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BASELINE RESULTS FROM A PSYCHOLINGUISTIC TOOL FOR THE ASSESSMENT OF LANGUAGE SHIFT IN TRUKU SEEDIQ[1]

APAY (AI-YU) TANG

A major obstacle to the early diagnosis of language shift is the absence of an easy-to-use measure of language strength. The body-part naming task being developed as part of the Hawai'i Assessment of Language Access (HALA) project exploits the fact that the speed with which bilingual speakers access lexical items in their two languages offers a sensitive measure of relative language strength. It also allows the evaluation of label accuracy, another indicator of language strength. The purposes of this study are to (i) further assess the HALA approach, (ii) assess Truku strength (vs. Mandarin) across age groups, and (iii) establish baseline data as a starting point for developing conservation programs. A total of sixty-eight participants in four age cohorts were tested (ages: 10–15, 16–25, 26–40, and 41–65). All were ethnic Truku. As predicted, Truku (non-dominant language) produced longer response times and lower accuracy than Mandarin (dominant language) across all speakers suggesting a cross-generational decline of Truku. Moreover, response time offers a more precise and superior measure of language access than accuracy does. Young adults and youth score equally well on vocabulary access in Truku, but the youth have slower response times suggesting further decline and the need for urgent remedial action if Truku is to survive for another generation.

1. INTRODUCTION. Despite the considerable amount of research and concern in the fields of bilingualism and language documentation, little attention has been paid to the early diagnosis of language attrition that eventually leads to language loss. Bradley and Bradley (2002:xi) state that "various scholars have estimated that up to 90 percent of the world's languages will disappear during the 21st century unless—and many perhaps even if—we do something now." However, in an observation on Australian Aboriginal languages, Schmidt (1990:32) notes that "recognition of language loss is often delayed." It is usually difficult to retrieve a disappearing language by the time a speech community becomes aware of impending language loss. Therefore, an easy-to-use measure of language strength is much needed as a tool to diagnose the degree of language vitality in a speech community. Though language loss is always in response to external economic, social, and political pressures, it is ultimately a neurological phenomenon. Language proficiency needs to be maintained by an intricate network involving changes in words, phrasal operations, and other resources that are comprised and implemented as "language" in a human's brain (O'Grady, Schafer, Perla, Lee, and Wieting 2009:100). This simple fact motivates the introduction of a new tool using psycholinguistic methods to assess and measure language loss. The body-part naming task being developed in the Hawai'i Assessment of Language Access (HALA) project allows the evaluation of two indicators of language strength: speed and label accuracy.[2] In this study, the task was tested in two languages: Truku, the disappearing language, and Mandarin Chinese (Mandarin), the dominant language in eastern Taiwan.

The purposes of this study are to (i) further assess the HALA approach, (ii) assess Truku strength (vs. Mandarin) across age groups, and (iii) establish baseline data as a starting point for developing conservation programs. Specifically, the question being asked is "Are younger generations weaker in Truku than

[1] The population of Truku is around 24,000, but the number of speakers is unknown. According to the classification for degree of language endangerment by Krauss (2007:1–8), Truku is categorized as a definitely endangered language, which is spoken only by the parental generation and up. Truku is one of the dialects of the Seediq language.

[2] The HALA project was developed by O'Grady et al. in 2009. It is "a series of tests that assess language activation in groups of speakers, by measuring speed of access to lexical items and structure-building routines" (O'Grady et al. 2009:100).

older speakers?" It is hypothesized that (i) all speakers have lower accuracy, longer response times, and lower reported proportion of use for Truku than for Mandarin; (ii) the older speakers have higher accuracy, shorter response times, and higher reported proportion of use in Truku than the younger ones; (iii) accuracy is higher and response times are faster for high-frequency than for low-frequency items; and (iv) reported proportion of use is positively correlated with accuracy and negatively correlated with response times. I begin with a brief discussion of the relationship among bilinguals, language dominance, attrition, and maintenance in section 2. In section 3, the body-part naming task and its application in this study to assess the relative strength of Truku and Mandarin is described. I then report the results on accuracy and speed (showing in Response Times/RTs), along with the demographic data in section 4. Finally, I discuss the results and conclude with some remarks about the further assessment of the HALA project and my future research.

2. BILINGUALS, LANGUAGE DOMINANCE, ATTRITION AND MAINTENANCE. Language dominance and attrition are intimately linked in a bilingual environment. In terms of language dominance, Yip and Matthews (2006:98) claim that "when the input is less than balanced, one of the two languages may develop faster or show greater complexity at a given age. This language is said to be dominant." Köpke (2007:3) points out that the recent view on the traffic between bilingual language systems is that it is bi-directional, in contrast to the traditional assumption that it is normally one-way. She further states that "the difference between L1 interference on L2 on one hand and L2 interference on L1 on the other is perceptible in both SLA and L1 attrition." Namely, when the L2 is prevalent in daily usage, the L2 becomes dominant and the L1 undergoes attrition. As for language attrition, it is traditionally assumed that there is a stable and unchanging baseline from which acquisition, knowledge, and relative use of L1 and L2 deviate in some way. Schmid and Köpke (2007:3) state that some conditions need to be satisfied in order for language attrition to set in: extensive use of the L2, extremely reduced use of the L1 in daily life, plus a fairly long time span (decades). They also note the influence of *plasticity* as significant among younger generations; as L1 use is reduced and the L2 is being learned, speakers need to adapt to the new linguistic environment. However, for the younger speakers, their synaptic connections are not yet fully mature, which facilitates their making an easier and quicker adaption to the new situation (Köpke 2007:18). For the Truku-Mandarin participants in this study, use of Truku has been extremely reduced in daily life, as can be predicted by the dominance of Mandarin, and young Truku are expected to be more greatly influenced by Mandarin.

