

CHINESE EFL LEARNERS' NOTICING OF RECASTS: ITS RELATION TO TARGET
STRUCTURES, UPTAKE, AND WORKING MEMORY CAPACITY

By

Xiaoqing Chen

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ABSTRACT

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Recasts are one type of corrective feedback that reformulates all or part of a learner's erroneous utterance during communicative interaction without changing the meaning. Categorized as implicit and input-providing corrective feedback, recasts have become the focus of debate in the area of interaction research in recent years. The debate primarily centers on (1) whether recasts facilitate learner noticing of the gap between the interlanguage and the target language, which is essential for learning to take place; and (2) whether uptake in response to recasts is a sign of learner noticing of recasts.

The current study aimed to shed some light on the debate about recasts by investigating (1) Chinese English-as-a-foreign-language (EFL) learners' noticing of recasts, (2) the relationship between learners' noticing of recasts and the types of structures targeted by recasts; (3) the relationship between learners' noticing of recasts and their production of modified output; and (4) the relationship between learners' noticing of recasts and their individual differences in working memory capacity. Sixty second-year college EFL learners from a university in China participated in this study. Each participant engaged in one session of audio- and video-recorded communicative interaction with the researcher. Immediately after the interaction, they participated in a stimulated recall interview in which they watched the video of their interactional

tasks and reported their perception of the recasts they received during interaction. The learners also did a L1-Chinese reading span test as a measure of their working memory capacity.

Results indicated that learners could perceive the corrective nature (i.e., noticing the corrective function and noticing the gap) of most recasts. In terms of target structures, learners were more likely to notice the gap of lexical and phonological recasts than noticing the gap of morphosyntactic recasts, suggesting that lexical and phonological recasts were more salient and noticeable than morphosyntactic recasts. In addition, learners were found to produce more modified output when they noticed the gap involved in recasts, suggesting a possible link between noticing of recasts and production of modified output. Finally, this study found that learners' working memory capacity did not predict their noticing of the corrective nature of recasts. This indicates that working memory is not the only cognitive factor that affect learner noticing of recasts, and that the effect of working memory on learners' noticing of recasts may be mitigated by factors such as learners' prior knowledge.

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This dissertation is dedicated to my family.

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CHAPTER 1 INTRODUCTION

1.1. The Interaction Approach: Theoretical basis of the current study

1.1.1. From the Interaction Hypothesis to the Interaction Approach

Second language (L2) interaction is a major subarea of the field of second language acquisition (SLA). The theoretical basis of research in this area¹, including the current study, is the Interaction Approach (Gass, 1997, 2003; Gass & Mackey, 2006a; Long, 1983, 1996, 2007; Pica, 1994; Swain, 1985, 1995, 2005). Since its inception in the late 1970s, the Interaction Approach has developed into a theoretical framework that can account for how L2 learners' engagement in communicative interaction drives their interlanguage development and how this can be attributed to the activation of their internal cognitive mechanisms. The Interaction Approach is not a monolithic construct; rather, it has integrated elements of an array of contributing hypotheses, including the Input Hypothesis, the Interaction Hypothesis, the Noticing Hypothesis, and the Output Hypothesis.

Hatch (1978) and Krashen (1981, 1985) are the two researchers who laid the ground for the development of the Interaction Approach. It was Hatch who first asserted that conversational interaction is not only a site for learners to practice their linguistic knowledge, but in itself a site for language learning to take place. Krashen (1985), on the other hand, proposed the Input Hypothesis, stating that what L2 learners need for their language development is comprehensible

¹ R. Ellis (2010) claims that “a full account of corrective feedback requires a sociocognitive orientation that combines the cognitive, social, and psychological dimensions” (p. 152). This study is focused on the cognitive dimension, viz. it examines the interactions between input, output, and the learner's internal mechanisms.

input, which is modified to such an extent that it is at a stage slightly beyond their current competence².

Subscribing to the role of interaction and comprehensible input in SLA, Long (1983) has taken a step further and made distinctions between modified input and modified interaction, the latter of which consists of interactional strategies such as comprehension check, clarification requests, and confirmation check (i.e., negotiation for meaning). Long (1983) argues that these interactional strategies lead to better comprehension than modified input because they occur at a time when communication breaks down. More importantly, negotiation for meaning may draw the learner's attention to the linguistic forms that are responsible for the communication breakdown, thereby facilitating L2 learning. This was the early version of the Interaction Hypothesis.

Another hypothesis that contributes to the Interaction Approach is the Output Hypothesis (Swain, 1985, 1995, 2005). Swain (1985) observed that L2 learners in a Canadian immersion program, although fluent in their speaking and good in their comprehension, were not accurate in their language use. Swain (1985, 1995) suggests that comprehensible input alone is not sufficient for learning to take place; rather, learners should also be provided with opportunities to produce output. According to Swain, when producing output, learners (1) are pushed to focus on the syntactic structures of the L2, (2) notice the gap between what they can say and what the target language is like, and (3) test their hypotheses about their interlanguage. Gass (1997, 2003) further claims that output plays an important role in automatizing learners' knowledge. Pica

² Krashen (1985) argues that understanding spoken language input is the only mechanism that results in linguistic competence. According to Krashen, if i represents previously acquired linguistic competence, learners can move from i to $i + 1$ by understanding input that contains $i + 1$.

(1994) also endorses Swain's view and suggests that negotiation for meaning during L2 interaction enables learners to adjust, manipulate, or modify their language production in order to fix communicative breakdown, thereby promoting learning.

