Title. Processing syntactic ergativity in Tongan relative clauses

Introduction.   In the psycholinguistic literature, it has been found that the processing cost for the subject relative clauses (SRC) is lower than that for the object relative clauses (ORC) in many languages (Kwon, et al., 2010, for review). At the same time, grammatical properties in a given language such as word order and its Case system are known to greatly influence how the parser processes sentences (Koizumi, et al., 2014, Aoshima, et al., 2004, among others). For example, previous research on the processing of relative clauses in ergative languages has shown absolute case (ABS) advantage: ABS-ORC is less costly to process than ergative (ERG) SRC (Polinsky, et al., 2012 on Avar; Carreiras, et al., 2010 on Basque; Ono, et al., 2019 on Tongan).

In Avar and Basque, which have SOV word-order and pre-nominal relative clauses, the observed "ABS advantage" may come from the bias for the linearly-short dependency. In contrast, since Tongan is V-initial and has post-nominal relative clauses, the ABS object is structurally and linearly distant from the head noun, making it possible to tease apart the two factors, Case and linear distance. While Ono, et al. (2019) show that ERG-SRC took more time to process than ABS-ORC in Tongan, crucially, their study does not include ABS-SRC. Thus, while their results show that Tongan has the ABS advantage, they do not necessarily show that Tongan does not exhibit the subject preference. Our study examined the relative clause processing in Tongan to address this point. A self-paced reading experiment shows that Tongan has the subject advantage, in addition to the ABS advantage.

Syntactic Ergativity.   Tongan exhibits syntactic ergativity in relative clause structures. As shown in (1a), when a transitive subject (ergative NP) is relativized (SRC), a pre-verbal resumptive pronoun (RP) *ne* must be present; on the other hand, as shown in (1b), when a transitive object (absolutive NP) is relativized (ORC), such an RP cannot appear.

(1a) 'a e tōketā   [na'a *(ne)   taa'i __   'a e neesi].
    ABS-doctor   PST   RP   hit   ABS-nurse   'the doctor who hit the nurse'

(1b) 'a e tōketā   [na'e (*ne)   taa'i   'e he neesi   ___].
    ABS-doctor   PST   RP   hit   ERG-nurse   'the doctor who the nurse hit'

Experiment.   Fifty-five native speakers of Tongan participated in a self-paced reading study conducted with the software *Linger* (written by Douglas Rohde), which measured the reading time for each phrase. Twenty-one sets of target sentence triplets were prepared, along with 46 filler sentences. A sample set of target sentence triplet is shown in (2), (3), and (4). The underlined part is the relative clause, and the subscripted number represents the region number.

(2)   Materials that precede (3abc)
    Na'e vakai 'e he kau ta'o maá . . .
    PST   visit   ERG-bread bakers

(4)   Materials that follow (3abc)
    . . . hili 'enau lau 'a e nusipepá.
    . . . after they read   ABS-newspaper

(3a) **Ergative Subject** extraction condition (transitive verb)
    . . . 'a e tangata faimana $\underline{na'a\ ne_5\ \ faitaa'i_6\ \ \ \ 'a\ e\ fakamaaú_7}$ . . .
    ABS-magician   PST-RP   photograph   ABS-judge
    'The bread bakers visited the magician who __ photographed the judge . . .'

(3b) **Absolutive Object** extraction condition (transitive verb)
    . . . 'a e tangata faimana $\underline{na'e_5\ \ \ \ faitaa'i_6\ \ \ \ 'e\ he\ fakamaaú_7}$ . . .
    ABS-magician   PST   photograph   ERG-judge
    'The bread bakers visited the magician who the judge photographed __ . . .'

(3c) **Absolutive Subject** extraction condition (middle verb)

... 'a e tangata faimana   <u>na'e$_5$</u>   <u>sio$_6$</u>   <u>ki e fakamaaú$_7$</u> ...
    ABS-magician   PST   see   OBL-judge
'The bread bakers visited the magician who __ saw the judge ...'

The critical RC regions (underlined, Reg-5, 6, and 7) contain a past tense-marker (and an RP in (3a)), a verb, and an NP with different case-markers. The tense-marker indicates the beginning of the relative clause, and a transitive verb is used in (3a) and (3b), while a middle verb is used in (3c) that takes an absolutive subject and an oblique object. The matrix subject is always a plural NP (e.g., *bread bakers*) in all conditions, in order to avoid the temporal ambiguity of *ne* in (3a) from being taken as a pronoun referring to the matrix subject. In addition to the conditions with a transitive verb in RC, the target sentences with a middle verb (3c) were also prepared in order to examine the interaction between Case and the syntactic positions.

Analysis.   Three participants were excluded whose accuracy rate was exceedingly low; similarly, responses were excluded that were beyond 5,000 ms and below 100 ms. The mean accuracy rate for the comprehension questions for the target sentences was about 74%. The rest of the data was modeled using LME, with random intercepts for participants and items.

Results.   The mean reading time at Region 5 showed that there was a slowdown in ERG-Subj condition (3a), compared to other two conditions ($p < .01$). The slowdown is too large for the length effect, so may be due to the syntactic processing cost. In Region 6, ERG-Subj condition was still slower than ABS-Obj condition (3b) (marginally, $p < .07$) and ABS-Obj condition was slower than ABS-Subj condition (3c) ($p < .01$). In Region 7, ABS-Obj condition (3b) was marginally slower than ERG-Subj condition (3a) ($p < .09$).

Discussion.   Combined with the tense-marker (and an RP, if any), the appearance of the verb in Region 6 provides a necessary cue to determine the RC gap position in (3a) and (3b). The slow reading time of ERG-Subj (3a) in Region 5 and 6 suggests that the extraction of ERG subject is more costly than that of ABS object. This is consistent with the claim that ERG-SRC is more costly than ABS-ORC in Tongan (Ono, et al. 2019). The current findings indicate that ergativity is one of the major factors that determine the processing cost for the filler-gap dependencies in RC (cf. Avar and Basque), but at the same time, the contrast between ABS-Obj (3b) and ABS-Subj (3c) illustrates the subject advantage, which seems to be similar to Avar to some extent; the ABS advantage and the subject advantage are independently observed.

    The fact that the effect showed up at the verb suggests that native speakers of Tongan incrementally process the RC structure based on the information of the clause-initial verb (cf. Sauppe, 2016, Tollan, 2019). With respect to the marginally slow reading time in ABS-Obj condition (3b) in Region 7, we suspect that ERG NP in this region is costly due to its marked nature; this slowdown should not be due to some kind of reanalysis because the parser should be able to predict its appearance based on the information in Region 5 and 6.

    Taken together, Tongan exhibits both the subject advantage and the ABS advantage. We should note that, unlike Avar, the ABS advantage seems stronger than the subject advantage. Although ABS-Subj indicates the subject advantage, the contrast between ERG-Subj and ABS-Obj still showed up. We suggest that syntactic ergativity is responsible for the strong influence of the ABS advantage.

Selected References.   Carreiras, et al. 2010. *Cognition* 115, 79–92. // Polinsky, et al. 2012. *Lingua* 122, 267–277. // Koizumi, et al. 2014. *Language* 90, 722–736. // Ono, et al. Talk at AFLA 26, Western University. // Sauppe. 2016. *Frontiers in Psychology* 7, 95. // Tollan. 2019. Ph.D. dissertation, University of Toronto.