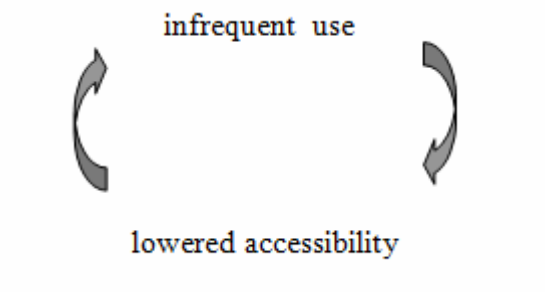
Maintaining two languages at comparable levels of activation requires effort. De Bot observes that whether in a bilingual or multilingual environment, all languages need to be used and maintained; otherwise, an unused language will attrite. He further asserts that the acquisition of another language will cause the less-used language to become less easy to access and states that "it's not about how much memory space we have to store language material ... but about the time and resources needed to keep all parts of the system in the foreground of processing ... learning another language does not remove older languages from memory, but does push them more to the background and makes it accordingly more difficult to access them" (2004:234). Hence, frequency of language use is closely correlated with the level of activation and speed of accessibility. As Paradis (2004:28) points out, to reach activation a certain number of neural impulses, correlated with language use, are needed.[3] Köpke (2007:18) also claims that "… those L2 items or rules used more frequently will be more easily activated when they are in competition with less frequently used L1 items or rules." Therefore, only frequency of use can maintain the accessibility of a language. O'Grady et al. (2009:4) view this as a natural cycle: "as a language becomes less accessible through infrequent use, its speakers become reluctant to use it, further decreasing its accessibility and creating the downward spiral that ultimately leads to language loss." This cycle is represented in figure 1.[4]

[3] This theoretical claim is based on Paradis's Activation Threshold Hypothesis, which assumes that the frequency of use entails facilitation of activation.

[4] This figure is from http://scholarspace.manoa.hawaii.edu/bitstream/10125/5105/9/5105.pdf (O'Grady et al. 2009:101).

Consequently, along with the evaluation of label accuracy, the speed of accessibility serves as a potent indicator of relative language strength. The newly developed HALA experiment provides an easier way to measure these two dependent variables in a bilingual setting.

FIGURE 1. The cycle of decreasing usage and lowered accessibility that leads to language loss



Along with the psycholinguistic phenomena, the assessment of language dominance and attrition requires knowledge of sociolinguistic parameters, including reported Truku dominance and proportion of Truku use. Lanza (2004:172–73) emphasizes that "language dominance is essentially a psycholinguistic phenomenon closely intermeshed with sociolinguistic parameters." In the same vein, Köpke (2007:10) puts emphasis on the correlation between language attrition and social aspects of language use. She claims that language attrition, though clearly defined as an individual phenomenon, is intimately linked to social aspects of language use. Before discussing the sociolinguistic parameters of this study, I now describe the psycholinguistic methods used to measure Truku language strength and shift.

3. METHOD. The body-part naming task exploits the fact that the speed with which bilingual speakers access lexical items in their two languages offers a sensitive measure of relative language strength. It also allows the evaluation of label accuracy, another indicator of language strength. Thus, it is crucial to compare how quickly and how accurately a speaker responds to a given lexical item in both Truku and Mandarin rather than to compare whether speaker A is faster and more accurate than speaker B at accessing a word in Truku or Mandarin within a cohort or group. The presence of asymmetry within a speaker helps to indicate the relative language strength. The validity of the body-part naming test is based on the three properties that the HALA project suggests: (i) having counterparts of vocabulary items in all languages; (ii) containing basic items that can be acquired by all speakers; and (iii) being resistant to replacement by borrowing (O'Grady et al. 2009:4).

3.1 PARTICIPANTS. A total of sixty-eight participants in four age cohorts was tested. The Older Adults (OA) ranged in age from 41 to 65 years old; the Adults (AD) were 26 to 40 years old; the Young Adults (YA) were from 16 to 25 years old; and the Youth (YO) were from 10 to 15 years old. All were ethnic Truku living in Qowgan village, Hualien, Taiwan. Each cohort had seventeen participants, with an almost even number of males and females in each group. All participants grew up in bilingual Truku- and Mandarin-speaking families. The participants in the OA group had experienced being forbidden to speak *fangyan* 'local dialects' in schools during the years 1945–1987. The participants in the YO group receive one hour a week of Truku instruction both at their schools and in an after-school program in the village due to the language policy of the "Nine-year Curriculum" begun in 1999. Except for OA, most participants in the other three groups have been exposed to Truku at home and to Mandarin outside the home. The proportion of reported Truku dominance and reported use of Truku is shown in table 3 in section 4.3. I excluded the data from five participants, three from AD and two from YA, because of their short habitation in Truku villages or inebriation at the time of testing.

3.2 MATERIALS. The task can be easily completed by participants. They name 43 pictures of body parts divided into three strata of frequency of occurrence, first in Truku and then in Mandarin or vice versa. The set of items is arranged into two different orders, order A and order B. Response times are re-

corded and measured from the onset of the picture to the onset of their response in milliseconds (ms). Thus, each participant's reaction times for Truku versus Mandarin within a cohort are compared.

