The Child Acquisition of Voice in Paiwan

Kaiying Lin, Yu-Tzu Chang, and Kamil Ud Deen

1. Endangered languages

Of the roughly 7000 languages spoken in the world, approximately 60% are currently endangered (UNESCO, 2010). A common reason for a language to become endangered or threatened is that most of the speakers shift their choice of language to a majority language, one that is more powerful and/or prestigious. And of course when a language reaches dormancy, it often results in the loss of distinct cultural knowledge embodied within the language. Such a loss represents a loss to the community, but also to humanity, in that it (often) represents the permanent loss of human knowhow. As such, the imperative to address this serious issue has risen to the forefront of the field of linguistics in the last several decades.

One major lacuna in the field is the ability, or indeed the recognition of the need, to assess the vitality of languages in a rigorous and scientific manner. There are some attempts to assess the vitality of languages, but as we show below, they are only initial and require additional rigor. In this paper, we attempt to assess the vitality of an indigenous language of Taiwan that is suspected of being on the weaker end of any vitality scale. We provide the first attempts at a method for assessing the vitality of such a language, with the hope that this will spur additional interest in the suite of tools that we propose.

2. Scales for assessing vitality

Language endangerment can be gauged through various qualitative methods such as sociolinguistic interviews and word lists. However, Fishman (1991) proposed the first in a series of scales that have come to be the norm in language vitality assessment. Fishman initially proposed the Reverse Language Shift (RLS) that includes eight stages of language endangerment. This was later expanded into the seminal Graded Intergenerational Disruption Scale (GIDS). This scale has been further developed into Extended Graded Intergenerational Disruption Scale (EGIDS, Lewis & Simons, 2010), which contains 13 levels. Moreover, UNESCO also developed a framework that later was published in "Language Vitality and Endangerment" (2003). And more recently, Lee and Van Way (2016) proposed

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 Proceedings of the 46th annual Boston University Conference on Language Development, ed. Ying Gong and Felix Kpogo, 456-468. Somerville, MA: Cascadilla Press.

the Language Endangerment Index (LEI), which uses multidimensional measures based on several factors. These factors are common to most of these scales: intergenerational transmission, number of speakers, domain of use. Our primary contention here is that for each of these scales, the tipping point from a language being healthy to a language being at-risk is when **intergenerational transmission** begins to erode. As such, the role of language acquisition by children is **the key** to assessing the initial stages of the move towards language endangerment, and may well be the leading indicator to the health of a language. This places special urgency on the development of tools and standards for the assessment of the acquisition of minority languages around the world.

Among these scales, EGIDS makes especially clear our point about intergenerational transmission. As seen below, EGIDS is organized into 13 levels ranging from the most vital at Level 0 to the least vital at Level 10. The critical transition from healthy to at-risk occurs from Level 6a ('Vigorous') to Level 6b ('Threatened'), and note that in the description for these two levels, the key difference between these two levels is the degree of intergenerational transmission. Thus, the tipping point of a language moving from 'Vigorous' to 'Threatened' lies in the degree of intergenerational transmission.

The current study centers on the Paiwan language, whose status is thought to be in the region of Levels 6b and 7 in EGIDS. These two levels also differ in the degree of intergenerational transmission: In 6b, (some) children are still acquiring the language, while in 7, children are no longer acquiring the language. The tipping point from "vulnerable" to "definitely endangered" is therefore whether *any* children acquire the language.

Table 1. Lewis and Simons (2010)'s Extended Graded Intergenerational Disruption Scale (EGIDS)

LEVEL	LABEL	DESCRIPTION	UNESCO
0	International	"The language is used internationally for a broad range of functions."	Safe
1	National	"The language is used in education, work, mass media, government at the nationwide level."	Safe
2	Regional	"The language is used for local and regional mass media and governmental services."	Safe
3	Trade	"The language is used for local and regional work by both insiders and outsiders."	Safe
4	Educational	"Literacy in the language is being transmitted through a system of public education."	Safe

