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Type of Feedback, Phonological Short-Term Memory, and L2 Development*

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The present study examines whether and how the type of corrective feedback (CF) affects the level of L2 learning. Two CF moves, recasts and metalinguistic feedback, were compared in terms of their efficacy on the acquisition of the English mixed conditional. The study also investigated the role of phonological short-term memory (PSTM) in the effectiveness of the two feedback moves. Twenty-four high-intermediate university students were randomly assigned to one of three conditions: recast, metalinguistic feedback, and comparison groups. One intensive treatment session was implemented between the pretest and posttest sessions. Two types of dependent measures were employed: one grammaticality judgment test (GJT) and one oral production test (OPT). PSTM was measured via a nonword repetition task. Results showed that both feedback moves were facilitative of the development of the target structure. However, learner performance showed different patterns, depending upon the type of measure. In the GJT, recasts were found to have contributed more to the acquisition of the target, whereas in the OPT metalinguistic feedback was more effective than recasts at promoting the development of the target. Somewhat surprisingly, PSTM, unlike previous research, was not found to be correlated with learner performance on either measure.

[recasts/metalinguistic feedback/phonological short-term memory/nonword repetition/mixed conditional]

I. INTRODUCTION

Cognitive interactionists with their support for the so-called interaction hypothesis (e.g., Gass, 2003; Gass & Mackey, 2006, 2007; Long, 1996; Pica, 1994, 1996) have clearly

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demonstrated the importance of having learners engage in conversational interaction in L2 development (e.g., Keck, Iberri-Shea, Tracy-Ventura, & Wa-Mbaleka, 2006; Long, 2007; Mackey, 2012; Mackey & Goo, 2007). Much attention has since been drawn to how interaction affects L2 learning, that is, what interactional features contribute to L2 development. Of all features, corrective feedback (CF) provided during negotiation for meaning has been at the epicenter of this intriguing scholarly exploration, inviting a great deal of discussion and research on the role of CF in interlanguage restructuring in various learning contexts (e.g., Ammar & Spada, 2006; Baralt, 2013; R. Ellis, Loewen, & Erlam, 2006; Goo, 2012; Kim, 2011; Loewen & Philp, 2006; Long, Inagaki, & Ortega, 1998; Lyster, 2004; Lyster & Izquierdo, 2009; Mackey & Philp, 1998; Nassaji, 2009; Philp, 2003; Sagarra & Abbuhl, 2013; Yang & Lyster, 2010, Yilmaz, 2012, 2013; Yoon, 2008). Varied CF moves (e.g., recasts, clarification requests, repetitions, elicitations, metalinguistic feedback) have been compared with each other in terms of their impacts on interactional patterns (e.g., Adams, Nuevo, & Egi, 2011; R. Ellis, Basturkmen, & Loewen, 2001; Lyster & Ranta, 1997; Panova & Lyster, 2002; Sheen, 2004), and even more research has been conducted on the relative efficacy of different CF types on L2 development (e.g., R. Ellis et al., 2006; Goo, 2012; Lyster, 2004; Lyster & Izquierdo, 2009; Sheen, 2007; Yang & Lyster, 2010; Yilmaz, 2012, 2013). The present study is designed to add further insights into this line of research. In what follows, previous research on CF is discussed, focusing on two CF moves, the relative effects of which are the main focus of the present investigation, recasts and metalinguistic feedback.

II. RECASTS AND METALINGUISTIC FEEDBACK

Long (2007) defined a corrective recast as "a reformulation of all or part of a learner's immediately preceding utterance in which one or more non-targetlike (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). Recasts have been operationalized in diverse forms in various research contexts with slightly modified terms (e.g., Doughty & Varela, 1998; Sheen, 2007). Long (2007) notes that recasts are psycholinguistically more appropriate in focus-on-form learning environments than any other CF moves. Because recasts are provided when there exists some level of understanding with respect to meaning, learners have attentional resources enough to lead them to focus on formal elements contained in recasts. Long claims that "Recasts convey needed information about the target language *in context* [italics in original], when interlocutors share a *joint attentional focus* [italics in original], and when the learner already has *prior comprehension* [italics in original] of at least part of

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the message, thereby facilitating form-function mapping" (p. 77). Also, an immediate juxtaposition of the learner's erroneous output and the correct alternative contained in recasts renders quite likely a cognitive comparison between the two, facilitating learner noticing, which in turn contributes to L2 development.