3.3 DESIGN AND PROCEDURE. Every participant needs to be tested in both Truku and Mandarin. To lower any expectation that might be generated of what pictures they will see in the second session of the test, half the participants are tested first in Truku, and then in English, whereas the other half of the participants were tested in the reverse order; participant A, for instance, is tested with order A in Truku on the first day and with order B in Mandarin the next day, while participant B is tested in the reverse order. Hence, 34 out of 68 participants were tested first in Truku and the other 34 were tested first in Mandarin. To familiarize them with the task, each participant first practiced naming 12 items after being given brief instructions about the experiment. Then the main set of items begins, and it appears in the following order: the high-frequency, the medium-frequency, and the low-frequency subsets, as shown in table 1. However, a different random order of the items is provided within each subset for each language. After the naming task, every participant in OA and AD is required to fill out the Language Experience and Proficiency Questionnaire (LEAP-Q) designed by Marian, Blumenfield, and Kaushanskaya (2007:940–67). However, to increase the level of objectivity, the LEAP-Q was administered orally with the young participants in YA and YO.

TABLE 1. Test items by stratum

High frequency/stratum 1		Medium frequency/stratum 2	Low frequency/stratum 3
back	mouth	arm	ankle
ear	nose	cheek	arch
eye	shoulder	chin	bicep
face	stomach	eyebrow	calf
fingers	teeth	fingernail	cheekbone
foot	tongue	forehead	elbow
hair		neck	eyelid
hand		palm	forearm
head		thumb	heel
knee		toe	knuckle
leg		waist	pupil
lips		wrist	shin
			toenails

The photo of each item appeared in the center of a laptop computer in a quiet room.[5] Each black and white image of an item was displayed while a short beep was simultaneously produced to capture participants' attention. As the photo was shown on the computer screen, the participant named a red-circled body part as quickly as possible. S/he could skip the item if it was unknown to them. Then the subsequent item followed after 5000 ms. The whole set of response times was audio recorded and measured in milliseconds from the onset of the picture to the onset of participants' reaction.

3. PREDICTIONS. Consistent with other psycholinguistic principles, response time is negatively correlated with frequency of language use. Hence, it is predicted that (i) speakers produce lower accuracy, longer response times, and lower reported proportion of use for Truku than Mandarin across all age groups; (ii) the older participants including OA and AD produce higher accuracy, shorter response times, and reported higher proportion of use for Truku than the younger ones including YA and YO; (iii) accuracy is higher and response times are faster for high-frequency than for low-frequency items; and (iv) reported proportion of use is positively correlated with accuracy and negatively correlated with response times.

[5] Sixty-two participants' experiments were done in Bou-Dou Tang's house in Qowgan village; the other six participants did their tests in their respective houses.

4. RESULTS. Psycholinguistic phenomena, including level of accuracy and response times, as well as the sociolinguistic parameter of participants' proportions of language use, and the correlations among level of accuracy, response times, and reported proportion of use are reported here.

4.1 ACCURACY. An item was coded as "accurate" if the participant produced and pronounced it correctly. Responses are considered inaccurate in the cases of: (i) mispronunciation, (ii) incomplete or no response, and (iii) an analyzer's being unable to hear the response. Figure 2 summarizes the level of accuracy of all participants, presenting the proportion of accurate responses to each item in the three different strata: high-frequency items in (2a), medium-frequency items in (2b), and low-frequency items in (2c).

FIGURE 2a. Accuracy on the naming task across four cohorts in **High**-frequency items

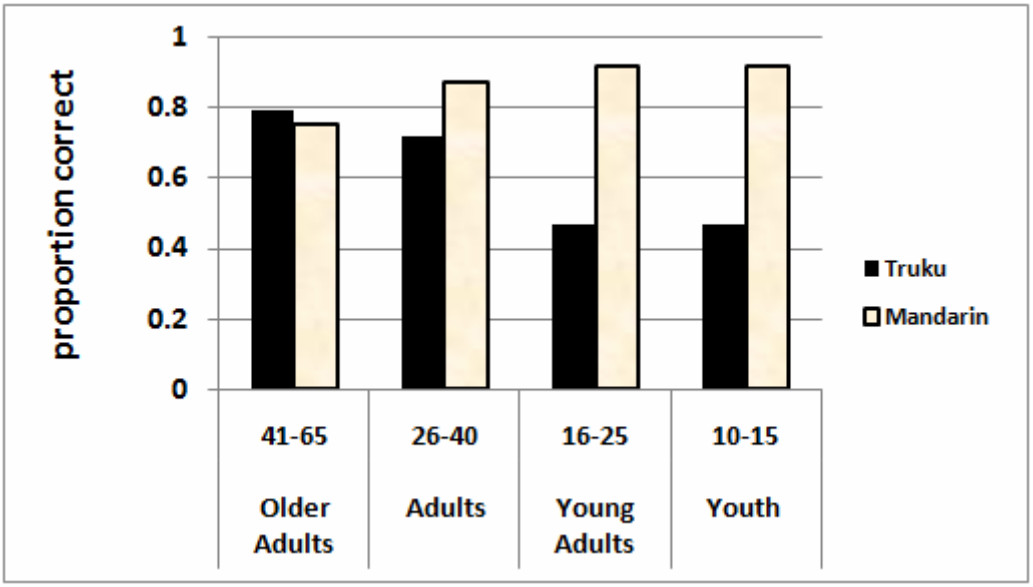


FIGURE 2b. Accuracy on the naming task across four cohorts in **Medium**-frequency items