5	Written	"The language is used orally by all generations and is effectively used in written form in parts of the community."	Safe
6a	Vigorous	"The language is used orally by all generations and is being learned by children as their first language."	Safe
6b	Threatened	"The language is used orally by all generations but only some of the child-bearing generation are transmitting it to their children."	Vulnerable
7	Shifting	"The child-bearing generation knows the language well enough to use it among themselves but none are transmitting it to their children."	Definitely Endangered
8a	Moribund	"The only remaining active speakers of the language are members of the grandparent generation."	Severely Endangered
8b	Nearly Extinct	"The only remaining speakers of the language are members of the grandparent generation or older who have little opportunity to use the language."	Critically Endangered
9	Dormant	"The language serves as a reminder of heritage identity for an ethnic community. No one has more than symbolic proficiency."	Extinct
10	Extinct	"No one retains a sense of ethnic identity associated with the language, even for symbolic purposes. "	Extinct

So Intergenerational transmission is the key to assessing when a language might slide towards risk. However, intergenerational transmission is not well-defined and it lacks a rigorous and reproducible method for assessment. Here we present a tool designed by a research team at the University of Hawai'i referred to as TITA (Tool for Intergenerational Transmission Assessment; Deen et.al., 2016). This tool is a suite of instruments designed to be easily implemented in the field, comparable across different field sites, reproducible, and are all based upon decades of research. TITA consists of six components as shown below.

TITA 1: Household language survey
TITA 2: child language survey
TITA 3: Inventory of Vocabulary (mini-CDI)
TITA 4: Picture selection task
TITA 5: Picture description Task
TITA 6: Signature property of the language

The first two components are surveys that can be conducted handily and quickly, and the last three measures are tasks applied directly on children. The current study makes use of the 6th measure, when researchers suspect children are acquiring the target language in a significantly different way from their parents or previous generation. The signature property of a language refers to a marked pattern in world's languages, and something that makes the target language distinct. In the current study, the Formosan Voice system was determined to be this signature property of the language, and is one that the dominant language in Taiwan -Mandarin- lacks. We surmise that children exposed to Paiwan and Mandarin (which is all children in the Paiwan community) are likely to struggle with this unusual feature of Paiwan, and it is therefore the perfect candidate to use as a leading indicator of the erosion of Paiwan. Our working hypothesis is that failure to acquire the Paiwan voice system is an indicator that the language is vulnerable to endangerment. In what follows, we present some background information about the Paiwan language and its people, and then we present two experiments that test Paiwan-acquiring children's control over the voice system.

3. Background on Paiwan

Paiwan is one of many Austronesian languages spoken in Taiwan (known as Formosan languages). Its roughly 100,000 (approximately 2.5% of Taiwan's population of 23 million) speakers are situated in mountainous southern region of Taiwan. In Taiwan, Mandarin is the most common and dominant language and over 95% of the Taiwanese population speak Mandarin Chinese. Moreover, discussions with local community members reveals that children appear to be acquiring the language, but only in certain domains. Based on these observations, we estimate that Paiwan is likely in EGIDS 6b and perhaps should be deemed as "vulnerable" under UNESCO's rating of endangerment. It is also possible that these community reports are overestimates of children's acquisition of Paiwan, and that the situation is more dire. Without assessment, we cannot tell where exactly this language is on any scale.

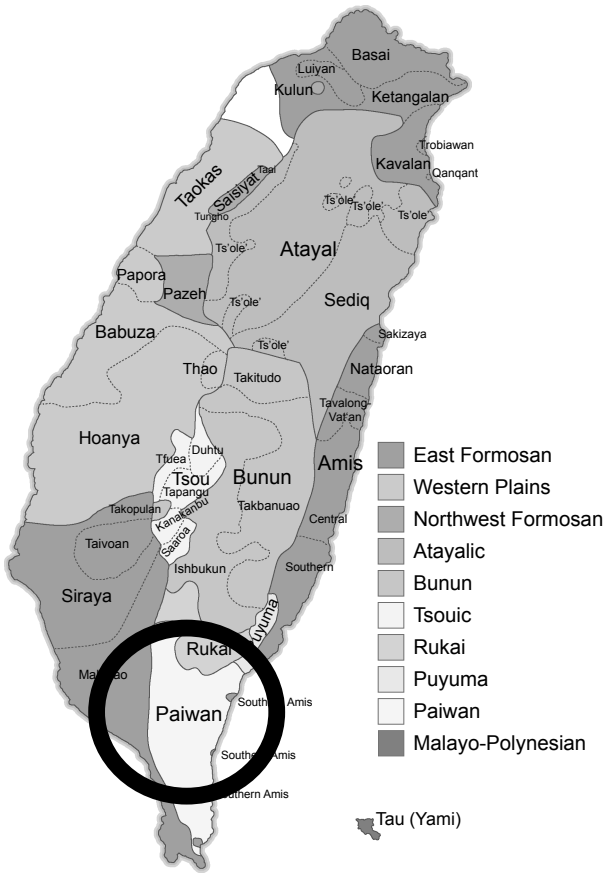


Figure 1. the location of Paiwan

Paiwan is a verb-initial language with a strong case-marking system. In a transitive sentence, the word order of the two arguments is flexible, perhaps due to the case marking system which allows for recoverability. It has been argued, however, that the patient-first order is preferred in Paiwan (Chang, 2018, see below).