Gass (1988, 1991, 1997) and Pica (1994) maintain that negotiation for meaning during interaction can function as negative evidence and assist L2 acquisition because it draws learners' attention to the discrepancy between their interlanguage and the target language (see also Schmidt & Frota, 1986). The emphasis of learners' attention to form during interaction conforms to Schmidt's Noticing Hypothesis. Schmidt (1990a, 1994a, 2001) refers to noticing as the "registration (detection) of the occurrence of a stimulus event in conscious awareness and subsequent storage in long-term memory" (Schmidt, 1994b, p. 179), and he contends that learners' conscious awareness to linguistic properties is necessary for learning to take place.

In his seminal article, Long (1996) incorporates the various elements entailed in the above-mentioned hypotheses into his updated Interaction Hypothesis. According to Long, "negotiation for meaning, and especially negotiation work that triggers interaction adjustments by the NS or more competent interlocutor, facilitates acquisition because it connects input, internal learner capacity, particularly selective attention, and output in productive ways." (pp. 451-452). The hypothesis further points out that "Negative feedback obtained during negotiation work or elsewhere may be facilitative of L2 development, at least for vocabulary, morphology and language-specific syntax, and essential for learning certain specifiable L1-L2 contrasts." (p. 414). The updated version of the Interaction Hypothesis lays an emphasis on the role of learners' attentional mechanism (i.e., selective attention) in benefiting SLA through interaction.

The updated Interaction Hypothesis has led to a plethora of studies that explored the relationship between interaction and L2 learning (see review and meta-analysis in Gass, 1997, 2003; Gass & Mackey, 2006a, 2006b; Keck, Iberri-Shea, Tracy-Ventura, & Wa-Mbaleka, 2006; Li, 2010; Lyster & Saito, 2010; Mackey, 2006b, 2007a, 2007b, 2012; Mackey, Abbuhl, & Gass, 2012; Mackey & Goo, 2007; Spada & Tomita, 2010). In addition, the updated Interaction Hypothesis has ushered in more hypotheses, such as DeKeyser's (1998, 2006, 2007) Skill Learning Theory and Lyster's (Lyster, 2007; Lyster & Mori, 2006) Counterbalanced Hypothesis. The Skill Learning Theory centers on the importance of practice in transforming L2 learners' declarative knowledge into procedural knowledge, as well as the role corrective feedback plays in this process. The Counterbalanced Hypothesis, on the other hand, states that L2 learners' uptake and repair to interactional feedback in L2 classrooms is influenced by whether or not classroom instruction orients their attention to form. Both hypotheses lend support to the Interaction Hypothesis and contribute to a better understanding of the relationship between interaction and L2 learning.

To date, research in interaction has developed to such breadth and depth that has prompted Gass and Mackey (2006b) to suggest that the Interaction Hypothesis is now "moving toward the status of a theory in the sense that it also attempts to explain why interaction and learning can be linked, using cognitive concepts derived from psychology, such as noticing, working memory, and attention" (p.176) (see also Jordan, 2005). The current study, following Gass and Mackey (2006b) and Mackey (2007a, 2012), refers to the Interaction Hypothesis as the Interaction Approach.

1.1.2. Important concepts concerning interaction

Interaction is a multi-componential construct. It encompasses a range of concepts, such as input, corrective feedback, including recasts, the focus of the current study, negotiation for meaning, and output. All these components are considered to be beneficial for learning.

The first component, input, refers to “language that is available to the learner through any medium” (Gass & Mackey, 2006b, p. 177). Gass (1997, 2003) categorizes input into (1) positive evidence, the set of well-formed sentences exposed to learners, which is “the most obviously necessary requirement for learning” (Gass, 2003, p. 226), and (2) negative evidence, input that indicates the incorrectness of a learner utterance. There are two types of negative evidence: pre-emptive negative evidence, which occurs without an error being made by the learner, and reactive negative evidence, which is provided in response to a learner error during interaction.

Reactive negative evidence is synonymous with corrective feedback³, which is another important component of interaction. In recent years, much attention has been drawn to the effect of corrective feedback on learning through interaction (Loewen, 2012; Mackey, 2012).

Corrective feedback can take the form of clarification requests, elicitation, repetition⁴, and recasts. It also encompasses other strategies which demonstrate a more obvious didactic and corrective sense, for example, explicit correction and metalinguistic feedback. Lyster and Ranta (1997) use the term *negotiation of form* to refer to corrective feedback in order to differentiate it from negotiation for meaning, an interactional component which is introduced next.

³ Negative evidence and corrective feedback have been used interchangeably in the L2 literature. Negative evidence has a more psychological emphasis, while corrective feedback has a didactic emphasis (Kim, 2008).

⁴ See Chapter 5 for definitions of these terms.

Corrective feedback can be categorized in different ways. For example, it can be distinguished between implicit corrective feedback and explicit corrective feedback. Explicit feedback states explicitly that there is an error (e.g., explicit correction and metalinguistic feedback), while implicit feedback does not indicate overtly the occurrence of the error (e.g., clarification requests and recasts). Some researchers suggest that different forms of corrective feedback lie in an explicit-implicit continuum, with recasts and explicit correction at either ends (Loewen & Nabei, 2007). Besides the implicit-explicit distinction, Sheen and Ellis (2011) distinguish between input-providing corrective feedback and output-pushing corrective feedback, the former of which refers to corrective feedback that supplies the correct reformulation (e.g., recasts and explicit correction), while the latter of which withholds the correct reformulation but instead encourages learners to self-repair (e.g., clarification requests, repetition, metalinguistic feedback).