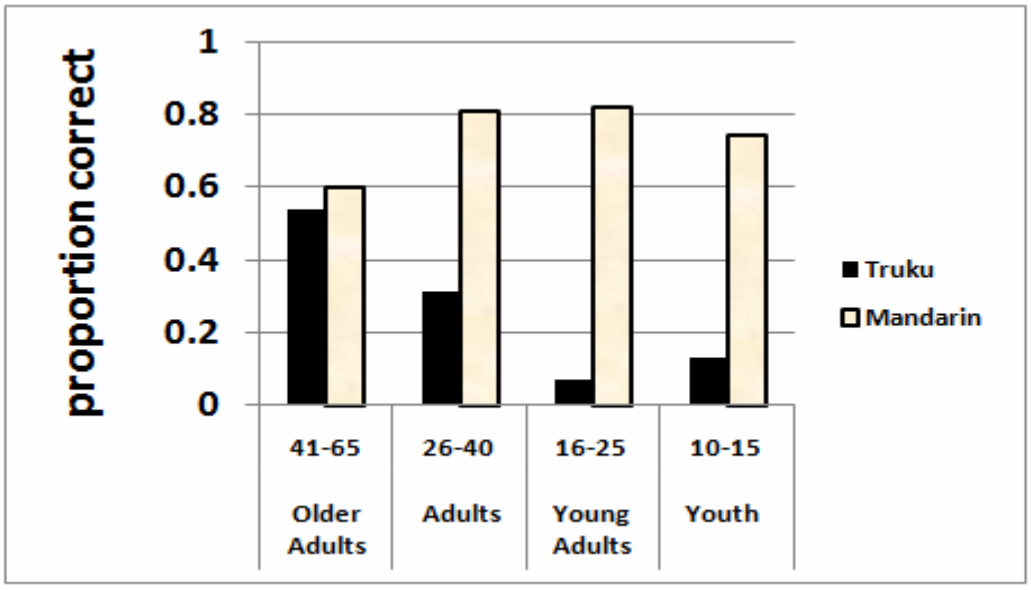
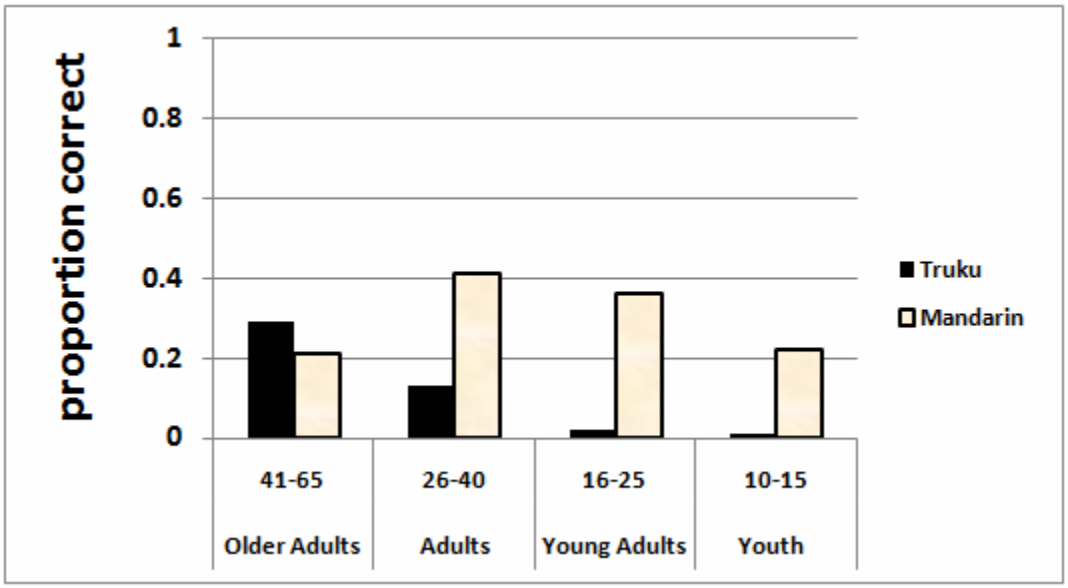


FIGURE 2c. Accuracy on the naming task across four cohorts in **Low**-frequency items



Four conclusions can be drawn here that provide evidence of Mandarin dominance and cross-generational decline of Truku. First, accuracy is higher in Mandarin than Truku in 10 of 12 cases (see below for a statistical analysis). All participants except those in OA show higher accuracy in Mandarin than Truku across all three strata, and there is a shift from a Truku to a Mandarin advantage starting with the participants in AD. The participants in OA and AD have a higher level of accuracy in Truku than those in YA and YO, whereas the participants in AD, YA, and YO appear to have a higher level of accuracy in Mandarin than those in OA. In the high-frequency items, the level of Mandarin accuracy is 75% in OA, 87% in AD, and 92% in both YA and YO. However, the level of Truku accuracy is 79% in OA, 72% in AD, and 47% in both YA and YO. In the medium-frequency items, the level of Mandarin accuracy is 60% in OA, 81% in AD, 82% in YA, and 74% in YO, whereas the level of Truku accuracy is 54% in OA, 31% in AD, 7% in YA, and 13% in YO. In the low-frequency items, the level of Mandarin accuracy is 21% in OA, 41% in AD, 36% in YA, and 22% in YO, while the level of Truku accuracy is 29% in OA, 13% in AD, 2% in YA, and only 1% in YO.