However, because the exact nature of recasts has been somewhat controversial (e.g., R. Ellis & Sheen, 2006; Leeman, 2003), and some researchers have been skeptical about the effectiveness of recasts in classroom contexts (e.g., Lyster & Ranta, 1997; Lyster, 1998a, 1998b; Panova & Lyster, 2002; see also R. Ellis et al, 2001 and Sheen, 2004 for related findings and discussion) despite overall research findings that indicate the potential effects of recasts on interlanguage development (e.g., Doughty & Varela, 1998; Han, 2002; Iwashita, 2003; Ishida, 2004; Long et al, 1998; Mackey & Philp, 1998; Mackey & Silver, 2005; Sagarra, 2007), interaction researchers have compared recasts and other feedback moves in terms of their relative efficacy on L2 learning (e.g., Ammar & Spada, 2006; R. Ellis et al., 2006; Goo, 2012; Lyster, 2004; Lyster & Izquierdo, 2009; Nassaji, 2009; Sato & Lyster, 2012; Sheen, 2007; Yang & Lyster, 2010; Yilmaz, 2012, 2013; see also for reviews and relevant discussion Goo & Mackey, 2013; Lyster & Ranta, 2013; Lyster, Saito, & Sato, 2013). The overall findings to date are rather mixed. The present study is another empirical attempt to investigate this issue, designed to compare recasts with metalinguistic feedback.

Metalinguistic feedback is defined as 'either comments, information, or questions related to the well-formedness of the student's utterance, without explicitly providing the correct form' (Lyster & Ranta 1997, p. 47). This type of feedback has also been compared with other types of feedback assumed to be beneficial (e.g. recasts, clarification requests, etc.) in terms of its relative role in second language learning (e.g., Ammar & Spada, 2006; R. Ellis, 2007; R. Ellis et al., 2006; Goo, 2012; Loewen & Nabei, 2007; Lyster, 2004; Sheen, 2007). R. Ellis et al. (2006) in their examination of the effects of interactional feedback on the acquisition of the English past tense morpheme found that metalinguistic feedback was more effective than recasts. However, Loewen and Nabei (2007) in their study on the effectiveness of different types of feedback (clarification requests, recasts, metalinguistic feedback) observed no significant difference among the treatment groups in either grammaticality judgment tests or oral production tests. Goo (2012) also found no significant differences in the development of the English *that*-trace filter. Interestingly, Goo examined whether his learners' working memory (WM) had any impact on the effectiveness of CF moves (recasts and metalinguistic feedback). WM was found to have mediated the beneficial effects of recasts on the acquisition of the target structure, but it did not affect the extent to which learners benefitted from metalinguistic feedback. Given this finding and potential impacts of cognitive factors on L2 learning, the present study is also

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intended to explore the role of phonological short-term memory (PSTM) in L2 learning through CF provided during interaction.

III. PSTM AND L2 LEARNING

Recognizing L2 learning involves various levels and steps of cognitive processing, SLA researchers have shown much interest in investigating cognitive factors, that is, what role individual differences in cognitive capacities play in L2 development. PSTM is one of those cognitive variables that have grabbed researchers' attention in the field of SLA. As such, PSTM in the context of language learning has been discussed extensively and researched in various experimental contexts, and PSTM has been found to play a pivotal role in various aspects of L2 development (e.g., N. Ellis, 1996; N. Ellis & Sinclair, 1996; N. Ellis & Schmidt, 1997; French & O'Brien, 2008; Gathercole & Baddeley, 1990; Kormos & Safar, 2008; Martin & N. Ellis, 2012; O'Brien, Segalowitz, Collentine, & Freed, 2006; O'Brien, Segalowitz, Freed, & Collentine, 2007; Papagno, Valentine, & Baddeley, 1991; Service, 1992; Service & Kohonen, 1995; Williams & Lovatt, 2003). N. Ellis and Sinclair (1996) found that those who were conditioned to repeat 30 computer-delivered Welsh utterances during the learning phase performed significantly better in terms of vocabulary acquisition, production of phrasal constructs, and explicit knowledge of the Welsh soft-mutation rules, and their grammatical production of the mutation than did the subjects in the articulatory suppression condition, under which they were prevented from repeating/articulating the Welsh stimuli by having to count a whispered one to five repeatedly while doing the experimental task. Kormos and Safar (2008) also found that PSTM was correlated with writing, oral fluency, and the range of vocabulary use in oral performance. As evidenced in N. Ellis and Sinclair's study, and in addition to earlier PSTM studies that indicate the important role of PSTM in vocabulary learning (e.g., Baddeley, Papagno, & Vallar, 1988; Papagno et al, 1991), N. Ellis (1996) claimed the relevance of PSTM to L2 grammar learning as well as other areas of L2 development, arguing that because PSTM determines L2 learners' sequencing ability, individual variation in PSTM likely affects the extent of L2 grammatical development. Supporting evidence has been provided in several studies (e.g., Martin & N. Ellis, 2012; O'Brien et al., 2006; Williams & Lovatt, 2003). Williams and Lovatt (2003), for instance, found that PSTM was related to the ability to store novel combinations of familiar morphemes and utilize those combinations in rule learning (determiner-noun agreement rules in semi-artificial microlanguages in their study). O'Brien et al. (2006) also showed that phonological memory was associated with the use of morphemes and subordinate clauses as well as vocabulary learning and narrative abilities in a L2 Spanish learning context (see