Recasts, the focus of the current study, are the type of corrective feedback that has been widely examined in interactionist research. Defined as “reformulation of all or part of a student’s utterance that contains at least one error within the context of a communicative activity in the classroom” (Sheen, 2006, p. 365), recasts are categorized as a type of corrective feedback that is (1) implicit and (2) input-providing. Due to these two features of recasts, there has been much debate concerning the effectiveness of recasts in drawing learners’ attention and promoting learner uptake (Ellis & Sheen, 2006; Gass, 2003; Long, 1996, 2007; Lyster, 1998a, 1998b; Lyster & Ranta, 1997; Nicholas, Lightbown, & Spada, 2001; Panova & Lyster, 2002).

Another important component of interaction is negotiation for meaning, which refers to conversational modifications or adjustments made in order to resolve a communication problem (Gass, 1997; Gass & Varonis, 1994; Long, 1996; Pica, 1988, 1992). As shown in the definition,

negotiation for meaning may or may not involve a problem in form. Negotiation for meaning shares some forms with corrective feedback, such as clarification requests, repetition, and recasts. Pica (1994) points out that “the twofold potential of negotiation – to assist L2 comprehension and draw attention to L2 form – affords it a more powerful role in L2 learning than has been claimed so far” (p. 508).

The last component of interaction discussed here is output. The type of output that is of particular interest in interaction research is uptake. Lyster and Ranta (1997) define uptake as “a student’s utterance that immediately follows the teacher’s intention to draw attention to some aspect of the student’s initial utterance.” (p. 48). Other researchers (e.g., Adams, Nuevo, & Egi, 2011; Mackey, 2007a, 2007b, 2012) prefer the term *modified output* to uptake, although they acknowledge that modified output is itself a type of uptake as well. Modified output refers to “the process of rephrasing or reformulating one’s original utterance in response to feedback or self-monitoring” (Mackey, 2012, p. 16). Mackey (2007a, 2007b, 2012) further posits that modified output is beneficial for learning regardless of whether it is more or less target-like. The current study follows Mackey (2012) and categorized learners’ uptake to feedback into modified output and non-modified output.

1.1.3. Controversy on the role of interaction in SLA

The expansion of the scope of the Interaction Approach has been followed by new research questions and research methods (Mackey, 2006b). For example, the early version of the Interaction Hypothesis has led to research that focused on the relationship between interaction and comprehension, as well as the factors that might promote negotiation for meaning (e.g., Gass & Madden, 1985; Gass & Varonis, 1985; Pica, 1988; Pica et al., 1987). The potential relation between interaction and acquisition, as emphasized in the updated version of the Interaction

Hypothesis, has turned researchers' attention toward whether interaction facilitates acquisition (Mackey, 2007a). In recent years, with the empirical establishment of the link between interaction and learning, research in this area has focused more on (1) what forms of interaction are more beneficial than others for learning, (2) how learners perceive or notice the various forms of interaction, and (3) how learner internal and external factors mediate the effects of interaction (Mackey, 2007a, 2012).

However, despite the bulk of studies which point to the benefit of interaction, some researchers have been skeptical about the role of interaction on learning. First of all, some researchers argue against the role of noticing in L2 learning (Krashen, 1981, 1982, 1985, 1994; Schwartz, 1993; Truscott, 1999), claiming that second language learning is largely the result of unconscious processes that are facilitated only by positive evidence in meaning-focused activities. This is in contrast to the argument that noticing is necessary for learning to take place (Gass, 1991; Long, 1996; Schmidt, 2001). Krashen contends that conscious awareness of grammatical rules can only lead to *learning*, not *acquisition*⁵, and his no-interface position holds that what is learned through learning cannot be converted to acquisition. By the same token, Krashen denies the role of the interactional strategies, such as corrective feedback and negotiation for meaning, in facilitating acquisition, because they only function to draw learners' conscious awareness of linguistic forms. Krashen's view is supported by Schwartz (1993), who claims that negative feedback perceived by the learner as corrective may affect performance, but cannot permeate underlying competence. Truscott (1999) further argues that corrective feedback

⁵ According to Krashen, *acquisition* is a subconscious process which requires meaningful interaction in the L2. *Learning*, in contrast, is a conscious process, in which language forms are represented consciously in the learner's mind. The current study did not distinguish acquisition and learning, and the two terms are used interchangeably.

is not only ineffective, but detrimental to L2 development, because correction “by its nature, interrupts communicative activities” (p. 442) and it causes “embarrassment, anger, inhibition, and feelings of inferiority” (p. 441). Carroll (1999, 2001), from another perspective, asserts that the effect of corrective feedback depends on the recognition of the corrective intention on the part of the interlocutor, which does not always happen. What’s more, even if learners can recognize the intention of the feedback, they may still find it hard to locate the error, which is the so-called *blame-assignment* (Pinker, 1989). Therefore, Carroll claims that corrective feedback does not play a primary role in SLA.

Despite the ongoing debate over the role of noticing in SLA, interactionist researchers take the stance that learning cannot take place without noticing and interactional techniques that aim to promote learner noticing are beneficial for learning. To start with, second language learning, adult second language learning in particular, proceeds like other kinds of skill learning (Bley-Vronman, 1989, 2009; DeKeyser, 1998, 2006, 2007; Doughty, 2001, 2004; Robinson, 2003, 2005; N. Ellis, 2005). Therefore, general cognitive mechanisms responsible for information processing such as attention, encoding, retrieval, and retention are all important for L2 learning. Second, in some cases negative evidence is not only facilitative, but necessary (e.g., White, 1991). Thirdly, what is learned explicitly can be converted to implicit and automatic knowledge (DeKeyser, 1998, 2001, 2007). Last but not the least, as summarized by the previously-mentioned studies, much empirical evidence has shown that instructional techniques that explicitly or implicitly raise learners’ awareness do lead to SLA (see also Doughty & Williams, 1998; Norris & Ortega, 2000).