Second, Truku accuracy becomes lower across the three strata as the cohort becomes younger. For example, as shown in (2a), for the high-frequency items the rate of accuracy changes from 79% in OA, to 72% in AD, and to 47% in both YA and YO in Truku. Next, the degree of Mandarin dominance is higher in the younger generations (YA and YO) than in the older generations (OA and AD). In the high-frequency items, the level of Mandarin advantage is 45 percentage points in YA and YO versus 6 percentage points in OA and AD; 68 percentage points versus 28 percentage points in the medium-frequency items, and 28 percentage points versus 10 percentage points in the low-frequency items. Finally, many participants, especially in YA and YO, show sound changes from (i) lateral fricative /□/ to alveolar nasal /n/; (ii) uvular stop /q/ to velar stop /k/; and (iii) velar fricative /x/ to glottal fricative /h/ throughout their responses.[6]

These results are consistent with their self-reports, shown in table 3 below, according to which Truku tends to be the dominant language in OA (71%) and AD (31%), and the use of Truku is 74% in OA and 45% in AD. In contrast, YA and YO report 0% of Truku dominance, and the Truku use is 20% in YA and 17% in YO. Inferential statistics were computed treating first participants and then items as random variables. In the by-participant analysis, a repeated measures analysis of variance (ANOVA) with factors language (Truku vs. Mandarin) and stratum/item frequency (S1 vs. S2 vs. S3) showed a significant main ef-

[6] These sound changes did not affect the scoring of accurate responses in the young adults and youth.

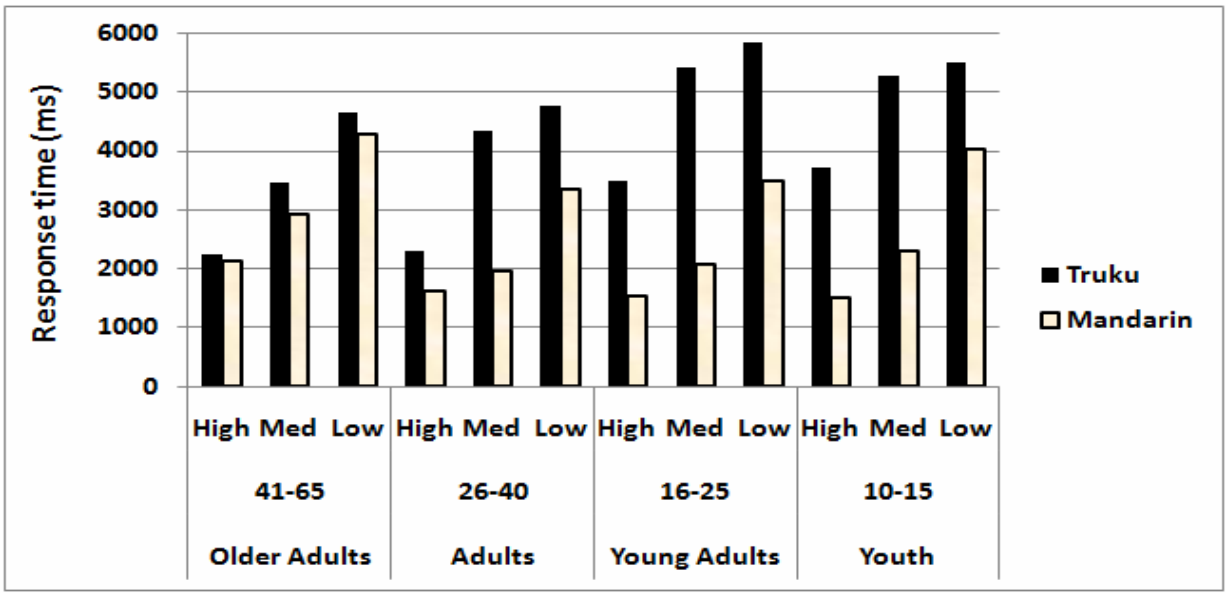
fect of stratum ($F(2,32)=238.534$, $p < .05$) in OA; a significant main effect of language ($F(1,13)=52.377$, $p < .05$), stratum ($F(2,26)=145.413$, $p < .05$), and interaction of strata and language ($F(2,26)=17.951$, $p < .05$) in AD; a significant main effect of language ($F(1,14)=189.455$, $p < .05$), stratum ($F(2,28)=133.839$, $p < .05$), and interaction of strata and language ($F(2,28)=46.060$, $p < .05$) in YA; and a significant main effect of language ($F(1,16)=371.801$, $p < .05$), stratum ($F(2,32)=335.323$, $p < .05$), and interaction of strata and language ($F(2,32)=49.922$, $p < .05$) in YO.

In the by-item analysis, OA showed a significant main effect of stratum ($F(2,86)=5.256$, $p < .05$); AD showed a significant main effect of language ($F(1,43)=5.596$, $p < .05$), and stratum ($F(2, 86)= 5.590$, $p < .05$); YA showed a significant main effect of language ($F(1,43)=125.291$, $p < .05$), and stratum ($F(2, 86)= 7.436$, $p < .05$); and YO showed a significant main effect of language ($F(1,44)=71.413$, $p < .05$), and stratum ($F(2, 88)= 8.873$, $p < .05$).

