

令和 5 年 6 月 22 日現在

機関番号：32615

研究種目：基盤研究(C) (一般)

研究期間：2018～2022

課題番号：18K00546

研究課題名(和文) A non-invasive test for diagnosing cognition in three SOV languages: Japanese, Korean and Bodo

研究課題名(英文) A non-invasive test for diagnosing cognition in three SOV languages: Japanese, Korean and Bodo

研究代表者

吉田 智行 (YOSHIDA, Tomoyuki)

国際基督教大学・教養学部・教授

研究者番号：50245669

交付決定額(研究期間全体)：(直接経費) 3,400,000円

研究成果の概要(和文)：本プロジェクトは、若年層と高齢者のSOV言語話者の文処理を研究した。日本語、韓国語、ノス彝[語]の3つの言語は、比較的自由的な語順、体言助詞の存在、名詞項の省略可能性などの文法的特徴を共有している。この研究では、他動詞文、道具項を含む他動詞文、および比較文の語順を調査した。三つの構造すべてにおいて、同等の結果が示された。若年層と比較して、高齢者は応答時間が遅いことに加えて正確度も低い傾向にある。これは、語順の変化により認知負荷が加わり、高齢者は若年層よりも負担が大きくなることを示唆している。これらの結果によって、助詞の存在だけではスクランブルされた文章を処理するには不十分であることが分かった。

研究成果の学術的意義や社会的意義

This cross-linguistic project has shown that (i) sentence processing mechanism across different SOV languages (Japanese, Korean, Nuosu Yi) is comparable, and (ii) the age effect is present in sentences with marked word order, which turned out to be more important than morphological marking.

研究成果の概要(英文)：This project investigated how younger and elder speakers of SOV languages process sentence types. The three languages, Japanese, Korean and Nuosu Yi share grammatical features, such as relatively free word order, the presence of nominal particles and possibility of dropping arguments. We investigated simple transitive sentences (subject-object versus object-subject), sentences with instrumentals (instrumental-object versus object-instrumental) and comparative sentences (target - standard versus standard-target).

In all three constructions, participants of the three languages display comparable results. Compared to younger speakers, elderly speakers tend to show lower accuracy in addition to slower response time, which suggests that the word order variation adds cognitive loads that burden elderly participants more than younger participants. These outcomes suggest that the presence of nominal particles may not be sufficient when speakers process scrambled sentences.

研究分野：Syntax

キーワード：Syntax Sentence Processing SOV languages Japanese Korean Nuosu Yi Aging effects

## 1. 研究開始当初の背景

Both Japan and Korea have an increasingly aged population. In Japan, it has been reported that the share of population by people over 65 reached 26% in 2014. In Korea, the ratio of elderly over 65 was 13% in 2015, but this number is expected to reach 40% by 2050. This project is unique in comparing two major SOV languages and an understudied SOV language that differ in the composition of aging population.

The significance of this proposal was three-fold. First, the project would collect data from three SOV languages (Japanese, Korean and a minority Tibeto-Burman language). Second, large scale data would be collected for both younger and elder groups in these languages. Third, results from this program would be an important steppingstone for further gerontology research based on linguistic perspectives.

This project aimed to contribute to the development of a cognitive oriented test that can be used in early diagnosis of non-typical language usage in elderly population. As such, collecting data from the younger generation was a critical part of the project, which would form a baseline of the entire research project. The findings would inform the research team about patterns in the elderly population who might not show easily identifiable linguistic patterns in everyday speech.

## 2. 研究の目的

The goal of the proposed research is to develop a cognitive test on sentence processing from three distinct languages (Japanese, Korean and Nuosu Yi) that differ minimally in the grammar of sentence structures. Data was to be collected from younger population as well as from the older population to observe any differences between these two distinct groups.

This research intended to produce data based on a non-invasive cognitive test that can be used for an early observation of the slowing of cognitive abilities. The research was to complement findings and methods in the medical field, in which researchers often approach aging from physiological perspectives, where chemical composites can elucidate any aging in progress. The medical approach is extremely useful once a body produces hormones related to aging. Our methods tried the same with cognitive tests. If findings from these two research streams would converge, it would suggest that these methods can be used in early observations.