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also O'Brien et al., 2007 for a significant relationship between PSTM and L2 Spanish oral fluency development).

More recently, Martin and N. Ellis (2012) investigated this potential relationship between PSTM and grammatical development in an artificial foreign language designed based on other experimental language systems (e.g., Daneman & Case, 1981) and natural language systems (e.g., Arabic and Swahili). In all cases except for the rule for forming plurals, statistically significant correlations were found between PSTM (measured via nonword repetition) and grammar learning (reflected in final grammar scores) with correlation coefficients ranging from .34 to .43. Similar levels of correlations were also observed between PSTM and vocabulary development. The results of hierarchical multiple regression analyses suggest that PSTM affects L2 grammar learning both directly (i.e., independently) and indirectly (i.e., through their impact on vocabulary acquisition, given strong correlations between vocabulary and grammatical development, as evidenced in their study).

All told, previous research on PSTM in relation to L2 learning has provided empirical evidence that PSTM plays a pivotal role in developing various aspects of a foreign language. Given these findings, it is not too far-fetched a claim/assumption that individual differences in PSTM may mediate the extent to which L2 learners can notice, and thus benefit from, corrective feedback that they receive during face-to-face oral interaction. Thus, the present study was designed to investigate this question by examining whether PSTM affects any potential benefits of two corrective feedback moves on the acquisition of the English mixed conditional: recasts and metalinguistic feedback. Below are two research questions addressed in the present investigation.

RQ1: Is there any difference between recasts and metalinguistic feedback in their efficacy on the acquisition of the English mixed conditional?

RQ2: Does PSTM mediate any impacts of recasts and/or metalinguistic feedback on the acquisition of the English mixed conditional?

IV. METHOD

1. Participants

A total of 24 high-intermediate EFL learners studying at a Korean university with education as their major and English education as their minor participated in the present study (male = 10, female = 14). Their age ranged from 20 to 26 (M = 21.78, SD = 2.21).

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They had taken several English conversation courses prior to the present experiment. They were randomly assigned to one of three groups: the recast (n = 10), metalinguistic feedback (n = 9), and comparison (n = 5) groups. The researcher played a role as an interlocutor during interaction in a dyad.

2. Target Structure

The target selected for the present study is the English conditional structure, which has been used as a target of acquisition in quite a few studies (e.g., McDonough, 2004; Rosa & O'Neill, 1999). Especially, the structure of the English mixed conditional is the main focus of this study (e.g., *If I had not seen the movie yesterday, I would not know what you guys are talking about.*). It was chosen in that linguistic features portrayed in the English mixed conditional are quite challenging even for high-intermediate learners due to its rather complex morphosyntactic and semantic features, the understanding of which is required to produce grammatically accurate mixed conditional sentences. That is, the mastery of the English mixed conditional necessitates well-designed instructional efforts including the provision of corrective feedback.

3. Tasks and Materials

1) Testing Tasks and Materials

Two tests were developed to measure the acquisition of the target structure: one timed grammaticality judgment test (GJT) and one timed oral production test (OPT). Decisions on the amount of time required for both dependent variable measures were made based on a small-scale pilot study. Each acquisition measure consists of two types: Type 1 and Type 2. A total of fifty-six sentences were included in each type of GJT; thirty-two target items, half of which were about the mixed conditional and the other half about another structure (which is not reported in this article) and twenty-four distractors. For each sentence in the GJT, the learners were given 10 seconds within which they had to make a decision on the grammaticality of the sentence and put a checkmark in the appropriate box on their answer sheet provided. Each sentence automatically showed up on the computer screen every 10 seconds one after another. Then, the learners received a piece of paper that included 56 sentences of which they had judged the grammaticality in the computer-based judgment test. They were asked to correct the sentences that they had judged as ungrammatical on another piece of paper provided.

In the timed OPT, there were 15 target items and 10 distractors. In the test, the learners had 15 seconds to make a conditional sentence out of each sentence containing two clauses

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connected by *so* (e.g., *I didn't have breakfast this morning, so I am hungry now*.). Fifteen sentences were designed for the mixed conditional, five for hypothetical conditional, and five for counterfactual conditional sentences. The learners' oral performance was recorded using computer software and scored later.