4.2 RESPONSE TIMES/RTs. The response times reflect the speed with which bilingual speakers access lexical items in each language. Two sets of RT results are presented here. First are all RTs including accurate and inaccurate responses. Second are the RTs with accurate responses only by matched-by-participant (MBP) analysis, meaning that only the items that a participant names accurately in both Truku and Mandarin are kept.

4.2.1 RTS WITH BOTH INACCUATE AND ACCURATE RESPONSES. Figure 3 summarizes the mean RTs of all participants in responding to all 43 body-part picture stimuli, with the average time in milliseconds at which they accurately or inaccurately named the image.

Figure 3. Mean response time (accurate and inaccurate responses)

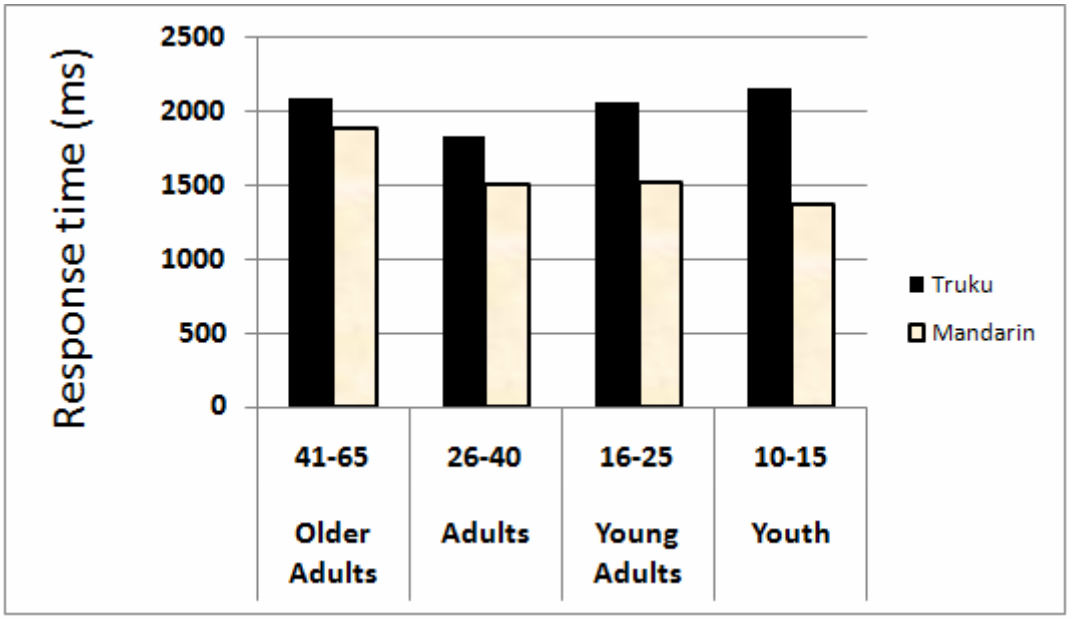


As shown here, all speakers exhibit longer response times in Truku and shorter response times in Mandarin on all three vocabulary strata. In addition, the language difference becomes stronger as the cohort becomes younger. Specifically, the participants in OA show little difference in response times in the two languages (348ms). The difference in response times between languages is much larger in AD (1499ms), YA (2558ms), and YO (2216ms). Moreover, a stratum effect is observed here: the response times for both languages are longer as the item frequency decreases across all cohorts. The longest response times (> 5000ms) fall onto the medium- and low-frequency items in YA and YO.

4.2.2 ACCURATE RESPONSES: To increase the validity of the data, all inaccurate responses were eliminated. Following common procedure in psycholinguistics, I excluded any response times that were more than the 2.5 standard deviation from the average response time for accurate responses in a partici-

pant. To carefully measure the response times for Truku vs. Mandarin in each speaker as an indicator of relative access, only items that a participant named accurately in both Truku and Mandarin were kept in the analysis. This reduces any confound due to picture difficulty or concept complexity. The results are presented in figure 4.

Figure 4. Mean response time for high accuracy items in match-by-participant analysis



Three observations can be made here. First, the validity is higher in this set of items because only high accuracy items in both languages were measured; the longest response time for Truku reduced to 2158ms, whereas the longest response time for Truku was 5852ms in the all-response data shown in figure 3 above. Next, Truku produced longer response times (2035ms) than Mandarin (1568ms) across all speakers even in the high accuracy items. Last, the dominance effect increased as the cohort became younger; the difference in response times for Mandarin and Truku grows larger as the cohorts get younger (208ms in OA > 330ms in AD > 543ms in YA > 787ms in YO). Statistically, paired t-tests did not find a significant effect of language in OA ($p < 0.4$) but found a significant effect of language in the other, younger cohorts ($p < 0.06$ in AD; $p < 0.04$ in YA; and $p < 0.001$ in YO) suggesting that language differences become stronger as the cohort becomes younger. Crucially, the difference between YA and YO was not captured by the accuracy measure reported in figure (2a) above (Truku accuracy is 47% and Mandarin accuracy is 92% in both YA and YO) but was captured in the measurement of response times as shown in figure 4.