## 3. 研究の方法

The research was conducted in various phases across 5 years (3 years plus 2 years of extension due to the pandemic). Common protocols were developed for collecting in comparable manner between the younger generation and the older generation. The collaborative team created sentences with varying syntactic conditions: (a) simple transitive sentences (subject-object-verb versus object-subject verb), (b) instrumentals (instrumental-object-verb versus object-instrumental-verb), and (c) comparatives (standard of comparison-associative-predicate versus associative-standard of comparison-predicate). After recording all the target sentences, they were judged for naturalness before a balanced set of examples is selected. Research assistants for each language group was trained with a written protocol to ensure that the same procedure is utilized to all pilot participants. After the pandemic that began in early 2020, data collection methods had to be revised to an online one. Using E-prime and Superlab that allowed remote data collection, online data collection was administered for Japanese and Nuosu Yi.

## 4. 研究成果

The main finding of this research project is that the three SOV languages, Japanese, Korean and Nuosu Yi, showed similarities in that unmarked word orders were processed faster and more accurately than marked word orders (subject first in transitive, object first in instrumental, associative first in comparatives). When different age groups are compared, the effect of aging was found across the constructions and the three languages as well. These findings further confirm those of Sung (2015) and Sung et al. (2017), in that the presence of nominal functional particles do not serve as sufficient cues in processing sentences.

The current program is unique because it compares three typologically similar languages across different age groups. As studies on aging and sentence processing often target speakers of English, the significance of this project is three-fold. First, we have found that the results between Korean and Japanese, two typologically close languages, are comparable across different constructions. Second, Nuosu Yi, a Tibeto-Burman language with SOV word order, also showed comparable results, suggesting that cross-linguistic similarities of these languages. Third, cognitively normal aged population are affected by word order of a sentence; marked word orders are processed with difficulties even though nominal particles are present.

These findings indicate that the effect of word order is stronger when processing sentences even in languages with nominal particles in aged population. The underutilization of morphology was unexpected which suggests that the types of syntactic structures take precedence over morphological information in the processing, suggesting comparability to English-like languages that do not have morphemes that denote grammatical information of nominals.

Future studies would need to address the online processing of syntactic information using eye-tracking in addition to forced choice judgement studies in this project. Such a study could show whether elderly speakers simply process information from left to right, or whether their behavior changes based on linguistic information.

An implication beyond the research topic has arisen related to communication with elderly speakers. The assumption has been that they would be sensitive to functional morphemes, but findings of this research project suggest that the presence of nominative particles may not be enough if the word order of a sentence deviates from the unmarked order, even in cognitively normal elderly group.

#### References:

- Sung, Jee Eun (2015) Age-Related Changes in Sentence Production Abilities and Their Relation to Working-Memory Capacity: Evidence from a Verb-Final Language. *PLoS ONE* 10(4): e0119424.
- Sung, Jee Eun, Jae Keun Yoo, Soo Eun Lee and Bora Eom (2017) Effects of age, working memory, and word order on passive-sentence comprehension: evidence from a verb-final language. *International Psychogeriatrics* 29(6) 939–948.

## 5. 主な発表論文等

〔雑誌論文〕 計3件（うち査読付論文 2件/うち国際共著 1件/うちオープンアクセス 3件）

1. 著者名 ARII Tomoe, LEE Seunghun J., YOSHIDA Tomoyuki, SUNG Jee Eun	4. 巻 64
2. 論文標題 Effects of Age, Word Order, and Sentence Types on Japanese Sentence Comprehension: A Replication Study of Sung et al. (2017) and Sung (2015) on Korean	5. 発行年 2022年
3. 雑誌名 Educational Studies	6. 最初と最後の頁 37-49
掲載論文のDOI（デジタルオブジェクト識別子） 10.34577/00005101	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 -