Learners' PSTM was measured via a nonword repetition task containing 16 pairs of nonwords; 3 pairs each for three-, four-, five-, and six-syllable words, and 2 pairs each for seven- and eight-syllable words. The learners listened to each pair of nonwords and were asked to repeat each pair immediately after they heard a sound signal (ting). The learners were given 10 seconds after each sound signal. A NS recorded all 16 pairs along with the task instructions. In addition to the recorded task instructions, the researcher explained to the participants in their L1, Korean, what they should do in the repetition task.

2) Treatment Tasks and Materials

A one-page treatment material was developed, which included instructions and space needed for the learner to write down 7 things that he or she had done or had not done the previous day. Also, a box that contained a number of verbs and simple phrases (e.g., *do homework*, *stay home*, *work*, etc.), which the learners were encouraged to use if necessary, was provided. The researcher used the same one-page material on his part for the same purpose. In a dyadic interaction, the learner told the researcher his or her sentences one at a time. Each sentence was followed by the researcher's one-sentence comment either in the present tense or in the past tense. Immediately after the researcher's comment, the learner was asked to make a conditional sentence incorporating his or her sentence and the researcher's one-sentence comment. If the researcher's comment was in the present tense (n = 5), the learner was supposed to make a mixed conditional sentence, but if it was in the past tense (n = 2), he or she was supposed to make a counterfactual conditional sentence. After the learner told the researcher all of his or her sentences and produced all 7 corresponding conditional sentences, the researcher began to tell the learner his own sentences; this time, however, the researcher uttered each sentence and made a follow-up comment using "so" in the same turn (i.e. *I didn't get much sleep yesterday, so I am tired now*). Then, he asked the learner to make a conditional sentence incorporating his original sentence and follow-up comment. This part of the treatment resulted in the same number of mixed (n = 5) and counterfactual conditional sentences (n = 2) as in the learner's turn.

4. Design

The study employed a pretest-posttest design to measure the effects of recasts and metalinguistic feedback on the acquisition of the English mixed conditional. Two

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experimental groups and one comparison group were compared in terms of learner performance. Shown below is the way each treatment condition was operationalized in this study.

1) Recast Group

During the treatment session, the researcher provided feedback on the learner's non-targetlike utterances. The learners received recasts from the researcher whenever they produced non-targetlike sentences involving the English mixed conditional during the treatment activities, as shown in Example 1 below.

Example 1
Learner: *I didn't do my homework yesterday.*
Researcher: *So you need to do more work today, right? Can you make a conditional sentence using your sentence and what I have just said?*
Learner: *If I did my homework yesterday, I wouldn't need to do more work today.*
Researcher: *If you had done your homework yesterday, you wouldn't need to do more work today.*

2) Metalinguistic Feedback Group

The learners were pre-taught grammatical/metalinguistic terms necessary to understand feedback under this condition. They received metalinguistic feedback whenever they produced non-targetlike mixed conditional sentences during the treatment session. Below is an example involving metalinguistic feedback.

Example 2
Learner: *I didn't do my homework yesterday.*
Researcher: *So you need to do more work today, right? Can you make a conditional sentence using your sentence and what I have just said?*
Learner: *If I did my homework yesterday, I wouldn't need to do more work today.*
Researcher: *It's a mixed conditional sentence, the past perfect in the "if" clause.*

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3) Comparison Group

Each of the learners in this group interacted with the researcher. However, unlike the other two groups mentioned above, the learners in this group did not receive any feedback from the researcher.

It should be noted, however, that no artificial manipulation to provide modified output opportunities (e.g., a long pause after the provision of feedback) was made in an effort to keep interaction as natural as possible.

5. Procedure

On Day 1, the participants were informed of the experimental procedure and asked to fill out a personal information questionnaire. On Day 2, each participant engaged in the computer-based pretests (grammaticality judgment and oral production). A brief instructional session on both tests was conducted before the actual tests. The pretest session took approximately 50 minutes. On Day 3, one information exchange task targeting the mixed conditional (30 minutes) was carried out in a dyad between the learner and the researcher. All individual treatment sessions were tape-recorded to ensure that the tasks were implemented as planned; this was confirmed after the review of those tapes. Immediately after the treatment session, the posttest was administered in the same format as in the pretest. In an attempt to counterbalance tests, approximately half of the participants in each group took Type 1 of each test in the pretest session and the other half Type 2, and vice versa in the posttest session. After the posttest, the learners took the PSTM test, which took approximately 10 minutes.