To show further how response times reflect language strength, I provide the counts of response time patterns for high accuracy items averaging over participants in table (2a) and for participants averaging over all high accuracy items (2b). Like the mean response times discussed above, the counts of response time patterns averaging over all participants and high accuracy items also show fine differences between the YA and YO as seen in (2a) and (2b) below. The notation "Truku < Mandarin" represents a Truku advantage while "Truku > Mandarin" shows a Mandarin advantage averaging over all participants in (2a) or items in (2b).[7]

[7] The notation "<" indicates that the response times in Truku are "faster than" those in Mandarin whereas ">" means that the response times in Truku are "slower than" those in Mandarin.

TABLE 2a. Counts of response time patterns for high accuracy **items**

Cohort	Truku < Mandarin	Truku > Mandarin
Older Adults	12	13
Adults	4	15
Younger Adults	1	9
Youth	1	7

As shown here in table (2a), the participants in OA were balanced in using Truku and Mandarin with the high accuracy items; twelve items showed a Truku advantage and thirteen items showed a Mandarin advantage. Then in AD, only four items showed a Truku preference and fifteen showed a Mandarin preference. The participants in both YA and YO consistently showed a Mandarin preference in response times even for items with high accuracy in both languages. There is only one item (i.e., baga 'hand') for each of the two younger groups showing a Truku preference.

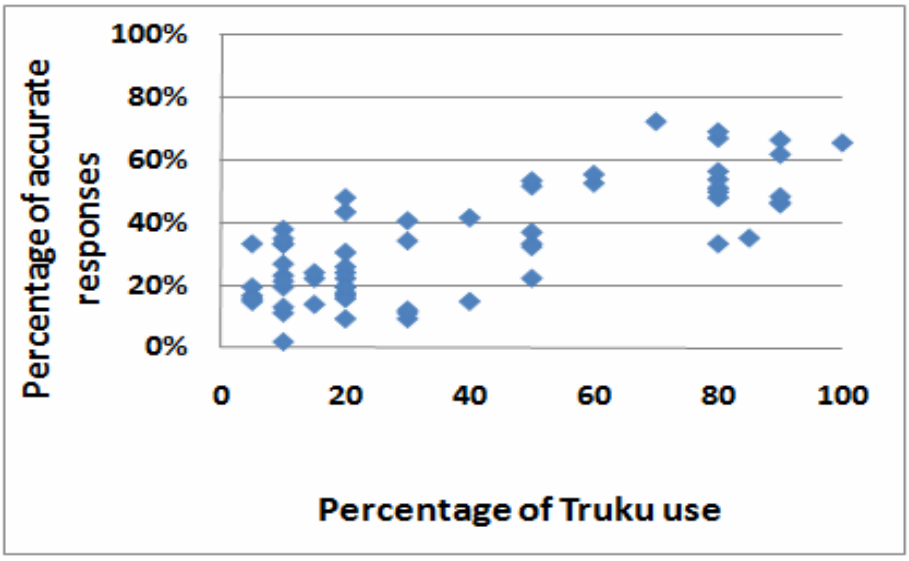
TABLE 2B. Counts of response time patterns for **participants** on high accuracy items

Cohort	Truku < Mandarin	Truku > Mandarin
Older Adults	8	9
Adults	4	10
Younger Adults	5	10
Youth	2	15

Similar to the counts of response times patterns for high accuracy items in (2a) above, the participants in OA were balanced in using both Truku and Mandarin with these high accuracy items as shown in (2b); eight participants showed a Truku advantage when averaging over all accurate items whereas nine showed a Mandarin advantage. Consistent with the items analysis in (2a), only four speakers showed a Truku preference, while ten showed a Mandarin preference in AD. In addition, most participants in YA and YO strongly shift to a Mandarin advantage.

4.3 PERCENTAGE OF LANGUAGE USE. Both accuracy and response times correlated with self-reports on language use. Figure 5a summarizes the correlation between the amount of accurate responses and the reported percentage of use in Truku. Figure 5b shows the correlation between the response times of accurate responses and reported percentage of use in Truku.

FIGURE 5a. Correlation between accuracy and reported percentage of use in Truku across all cohorts.

