

The Effects of Recasts and Working Memory on Korean EFL Learners' Past Tense Accuracy*

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Kim, Sowon, & Cho, Young Woo. (2017). The effects of recasts and working memory on Korean EFL learners' past tense accuracy. *English Teaching*, 72(4), 105-132.

This study investigated whether recasts provided during communicative interaction may improve Korean EFL learners' accuracy with regard to regular and irregular English past tense forms, and whether individual differences in working memory capacity may intervene in the effects of recasts. To this end, forty-two Korean university students were placed into either the recast or the control group, and took the pretest and two types of working memory tests: phonological short-term and verbal. The learners participated in one-on-one conversational interactions with the researcher in three two-way communicative tasks one at a time on a weekly basis. Only the treatment group received explicit recasts on their past tense errors while the control group received no feedback of any kind. Finally, they took the posttest and completed the exit questionnaire. Results showed that recasts were beneficial for raising the learners' accuracy level of English past tense forms, both regular and irregular, though the effects were much larger for the irregular forms. The improvements were not significantly correlated with neither of the working memory measures. Explicit and intensive recasting alone was sufficient in improving EFL learners' English past tense accuracy in this one-on-one communicative interaction setting.

Key words: recasts, working memory, English past tense, corrective feedback, conversational interaction

1. INTRODUCTION

Recasts have a firm status within the realm of cognitive-interactionist second language

* This article is based on the first author's MA thesis completed at Pai Chai University in 2015. An earlier version of this article was presented at the KATE International Conference held in Seoul on August 29th in 2015.

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(L2) research (Gor & Long, 2009; Long, 1996; Mackey, 2012). On the whole, previous research on recasts has attested to its benefits for facilitating L2 development or at least improving grammatical accuracy (Doughty & Varela, 1998; Goo, 2012; Han, 2002; Ishida, 2004; Iwashita, 2003; Kim, 2012; Lyster & Izquierdo, 2009; Mackey & Philp, 1998; McDonough, 2007; Rhee, 2012; Suh, 2015). The benefits of recasts for overall L2 development were confirmed in Mackey and Goo's (2007) comprehensive meta-analysis. The effectiveness of recasts is generally ascribed to implicit negative evidence that they contain, which offers L2 learners reliable information about what is *not* possible in the target language (Gor & Long, 2009). On the other hand, Leeman (2003) aptly pointed out that the benefits of recasts can be better explained by its function of rendering positive evidence more salient.

With this firm theoretical and empirical basis, research efforts have been extended to finding some key learner-internal variables that might explain how individual differences may mediate the effects of recasts. This line of research has noted L2 learners' *working memory* (WM) capacity, among others. Working memory is considered a direct mechanism involved in storing and processing linguistic information about the pertinent form-meaning relationship contained in the input immediately after a recast is given to a learner (Mackey, 2012). Then, it can be expected that learners with a higher level of WM capacity are more likely to process recasts effectively. However, mixed findings have been reported in previous empirical studies on the relationship between recasts and WM capacity. Quite a few studies have found that individual differences in WM capacity indeed are implicated in the efficacy of recasts (Goo, 2012; Mackey, Philp, Egi, Fujii, & Tatsumi, 2002; Sagarra & Abbuhl, 2013; Trofimovich, Ammar, & Gatbonton, 2007), whereas some studies found no significant effect (Goo, 2014a; Goo, 2014b). Thus, the relationship between recasts and WM needs further empirical examination.

Another issue in this strand of research is the relationship between recasts and type of linguistic form. Empirical studies so far have tested the benefits of recasts for forms such as English question formation (Mackey & Philp, 1998), English past tense (Doughty & Varela, 1998; Ellis, Lowen, & Erlam, 2006; Jang & Kim, 2011), English possessive determiners and verbal transitivity (Trofimovich, Ammar, & Gatbonton, 2007), and English *that*-trace filter acquisition (Goo, 2012, 2014a).

Of these forms, English past tense was considered an optimal testing ground due to its unique dual nature: regular and irregular verb forms. Regular verb past tense forms are conjugated through the simple rule of attaching the {-ed} marker to its base (e.g., *work-worked*) whereas irregular verbs take on formulaic forms (e.g., *catch-caught*). Mackey and Goo (2007) found a tendency in their meta-analysis that recasts were more effective for lexical/formulaic learning on immediate posttests whereas the effectiveness of recasts for grammatical forms was borne out on delayed posttests. Thus, it would be intriguing to

investigate whether recasts have the same or differential effects on the regular and irregular forms of English past tense during communicative interaction.

Therefore, the present study was aimed at examining whether recasts are effective for Korean EFL learners to improve their accuracy regarding English past tense forms, both regular and irregular verbs, during communicative interaction, and also whether the effectiveness of recasts is mediated by differential learner WM capacities.

2. LITERATURE REVIEW

2.1. The Effectiveness of Recasts for L2 Learning

According to Long (1996), recasts as implicit negative feedback, commonly found in first language (L1) acquisition, are conducive to L2 learning, which has been a fundamental basis for the current maturity of research into recasts in second language acquisition (SLA) for the past two decades. Whereas there is no definitional agreement, Long's (2007) definition has been most widely cited, which refers to a recast as:

A reformulation of all or part of a learner's immediately preceding utterance in which one or more non-target like (lexical, grammatical, etc.) items is/are replaced by the corresponding target language form(s), and where, throughout the exchange, the focus of the interlocutors is on meaning, not language as object (p. 77).

A number of studies on the role of recasts as implicit corrective feedback in L2 learning have reported positive effects mostly in laboratory-based settings (Han, 2002; Ishida, 2004, Iwashita, 2003; Leeman, 2003; Lyster & Izquierdo, 2009; Mackey & Philp, 1998; McDonough, 2007) and also in some classroom settings (Doughty & Varela, 1998; Lyster & Izquierdo, 2009; McDonough, 2007). Mackey and Philp (1998) was one of the early laboratory-based studies in support of the positive effects of recasts for L2 development. Through the pretest, immediate posttest, and delayed posttest design, the researchers gave 35 advanced ESL learners some dyadic interactional tasks with/out intensive recasts. Results showed that providing intensive recasts was beneficial for the development in English question formation. It was also found that these benefits were gained only by those learners who were developmentally ready to move up the next stage. Then, Han (2002) reported in a small-scale study that L2 learners who received recasts were able to strengthen their awareness of tense consistency on the written and oral narrative tasks. Iwashita (2003) and Ishida (2004) added more empirical evidence of the positive role of

recasts in Japanese learning. Leeman (2003) explained these benefits of recasts in terms of making positive evidence more salient.

