Human Participants (2011), the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (2016), and the National Ethical Guidelines for Health and Health-related Research (2017), has approved the following study protocol and related documents:

TYPE OF SUBMISSION: Resubmission	
UPMREB CODE: UPMREB 2021-0583-01	
SUBMISSION DATE: 12 November 2021	
STUDY PROTOCOL TITLE: Tagalog Sentence Repetition Test for Tagalog Speakers: Content validation and Pilot testing	
PRINCIPAL INVESTIGATOR: Hannah Albert	
TYPE OF REVIEW: Expedited	
SPONSOR/FUNDING AGENCY: None	
APPROVAL DATE: 23 November 2021	EXPIRY OF ETHICAL CLEARANCE*: 22 November 2022
DUE DATE OF APPLICATION FOR RENEWAL OF ETHICAL CLEARANCE (30 days before expiry): 22 October 2022	FREQUENCY OF CONTINUING REVIEW: Yearly
Submit application using the UPMREB FORM 3(B): Continuing Review Application Form.	
APPROVED SITE/S: College of Allied Medical Professions	
DATE OF BOARD MEETING: N/A	
QUORUM: N/A	
CONFLICT OF INTEREST: N/A	
MEMBERS IN ATTENDANCE: N/A	
ACTION TAKEN DURING BOARD MEETING: N/A	
DOCUMENTS APPROVED BY UPMREB:	
<ol style="list-style-type: none"> 1. Tagalog SRT Proposal Outline_November 2021_v.2 2. Tagalog SRT Proposal Diagrammatic Workflow_November 2021_v.2 3. Informed Consent Form (English) version 2 dated November 2021 4. Informed Consent Form (Tagalog) version 2 dated November 2021 	

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05/11/2021

<ol style="list-style-type: none"> 5. Simplified Informed Consent Form (English) version 2 dated November 2021 6. Simplified Informed Consent Form (Tagalog) version 2 dated November 2021 7. Informed Assent Form (English) version 2 dated November 2021 8. Informed Assent Form (Tagalog) version 2 dated November 2021
TECHNICAL DOCUMENTS INCLUDED IN THE REVIEW: <ol style="list-style-type: none"> 1. Curriculum vitae and GCP certificate of the investigator: Hannah Maria D. Albert, CSP-PASP 2. Curriculum vitae and GCP certificate of the so-investigator: Prof. Elynn Cassey K. Chua
ADDITIONAL DOCUMENTS APPROVED BY UPMREB THROUGH EXPEDITED REVIEW: N/A
RESPONSIBILITIES OF PRINCIPAL INVESTIGATOR WHILE STUDY IS IN PROGRESS (Please note that forms may be downloaded from the UPMREB website: reb.upm.edu.ph): <ol style="list-style-type: none"> 1. Register research study in the Philippine Health Research Registry upon approval (http://registry.healthresearch.ph) 2. Progress report using the attached UPMREB FORM3(B)2012: Continuing Review Application Form, as indicated above, which includes the following: (NOTE: In view of active ethical clearance, this report is mandatory even if the study has not started or is still awaiting release of funds.) <ol style="list-style-type: none"> a. Date covered by the report b. Protocol summary and status report on the progress of the research c. Philippine Health Research Registry ID d. Number of participants accrued e. Withdrawal or termination of participants f. Complaints on the research since the last UPMREB review g. Summary of relevant recent research literature, interim findings and amendments since the last UPMREB review h. Any relevant multi-center research reports i. Any relevant information especially about risks associated with the research j. A copy of the informed consent document 3. Any amendment/s in the protocol, especially those that may adversely affect the safety of the participants during the conduct of the trial including changes in personnel, and revisions in the informed consent, must be submitted or reported using UPMREB FORM3(A)2012: Study Protocol Amendment Submission Form.

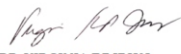
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<ol style="list-style-type: none"> 4. Report of non-compliance (deviation/violation), whether minor or major, at the soonest possible time up to six (6) months after the event, using UPMREB FORM 3(D)2012: Study Protocol Non-Compliance (Deviation/Violation) Report. 5. Reports of adverse events including from other study sites (national, international) using the UPMREB FORM 3(C)2012: Suspected, unexpected serious adverse event/reaction/s report, with timelines for submission guided by the GL 02 Version 2.0: Guideline on Reporting Serious Adverse Events; or list of reportable negative events using the UPMREB FORM 3(I)2012: Queries, Notification, and Complaints. 6. Notice of early termination of the study and reasons for such using UPMREB FORM 3(E)2012, or notice of time of completion of the study using UPMREB FORM 3(C)2012: Final Report Form. 7. Any event which may have ethical significance, and/or any information which is needed by the UPMREB to do ongoing review.
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DR. VIRGINIA DE JESUS
 Chair, UPMREB Review Panel 2

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Appendix B
4-point Likert scale for comprehensibility and relevance