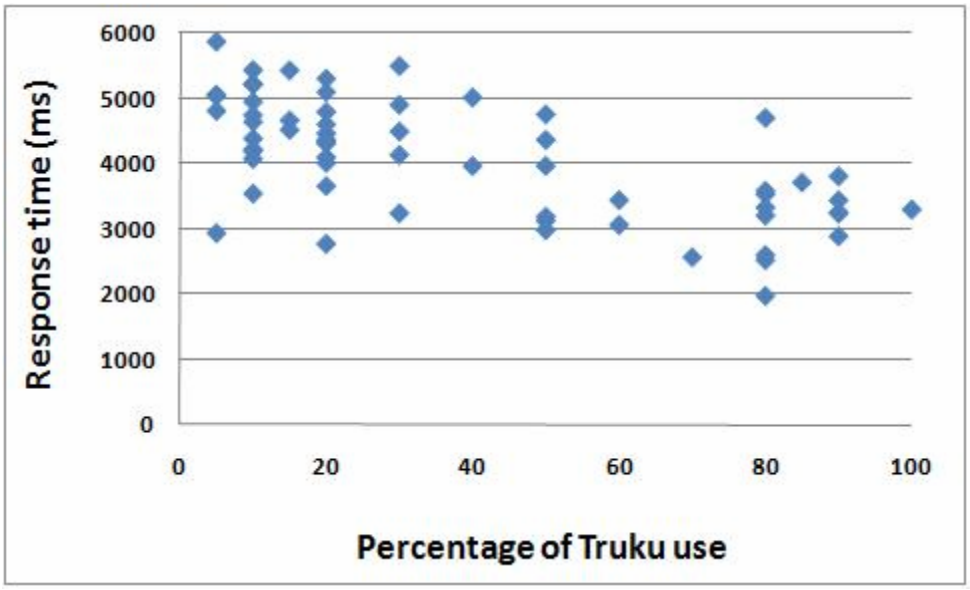


As can be seen here, the reported proportion of use is positively correlated with the level of accuracy: the less Truku is used, the less accurate participants are. As for the older speakers, 71% of participants in OA and 31% in AD considered Truku as their dominant language and reported speaking Truku for between 74% and 45% of their daily language use.[8] These reported data correlated with their level of accuracy (80% in OA and 72% in AD), as shown in table 3. In contrast, no participant in the younger groups of YA and YO considered Truku to be their dominant language, and it constituted only between 20% and 17% of their daily language use. They also performed at lower level of accuracy, 47%.

TABLE 3. Proportion of reported Truku dominance, use and accuracy

Cohort	OA (Older Adults)	AD (Adults)	YA (Young Adults)	YO (Youth)
Reported Truku dominance	71%	31%	0%	0%
Reported Truku daily use	74%	45%	20%	17%
Level of accuracy (high-frequency words)	80%	72%	47%	47%
Differential in response times for Mandarin and Truku	208ms	330ms	543ms	787ms

FIGURE 5b. Correlation between response times and reported percentage of use in Truku across all cohorts.



As shown in figure 5b, the reported percentage of use is negatively correlated with response times; the less Truku is used, the slower participants are. As can be seen in table 3 above, the older speakers reported that Truku is their dominant language and showed a smaller difference in response times for Mandarin and Truku (208ms in OA and 330ms in AD) than the younger participants. The self-assessment in younger cohorts reported that Mandarin is their dominant language, and the difference in response times for the two languages is much larger than for the older speakers (543ms in YA and 787ms in YO). How-

[8] 74% and 45% were the average of the participants' reported percentage of daily Truku use in OA and AD, respectively.

ever, it is noteworthy that OA reported more use of Truku, but still responded faster in Mandarin, suggesting that self-reports may be misleading.

5. DISCUSSION. Two main findings can be supported from these test results. First, though the level of accuracy in the young adults and youth was equivalent in the high-frequency items, the response time for items that the participants named accurately in both Truku and Mandarin were slower in the youth. Statistically, both groups showed a significant effect of language in the response times, but the effect of language dominance did show up more strongly in the youth ($p < 0.04$ in YA and $p < 0.001$ in YO). This shows that level of accuracy can serve as an indicator of language strength but is not as reliable as response time in detecting the subtle differences between two languages. As a result, compared to accuracy, response time is a superior measure of dominance effects. The young adults and the youth show very similar levels of accuracy on high, mid, and low frequency vocabulary items. This might suggest stabilization in language loss. However, if we take a closer look at reaction times, the differential in response times for Mandarin and Truku is larger for the youth (787ms) than for the young adults (543ms). This suggests ongoing language decline in the youth group.

Second, the effect of language dominance is manifested in the differences in response times for the two languages even in the high accuracy items. In addition, the differences between the young adult group and the youth group in the number of correct responses and the response times for both languages can be measured even with high accuracy items. Inferential statistics also show that the language difference becomes stronger as the cohort becomes younger. This confirms the inference that response times can serve as a more reliable indicator of dominance.

6. CONCLUDING REMARKS. As we can see from the results of this body-part naming task, there are three strong signs of cross-generational decline of Truku. First, the level of accuracy in vocabulary use is higher in older speakers than in younger ones in the high-frequency words (80% > 72% > 47% > 47%). In addition, the young adults and the youth show very similar levels of low accuracy on high, mid, and low frequency vocabulary items. Second, response time difference between Truku and Mandarin grows greater for younger groups, even for high-accuracy items (208ms > 330ms > 543ms > 787ms). This suggests slower access to the language for young speakers. Third, both accuracy and response times correlated with self reports on language use: the less Truku is used, the less accurate and slower the participants are. In addition, OA reported more use of Truku, but still responded faster in Mandarin. However, the most important finding from this study in terms of the measurement of language strength is that response time offers a more precise measure of language access than accuracy does. Young adults and youth score equally well on vocabulary access in Truku, but the youth have slower response times—suggesting further decline and the need for urgent remedial action if Truku is to survive another generation.

In this study, we see a strong correlation between language dominance and response times even with highly fluent participants. The HALA test creates a psycholinguistic record of Truku strength at the lexical level by using the body-part naming task. In addition, based on the results of response times especially, we see not only strong signs of cross-generational decline of Truku, but also further decline in the youth compared to the young adults. It is hoped that the baseline results of the current study can serve as a point of comparison for further assessing Truku language skills, and as a starting point for developing Truku conservation programs in the near future. To increase the validity of the data and for comparison to the baseline results from the present body-part naming task, I will further look at the degree of Truku attrition at other lexical and phrasal levels by exploring young Turku's ability to access structure-building operations through nature naming and syntax tasks provided by the HALA project. The results derived from the three HALA tests will be quantified and serve as supplemental support to the observation that linguistic characteristics are undergoing attrition. It is my hope that together with descriptive linguistic documentation, this psycholinguistic record of Truku strength can provide quantitative data to convince the government and Truku local communities to take urgent remedial action for the indigenous languages in Taiwan.

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