別紙様式３（第３条関係）

論　文　要　旨

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論文題目（外国語の場合は、和訳を併記すること。）

The Role of Working Memory in L2 Listening Comprehension

（第２言語聴解における作動記憶の役割）

論文要旨（別様に記載すること。）

（注）１．論文要旨は、A4版とする。
２．和文の場合は、４０００字から８０００字程度、外国語の場合は、２０００語から４０００語程度とする。
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Abstract

Listening is a complex activity which involves physiological and cognitive processing at different levels, and deserves more attention and research on instruction in L2 listening (Field, 1998; Vandergrift, 1999). Current models for L2 comprehension accept a trade-off between the storage and processing functions of working memory (Just & Carpenter, 1992). Working memory is considered to play an important role in the component processes involved not only in L1 but also L2 performance and development. More specifically, there has been found to be a positive correlation between working memory capacity and specific L2 skills, such as reading comprehension (Alptekin & Ercetin, 2010; Geva & Ryan, 1993; Harrington & Sawyer, 1992; Miyake & Friedman, 1998; Waters & Caplan, 1996), and syntax (Harrington & Sawyer, 1992; Miyake & Friedman, 1998). Working memory capacity is also reported to be related to the ability to control attention (Engle, 2002) and the efficiency of information processing (Osaka, 2000). Therefore, working memory is also thought to play a critical role in listening processing by storing the result of the listeners' comprehension as they deal with the information in a spoken discourse at the same time.

However, despite the importance of working memory capacity, there is little published research distinguishing the information processing and storage function of it, especially in the listening process. Based on an assumption that the limited capacity of working memory could affect integration of overall processing skills in L2 listening, the present study aims at examining the contribution of working memory capacity to the processing of L2 listening with both higher–level and lower–level L2 listeners. Specifically, the study focuses on the differences in the effects of working memory capacity on L2 listening comprehension as a global construct, L2 linguistic knowledge and sub–skills, literal and inferential dimension of L2 listening comprehension, and recall errors in L2 listening between lower–level and higher–level listeners.

This thesis reports a series of studies that investigated the role of working memory in L2 listening comprehension with Japanese EFL learners. The thesis comprises of three preliminary studies and four main studies.

The preliminary study A investigated how working memory capacity influences the component processes of L2 listening. In Study 1, the relationship between working memory capacity and word recognition skills in the perceptional processing was examined. The result showed a significant difference between high-span and low-span listeners in the dictation test scores focusing on the phonological modification in the spoken discourse. Study 2 focused on the relationship between working memory

capacity and the use of L2 cognitive and metacognitive listening strategies in the higher-level processing. The result suggested that high-span listeners in both higher-proficiency and lower-proficiency groups possibly use significantly more metacognitive strategies than low-span listeners in the same groups. These results derived from the two studies highlight a key role of working memory capacity in L2 listening processing regardless of proficiency levels of listeners.

The preliminary study B was to replicate the results of the preliminary study A and examine the relationship between WM capacity and word recognition skills in the perceptional processing, and metacognitive listening strategies in the higher-level processing. In this study, metacoginitive listening strategy use was measured with the Metacognitive Awareness Listening Questionnaire (MALQ) (Vandergrift, Goh, Mareschal, & Tafaghodtari, 2006). In addition to the Japanese (L1) version of Reading Span Test used in the preliminary study A, ESL (L2) version of Reading Span Test was conducted in the preliminary study B. The study also compared two common methods for scoring the RST, the total number of the words recalled and traditional span scores. The results of the study showed that individual differences in WM capacity are related to both lower-level processing such as word recognition skills and higher-level processing such as metacognitive strategy use as well as L2 listening comprehension. With regard to the scoring methods of the Reading Span Test, the results of the present study showed that total words scores had reasonably higher correlations with L2 listening comprehension than truncated span scores. The relationship between L1 and L2 WM capacity based on total words scores are also higher than the corresponding correlation based on truncated span scores.

The preliminary study C examined the extent to which working memory capacity plays a role in the processing of L2 listening. The study also investigated the extent to which this role varies according to different levels of L2 proficiency. In the study, the relationship among the measures of L1 and L2 complex working memory capacity, phonological modification knowledge, syntactic knowledge, vocabulary breadth, sentence stress awareness and metacognitive knowledge were examined as well as global L2 listening comprehension. The correlation analysis suggested that the individual differences in working memory capacity were related to both bottom-up and top-down processing in L2 listening, and the relationship between working memory capacity and L2 listening comprehension was stronger in the lower-level group than the higher-level group. The multiple regression analysis showed that syntactic knowledge and phonological modification knowledge were the two significant contributors to L2 listening comprehension in the higher-level group whereas phonological modification

knowledge and L2 working memory capacity were the two significant contributors to L2 listening comprehension in the lower-level group. The findings of the study suggest that working memory may play a greater role in controlled processing than in automatic processing of L2 listening.