Recasts were seen as effective in some classroom-based studies as well. Doughty and Varela (1998) found the efficacy of recasts on English simple past and past conditional in a classroom ESL setting. The learners provided with corrective recasting gained grammatical accuracy on both oral and written delayed posttests. In a Thai EFL setting, McDonough (2007) compared clarification requests and recasts through communicative tasks with respect to the emergence of English simple past activity verbs. The results showed that both feedback types facilitated 74 Thai university-level learners' learning of simple past activity verbs. Lyster and Izquierdo (2009) similarly found that recasts and prompts were equally effective for French learning in dyadic settings. All these studies lend support to the benefits of recasts for L2 grammatical learning.

On the other hand, some empirical studies found that recasts were not effective compared with other types of corrective feedback in laboratory settings (Carroll & Swain, 1993) and also in classroom-based settings (Ammar & Spada, 2006; Lyster, 1998a, 1998b; Lyster & Ranta, 1997; Panova & Lyster, 2002). In Carroll and Swain (1993), Spanish-speaking learners were given one of the four types of interactional feedback on English dative alternation errors: explicit hypothesis rejection (i.e., explicit metalinguistic feedback), explicit utterance rejection, modeling plus implicit negative feedback (i.e., recasts), and no feedback. The group receiving explicit metalinguistic feedback performed better than the other feedback (including recasts) groups.

In a classroom setting, Lyster and Ranta's (1997) descriptive study observed four immersion classrooms of French speaking students, analyzing six types of corrective feedback: *explicit correction*, *recast*, *clarification request*, *metalinguistic feedback*, *elicitation*, and *repetition*. Recasts were found to be the most frequently used feedback type, yet with the least frequency of uptake because of its ambiguous corrective intent. This study was followed by Lyster (1998a), Lyster (1998b), and Panova and Lyster (2002), all of which supported the uncertainty regarding the effects of recasts. However, due to the descriptive nature of these studies, no firm conclusion was drawn about the effectiveness of recasts. Also, the findings of this study should be understood in relation to the highly meaning-focused context of instruction (i.e., immersion education), where learners tend to develop a strong orientation toward meaning rather than form. Within such a context, it is understandable that recasts are taken as feedback on the message rather than on the form.

Ammar and Spada's (2006) quasi-experimental study directly compared recasts and prompts with 64 sixth-graders in ESL classrooms in the Montreal area, targeting third-person possessive determiners. It turned out that prompts were more effective while recasts were associated with learners' proficiency. This means that high-proficiency learners benefited from both feedback types, whereas their low-proficiency counterparts benefited

significantly more from prompts. This is some evidence that proficiency may play a role in the effectiveness of recasts.

In Korean EFL settings, recasts have been found to be ineffective in some studies (Cho, 2012; Jeong & Ma, 2012). More specifically, Jeong and Ma (2012) found no significant difference between the recast and the control group. Cho (2009) compared metalinguistic feedback, recasts, and prompts to measure their effects on noticing of regular past tense and plural forms with 28 adult students. It was found that recasts were the least effective, compared to metalinguistic feedback and prompts, for learners to notice the target structures.

To summarize, previous empirical studies mostly support the positive role of recasts for facilitating lexical and grammatical L2 learning. Some studies have reported that metalinguistic feedback or prompts may be more effective in contexts where meaning receives primary attention. However, this does not weaken the status of recasts because the findings would be different if they were conducted in contexts where learners are well aware of the corrective intents of the recast supplier (Goo & Mackey, 2013). Many studies reporting that recasts were not effective in diverse contexts and learner groups suggest that many linguistic, contextual, and learner-related variables may be involved in determining the overall effectiveness of recasts.

As part of effort to disentangle the complexity existing in research on recasts, researchers have paid considerable attention to several variables for their potential relationship with the effects of recasts such as developmental readiness (Ammar & Spada, 2006; Long, Inagaki & Ortega, 1998; Mackey & Philp, 1998), types of linguistic target form (Ellis, 2007; Jeon, 2007; Long, 2007), characteristics of recasts (Kim & Han, 2007; Loewen & Philp, 2006; Lyster, 1998b; Sheen, 2006), and working memory (Goo, 2012; Goo, 2014a; Mackey, Philp, Egi, Fujii, & Tatsumi, 2002; Trofimovich, Ammar, & Gatbonton, 2007). Among others, this study chose to investigate the relationship between recasts and WM capacity in relation to type of linguistic form. The following section provides key rationales underlying the chosen foci of this study.

2.2. Recasts and Working Memory

Working memory is commonly defined as “a brain system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning” (Baddeley, 1992, p. 556). Baddeley’s (2010) WM model has been most influential in previous empirical studies of SLA. This model posits four subcomponents interacting with each other in the whole WM system: the visuospatial sketchpad, the episodic buffer, the phonological loop, and central executive. Alternatively, Cowan (2008) views WM as part of long-term memory that is in activation.

SLA researchers have specifically focused on two of the functions of WM. One is called verbal WM, which represents the real-time processing and storing aspect of overall WM. The second is phonological short-term memory (PSTM), which represents the function of phonological loop that stores acoustic information temporarily.

Harrington and Sawyer (1992) was a pioneering study that examined the relationship between WM and L2 learning. Using Daneman and Carpenter's (1980) reading span task, the researchers found a positive relationship between verbal WM and EFL learners' reading proficiency. Then, Miyake and Friedman (1998) demonstrated a significant relationship between verbal WM and both L1 and L2 learners' listening comprehension abilities. A positive role of PSTM has been reported as well for L2 vocabulary learning (Daneman & Case, 1981; Papagno & Vallar, 1992; Papagno, Valentine, & Baddeley, 1991; Service, 1992, Service & Kohonen, 1995) and also for L2 grammar learning (French & O'Brien, 2008).