6. Scoring

One point was given for each correct judgment in the GJT and for each targetlike utterance in the OPT and 0 for each incorrect judgment in the GJT and for each non-targetlike production in the OPT. For each item judged as ungrammatical in the GJT, one point was given only when an accurate grammatical correction was also provided. In the GJT, the maximum score for each target item was 16. In the OPT, the maximum score was 15. Although all distractors were also scored, they were not included in any statistical analysis. In the PSTM test, one point was given for each word pronounced correctly; however, for the pairs from 1-9, if there was only one phoneme difference, one point was given to the learner (zero if there were two or more different phonemes in the learner's repetition); for the remaining pairs (10-16), one point was also given to a repeated word with two different phonemes (zero if three or more different phonemes were involved). The

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maximum score was 32 as there were 16 pairs in total. Two NSs scored approximately 30% of the data on PSTM (Cohen's Kappa was .76). Differences were resolved during a follow-up discussion. Then, one of them scored the remaining data.

7. Analysis

Several tests were conducted to check the assumptions for parametric statistical analyses (e.g., skewness, kurtosis, homogeneity of variances). Decisions on what statistical methods should be used were made based on the results of those tests. Parametric tests such as ANCOVA, and independent samples (and paired-samples) *t*-tests were utilized whenever those assumptions were met (independence, normality, and homogeneity of variances) and nonparametric tests such as Kruskal-Wallis and Wilcoxon signed ranks were used when the assumptions were not met. The significance level was preset at .05 for all statistical tests.

V. RESULTS

First, no significant between-groups difference was found in either type of dependent variable measure and in either test session (see Tables 1 & 2). However, as seen in Tables 3 and 4, the post-experimental performance of the recast and metalinguistic groups significantly improved, compared to their pre-experimental performance, either on the GJT (in the case of the recast group) or on the OPT (in the case of the metalinguistic feedback group). The comparison group did not show any significant pre-to-post improvement in either test measure.

TABLE 1

Results of Grammaticality Judgment on Mixed Conditional

	Recast (n = 10)		Meta (n = 9)		Comp (n = 5)		Kruskal-Wallis	
Test	*M*	*SD*	*M*	*SD*	*M*	*SD*	*H*	*p*
Pretest	5.50	4.97	7.67	4.90	2.40	2.51	3.32	.190
Posttest	10.20	4.44	11.00	2.69	4.80	4.87	4.33	.115

TABLE 2

Results of Oral Production Involving Mixed Conditional

	Recast (n = 10)		Meta (n = 8)		Comp (n = 3)		Kruskal-Wallis	
Test	*M*	*SD*	*M*	*SD*	*M*	*SD*	*H*	*p*
Pretest	3.90	3.98	3.25	3.92	1.33	1.53	.92	.632
Posttest	6.00	4.37	7.75	4.17	4.33	4.04	1.16	.560

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Table 3 shows the pre-to-posttest development on the mixed conditional for each group in the GJT (see also Figure 1). A statistically significant pre-to-post improvement was evidenced only in the recast group with a large effect size (t (9) = -3.74, p = .005, d = 1.00). Although it did not reach the preset significance level, a trend towards significance was observed, and the performance of the metalinguistic group showed a large effect size (t (8) = -2.12, p = .067, d = .84). A medium effect size was found for the comparison group with no statistically significant pre-to-posttest development (Z = -1.07, p = .285, d = .62).

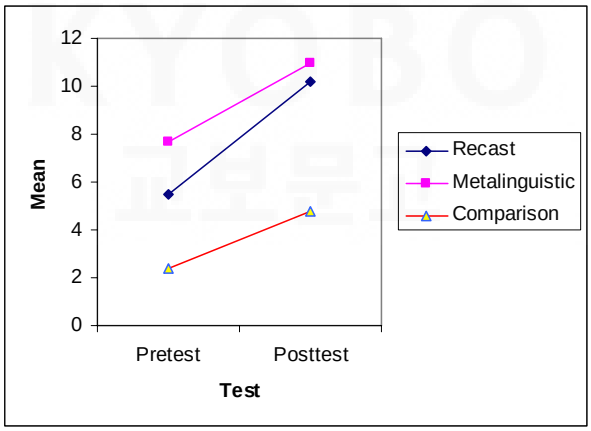
TABLE 3

Pre-to-Posttest Development in GJT

	Pretest		Posttest		Wilcoxon Signed (Z) or Paired-samples (t)			Effect size
Group	*M*	*SD*	*M*	*SD*	*Z*	*t*	*p*	*d*
Recast (n = 10)	5.50	4.97	10.20	4.44		-3.74*	.005	1.00
Meta (n = 9)	7.67	4.90	11.00	2.69		-2.12	.067	.84
Comp (n = 5)	2.40	2.51	4.80	4.87	-1.07		.285	.62