1.2. Purpose of the current study

Without doubt, the type of interactional feedback that has drawn most of researchers' attention in recent years is recasts (Long, 2007; Mackey, 2012). The popularity of recasts can be ascribed to their frequent use in and out of classroom (e.g., Lyster & Ranta, 1997; Sheen, 2004) and to the mixed findings that studies on recasts have yielded, regarding the amount of uptake (e.g., Lyster & Ranta, 1997; Sheen, 2004) as well as their effect on learning (e.g., Ammar & Spada, 2006; Mackey & Philp, 1998; R. Ellis, 2007; Lyster, 2004). The inconclusive findings have provoked debates over the ability of recasts to promote learner noticing and over the relationship between uptake and learning through recasts.

As elucidated in its definition, recasts are multi-componential corrective feedback that entails positive evidence, implicit negative evidence, and content (Leeman, 2003; Long, 1996). Long (1996, 2007; Long & Robinson, 1998) argues for the benefits of recasts because of the contingency of meaning and the juxtaposition of the learner error and the targetlike reformulation, both of which, according to Long, help to draw learners' attention to the gap between what they produce and what is reformulated, thereby leading to learning. However, the multi-functional feature and the implicitness of recasts, in Lyster's (1998a, 1998b; Lyster & Ranta, 1997) view, render them ambiguous and, in turn, ineffective in promoting noticing and learning.

In terms of the role of uptake, Lyster (1998a, 2004) argues that, as input-providing corrective feedback, recasts are not as effective as output-pushing corrective feedback such as clarification requests and metalinguistic feedback. In addition, recasts may not play an important role in the process of proceduralization of L2 knowledge during practice (Lyster, 2004, 2007; Ranta & Lyster, 2007) because they do not always trigger learner uptake. However, an opposite

view holds that, because uptake is an optional move (R. Ellis & Sheen, 2006) and the provision of uptake is influenced by various discorsal situations (Egi, 2007a; Oliver, 1995), it is not a justifiable measure of noticing recasts and it is not equal to learning (Gass, 2003; Loewen & Philp, 2006; Long, 2007; Mackey & McDonough, 2006; Mackey & Philp, 1998).

Some researchers attempt to mitigate these conflicting views about recasts, suggesting that the effect of recasts is affected by a variety of learner-internal and external factors (Loewen & Philp, 2006; R. Ellis & Sheen, 2006; Sheen, 2006). These factors include learners' proficiency level or readiness (e.g., Philp, 2003), types of target structures (e.g., Mackey, Gass, & McDonough, 2000; Kim & Han, 2007), intensity of recasts (Loewen, 2009), individual differences in aptitude and working memory (e.g., Goo, 2012; Mackey, Philp, Egi, Fujii, & Tatsumi, 2002; Révész, 2012), to name just a few. According to these researchers, the effect of recasts is the result of the interaction of various factors and these factors should be taken into account when considering whether or not recasts are effective on learning.

One way to address the issue of whether recasts promote noticing and whether uptake is a sign of noticing is to tap directly into learners' own perception of recasts by means of introspective methods (Gass & Mackey, 2000; Jourdenais, 2001; Mackey et al., 2000), and to compare learners' perception against their uptake. In recent years, there has been an increasing interest in directly examining learners' noticing of corrective feedback (e.g., Egi, 2007a, 2007b, 2010; Gass & Lewis, 2007; Kim & Han, 2007; Mackey et al., 2000; Philp, 2003). However, it is noted that only a few of these studies examined specifically the noticing of recasts, and there have been fewer studies that has related learners' perception of recasts to their uptake (Bao, Egi, & Han, 2011; Egi, 2010).

Given the paucity of studies in this line, this current study attempts to shed some light on the debate over the effectiveness of recasts in promoting learner noticing and the relationship between noticing of recasts and uptake to recasts. The purpose of the current study is three-fold: (1) to explore whether L2 learners notice the corrective nature of recasts and whether types of target structures affect their noticing; (2) to explore the relationship between learners' noticing of recasts and their uptake; and (3) to examine whether individual differences in working memory capacity affect learners' noticing of recasts.

1.3. Outline of the dissertation

Chapter Two of this paper is focused on recasts. This chapter begins with the problem of how to define recasts, followed by a summary of previous studies on recasts. Then the chapter introduces the controversies over the effects of recasts on noticing and provision of uptake, followed by ways to tackle these controversies.

Chapter 3 discusses noticing, viz. the cognitive mechanism that the effectiveness of recasts and other interaction components are based on. This chapter will first make clear some theoretical constructs such as attention and awareness, followed by an account of the Noticing Hypothesis and some current controversies over the role of noticing in L2 learning. Empirical evidence from SLA concerning explicit and implicit learning is then reviewed. Then this chapter will review the studies that tackled noticing of corrective feedback. Finally, it will review how noticing is measured in the field of SLA.

Chapter 4 will first present the relationship of language aptitude to working memory. Then this chapter will talk about the major working memory models that are related to this study, mainly Baddeley's and Cowan's model. Accounts of the role of consciousness or focus of attention in working memory will be introduced, too.

Chapter 5 will introduce the research questions, the hypotheses, and general method employed in this study to answer the research questions. Chapter 6 will report both the descriptive and the inferential statistics for each research question. The last chapter, Chapter 7, will discuss the findings regarding each research questions, followed by theoretical and pedagogical implications, limitations and suggestions for future research.