Working memory has drawn much attention from L2 researchers interested in recasts obviously because recasts require concurrent processing of form-meaning relationships. In order to take in the target form contained in a recast, the L2 learner needs to hold both forms in memory, and compare the non-target-like utterance and the target-like utterance simultaneously during interaction (Doughty, 2001). This cognitive comparison is directly related to WM, which processes and temporarily stores incoming information. This leads to the prediction that learners with a high-level WM span may benefit more from recasts than otherwise (Robinson, Mackey, Gass, & Schmidt, 2012).

Some studies have looked at WM in relation to interactional feedback (Goo, 2012, 2014a, 2014b; Mackey, Philp, Egi, Fujii, & Tatsumi, 2002). First of all, Mackey and her colleagues (2002) explored the relationship between noticing of interactional feedback, WM, and development of question formation. With 30 Japanese-speaking ESL learners, some communicative tasks were given in treatment sessions and their verbal WM (with a reading span task in the L1 and the L2) and PSTM (with a non-word recall test in the L1) capacities were measured. As a result, positive relationships between WM capacity, noticing, and interlanguage development were found to indicate that higher WM capacity learners tended to notice more and showed more development on the delayed posttest, whereas low-span learners noticed feedback less and improved only on the immediate posttest.

In Révész (2012), 90 learners with higher verbal WM (reading span) performed better on the written production test, while those with higher PSTM (digit and non-word spans) performed better on the oral production test. For the control group, these significant associations were not found. These findings hint the possibility that different types of WM may be related with different aspects of L2 learning. Given the findings of this study, it can be said that PSTM is more closely involved in enhancing the benefits of recasts for oral production.

Goo (2012) examined the role of verbal WM in determining the effects of recasts and

metalinguistic feedback on English *that*-trace filter, employing both a reading span task and an operation span task as verbal WM measures. The results evidenced significant effects of recasts, comparable to the effects of metalinguistic feedback, and these effects were significantly mediated by individual variation in WM capacity. For metalinguistic feedback, however, WM had no significant influence. He explained this difference as a function of externally driven processing for metalinguistic feedback and internally driven processing for recasts. According to this interpretation, the explicitness of metalinguistic feedback used in this study may have been helpful in perceiving the feedback easily, but this type feedback may not be effective in triggering cognitive comparison needed for processing the error-target form relationship (Doughty, 2001). In contrast to metalinguistic feedback, recasts may have been effective in inducing the learners' cognitive control of attention to the target forms. Thus, the learners with a higher level of WM capacity may have been able to capitalize on this advantage.

Goo (2014a), conceptually replicating Goo (2012), compared recasts and metalinguistic feedback for their relative effects on 29 adult Korean learners' English *that*-trace filter acquisition in relation to PSTM. Contrary to the results found in Goo (2012), metalinguistic feedback was more effective than recasts. Another finding was that PSTM was not correlated with neither of the two feedback types, which was in contrast to Goo (2012), where verbal WM was significantly related with the effects of recasts.

Goo (2014b) also tackled the same issue of whether PSTM is involved in mediating the effects of recasts and/or metalinguistic feedback. In this study, twenty-four Korean university students were given either recasts or metalinguistic feedback whenever they produced errors associated with English mixed conditionals during conversational interaction. Contrary to Goo (2012), again, both types of feedback were found to be beneficial. PSTM was not a significant variable in explaining the significant effects of the feedback types, which was consistent with the finding obtained in Goo (2012).

In summary, WM is sure to be a key learner-internal variable significantly involved in determining L2 comprehension and production outcomes in general, which is evidenced in Linck, Osthus, Koeth, and Bunting's (2014) meta-analysis. A deeper look at the literature on its relationship with recasts, however, attests to the fact that the picture is more complicated than expected, with several variables such as target linguistic form, type of feedback, type of WM, instructional context, and others interacting with one another. In particular, it is still unclear whether WM may indeed intervene in the effects of recasts, which provided a justification for the current study that looked at both verbal WM and PSTM.

2.3. The Effects of Recasts and Simple Past Tense

This section describes some key rationales underlying the choice of English past tense as

the target form for this study. The first rationale comes from the fact that past tense is a tricky form for many English learners. Even though its form and grammatical rule are very simple, learners produce frequent errors especially in verbal interaction (Ellis, Lowen, & Erlam, 2006). Many Korean EFL learners are known to have trouble using past tense in communication despite its familiarity and exposure in the early step of their learning (Kim, 2012). Though simple in structure, past tense in English poses significant learning challenges to learners especially due to its regular and irregular aspects. Thus, it has a high pedagogical value in EFL learning.

Interaction research started investigating past tense forms when Sato (1986) observed two Vietnamese learners' interlanguage development. She found that there was little opportunity for the learners to receive corrective feedback on past tense errors during interaction, and thus there was little evidence that interaction benefited the development of English past tense forms. Other early small-scale experimental studies (Nobuyoshi & Ellis, 1993; Takashima & Ellis, 1999) reported that clarification requests provided during communicative interaction had a limited impact on past tense production.

More recent studies investigated past tense in relation to recasts. For example, Mackey (2006) looked at whether 28 ESL learners may experience noticing and gain developmental benefits by receiving different types of corrective feedback (i.e., negotiation, recasts, and both combined) on their errors with three types of linguistic form (i.e., plurals, questions, and past tense). The results showed that the lowest levels of noticing and development were found for past tense, compared to plurals and questions. This confirms the validity of the aforesaid statement on the learning difficulty of English past tense despite the simplicity of its form and rule. Despite this difficulty, it turned out in this study that recasts were not frequently provided to past tense errors.

In contrast, Doughty and Varela (1998) found a beneficial role of corrective recasting for past tense accuracy improvement, both in oral and written modes, in a classroom environment. It should be noted that the kind of recasts used in this study was more explicit (e.g., a recast with an emphatic stress and/or a raised tone) than recasts commonly found in natural, non-instructional interaction. This finding suggests that some degree of planned intensive (i.e., targeting a single form) and explicit recasting may be useful in addressing English past tense errors. Han (2002), however, provided some empirical evidence in support of the use of more *implicit* corrective recasts for past tense provided over eight interaction sessions. In this study, implicit recasts were provided to errors regarding inconsistent tense use. The effectiveness of recasts was confirmed both on the immediate and delayed posttests.