FIGURE 1

Pre-to-Posttest Development in GJT



In the OPT (see Table 4 and Figure 2), only the metalinguistic group showed a statistically significant pre-to-posttest improvement with a large effect size (Z = -2.54, p = .011, d = 1.11). No significant pre-to-posttest difference was observed in the performance of either of the other two groups. A medium effect size was found in the performance of the recast group although the pre-to-posttest difference did not reach the significance level (t (9) = -1.80, p = .106, d = .50). A large effect size was evidenced in the performance of

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the comparison group (Z = -1.34, p = .180, d = .98); however, data were collected from only three participants, rendering it impossible to interpret the results in any meaningful way.

TABLE 4

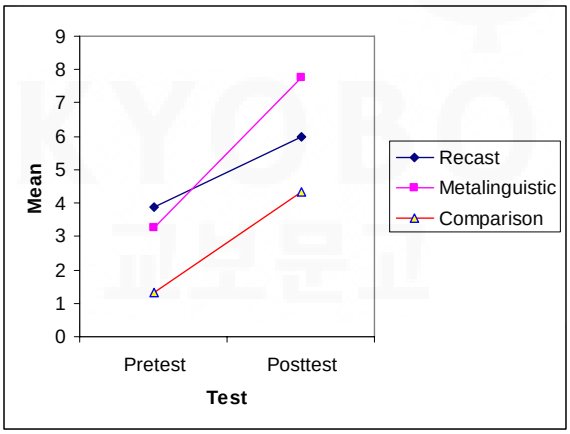
Pre-to-Posttest Development in Oral Production

	Pretest		Posttest		Wilcoxon Signed (Z) or Paired-samples (t)			Effect size
Group	*M*	*SD*	*M*	*SD*	*Z*	*t*	*p*	*d*
Recast (n = 10)	3.90	3.98	6.00	4.37		-1.80	.106	.50
Meta (n = 8)	3.25	3.92	7.75	4.17	-2.54*		.011	1.11
Comp (n = 3)	1.33	1.53	4.33	4.04	-1.34		.180	.98

Note. Due to the subject mortality, different numbers of participants were shown in different types of tests.

FIGURE 2

Pre-to-Posttest Development in Oral Production



The second research question is concerned with the role of PSTM in the efficacy of recasts and metalinguistic feedback on the development of the target structure. First, correlation coefficients were calculated in order to see the relationship between the effectiveness of the two feedback moves (i.e., gain scores) and the learners' PSTM. No significant correlation was found. Next, to compare the two experimental groups, two independent-samples t tests on the learners' pre-to-post gain scores were conducted, one for each dependent variable measure, followed by the corresponding number of ANCOVAs (PSTM as a covariate). As shown in Tables 5 and 6, the p-values of the ANCOVAs are

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quite similar to those of the *t* tests, which, along with non-significant correlations between PSTM and pre-to-post gain scores (see Table 7), indicates that PSTM played no significant role in the effects of either feedback move on the acquisition of the target structure.

TABLE 5

Gain Score Results of GJT on Mixed Conditional

	Recast (*n* = 10)		Meta (*n* = 9)		*t*-test		ANCOVA	
	M	*SD*	*M*	*SD*	*t*	*p*	F^a	*p*
Gain scores	4.70	3.97	3.33	4.72	.69	.502	.344	.566

[a]*df* = 1.

TABLE 6

Gain Score Results of Oral Production on Mixed Conditional

	Recast (*n* = 10)		Meta (*n* = 8)		*t*-test		ANCOVA	
	M	*SD*	*M*	*SD*	*t*	*p*	F^a	*p*
Gain scores	2.10	3.70	4.50	2.27	-1.61	.128	2.443	.139

[a]*df* = 1.

TABLE 7

PSTM × Gain Score Correlation Coefficients

	GJT Gain	OPT Gain
Recast	-.242	.084
Metalinguistic	-.174	-.237

Note. They are all non-significant ($p > .05$).

VI. DISCUSSION AND CONCLUSION

The results of this small-scale study showed that both recasts and metalinguistic feedback contributed to the development of the English mixed conditional in one way or another. Despite no evidence of statistically significant between-groups differences in either test measure, recasts were found to have facilitated the acquisition of the target, as shown in their pre-to-post improvement in the GJT. Metalinguistic feedback, however, appears to have benefitted learners with respect to oral production involving the target structure. Another interesting finding is that PSTM did not play any significant mediating role in the effectiveness of the feedback moves investigated.