CHAPTER 2 RECASTS AND L2 LEARNING

2.1. Defining Recasts

Definitions of terms in SLA should be clear and standardized wherever possible (Long, 2007). However, after years of research in recasts, how to define recasts has still been an unsolved problem. The problem stems mainly from whether the provider's focus of attention is on language or on meaning (Long, 1996, 2007)⁶.

Most definitions of recasts concur in the core properties of recasts. These properties include: (1) a recast immediately follows an erroneous learner utterance; (2) the error(s) is reformulated in the recast; (3) the central meaning is retained; and (4) the learner utterance is expanded in some way (Han, 2007; Long, 1996). Long (2007, p. 77), based on these properties, defines recasts as “a reformulation of all or part of a learner's immediate 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, through the exchange, the focus of the interlocutors is on meaning, not the language as object”. Long further emphasizes that recasts are “implicit and incidental” (p. 77). Similarly, Sheen (2006, p. 365) defines recasts as a type of corrective feedback that “consists of the teacher's reformulation of all or part of a student's utterance that contains at least one error within the context of a communicative activity in the classroom.” The following example illustrates the properties of a recast⁷. Transcription conventions are shown in Appendix C.

⁶ In recent years there have been controversies over whether recasts should be considered an implicit form of corrective feedback (for details see R. Ellis & Sheen, 2006; Sheen, 2006).

⁷ All examples in this paper are from the data of the current study.

Example 1 (P = Participant; I = Interlocutor)

P: There is a boy and a girl *in the front of* the blackboard.

I: in front of the blackboard?

S: Yeah. They are writing something.

In this example, the triggering learner utterance had an error in proposition use, *in the front of*. The interlocutor provided a recast, which corrected the propositional phrase with a target-like reformulation, *in front of*. At the same time the meaning of the learner utterance was retained.

Although sharing the central properties of recasts, the two definitions mentioned above differ in whether the provider's focus of attention in recasts is on linguistic form or on meaning. As R. Ellis and Sheen (2006) point out, Long's (2007) definition excludes those recasts that involve even a brief focus on form. This seems too extreme given the abundant evidence revealing that recasts are provided even though there is no communication breakdown (Kim, 2008; Lyster & Ranta, 1997; R. Ellis, Basturkmen, & Loewen., 2001). In contrast, Sheen's definition implies both possibilities for providing recasts (R. Ellis & Sheen, 2006); That is, recasts can be provided as a way to negotiate meaning and/or to correct error(s) in form. In the following example, the meaning of the learner utterance was clear, so there did not seem to be a communication breakdown. Nevertheless, the interlocutor recast the linguistic error in plurality.

Example 2

P: On the children's right, there are also two *childrens*.

I: There are also two children.

P: There are also two children, yes.

Given its advantage of elaborating recasts in both meaning negotiation and/or form-correction, this current study takes Sheen's definition of recasts⁸.

Some researchers propose that recasts are not monolithic and their various characteristics, such as length, segmentation, intonation, stress, and changes, etc., may put them at different points in an explicit-implicit continuum (Loewen & Philp, 2006; Sheen, 2006). R. Ellis and Sheen (2006) suggest that recasts can be defined alternatively based on a classification of their different characteristics. However, the current study endorses the general definition of recasts as a type of implicit correction because characteristics of recasts are not a focus of this study.

2.2. Components of recasts

Recasts are multi-componential corrective feedback. The first component of recasts is content, as they keep constant the meaning of the erroneous learner utterance. In other words, recasts can in part serve a discourse function, confirming or acknowledging the information provided in the erroneous learner utterance (Chaudron, 1988; Egi, 2007a; Lyster, 1998a; Nicholas et al., 2001). Second, the target-like reformulation of the learner's error suggests that recasts provide positive evidence. Finally, the juxtaposition of reformulation and learner error implicitly indicates the ungrammaticality or inappropriateness of the original learner utterance, thereby providing negative evidence (Long, 1996; Long & Robinson, 1998; Saxton, 1997, 2000). By providing negative and positive evidence, recasts function as corrective feedback.

⁸ Sheen (2006) defines recasts in the context of L2 classrooms. The current study expands it to laboratory setting but keeps its central claim that recasts can be provided with or without a focus of meaning.

The multiple functions of recasts derived from their components may affect how learners perceive or interpret them, which, in turn, affect the benefits of recasts for learning. Researchers generally agree that the content component of recasts does not contribute much to learning (e.g., Egi, 2004, 2007a; Lyster, 1998a, 1998b; Lyster & Ranta, 1997; Mackey, 2012). However, it is controversial as to whether learning is the result of learners' noticing of the negative evidence, positive evidence, or both (Carpenter et al., 2006; Egi, 2007a; Leeman, 2003; Long, 2007). Some researchers found that positive evidence of recasts is responsible for learning (Egi, 2007a; Leeman, 2003; Lyster, 1998b). For instance, Lyster (1998b) contends that recasts "serve as positive evidence, in the same way that noncorrective repetitions do, in that they provide learners with exemplars of what is possible in the language." (p. 207). Leeman (2003) provides empirical evidence that recasts work for learning because of the enhanced salience of the positive evidence instead of the implicit negative evidence.