Ellis, Lowen, and Erlam (2006) compared recasts and metalinguistic explanation as corrective feedback on the regular past tense marker {-ed} with low-intermediate ESL learners. The results pointed to a higher level of acquisition of both implicit and explicit

knowledge of regular past tense for metalinguistic feedback over recasts. This was interpreted as evidence that explicit corrective feedback provided during communicative interaction may facilitate the automatization of past tense rule application in real-time interaction.

More studies followed to yield mixed findings. In Yang and Lyster (2010), for example, recasts were beneficial only for irregular past tense forms. In contrast, prompts were effective for both regular and irregular forms. In Jang and Kim (2011), recasts were effective for both regular and irregular past tense forms. Kim (2012) also reported that recasts were beneficial for both regular and irregular forms. This study compared two types of recasts (explicit and implicit) on both regular and irregular past tense forms with six elementary school students through a time-series research design. After six weeks of treatment sessions, recasts were found to be beneficial in improving the grammatical accuracy of both past tense forms. In contrast, Cho (2012) found that recasts were effective only for irregular past tense for short-term explicit knowledge measured through grammaticality judgment. For oral imitation test, no effect was found for prompts and recasts for implicit knowledge development.

A key factor complicated in discussing the relationship between recasts and past tense is the peculiarity of past tense that it consists of regular and irregular verb forms. This is reminiscent of Skehan's (1998) dual-mode language processing, according to which the past tense of regular verb forms is produced as a result of the application of the pertinent grammatical rule (e.g., *push+ed*). In contrast, the past tense forms of irregular verbs are manifested through the retrieval of the corresponding ready-made chunk stored in memory (e.g., *caught*). This is a result of *instance*-based learning or item-based learning (Logan, 1988) or *exemplar*-based learning in Skehan's (1998) terms. This mode of learning involves processing a single lexical item or a formulaic expression as a whole. This model is in close line with words and rules theory (Pinker, 1999; Pinker & Ullman, 2002), which also posits two types of psycholinguistic processing mechanism that govern the acquisition and production of lexical items/chunks and grammatical rules. According to this theory, irregular forms are produced just as lexical items are produced, a subdivision of the learner's long-term memory. In contrast, regular forms are productively generated by the grammatical rule-based knowledge system.

Gor and Long (2009) stated that these two systems offer different implications for learners with different proficiency levels. Advanced learners, for example, may be able to use both systems simultaneously whereas lower-level learners may not be skillful at using either one. This interpretation makes it possible to formulate the hypothesis that recasting may have different effects on the past tense forms of regular and irregular verbs. Thus, this study put this hypothesis to empirical testing by choosing both regular and irregular English verbs as the target for recasting.

2.4. Purpose of Study

The review so far demonstrated that the issues related to the effectiveness of recasts and WM capacity are not conclusive. Thus, a further empirical investigation is in order to determine whether WM capacity is related in some way with the effectiveness of recasts.

Another gap in previous research is the uncertainty as to whether recasts are effective for both regular and irregular English past tense forms. In Korean EFL settings, only a few studies have focused on the relationship between recasts and past tense forms, looking at both regular and irregular forms (e.g., Cho, 2009; Kim, 2012). No study has investigated the relationships among corrective recasts, working memory, and English past tense in a single study. Further investigation is needed on this aspect of research on recasts in a Korean EFL setting. Thus, the following research questions were formulated to meet the purpose of the current study.

1. Are recasts equally effective for improving Korean EFL learners' past tense accuracy level regarding both regular and irregular verb forms in communicative interaction in English?
2. Do individual differences in working memory capacity affect the effects of recasts on learning English past tense forms?
3. How do learners perceive communicative task-based interaction and recasts as corrective feedback?

3. METHOD

3.1. Participants

The participants were 42 undergraduate students majoring in English at a local university in Korea, and their ages ranged from 18 to 23. Six students reported studying in Canada, India, Malaysia, New Zealand, the Philippines, or the U.S. with 12 months of studying on average. Their proficiency level was measured through English Speaking and Writing Test (ESWT) developed by Kim (2009, 2011). The test score ranged from 1 to 5. Around two thirds of them ($N = 29$) gained a low-level score (1-2), and one third of them ($N = 12$) were intermediate-level learners (3). Only one learner was at a high-intermediate level on the test (4). The interactor was the primary researcher, who was an MA TESOL candidate at the same university. She had over three years of English teaching experience levels ranging from elementary school to university.

3.2. Procedure

All learners participated in five sessions consisting of a pretest, three task-based

interaction sessions, and a posttest. In the first session, they took the pretest and two kinds of WM tests. The pretest was given in the form of one-on-one task-based interaction, and took about 10 minutes, depending on each learner. No strict control of time was imposed so that learners might feel comfortable performing the given task. After that, they were divided into two groups: control and recast. During the three treatment sessions, they were given two-way communicative tasks in which they interacted with the researcher for 30 minutes. For the recast group, the researcher provided corrective recasts on their errors whereas no feedback was given at all to the control group. Subsequent to the treatment period, they took the posttest, the same as the pretest, and answered the exit questionnaire in the final session. This procedure is summarized in Table 1 below.

TABLE 1
Research Procedure

Session #	Recast group	Control group
1	Pretest, LS test, PSTM test	
2	Story completion task 1 with recast treatment	Story completion task 1
3	Story completion task 2 with recast treatment	Story completion task 2
4	Story completion task 3 with recast treatment	Story completion task 3
5	Posttest, exit questionnaire	

3.3. Materials

Two story completion tasks were used for the pre- and posttest. Prior to administration, instructions were given that the tasks were about the main characters' yesterday and they had to make stories with 16 cards in a fixed order. Each task was provided along with 12 target verbs written in the learners' L1 (Korean) on each picture, including four of non-target verbs as distracters to keep them away from noticing the target verbs. To avoid test-retest effects, dissimilar contexts and different distracters were used. Some follow-up questions (e.g., *who did he go to the library with?*) were used to elicit more utterances from them.