<h2 style="margin: 0;">Comprehensibility ng Tagalog Sentence Repetition Test</h2> <p>Sinusuri ng bahaging ito kung ang instructions ba ng Tagalog Sentence Repetition test ay naintindihan ng maayos</p> <p>Mag-sign in sa Google para i-save ang iyong pag-usad. Matuto pa</p> <p>*Kinakailangan</p> <p>Gaano mo naintindihan mo ang instructions ng Tagalog Sentence Repetition test? *</p> <p><input type="radio"/> 4 - naintindihan ko agad kung ano ang gagawin</p> <p><input type="radio"/> 3 - medyo nahirapan akong intindihin kung ano ang gagawin</p> <p><input type="radio"/> 2 - nahirapan akong intindihin kung ano ang gagawin</p> <p><input type="radio"/> 1 - hindi ko naintindihan ang gagawin</p> <p>Pangalan at edad *</p> <p>Iyong sagot _____</p> <p style="text-align: right;">Submit I-clear ang form</p>	<h2 style="margin: 0;">Tagalog Sentence Repetition test</h2> <p>Sinusuri ng bahaging ito kung gaano ka familiar ang bawat salita sa pangungusap. Pumili mula "1" hanggang "4", kung saan "1" ay hindi pamilyar ang mga salita, at "4" ay pamilyar lahat ng salita.</p> <p>Mag-sign in sa Google para i-save ang iyong pag-usad. Matuto pa</p> <p>*Kinakailangan</p> <p>Full name and age *</p> <p>Iyong sagot _____</p> <p>1. Basa ang sisiw at baboy *</p> <p><input type="radio"/> 4 - Alam ko lahat ng salita sa pangungusap</p> <p><input type="radio"/> 3 - Isang salita lang ang hindi ko alam</p> <p><input type="radio"/> 2 - Hindi ko alam ang dalawa o higit pa sa mga salita</p> <p><input type="radio"/> 1 - Hindi ko alam ang lahat ng salita sa pangungusap</p> <p>Alin sa pangungusap na "Basa ang sisiw at baboy" ang hindi mo alam? (i-skip ang tanong na ito kung "4" ang naging sagot)</p> <p>Iyong sagot _____</p>
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Appendix C
Script for sentence repetition test proper

Investigator: Paki suot ang headphones/earphones. Naririnig mo ba ako ng maayos? Masaydo bang malakas o mahina ang mga tunog? Pwede mo ba ipakilala ang sarili mo para marinig ko kung maayos din ang tunog ng microphone mo?

Investigator: May mga naka pangungusap akong ipaparining sa iyo. Naka record ito, at ipaparinig ko sila isa isa. Pagkatapos ng bawat pangungusap, kailangan mong ulitin ang narining mo. Pwede mo ipaulit saakin ang pangungusap ng isang beses kung hindi mo ito maalala o hindi mo narinig ng maayos. Handa ka na ba?

Sample Instructions

May mga sentences akong ipaparining sa iyo. Ipaparinig ko sila isa isa. Pagkatapos mo marinig, ulitin mo iyong sinabi. Pwede mo ipaulit saakin ang pangungusap ng isang beses kung hindi mo ito maalala o hindi mo narinig ng maayos" (I will let you listen to some sentences. You will listen to them one by one. After you hear it, you need to repeat what you heard. You can ask me to play it back if you do not remember the sentence or did not hear it properly).

If the participant has no more questions or logistical concerns, the investigator will proceed to play the trial sentences. If the participant successfully repeats them, they will continue to the Tagalog SRT items. However, if the participant is unable to repeat the trial sentences, the investigator will proceed to the closing interview.

Closing interview

Investigator: Maraming salamat sa iyong partisipasyon sa pag-aaral na ito. Bago tayo magtungo sa online evaluation, maaari bang malaman kung may nakakalito o mahirap sa Tagalog sentence repetition test? May nakakalito ba sa instructions or sa paraan ng pagsusulit? Once all questions and feedback has been received, we will move on to the post test evaluation

Investigator: Ngayon naman, tayo ay magtutungo sa isang online evaluation form. Sa evaluation na ito aalamin kung may mga salita sa mga pangungusap kanina, na hindi mo alam o hindi pamilyar sayo. Walang tama o maling sagot dito. Handa ka na ba o gusto mo munang magpahinga ng ilang minuto? May link akong ipapadala sa inyo, paki pindot lang iyon at paki sagutan. Kung may mga tanong ka, sabihin mo lang saakin dahil mag aatay ako dito sa zoom room habang nag sasagot ka. Papatayain ko lang muna ang aking camera para makapag sagot ka ng maayos, pero makikinig ako kung sakaling may gusto kang itanong o klaruhin. Kung ikaw ay nahihirapan pang magbasa, pwede kong ulitin ang mga recording isa isa.

At the end of the post test evaluation

Investigator: May parte ba ng evaluation na mahirap o nakakalito para sa iyo? May suhestyon o rekomendasyon ka ba?