Leeman's findings argue against Long's (1996) view that recasts are effective primarily because they provide implicit negative evidence. Some researchers posit that negative evidence is beneficial because (1) L2 learning is conscious and explicit (Doughty, 2001; DeKeyser, 1998, 2007; Schmidt, 1990b), and (2) given learners' limited cognitive capacity (VanPatten, 1990, 1996), negative evidence is important in drawing learners' attention to form-meaning mismatch. However, it is noted that learners' noticing of recasts as negative evidence alone may not guarantee learning, as they might fail to locate their error (Carroll, 1999, 2001; Nicholas et al., 2001; Pinker, 1989), or fail to spot the positive evidence (i.e., reformulation), or both. Egi (2007a) found that when learners interpreted recasts as positive evidence or a combination of positive and negative evidence, they benefited more from recasts than when they noticed recasts as responses to content. This result suggests that for recasts to lead to learning, the learner should at least

know what is being corrected in their utterance. Recognition of an error in their utterance might trigger learners' cognitive mechanisms, leading to either a modification or reinforcement of previous knowledge in their long-term memory or a search for the targetlike form in input when the learner is ready (Gass, 1997). In other words, to benefit from recasts, learners must notice the gap between what they can say and what the targetlike form is (Doughty, 2001; Gass, 1988, 1997; Schmidt & Frota, 1986). And, at times, learning may occur after the interactive event.

2.3. Empirical research on recasts

Recasts have been the focus of attention in the area of interactionist research in recent decades, as demonstrated by some review articles that specifically discuss recasts (e.g., Long, 2007; Nicholas et al., 2001; R. Ellis & Sheen, 2006), and numerous review articles and meta-analyses that singled out recasts from other interactional components for discussion (e.g., Gass, 1997, 2003; Gass, Mackey, & Pica, 1998; Gass & Mackey, 2006a, 2006b; Li, 2010; Loewen, 2012; Lyster & Saito, 2010; Mackey, 2007a, 2007b, 2012; Mackey, Abbuhl, & Gass, 2012; Mackey & Goo, 2007; Russel & Spada, 2006; Sheen & Ellis, 2011; Spada & Tomita, 2010). There are many reasons that can be ascribed to the emphasis on recasts. To begin with, recasts have been found to be the most frequently used type of corrective feedback in various classroom settings (e.g., Lyster & Ranta, 1997; R. Ellis et al., 2001; Sheen, 2004) or NS-NNS interaction outside of classroom (Braidì, 2002). Secondly, from the perspective of language teaching, teachers' provision of recasts draws learners' attention to form-meaning mapping only briefly, thus they are less distractive and keep learners' focus on meaning (Long, 1996, 2007). Thirdly, the implicitness of the negative evidence in recasts functions to save the face of the learner, while other types of corrective feedback, such as explicit correction, are likely to threaten learners' face and confidence (Aston, 1986; Truscott, 1998). Finally, research on the effect of

recasts may shed light on the debate over (1) whether negative evidence plays a role in L2 learning (DeKeyser, 2006, 2007; Krashen, 1985, 1994; Robinson, 1995a, 2003; Schmidt, 1990a, 1995; Schwartz, 1993; Truscott, 1998), and (2) whether implicit negative evidence like recasts is facilitative of promoting learner noticing and learning (Doughty, 2001; Long & Robinson, 1998; Lyster, 1998a, 1998b, 2004).

A number of studies have investigated recasts from their various perspectives. Most of these studies are presented in Table 1, Table 2, and Table 3. Table 1 lists studies that are mainly observational in nature, with a focus on the frequency of recasts and the extent to which they elicit learner uptake. Studies included in this table are mainly classroom studies, but there are also a few studies that were conducted outside of classroom (e.g., Oliver, 1995; Nassaji, 2007). Studies presented in Table 2 are mainly experimental studies that specifically examined the effect of recasts on learning. Finally, in Table 3 are quasi-experimental and experimental studies that compared the effects of recasts against other types of corrective feedback. There have also been studies that directly examined learners' perception and noticing of recasts and other corrective feedback (e.g., Egi, 2007a, 2007b; Gass & Lewis, 2007; Mackey et al., 2000; Philp, 2003), which will be discussed in detail in Chapter 3.

2.3.1. Studies on recasts and uptake

Most studies on recasts and uptake were conducted in a variety of classroom settings, ranging from the Canadian immersion program (Lyster & Ranta, 1997), the US immersion program (Lyster & Mori, 2006), the Canadian ESL classroom (Panova & Lyster, 2002), the New Zealand ESL classrooms (R. Ellis et al., 2001; Loewen, 2004; Zhao & Bitchener, 2007), to foreign language learning classrooms such as Spanish in the U.S. (Zyzik & Polio, 2008), and EFL in Korea (Sheen, 2004).

With regard to recasts, all studies in Table 1 reported that recasts were used more frequently than any other form of corrective feedback, regardless of the context. For example, Sheen (2004) compared the use of corrective feedback in four contexts, Canadian immersion, Canadian ESL, New Zealand ESL, and Korean EFL, and found that recasts accounted for more than 50 per cent of all corrective feedback across the four settings. The rate of recast use was the highest in the EFL setting.

Despite their concurrence with regard to the frequent use of recasts, these observational studies differ in terms of the uptake that recasts induced. Lyster and Ranta (1997) and Panova and Lyster (2002) found that recasts in the Canadian immersion setting and the Canadian ESL setting led to the lowest rate of uptake (31% and 40%, respectively), and concluded that recasts were the least likely to promote noticing and learning. However, some researchers raise questions about the way Lyster and Ranta (1997) coded uptake (Oliver, 1995; Sheen, 2004). Oliver (1995) argues that Lyster and Ranta based the percentage of uptake on the total number of recasts, without eliminating those instances where uptake was not possible or not appropriate because of topic continuation or requirement for acknowledgment. When these instances were eliminated, recasts were found to lead to a higher rate of uptake and repair (Oliver, 1995; Braid, 2002). It is worth noting, however, that uptake may not be a justifiable measure of learners' noticing of recasts (Ammar & Spada, 2006; Gass, 2003). In some cases, for example, although learners respond to recasts with uptake, it may be just simple repetition without any cognitive processing, thereby contributing little to learning.