For the treatment sessions, two story sequence tasks and one information gap task were used in a counterbalanced manner (see Appendix for some examples of the tasks used). All tasks were based on yesterday, last week, or last weekend to induce them to use past tense verbs. Some distracter verbs were embedded so that the learners might not perceive the target verbs easily. During the story sequence tasks, the learners participated in sequencing 16 pictures and making up stories. The researcher took a turn and asked some questions about the stories subsequent to their turns.

The information gap task developed by the researcher was analogous to a role-play task. The learner served as one of the suspects of a crime and the researcher served as a detective under the condition that Mrs. Kim's car had been stolen the last weekend. Two worksheets were given to the suspect and the detective separately with some modifications. The suspect's schedule was shown on the worksheet and there were some empty space on the detective's. The detective interrogated by asking questions about what the suspect did the last weekend (e.g., *what did you do at 3:00 last Sunday?*) During the detective's investigation, they had to answer all the questions.

3.4. Recast Treatment and Target Form

The effectiveness of recasts may vary depending on its characteristics, and thus it was important to determine the specifications of recasts to be used for this study. Based on Loewen and Philp (2006), recasts with interrogative intonation, shortened length, and one change were chosen for the treatment. The following example illustrates the type of recasts used in the treatment sessions.

Example 1

Provision of a recast with interrogative intonation, shortened length, and one change

L: Rachel draw her mom in home.

R: Rachel drew?

L: Drew her mom.

When the learner uttered an error-containing sentence, the researcher corrected the learner's preceding utterance with rising intonation (interrogative intonation). The researcher did not complete the whole sentence to make the recast short (shortened length) and only one target error was modified even when there were more errors (one change).

As the target for recasting, six regular (i.e., *watch, study, play, talk, cook, clean*) and six irregular target verbs (i.e., *run, ride, sing, read, swim, draw*) were selected based on their relatively high frequency in learners' personal lives and also their relevance to the tasks designed for interaction in this study.

3.5. Measures of Working Memory Capacity

The current study adopted two types of WM tests based on previous research. Verbal

WM was measured through a listening span test (the LS test), and PSTM was measured through the non-word recall test (the PSTM test). The two WM tests were administered in the learners' L1 (Korean) based on the finding that WM capacity is language-independent (Osaka & Osaka, 1992; Osaka, Osaka, & Groner, 1993). To insure the validity of the test, the test materials (manipulated sentences and non-words) were examined by two experts who were university professors specializing in Korean linguistics.

3.5.1. The LS test as a measure of verbal WM

The process of making the Korean version of the LS test was based on previous studies (Lee, 1995, 2002; Mackey & Sachs, 2012; Mackey, Adams, Stafford, & Winke, 2010). Thirty-six unrelated sentences were constructed consisting of 7 to 10 words. Lee's (1995) analysis demonstrated that more than 70 % of the sentences in Daneman and Carpenter (1980)'s test ended with nouns, but sentences ending with only nouns is not possible in Korean. Thus, the predicate of each sentence was made to be either combinations of an action noun and particle - *hada* (하다), an action noun and past particle - *haessda* (했따), or a noun and particle - *ida* (이다). The sentence-final nouns were non-compound nouns, irrelevant to each other, had one to three syllables, and did not rhyme. The sentences were categorized into one of four types: (a) grammatically correct, (b) grammatically incorrect, (c) semantically plausible and (d) semantically implausible. In order to generate such sentences, postpositional particles, ending of words, or predicates were manipulated. Table 2 presents the four categories of the sentences.

All sentences were spilt into nine sets consisting of three subsets of three, four, and five sentences, respectively. Three additional sentences were designed for practice sessions. The test was individually taken and a practice set with detailed instructions was initially provided for helping participants to be fully accustomed to the test. Each sentence was presented at five second intervals. Ten, fifteen, twenty second intervals were given between three-sentence sets, four-sentence sets, and five-sentence sets respectively in a counterbalancing manner and in an ascending order. A paper answer sheet was provided for the learners to mark. When recalling the final words, they were required to say aloud, and then write them down on the answer sheet after they listened to the test sets.

TABLE 2
Examples of LS Test Sentences

	Grammatically +	Grammatically -
Semantically +	<p>휴일에 서점에서 책을 보는 것은 내가 가장 좋아하는 취미이다. (G+S+)</p> <p><i>Hyuile sejeonmeseo chaegeul boneun geoseun naega gajang johahaneun chwimiida.</i></p> <p><i>My favorite past time is reading at a library.</i></p>	<p>사랑하는 사람을 함께 하는 시간은 누구에게나 달콤한 순간이다. (G-S+)</p> <p><i>Salanghaneun slameul hamkke haneun siganeun miguegena dalkomhan sunganida.</i></p> <p><i>The moment with a beloved one is sweet to everyone.</i></p>
Semantically -	<p>도련님은 끈 출산을 앞둔 양말에게 배냇저고리를 선물했다. (G+S-)</p> <p><i>Dolyeonnimeun god chulsaneul apdum yangmalege baenaesjeogolileul seonmulhaessada.</i></p> <p><i>A young master gave a cloth for a newborn infant as a present to a sock who was a expecting a baby.</i></p>	<p>책상이 물가를 잡기 위하여 내놓은 정책을 실패였다. (G-S-)</p> <p><i>Chaegsangi mulgaleul jabgi wihayeo naenoheun jeongchaegeul silpaeyeossda.</i></p> <p><i>The policy to stabilize prices made by a desk was a failure.</i></p>

3.5.2. The non-word recall test as a measure of PSTM

In order to assess learners' PSTM capacity, *non-word repetition test* or *non-word recall test*, was administered on the basis of the studies of Gathercole (1995), Mackey et al. (2002), and Mackey and Sachs (2012). Due to the finding of Gathercole (1995) demonstrating the influence of long-term lexical knowledge on non-words resembling real words, the non- words were rated by twenty Korean native speakers on a 5-point Likert scale. Non-words above 3-point were considered as highly word-like non-words, and thus were eliminated. Twenty-one pairs of non-words ranging from two to eight syllables were eventually selected (e.g. 나퀴-오폴 *nakwi-yopun*, 휴배오-알시두 *hybaeo-alsidu*). A practice set consisting of two pairs of non-words with instructions were initially taken before the test. During the implementation, each learner was presented with pre-recorded pairs of non-words in an ascending order at ten second intervals between sets in which they were asked to recall and repeat the non-words.