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The first research question is concerned with the relative efficacy of one feedback move over another (recasts vs. metalinguistic feedback) on the acquisition of the English mixed conditional. It was found that recasts were more beneficial than metalinguistic feedback in developing metalinguistic knowledge on the mixed conditional, but not in oral performance in which metalinguistic feedback was more effective than recasts. As indicated above, their knowledge on the mixed conditional even after the experimental treatments was not stable enough to perform well on both modes of outcome measures at a more or less equal level. As indicated in previous research syntheses (e.g., Mackey & Goo, 2007; Norris & Ortega, 2000), it appears that the modality of dependent variable measure may have affected the performance of the learners in both groups somewhat differentially. If it is assumed that grammaticality judgment utilized in the present study is supposed to measure explicit knowledge and oral production implicit knowledge to some extent (see R. Ellis 2004, 2005, 2006; R. Ellis, Loewen, Elder, Erlam, Philp, & Reinders, 2009; Erlam, 2006 for more discussion on implicit and explicit knowledge and related measures), it can be claimed that recasts are more beneficial than metalinguistic feedback in the development of explicit knowledge, and that metalinguistic feedback is more effective than recasts in the building of implicit knowledge.

However, given the OPT utilized in the study was a highly controlled and focused production measure, compared to other possible oral production measures embedded in meaningful interactional contexts, the presumed distinction between the GJT and OPT may not be an accurate description of the two dependent variable measures employed here. The OPT may have been a challenging measure to test both sides of knowledge, necessitating the activation of complex cognitive processes that require skills needed to link receptive knowledge and verbal production. That is, metalinguistic feedback contributed to the development of what was required to perform well on the OPT, whereas learners benefitted from recasts in the building of their receptive explicit knowledge on the target structure, but not enough to grab the level of knowledge needed for accurate oral production involving the mixed conditional. It seems that input-providing (or model-providing, to be more precise) feedback such as recasts may work better with tasks in which they can compare test items with those models that they have received during treatments. Then, the question is how come the metalinguistic group failed to show any significant improvement in the GJT designed to measure explicit knowledge despite their significant improvement in terms of knowledge as evidenced in the OPT. Their performance on the posttest, albeit nonsignificant, did in fact improve from their pretest performance, showing a trend towards statistical significance (p = .067), and more importantly, a large effect size (d = .84). Another piece of evidence indicating the overall positive impact of metalinguistic feedback on the development of the target structure comes from a much smaller standard deviation (SD = 2.69) found in their posttest performance, compared to that of the recast

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group. However, the interaction between the impacts of feedback on L2 learning and the mode of dependent variable measure is quite intriguing a question that still needs more clear-cut explanations, and of course, for that reason, merits further research.

The present study also investigated the role of PSTM in the effectiveness of recasts and metalinguistic feedback in the acquisition of the English mixed conditional. The findings indicate that PSTM did not mediate the degree to which recasts or metalinguistic feedback contributed to the development of the target structure. This is rather unexpected, given previous research findings that suggest an important role that PSTM plays in language learning (e.g., N. Ellis, 1996; N. Ellis & Sinclair, 1996; N. Ellis & Schmidt, 1997; French & O'Brien, 2008; Gathercole & Baddeley, 1990; Kormos & Safar, 2008; Martin & N. Ellis, 2012; O'Brien et al., 2006; O'Brien et al., 2007; Papagno et al., 1991; Service, 1992; Service & Kohonen, 1995; Williams & Lovatt, 2003). The nonsignificant impact of PSTM found in the present study indicates that PSTM may not be a critical factor in L2 learning through corrective feedback such as recasts and metalinguistic feedback. However, considering the small sample size of the study and their overall low performance on the PSTM test, any conclusion seems premature (M = 6.60, SD = 3.37 for the recast group and M = 7.44, SD = 4.77 for the metalinguistic group). Also, their overall low scores in the PSTM test may have been attributable to differences in phonological features between L1 and L2 (e.g., no distinction between [l] and [r] in Korean). The question is whether a PSTM measure developed based on their L1 phonological system would have made any differences in their performance. Future research that develops and employs a PSTM measure in full consideration of L1 phonological features can provide legitimate answers to the question.