(1) a. PATIENT-FIRST WORD ORDER

‘eman	ta	vurati	ti	Zepulj
eat(agent-voice)	obl	sweet.potato	pivot	name

b. AGENT-FIRST WORD ORDER

‘eman	ti	Zepulj	ta	vurati
eat(agent-voice)	pivot	name	obl	sweet.potato

‘Zepulj eats sweet potatoes’

There is a voice marker on the verb which indicates prominence of one of the arguments, either agent or patient. This 'prominence' is a topic of discussion within Austronesian linguistics, but there are various kinds of privileges bestowed to the voice-marked argument (e.g., extraction for relativization is limited to the voice-marked argument). The argument indicated by the voice marker is case-marked with a marker that is referred to as the *pivot* marker. As shown below in (2), when the verb is marked agent-voice (2a), the agent is pivot-marked (there are many morphological variants in Paiwan), and the patient is marked with a different case marker, referred to in the Paiwan literature as an oblique marker. On the other hand, when the verb is marked patient-voice (2b), the patient in the sentence is pivot-marked and the agent receives a non-pivot case marker (referred to in the Paiwan literature as a genitive case marker, a kind of oblique marker). This case-marking system allows Paiwan to show flexible free-order as the thematic roles of each argument are recoverable from the combination of voice and case, as shown in the table below.

Table 2. case-marking and voice in Paiwan

	Agent-Voice	Patient-Voice
Agent Case Marking	Pivot (ti, tia, a)	Oblique (genitive) (ni, nia, na, nua)
Patient Case Marking	Oblique (ta,tjai, tua, tu, tjai, tjaya)	Pivot (ti, tia, a)

The inclusion of Voice and case-markers in a sentence is shown in (2). When the verb is marked agent-voice, the agent *Zepulj* must be marked pivot. The other argument, hence the patient, should be marked oblique, as exemplified in (2a). When the verb is marked patient-voice, as in the example (2b), the patient 'sweet-potato' is marked pivot, with the agent *Zepulj* in the sentence receiving the genitive case.

(2) a. VERB MARKED AGENT-VOICE (agent=pivot marked)

'an	ta	vurati	ti	Zepulj
<av>eat	obl	sweet.potato	pivot	name

'Zepulj eats sweet potatoes'

b. VERB MARKED PATIENT-VOICE (patient=pivot marked)

'<in>an	ni	Zepulj	a	vurati
<pv>eat	gen	name	pivot	sweet.potato

'Zepulj eats sweet potatoes'

4. Research questions—comprehension of simple declarative sentences

Although there is a good amount of pedagogical and analytical work on Paiwan, this is the first-ever child acquisition study on Paiwan children. As such, nothing is known about how children acquire (or don't) the Paiwan language, making predictions something of a challenge. However, there are related languages about which we know a great deal, including something about how children acquire these languages. One language in particular may help us with predictions about what we might find in Paiwan, and that is Tagalog – another Austronesian language which has been studied relatively more intensely. Tagalog has a similar case-marking system as Paiwan: it exhibits a similar agent-patient voice system, with a similar case marking system. Based on several studies on Tagalog and its acquisition (Tanaka, 2016; Bondoc et al., 2018; Garcia & Kidd 2020) we can say that Tagalog adults generally prefer patient-voice with agent-first word order. Children, on the other hand, initially show variable preferences, but very quickly show the same preference as adults. We might therefore predict that Paiwan children will show the same preference as Tagalog children.

However, Chang (2018) in a reference grammar states that the preferred voice system in Paiwan is agent-voice, and the preferred word order is patient-first word order. Chang's claim is based on descriptions of several native speakers. This is intriguing because it is widely believed that agent-before-patient is an universal preference in human language (e.g. Bates & MacWhinney, 1989). If Chang's claim is true, this violates this universal preference.