3.6. Exit Questionnaire

An exit questionnaire was administered as a supplement subsequent to the posttest. The purpose of this questionnaire was to help determine whether the instructional sequence may be used in actual EFL lessons. The questionnaire consisted of 32 close-ended questions on a five-point Likert scale. The close-ended questions included 24 questions about learners' affective states before and after the sessions such as self-confidence, interest, and anxiety during interactions with English native speakers (ENS) or Korean

native speakers (KNS), seven questions asking their satisfaction with the tasks, two for task difficulty, two for further participation, and the other two about their perceptions of proficiency improvement.

3.7. Analysis

The quantitative data did not meet the homogeneity of variance assumption needed for performing a parametric statistical test. For this reason, a non-parametric Mann-Whitney test procedure was used to compare the recast and the control group to determine whether recasts were effective for improving the learners' accuracy levels regarding English past tense accuracy. The Mann-Whitney test was chosen because it is a widely used non-parametric test for comparing two independent groups (Field, 2009). For the relationship between effects of recasts and WM capacity, parametric ANCOVA could not be used for the same reason of not meeting the homogeneity of variance assumption. Thus, binary correlational analysis was performed instead (i.e., pre-posttest score improvement by the two WM measures).

The reliability of data scoring was examined by two independent raters (primary rater: the researcher, the second rater: a TESOL graduate student). A high degree of reliability was obtained for the pretest ($\alpha \geq 0.7$), posttest ($\alpha \geq 0.9$), LS test ($\alpha \geq 0.9$), and PSTM test ($\alpha \geq 0.9$) in the first session. Due to the fact that only the reliability for the pretest was less than score of .9, an additional session was carried out. In the second session, the reliability of all four tests reached a sufficiently high level ($\alpha \geq 0.9$). This improvement was due to the second rater's raised understanding of the context of this study after the two analytical sessions. Thus, a sufficient level of reliability was obtained for the data.

3.7.1. Coding pre and posttest data

Target-Like Use (TLU) analysis, widely used in a number of studies (e.g., Ishida, 2004; Kim, 2012; Pica, 1983), was utilized in order to measure the accuracy level of past tense use. The sum of obligatory context and overuse of the target forms was divided by the number of correct use of target forms, and then was multiplied by 100.

$$TLU = \frac{n \text{ of correct use} \times 100}{n \text{ of obligatory contexts} + n \text{ of overuse}}$$

3.7.2. Scoring WM test results

By following Mackey et al. (2010) and Mackey and Sachs (2012), aggregate scoring was employed regarding the LS test. According to these studies, the anticipation of the size

of upcoming sets may enable test-takers to use a trade-off strategy, and thus it might affect the score if absolute scoring is employed, in which the maximum set size of recalling sentence-final words is important. Aggregate scoring, in contrast, is based on the sum of correctly processed sentences and recalled words. One point was awarded for each correctly answered sentence and word with the maximum score being 108. The PSTM test was scored by giving one point to each accurately repeated word or non-word including only one phonemic error, and the maximum score was 42.

4. RESULTS AND DISCUSSION

4.1. The Effects of Recasts on Grammatical Accuracy

Research Question 1 addressed whether recasts may help improve EFL learners' accuracy level of English past tense use. Table 3 below outlines the descriptive statistics from the pretest and the posttest. The scores on the pretest ranged from 0 to 87.10 whereas the score range for the posttest was between 0 and 100. Initially, there was little difference between the two, but there came a dramatic increase on the posttest. The total mean score of the posttest ($m = 60.06$) was nearly twice of that of the pretest ($m = 34.77$). The increase was shown as well in the scores of both regular forms and irregular forms. The mean score of regular forms rose from 38.99 to 59.13 and irregular forms from 28.98 to 61.17. In regard to the scores according to group, there was a clear difference between the recast and the control groups. The mean score of the recast group on the pretest ($m = 35.49$) rose more than two times on the posttest ($m = 73.59$). The pretest score in the control group ($m = 34.04$) increased on the posttest to a lesser extent ($m = 46.59$). Overall, the improvement level was far higher in the irregular category, compared to the regular one.

TABLE 3
Descriptive Results of the Pre- and Post-test

Learner (<i>N</i>)	<i>M</i>		<i>Mdn</i>		<i>SD</i>	
	Pre	Post	Pre	Post	Pre	Post
Recast group (21)	35.49	73.59	34.62	76.92	29.80	16.02
Regular forms	37.67	66.77	25.00	69.23	31.12	19.57
Irregular forms	30.27	80.46	10.00	83.33	35.57	17.94
Control group(21)	34.04	46.59	33.33	48.00	28.73	31.15
Regular forms	40.31	51.50	33.33	63.64	31.65	35.15
Irregular forms	27.70	41.87	16.67	42.86	30.73	30.80

The observed score differences between the two groups were subjected to a Mann-Whitney test. The results revealed no difference between the recast and control group on the pretest ($U = 218.00, p = .95$). When the pretest was divided into its two subsets, regular

and irregular, no significant difference was detected, either ($U = 208.00, p = .75$ for regular; $U = 213.00, p = .85$ for irregular). Subsequent to the provision of recasts, however, a significant difference was found, which is summarized in Table 4 ($U = 103.00, p = .003$). The score improvements for the regular/irregular subgroups were significant as well ($U = 133.00, p = .03$ for regular; $U = 79.50, p < .001$ for irregular).