In sum, the present small-scale experimental study provides empirical evidence for beneficial roles of recasts and metalinguistic feedback in L2 learning. However, the small sample size delimits the reliability and generalizability of the interpretations and arguments made based on the results. Also, only two feedback moves were examined in the present study among various types of feedback. Future research on differential effects of different types of feedback on L2 learning should consider including other feedback types such as clarification requests, elicitation, repetitions, and explicit corrections. Another important issue that merits further research is whether and how the type of CF interacts with the type of target structure in the extent to which learners can benefit from CF. This is so because perceptual salience of L2 target structures may also determine the level of treatment effects, as much discussed in SLA literature (e.g., DeKeyser, 2005; Goldschneider & DeKeyser, 2001; Long, 2007). Long (2007) suggests that implicit feedback such as recasts works better with salient target features and explicit feedback better with non-salient target features. Similarly, target structures may differ in their level of complexity, and this complexity factor may also affect the effectiveness of CF. Yucel (2013) compared two

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CF moves, explicit correction and recasts, and found that explicit correction was more effective than recasts regardless of the type of target. However, more research should be conducted on this type-of-target issue. Last but not least, because such cognitive abilities as verbal working memory, attention control, and PSTM have been found to be potentially critical factors (see Juffs & Harrington, 2011; Williams, 2012 for reviews of research on WM and PSTM in L2 learning) that may mediate the extent to which L2 learners benefit from corrective feedback, despite the nonsignificant role of PSTM in the present study, it is of importance that interaction researchers continue to investigate those cognitive factors in their future studies on corrective feedback.

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APPENDIX A

Grammaticality Judgment Test Items (Type 1)

If he had taken better care of the dogs, they wouldn't be sick now.
If I didn't have to go to the meeting right now, I would listen to your story.
If Sonia had saved more money last year, she would be able to buy a better car now.
If John had been nice to her at school last year, they would be good friends now.
If I had a job, I would have to get up early every morning.
If I had not had that much coffee, I could have gone to bed earlier yesterday.
If I had a girlfriend, I would have introduced her to my parents now.
If Sherry met James last week, James would be dating her now.
If John had left this company last year, I wouldn't be working here now.
If you had been born in the US, you wouldn't have to apply for citizenship now.
If I had my own airplane, I would have taken you there right now.
If I told you my love story the other day, you wouldn't be here with me.
If my dad had worked at this company, he would be retiring soon.
If the teacher postponed the test last week, I could be better prepared now.
If Mary had said "yes" to John's request, he wouldn't go to the hotel yesterday.
If Sarah closed the window last night, she wouldn't be sick now.
If my dad had not sent me any money, I would stop my studies 2 years ago.
If Sarah had been more careful, she would have avoided a car accident yesterday.
If Sean had started to learn English a year ago, he would be a fluent speaker now.
If Jane worked harder last year, he would be a better candidate for this job now.
If she grew up in the US, she wouldn't be studying English now.
If Angela had a high school degree, she could apply for this job.
If John didn't work hard last year, he wouldn't be able to buy a house now.
If you had passed the test to become a lawyer, she wouldn't have left you last summer.
If I had a sister, I would have asked her for advice on how to attract a girl now.
If Harry had not met Sally in New York, he would get married to Silva last year.
If Adrian didn't break his arm a year ago, he could be playing professional golf now.
If I had eaten a sandwich this morning, I wouldn't be eating this much food now.

APPENDIX B

Oral Production Test Items (Type 1)

Greg does not like her idea, so she needs to talk to him in person.
He did not spend much time on it, so he refused to take credit for the project.
I forgot to cancel the appointment, so I have to leave now.
The teacher asked them to read a magazine, so they are meeting tonight.
He was not interested in the topic of the discussion, so he did not take notes.

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He did not finish his high school, so he goes to school in the evenings.
He used Google to find answers, so he could finish his homework on time.
Robert was not in class today, so I have to tell him what we did in class.
He was working in Africa last year, so I was not able to contact him.
He had an accident this morning, so he is in the hospital now.
I enjoy swimming and playing racquetball, so I go to the gym every day.
We practiced a lot yesterday, so we are leading the game by 20 points.
She won all the competitions last weekend, so she is very happy today.
Ron made efforts to learn about drawings, so he can draw fine pictures now.
She does not like Chinese food, so she avoids working at a Chinese restaurant.
I asked him to write a report about birds, so he is going to the library.
Tom did not go to a hospital yesterday, so he has more pain now.
Jeff goes to bed early, so he hates having a meeting late at night.
Sam missed her bus this morning, so she walked to school.
Jane did not take the exam yesterday, so she can't apply for a job.
He did not go to the meeting, so he does not know what they discussed.
Alex did not finish his job this afternoon, so he is working hard right now.
She sweated a lot minutes ago, so she is taking a shower now.
He feels lonely in summer, so he goes to Europe every summer.
Sam started her own company last month, so she is not working here.

Examples in: English
Applicable Languages: English
Applicable Levels: Tertiary

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