We therefore have diverging predictions, one based upon a reference grammar, and one based upon comparisons with a closely related and typologically similar language (Tagalog). With this, we now present our three research questions:

1. Do children have a preference for either voice?
2. Do children have a preference for agent-initial or agent-final word order?
3. Do children show a reasonable level of acquisition of this system, or does intergenerational transmission look to be at risk?

5. Experiment-picture selection task

5.1. Participants

We collected data from 21 Paiwan-speaking children aged 4;0–5;11(mean age 4;10) and three adult Paiwan speakers aged 21–56 (mean age 35). All the child data were collected from a Paiwan immersion school located in southern Taiwan. According to the school's language policy, teachers and students must communicate only in Paiwan and not in Mandarin (the dominant language of the society), both in class and during break times. However, we observed that not all of the faculty members were Paiwan speakers. Based on our observations, the students and the Paiwan teachers occasionally code-switched to Mandarin when communicating with the non-Paiwan-speaking faculty.

According to the Paiwan teacher we interviewed, as most students do not understand Paiwan when they join the program at the beginning of the semester, Mandarin is used more frequently than Paiwan. Later in the semester, Paiwan is the dominant language used at the school. However, based on our observation during the time we conducted the experiment in the summer, we found that Mandarin was used more often than we had been led to expect. We estimated that the two languages were being used with approximately equal frequency.

We used a language background questionnaire from Tanaka (2016) to investigate both children and adult's daily exposure to Paiwan. The results showed that parents use Paiwan 20–30% of the time when talking to children and that grandparents use Paiwan 50% of the time when talking to children. We also found that siblings hardly ever use Paiwan when talking to each other and that only about 20% of the media that children are exposed to is in Paiwan. Based on these results, Paiwan qualifies as a threatened language based on the EGIDS criteria.

The adult participants, who were not involved with the immersion school, reported that their age of acquisition for Paiwan ranged from birth to four years and that their current total daily exposure was 10–20%.

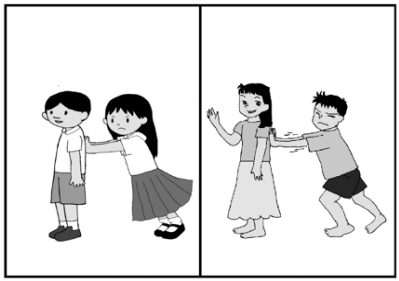
5.2. Materials

In designing our stimuli, we were careful to control for the factors Voice and the Word Order. Voice refers to whether the verb in the sentence is marked with agent-voice or patient-voice. We controlled this factor because we were interested in whether Paiwan speakers prefer the patient-voice, as research has shown to be the case for Tagalog speakers (e.g., Tanaka, 2016; Bondoc et al., 2018; Garcia & Kidd, 2020), or agent-voice (as claimed by Chang, 2018). The second factor we manipulated was word order - whether the noun arguments in the sentence are in the agent-patient or patient-agent order. The motivation for this manipulation was to ascertain whether agent-patient order is easier to comprehend, as in Tagalog (e.g., Tanaka, 2016; Bondoc et al., 2018; Garcia & Kidd, 2020), or whether patient-agent order is the easier option, as Chang (2018) has claimed.

We prepared 22 items in total: 10 critical items and 12 fillers. The critical items were simple transitive sentences, each of which contained one of five reversible verbs (RVs; *carry, chase, hug, push, spray*). These items were distributed crossing voice (agent vs. patient) and word order (agent-patient vs. patient-agent). The fillers consisted of six sentences containing adjectives and six sentences containing non-reversible verbs (NRVs). Participants were randomly assigned to one of the two resulting running lists.

The sentences in Figure 2 illustrate the different types of items we used. Figure (2a) is an RV marked with patient-voice and patient-agent word order. The two filler types were NRV and adjectives, as shown in Figure (2b) and Figure (2c) respectively. These items were paired with pictures for selection.

Zulung-en a uqaljai na vavayan
<av>pick pivot boy obl girl
'The girl pushes the boy.'



C-em-pis a vavayan ta hana
Push<pv> pivot girl obl flower
'The girl picks the flower.'

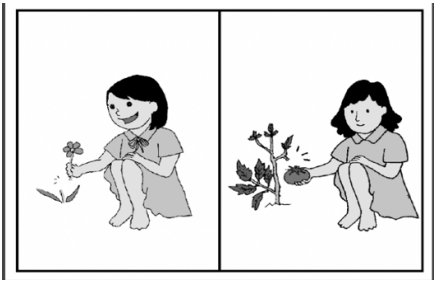


Figure 2a. example stimulus of RV items and Figure 2b. example stimulus of NRV items

Qualuman a ngiyav
Fat pivot cat
'The cat is fat.'