1. 著者名 IBARA Yuri, MUTO Hikaru, FUKUDA Masaki, SUZUKI Michinori, OHO Atsushi, YOSHIDA Tomoyuki, LEE Seunghun J.	4. 巻 64
2. 論文標題 Remote Data Collection from Younger and Elder Population Using E-Prime and SuperLab	5. 発行年 2022年
3. 雑誌名 Educational Studies	6. 最初と最後の頁 125-134
掲載論文のDOI（デジタルオブジェクト識別子） 10.34577/00005109	査読の有無 無
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 -

1. 著者名 TENOU Yuri, LEE Seunghun J.	4. 巻 34
2. 論文標題 Identifying Prosodic Features in Heritage Learners of Japanese: A Study based on OPI Interviews	5. 発行年 2020年
3. 雑誌名 Studies in Foreign Language Education	6. 最初と最後の頁 221-246
掲載論文のDOI（デジタルオブジェクト識別子） なし	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 該当する

〔学会発表〕 計6件（うち招待講演 1件/うち国際学会 2件）

1. 発表者名 MUTO Hikaru, IBARA Yuri, FUKUDA Masaki, LEE Seunghun J., YOSHIDA Tomoyuki
2. 発表標題 Aging Effects on Comparative Sentences Processing of Japanese Native Speakers
3. 学会等名 Linguistics Fest 2022
4. 発表年 2022年

1. 発表者名 LEE Seunghun J., CHOI Woonho
2. 発表標題 A quantitative study of the syntax-prosody interface in two varieties of Korean
3. 学会等名 Phonology Festa 2021 (招待講演)
4. 発表年 2021年

1. 発表者名 OH O Atsushi, SUZUKI Michinori, ASHIDA Mana, HASEGAWA Rika, NAKAYAMA Sachiko, IBARA Yuri, MUTO Hikaru, LEE Seunghun J.
2. 発表標題 Collecting perception data from senior citizens during the COVID-19 pandemic
3. 学会等名 言語学フェス2021
4. 発表年 2021年

1. 発表者名 有井巴, 吉田智行, LEE Seunghun J.
2. 発表標題 SOV語における統語処理研究日本語、韓国語、ボド語の比較
3. 学会等名 海外学術調査フォーラム
4. 発表年 2019年

1. 発表者名 LEE Seunghun J., RIEDEL Kristina
2. 発表標題 Prosodic effects of DP-internal word order variation in Xitsonga
3. 学会等名 HISPhonCog2019 (国際学会)
4. 発表年 2019年

1. 発表者名 SUNG Jee Eun, DEDE Gayle, LEE Seunghun J.
2. 発表標題 Cross-linguistic validations of semantic and syntactic interface for aging-related changes in sentence processing
3. 学会等名 The 60th Annual Meeting of the Academy of Aphasia (国際学会)
4. 発表年 2022年

〔図書〕 計0件

〔産業財産権〕

〔その他〕

Ewha Woman University (SUNG Jee Eun), Temple University (DEDE Gayle), IIT Guwahati (SARMAH Priyankoo) Website SOV (2018.4-2021.3) <a href="https://sites.google.com/info.icu.ac.jp/linglab/projects/sov">https://sites.google.com/info.icu.ac.jp/linglab/projects/sov</a>
---

6. 研究組織

	氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
研究分担者	李 勝勳  (LEE Seunghun)  (20770134)	国際基督教大学・教養学部・上級准教授   (32615)	

	氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
研究協力者	小野 創  (ONO Hajime)		
研究協力者	石井 透  (ISHII Toru)		

6. 研究組織（つづき）

	氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
研究協力者	川崎 典子  (KAWASAKI Noriko)		
研究協力者	桃生 朋子  (MOMOU Tomoko)		
連携研究者	有井 巴  (ARII Tomoe)  (00848236)	横浜市立大学・国際教養学部・専任講師    (22701)	

7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計0件

8. 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関			
韓国	Ewha Womans University			
インド	IIT Guwahati			
米国	Temple University			