Based on the results of the preliminary studies, main study A examined the role of working memory in L2 listening comprehension. The study also investigated the extent to which this role varies across L2 proficiency levels. 210 Japanese EFL learners completed L1 and L2 digit span tasks, listening span tasks, and L2 listening comprehension tasks. A correlation analysis showed that both L1 and L2 working memory capacity was related to L2 listening, but that the predictive power of L2 working memory capacity was larger than that of L1 working memory capacity. The main findings in the multiple regression analysis were (a) L2 working memory capacity accounted for a significant 19.2 % of unique variance in L2 listening comprehension for the most proficient L2 users, and (b) L1 working memory capacity accounted for a significant 21.7 % of unique variance in L2 listening comprehension for the least proficient L2 users. The results showed that working memory capacity played a greater role in L2 listening performance than short-term memory capacity with both advanced and elementary level listeners. The study also examined if working memory capacity was related to the performance of Japanese EFL learners on listening comprehension sub-skills. More specifically, the study attempted to focus on the abilities measured in the TOEIC listening test. TOEIC listening test forms are designed to measure the listening comprehension abilities identified in 4 claims. Claims 1 and 2, measuring the ability to infer gist, purpose and basic context based on the information, are related to inferential understanding. On the other hand, Claims 3 and 4, measuring the ability to understand details, are related to literal understanding. The results of the analysis confirmed that working memory capacity was related to both literal and inferential understanding in L2 listening comprehension.

Main study B investigated the role of working memory in L2 listening comprehension and its component processing. The study also investigated the extent to which this role varies across L2 proficiency levels. 150 Japanese EFL learners completed L1 and L2 digit span tasks, listening span tasks, L2 listening comprehension tasks, and a battery of L2 proficiency tasks. The correlation and *t*-test analysis showed that working memory capacity was related to both bottom-up and top-down processing in L2 listening, and the association between working memory capacity and L2 listening comprehension was found to be stronger in the lower-level group than the higher-level group. The main findings in the multiple regression analysis were (a) working memory

capacity significantly predicts top-down processing for the higher-level group, and bottom-up processing for the lower-level group and (b) L1 working memory capacity accounted for a significant 16.1 % of unique variance in L2 listening comprehension for the lower-level group. The results of the study suggest that limited capacity of working memory could affect L2 listening comprehension when L2 linguistic knowledge and processing skills are not efficient (less automatized). Working memory capacity is assumed to play a greater role in attention controlled processing than automatic processing executed without conscious awareness (Engle, 2002; Ortega, 2009). These findings indicate that WM plays a greater role in controlled processing than in automatic processing of L2 listening. The results also suggested that L1 working memory capacity had an independent contribution to L2 listening comprehension even when the effects of short-term memory capacity and L2 linguistic knowledge were partialized out in the lower-level group.

Main study C examined if working memory capacity was related to the performance of Japanese EFL learners on listening comprehension sub-skills. More specifically, the study focused on L1 and L2 working memory capacity, and its effect on two dimensions in L2 listening comprehension: literal comprehension and inferential comprehension. The study also investigates the extent to which the role of working memory in the processing of L2 listening varies according to different levels of L2 proficiency. The results of the study suggested that individual differences in L1 and L2 working memory capacity affected both two dimensions of listening abilities: inferential comprehension and literal comprehension. Moreover, the results showed the different patterns of influence of L1 and L2 working memory capacity on literal and inferential comprehension in L2 listening. Whereas L2 working memory capacity was a significant predictor of L2 inferential listening in the case of the skilled listeners and L2 literal comprehension in the case of the lower level listeners, L1 working memory capacity significantly predicted L2 inferential listening in the case of the less-skilled listeners. These findings suggest that working memory resources can be allocated to the execution of top-down processing in the case of the higher-level listeners, and both top-down and bottom-up processing in the case of the lower-level listeners. The findings also indicate that working memory may play an important role in L2 listening comprehension, especially in cognitively demanding listening tasks.

Main study D investigated the effect of L2 listening proficiency on L2 listening span recall with the Listening Span Test. With the addition of error analysis by type for recall errors made on the listening span test, the span scores and the number of the recall errors were compared between the higher–level and the lower–level listeners. Recall

errors were coded as either intrusion errors or omissions. Intrusion errors were defined into within–task intrusions, phonemic intrusions, categorical intrusions, and non–categorical intrusions. With regard to the error analysis, most of the total recall errors were omission errors. However, there was no significant difference in the total number of omission errors between the higher–level group and the lower–level group. The results suggest that the two groups didn't differ in terms of the storing mechanism of working memory. On the other hand, phonemic intrusion errors were significantly differentiated by the higher–level group from the lower–level group. In terms of within–task intrusion errors, an interaction between proficiency and listening span was observed for immediate intrusion errors. The results suggest that the lower–level listeners have a deficit in inhibiting irrelevant information when their WM capacity is low, and this deficit is implicated in L2 listening comprehension difficulty. The findings that the lower–level listeners with lower WM capacity made more phonemic and delayed intrusion errors than the higher–level listeners suggest that the recall errors of the lower–level listeners with lower WM capacity could be caused by a deficit in decoding skills and the ability to inhibit irrelevant information rather than difficulty in maintaining the relevant information in the phonological loop within working memory.

The findings in the present study suggest that the availability of WM resource is assumed to influence more specific aspects of L2 processing according to the proficiency of L2 learners. Overall, the results of the whole study highlight a greater role of WM in controlled processing than automatic processing involved in L2 listening comprehension and suggest that the extent to which WM resources contribute to both top-down and bottom-up processing in L2 listening would be different among individuals according to their levels of automatization of each processing. The findings are discussed in terms of existing theoretical models of working memory and L2 listening processing.