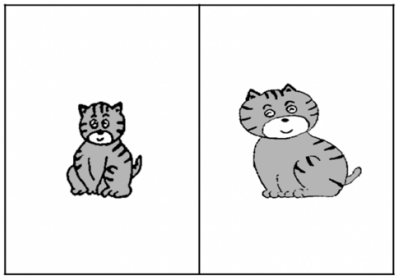


Figure 2c. example stimulus of adjectives items

5.3. Procedure

Our data collection procedures needed to be modified due to the COVID pandemic. For our data collection with children, we travelled to an immersion school in southern Taiwan and tested participants in person. However, we had to test the adults over the Internet because of the sudden COVID outbreak in Taiwan in the summer of 2021.

The children were tested individually at the immersion school. The pre-recorded Paiwan sentences were presented to the children on a laptop computer with the audio played over headphones. One experimenter interacted with the children using Mandarin and recorded their responses in Paiwan. Children were trained with three intransitive items (a type of sentence that was not included in the experiment), followed by the critical items and fillers described above. The technique we used to test the children's comprehension is a picture selection task.

A series of two-picture panels were shown to them, each of which depicted a pair of individuals involved in an action such as pushing.

For each item, children were asked to listen to a pre-recorded sentence while looking at the pictures on the screen, and then they were instructed to put a sticker on the picture that best matched the sentence they heard. Take Figure 2 as an example. If the participants heard a sentence meaning "The girl pushes the boy," they should put a sticker on the picture on the left. The pictures we used in the experiment were borrowed from Tanaka et al. (2016).

The experiments were written in jsPsych (de Leeuw, 2015) and the adults were tested over the Internet using Cognition (https://www.cognition.run/), which is a platform for hosting scientific experiments. A link to the experiment was sent to the participants ahead of time. There were no experimenters present while participants were doing the experiment.

6. Results

6.1. Adults

We first report the results for the adults (see Table 3). We only had three adult participants because COVID severely disrupted our data collection plans. However, we are planning to collect data from more participants in the near future.

Table 3. Overall accuracy of adults in conditions

		Voice	
	Word Order	AV	PV
Critical items (reversible sentences)	agent-patient	60%	20%
	patient-agent	80%	100%
Filler items (non-reversible sentences)		100%	86%

Overall, the adults had a very high accuracy rate on the fillers. They had an accuracy rate of 100% for the agent-voice fillers and 86% for the patient-voice fillers, suggesting that the adults were able to perform the task effectively even when it was in an online format. As for the critical items, the adults had higher accuracy with the patient-agent word order (80% for the agent-voice and 100% for the patient- voice) than with the agent-patient word order (60% for the agent-voice and 20% for the patient-voice).

When we inspected the individual data for the adults, we noticed that one of the participants had poor accuracy in almost every condition in the critical items. If we are able to collect more data from adults, we will likely exclude this one adult from future analyses.

6.2. Children

Table 4 shows the results for the children. The children performed well with the fillers in both voices (94% for the agent-voice and 85% for the patient-voice), suggesting that they were able to perform the task. As for the critical items, we analyzed their accuracy rates across the four conditions using a mixed-effects logistic regression model analysis. The results showed that the children chose answers at chance most of the time. However, their accuracy rate on trials with agent-voice and patient-agent word order (i.e. 62%) was marginally significant.

Table 4. Overall accuracy of children in conditions

		Voice	
	Word Order	AV	PV
Critical items (reversible sentences)	agent-patient	51%	54%
	patient-agent	62%	52%
Filler items (non-reversible sentences)		94%*	85%*

* Significantly above chance

To further understand the children's response patterns, we also report an individual analysis of the child data. Each panel in Figure 3 represents a child's mean accuracy rate in the four critical conditions.

Of particular interest here are the results for trials with agent-voice and patient-agent order (i.e., the grey crosses on the left side in each panel) because this is the only condition where children performed marginally above chance. More than two-thirds of the children were above 50% accuracy in this condition. This suggests that there is a slight preference for the patient-agent word order, at least for some children, which is different from the findings from Tagalog (Tanaka, 2016; Bondoc et al., 2018; Garcia & Kidd, 2020) and challenges the idea that there is a universal preference for agent-initiality.