Another finding is that the production of uptake and repair is affected by various factors such as learner proficiency and contexts. For example, New Zealand ESL classrooms (R. Ellis et al., 2001a), Korean EFL classrooms (Sheen, 2004), and Japanese immersion program (Lyster &

Mori, 2006), led to a much higher rate of uptake and repair than Canadian immersion program (Lyster & Ranta, 1997) and Canadian ESL context (Panova & Lyster, 2002). Part of the reason, according to Sheen (2004), is related to the educational backgrounds in these classroom settings. The Canadian immersion program is focused on teaching subject matters, while the Korean EFL classroom setting is focused on language itself. This indicates that the ability of recasts to elicit uptake should be considered in light of environmental factors. In other words, it is not about whether or not recasts are effective in leading to uptake, but about when, how, and to whom they are effective (Mackey, 2012).

Acknowledging the importance of contextual difference, Lyster (2007; Lyster & Mori, 2006) proposed the Counterbalanced Hypothesis. The hypothesis states that “instructional activities and interactional feedback that act as a counterbalance to the predominant communicative orientation of a given classroom setting will be more facilitative of interlanguage restructuring than instructional activities and interactional feedback that are congruent with the predominant communicative orientation” (Lyster & Mori, 2006, p. 294). This hypothesis explains why uptake as well as learning through corrective feedback may be determined in part by the context of instruction that the learner is involved in; it also explains why learners in different context may have different interpretation of the same type of corrective feedback, especially implicit corrective feedback.

Table 1 Studies on Recasts and Uptake

Studies	Classroom Setting	Way of Interaction	Participants	Data Collection	Results
Oliver (1995)	Australian elementary ESL setting, but the study was done out of classroom	NS-NNS interaction	NS children and children ESL learners	Data from NS-NNS communicative activities	Recasts were used frequently, but uptake was not provided by learners as frequently. However, the rate of uptake was higher when recasts involving interactions in which it was not possible or inappropriate to provide uptake were eliminated.
Lyster & Ranta (1997)	Canadian French Immersion program	Teacher-learner interaction	Four NS French teachers and young learners of French from Grade 4 to 6	Classroom observation of 7.8 hours of French language arts instruction and 10.5 hours of content-based instruction	Recasts were the most frequently used type of feedback but they were the least likely to promote learner uptake.
R. Ellis et al. (2001)	New Zealand ESL classroom	Teacher-learner interaction	Two NS English teachers and adult ESL learners with different L1 backgrounds	A total of 12 hours of video- and audio-taped classroom communicative activities	There were less uptake and successful uptake following recasts than following other types of corrective feedback, but the rate of uptake was still high.
Panova & Lyster (2002)	EFL classroom setting	Teacher-learner interaction	One NS English teacher and adult learners of English as a foreign language	10 hours of observation of classroom interaction	Uptake and repair following recasts were much lower than those following other types of feedback.

Table 1 (Cont'd)

Oliver & Mackey (2003)	Australian ESL classroom setting	Teacher-learner interaction	Five NS ESL teachers and children ESL learners	4.5 hours of videotaped classroom activities	Contexts of teacher-learner exchanges affect the amount and uptake of corrective feedback.
Lyster & Mori (2006)	French immersion classes in Canada and Japanese immersion classes in the US	Teacher-learner interaction	NS French and Japanese teachers and elementary-school level L2 learners	18.3 hours of French immersion and 14.8 hours of Japanese immersion classes	There were more recasts than prompts in both settings. There was higher rate of uptake and repair followed prompts in French immersion classes, but there was higher rate of uptake and repair following recasts in Japanese immersion class.
Sheen (2004)	Data from Lyster & Ranta (1997), Ellis et al. (2001a), Panova & Lyster (2002), and Korean EFL classroom setting.	Teacher-learner interaction	NS English and French teachers and learners of French as a foreign language, English as a second language in Canada and New Zealand, and English as a foreign language in Korea	Audio and/or videotaped classroom observation data	Recasts were the most frequent corrective feedback across the settings. New Zealand ESL and Korea EFL settings showed significantly higher rates of uptake and repair to recasts than Canadian immersion programs and ESL program. Recasts led to less uptake than other types of feedback.
Nassaji (2007)	ESL classroom, but interaction took place out of class.	Teacher-learner interaction	2 NS English teachers and adult ESL learners from different L1s	Video-taped teacher-learner communication	Recasts were used more frequently than elicitations. Both recasts and elicitations led to low rate of repair. Isolated recasts led to more repair than embedded recasts

Table 1 (Cont'd)

Zhao & Bitchener (2007)	New Zealand ESL setting	Teacher-learner and learner-learner interaction	2 NS English teachers and adult ESL learners from different L1s.	10 hours of task-based interaction	Teachers and learners used the same rate of recasts and other types of feedback. They drew similar rate of uptake.
Zizyk & Polio (2008)	US university L2 Spanish literature classes	Teacher-learner interaction	Three NS or near-NS literature teachers and adult Spanish major or minor learners	Data from observation charts, videotaped observations, and stimulated recall interviews	Recasts were the most favored form of feedback.