TABLE 4
Comparison of Pre- and Post-test Score Improvement by Group

Group	<i>M</i>	<i>Mdn</i>	<i>SD</i>	<i>p</i>	<i>r</i>
Regular form					
Recast group	29.10	33.52	30.80		
Control group	11.19	7.14	18.33	.03	.35
Irregular form					
Recast group	50.20	53.57	32.01		
Control group	14.17	12.12	17.84	.001	.56
Regular-irregular combined					
Recast group	38.10	44.02	28.79		
Control group	12.48	9.62	15.35	.003	.47

Then, the effect sizes, represented by *r*, were compared. The effect size of the irregular form is much larger compared to that of the regular form. An effect between .3 and .5 is considered a moderate one and an effect above the .5 threshold is considered large (Field, 2009). Thus, it was concluded that recasts had a large effect on irregular past tense forms and had a moderate effect on regular forms. This suggests that recasts may be more advantageous for lexical/item learning, though it is also effective for rule learning. This finding is reminiscent of the finding reported in previous research that recasts were more effective for lexical learning than morphosyntactic rule learning (Mackey, Gass, & McDonogh, 2000; Trofimovich, Ammar, & Gotbonton, 2007). This finding also partly supports the dual-mode processing model (Skehan, 1998) and words and rules theory (Pinker, 1999) in that recasts had differential effects in the same treatment in this study.

4.2. The Role of Working Memory

The second research question addressed the role of working memory. Table 5 and 6 describe the results from the WM tests measured through the LS test and the non-word recall test (the PSTM test). Table 6 illustrates WM capacity divided into low and high categories with the median as the benchmark. These tables demonstrate that the learners' WM scores were proportionately distributed across the two groups.

TABLE 5
Descriptive Statistics of the Working Memory Tests

WM test	<i>M</i>	<i>SD</i>	Min	Max
LS test	79.43	8.25	62.00	96.00
PSTM test	22.21	4.39	15.00	33.00

Note. The maximum score for the LS test was 108 and for the PSTM test was 42.

TABLE 6
Frequency (Percentage) Table for WM Tests by Group

WM test	Low (%)	High (%)
LS test	20 (47.6)	22 (52.4)
Control group	10 (47.6)	11 (52.4)
Recast group	10 (47.6)	11 (52.4)
PSTM test	21 (50)	21 (50)
Control group	12 (57.1)	9 (42.9)
Recast group	9 (42.9)	12 (57.1)

Results from the binary correlational analysis revealed that, for the regular verbs, the score improvement from the pretest to the posttest had a very weak positive correlational relationship with PSTM capacity ($r = .15$), albeit not significant ($p = .35$). Similarly, the pre-posttest score improvement for the irregular verbs was not significantly correlated with PSTM capacity ($r = .23$, $p = .14$). For the verbal WM capacity, the scores for the regular verbs had a non-significant weak negative correlation ($r = -.12$, $p = .45$). Those for the irregular verbs had a very weak non-significant positive correlation ($r = .03$, $p = .85$). From these results, it can be concluded that, as far as the current data were concerned, working memory was not significantly involved in the observed accuracy improvement. This finding is not congruent with many previous studies that showed positive relations of WM with L2 comprehension and production. On the other hand, it is in line with some studies showing no evidence of the role of working memory in influencing the effects of recasts (Goo, 2014a, 2014b).

Several interpretations of these results are possible given from different angles. First of all, the high saliency of recasts in the present study might have had an influence on the non-significance of working memory. The characteristics of the recasts provided to learners in the present study (i.e., shortened length, one change, and interrogative intonation) may have helped learners to notice recasts easily. This corroborates the finding of Loewen and Philp (2006) showing that the type of recasts used in this study were beneficial in gaining a higher-level accuracy on the posttest. It was also found in Philp (2003) that learners noticed recasts more easily with shorter length and less changes. In Goo's (2012) study, full recasts were compared with metalinguistic feedback. He argued that the explicitness of feedback is closely related to the role of working memory. Due to the explicitness of metalinguistic feedback, cognitive control of attentional resources may not be necessary whereas the implicitness of recasts requires more internally driven

cognitive control. The recasts given to learners in the current study were highly explicit. Thus, it is possible that the high saliency of explicit recasts eased the learners' burden of noticing recasts without consuming too much working memory resources.

The non-influence of working memory may be explained also by taking context into consideration. The current study employed dyadic communicative tasks in which learners were well aware of the recasts they were receiving as corrective feedback because they had been accustomed to receiving recasts from their English-speaking instructors in regular English courses. Moreover, learners were given enough time to work on the task, which may have obviated the need for them to have high WM capacity. This interpretation is backed by their responses to the exit questionnaire, which asked the learners in the treatment group whether they noticed recasts as corrective feedback during interactions. It turned out that 15 out of 21 (71.43%) reported their recognition of recasts. This finding is consistent with Lyster and Izquierdo (2009), which found that both prompts and recasts were effective when they were given in focused dyadic settings. Yang and Lyster (2010) also stated that research context is associated with the saliency of recasts. In this study, all treatment sessions were carried out in a laboratory setting through dyadic tasks. That is to say, the focused one-one-one setting without strict time limit may have helped learners concentrate on their interactive work with less distraction. Thus, the context of this study may have been conducive to enhancing the saliency of recasts.

Alternatively, the different degrees of saliency of the target structure may have contributed to the non-significant role of working memory. Regular forms are not salient because of its structural regularity (DeKeyser, 1998) whereas irregular forms have a relatively high level of saliency (Salaberry, 2000). Based on these facts, Yang and Lyster (2010) argued that regular forms are processed in a rule-based manner whereas the processing of irregular forms is governed by the exemplar-based (i.e., item-based) system that can be easily and quickly retrieved in real-time communication. Thus, it may have been possible that recasts on regular forms were relatively more difficult for the learners to notice after receiving a recast, even though it was explicit. On the other hand, recasts on irregular forms may have been relatively more salient, which may have been an easier target for noticing and processing in the working memory system. This may explain how the learners gained a higher level of accuracy in the irregular category.

4.3. Learner Perceptions

Finally, the third research question was posited with a consideration of the feasibility of using the treatment procedure for practical purposes, not just for pure research purposes. In this sense, the exit questionnaire helped glean some additional information about the learners' affective states, task satisfaction, task difficulty, perception of improvement, their interest in

further participation, and noticing of recasts, all of which are crucial in implementing an instructional procedure like the one used in this study in an actual classroom context.