However, perhaps more intriguingly, further inspection of the results in Figure 3 shows that 15 of the 21 children had higher than 90% accuracy in at least one condition, and it was not necessarily in the condition with agent-voice and patient-agent word order. Meanwhile, only two of the 21 participants scored below 60% in all the conditions, i.e., child #14 and child #25. Taken together, this is suggestive of a more complicated pattern than we had initially anticipated, which we will now discuss in the following section.

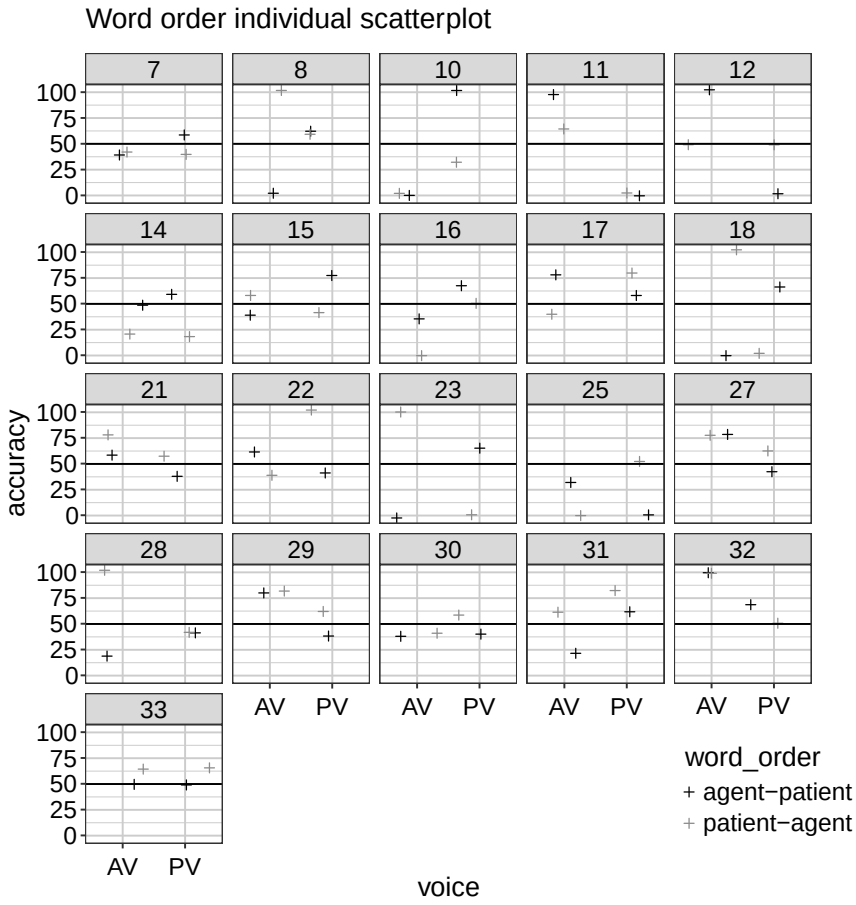


Figure 3. Scatterplot of individual data of children

7. Concluding remarks

Our results show that Paiwan children struggle with simple declarative sentences. Their selection patterns in the aggregate were random and at-chance, except for the condition in which the verb was marked with the agent-voice and the word order was patient-agent. This result is consistent with the report on adult's preference in the reference grammar of Chang (2018). It differs, however, from the preference of Tagalog speakers, as well as the purportedly-universal agent-initial preference. Nonetheless, further inspection of our results revealed that most children showed high accuracy in at least one of the conditions in our experiment, but which pattern varies from child to child. This suggests that Paiwan children take different routes in the acquisition of voice and declarative clauses. Nonetheless, despite accuracy in one of the four conditions, the fact remains that by age 5yrs, children acquiring Paiwan in its most favorable context

(a supposed immersion school in the heart of the traditional Paiwan region) struggle with a basic property of declarative clauses.

This fact augers poorly for the future of the language, as it suggests weakness and vulnerability to erosion. Our experiment therefore indicates the (partial) failure of intergenerational transmission of the Paiwan language, and further underscores its current endangered status. These results will be reported to the community, and we plan to assist the community in addressing these issues, if they so wish.

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Proceedings of the 46th annual Boston University Conference on Language Development

edited by Ying Gong
and Felix Kpogo

Cascadilla Press Somerville, MA 2022

ISSN 1080-692X
ISBN 978-1-57473-077-7 (2 volume set, paperback)

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