Table 7 shows the learners' responses as to the learners' affective states. The table shows that the level of self-confidence and interest in speaking English slightly increased for interactions with both English speakers (ENSs) and Koreans (KNSs), showing a mean score from 2.93 to 3.81 and from 3.41 to 3.90, respectively. The anxiety level decreased from 3.39 to 2.80. All these results show the learners' favorable attitudes to the treatment overall.

TABLE 7
Results of Questionnaire on Affective States

Questions	<i>Mean</i>		<i>Mdn</i>		<i>SD</i>	
	Before	After	Before	After	Before	After
Confidence	2.93	3.81	3.00	4.00	.89	.60
ENS	2.89	3.79	3.00	4.00	.94	.70
KNS	2.96	3.83	3.00	4.00	.84	.48
Interest	3.41	3.90	3.50	4.00	.78	.49
ENS	3.48	3.90	3.50	4.00	.80	.49
KNS	3.35	3.90	3.25	4.00	.75	.50
Anxiety	3.39	2.73	3.50	3.00	.94	.69
English	3.48	2.80	3.50	3.00	.98	.67
Korean	3.30	2.70	3.50	2.50	.90	.71

Notes. The maximum score was 5 for all categories.

The questions on task satisfaction, task difficulty, perception of improvement, and further participation are shown in Table 8 below. The task satisfaction scores showed a mean score of 4.10 and task difficulty was 3.10, which could be interpreted as evidence that most of the learners were satisfied with the tasks in some way and the level of difficulty was appropriate. In terms of the learners' perceptions of improvement and further participation showed a mean of 4.06 and 4.00, indicating many of the students felt that their speaking ability had improved and they would like to participate in this type of interaction in the future again. As to their perceptions of the treatment sessions, 30 out of 42 students (71.43%) responded that they enjoyed the interactions, and were satisfied with them, asking for more sessions for long-term learning. To sum up, the learners' responses to the questionnaire were positive overall, which and may mean that the procedure used in this study has a high pedagogical value.

TABLE 8
Results of Questionnaire on Task and Improvement

Questions	<i>Mean</i>	<i>Mdn</i>	<i>SD</i>
Task satisfaction	4.10	4.00	.65
Task 1	4.03	4.00	.69
Task 2	3.90	4.00	.67
Task 3	4.23	4.00	.60
Task Difficulty	3.10	3.00	.62
Improvement	4.06	4.00	.67
Further Participation	4.00	4.00	.63

5. CONCLUSION

To summarize, this study demonstrated that the provision of recasts may play a beneficial role in improving university-level EFL learners' English past tense forms, both regular and irregular. The actual effects of recasts, however, were more conspicuous in the irregular verb category. WM capacity showed no significant relationship with the effects of recasts. The significant efficacy of recasts on the learning of English past tense forms and non-significant role of working memory might be explained in terms of the characteristics of recasts rendered more salient and also the context in which the learners were easily able to pay attention to the recasts in an intensive and focused interactional environment. As to the differential effect sizes on the two past tense forms, different processing mechanisms and saliency of the target forms may have played a role. Thus, it can be concluded that recasts are effective on learning English past tense forms, with irregular forms more amenable to the corrective force of recasts. In addition, when recasts are provided in a high-involvement interactional context, their processing does not require a high level of WM capacity. Conversely, it would be possible that in a more challenging interactional environment, learners with a higher level of WM capacity perform better than their lower-level counterparts.

These results provide some implications for teaching and learning English in Korean EFL settings. First of all, the provision of recasts may be a desirable way to enhance learners' interlanguage development in a personalized learning context such as one-on-one coaching-based learning. As class size is getting smaller in schools across Korea, learning with a language learning coach or facilitator in a one-on-one setting may be a viable learner-friendly approach to L2 practice. In some studies investigating the effects of coaching in relation to English learning, it was revealed that students felt comfort and gained positive improvement in their affective domains (Kim, 2010; Shin & Kim, 2009). In this setting, provision of recasts may be an appropriate way of teaching. According to Jang (2004), recasts provoked less anxiety than other correctional options. The questionnaire of this study reported the positive improvement in the learners' affective states, which can be interpreted as evidence that recasts provided during interaction did not intimidate learners.

Giving enough consideration to the target linguistic form of recasts would also be important because this study found that recasts may work differently depending on the type of form: rule-based and instance-based. Teachers may need training in detecting learner errors that are susceptible to recasts and providing timely recasts intensively so that learners may notice recasts through repeated experience with them.

Several limitations need to be addressed in future research. First, due to the small sample size, the results of the current study are not enough for generalization. Second, the design of the present study did not consider long-term effects of learning. Also, it would be

important to investigate differential effects of different types of recasts in terms of the degree of explicitness, intensity, and saliency. Taken together, further studies are suggested with a larger sample size to gain more statistical power and a delayed posttest design to measure more long-term learning gains. Finally, more research examining different types of linguistic forms as a mediating factor is needed due to the differential effects of recasts on different target structures.

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APPENDIX A

Sample Treatment Task: Prove Your Alibi

Prove Your Alibi! (Suspect)

Mrs. Kim's car was stolen last weekend. You are accused of stealing her car. Now you are in a police station and asked what you did last weekend. You should prove your alibi to show that you are not the thief. The following is the table that shows your last weekend schedule. Answer the detective's questions with more details according to the table.

Here is an example:

Detective: What did you do at 1:30 on Saturday?

Me: I had brunch with my mom.

Detective: Where did you have it?

Me: I had it at home. Mom can prove my alibi.

Prove Your Alibi! (Detective)

Mrs. Kim's car was stolen last weekend. You are accused of stealing her car. Now you are in a police station and asked what you did last weekend. You should prove your alibi to show that you are not the thief. The following is the table that shows your last weekend schedule. Answer the detective's questions with more details according to the table.

Here is an example:

Detective: What did you do at 1:30 on Saturday?

Me: I had brunch with my mom.

Detective: Where did you have it?

Me: I had it at home. Mom can prove my alibi.

Applicable levels: Tertiary

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Received on September 1, 2017

Reviewed on October 15, 2017

Revised version received on November 15, 2017