2.3.2. Studies on the effects of recasts on learning

There have also been a lot of studies that directly examined the effect of recasts on learning. As summarized in Table 2 and Table 3, these studies are mainly of two types: (1) studies comparing the effect of recasts with that of other types of corrective feedback, and (2) studies only examining the effect of recasts. Most studies in the first type are quasi-experimental studies, with a few exceptions (e.g., McDonough, 2007), while the second type consists exclusively of laboratory experimental studies. In addition, most of the experimental and quasi-experimental studies pre-determined a limited number of target structures, usually no more than two structures, so that a pretest could be designed and a comparison of gains was possible. In recent years,

however, there have emerged some studies that investigated recasts which were provided to learner errors that arose incidentally (e.g., Loewen, 2005; Egi, 2007b; Nassaji, 2009)⁹.

All of the laboratory experimental studies listed in Table 2, except Erlam and Loewen (2010), are consistent in their findings; that is, they all found a positive role of recasts in facilitating L2 learners' interlanguage development. All these studies took a pretest-treatment-posttest-delayed posttest design. For example, Mackey and McDonough (2006) investigated the impact of recasts and learner response to recasts on Thailand college ESL learners' question development. Learners were assigned into either experiment group which received recasts when errors concerning question formation arose, or control group which just participated in communicative activities. They found that recasts were facilitative of participants' development in question formation. However, immediate learner response following recasts (i.e., uptake) was not a predictor of learning; instead, delayed responses to recasts were associated with learning.

Contrary to other experimental studies, Erlam and Loewen (2010) found that recasts did not promote learning. This study examined whether two types of recasts, implicit and explicit recasts, were effective in improving year-2 and year-3 French L2 learners' implicit and explicit knowledge of the noun-adjective agreement in French. Learners were randomly assigned to implicit recast, explicit recasts, and control group and they participated in a one-hour long communication with one of the researchers. Those in the two recast groups received recasts, in the form of implicit recasts (i.e., recasts with rising intonation) and explicit recasts (i.e., recasts with declarative intonation). Erlam and Loewen found that participants in the two recast groups

⁹ Due to the unpredictability of learner errors, it is not possible to pretest participants (Loewen, 2005). Studies examining the effect of recasts that are provided incidentally designed individualized tests based on the errors that individual learners made. For the pros and cons of this type of tests, see Nassaji (2009).

and the control group did not demonstrate any improvement in their implicit knowledge and explicit knowledge of the target structure. The researchers attributed the ineffectiveness of recasts to the laboratory environment and the intensity of recasts as well as the essentialness of their treatment tasks (Loschkey & Bley-Vronman, 1993)¹⁰.

In contrast to the near-unanimous positive result for recasts in studies where only recasts were examined, the findings from studies that compared the effects of recasts and other types of corrective feedback have been mixed. Some studies found that recasts, although also effective, were not as effective as other types of feedback (Ammar, 2008; Ammar & Spada, 2006; Carroll & Swain, 1993; R. Ellis, 2007; Lyster, 2004; Sheen, 2007; Yang & Lyster, 2010). There have also been studies providing evidence that recasts were as effective as other types of corrective feedback (Loewen & Nabei, 2007; Lyster & Izquierdo, 2009; McDonough, 2007). Finally, two studies found that recasts were more beneficial in leading to interlanguage change (Adams et al., 2011; Nassaji, 2009).

In conclusion, the jury is still out (Long, 2007; Han, 2007) when it comes to the effect of recasts on learning. However, with more and more studies indicating that recasts are as effective as other output-pushing corrective feedback (i.e., prompts) and even explicit corrective feedback (i.e., explicit correction), it is not meaningful to argue whether recasts are effective or not (Mackey, 2007a, 2012); what is meaningful is to find out how recasts can best draw learners' attention and, in turn, promote L2 learning.

¹⁰ Erlam and Loewen (2010) suggest that the tasks designed in their study met Loschky and Bley-Vronman's (1993) criterion of "task essentialness", because successful completion of the tasks required the use of the target structure.

Table 2 Experimental studies on the effect of recasts

Studies	Participants	Target Structures	Research Design	Results
Doughty & Varela (1998)	34 middle school students studying science at an intermediate ESL level	Past and conditional past for time-reference	Pre-, post-, and delayed post-test design	Narrowly focused, frequent recasts were effective in leading to learning of past and conditional past for time reference.
Long, Inagaki, & Ortega (1998)	24 adult learners of Japanese 30 adult learners of Spanish	Adjective ordering and a locative construction. Direct objects in Spanish	Pre-, post-, delayed posttest and control group design	Recasts have selective effectiveness on different grammatical features.
Mackey & Philp (1998)	Adult ESL learners	Question forms	Pre-, post-, and delayed post-test design	The posttests showed a greater production of question forms, but only by learners at higher level of proficiency. Uptake was not related with learning.
Ayoun (2001)	French-as-a-foreign-language learners at a university in the US	Two French past tense	Pretest, posttest, delayed posttest design	Participants who received written recasts did significantly better than participants who received explicit positive evidence and negative feedback.
Han (2002)	8 adult ESL learners of English	Past tense	Pre-, post-, delayed posttest design	Recasts were effective in leading to learning of English past tense.
Iwashita (2003)	55 English L1 learners of Japanese	Two Japanese locative-initial constructions and <i>te</i> -form verb	Pretest-treatment-posttest-delayed posttest design	Recasts were one of the predictors of test gains on only one of the target structures.
Leeman (2003)	74 Spanish L2 learners from a US university	Noun-adjective agreement in Spanish	Pretest-treatment-posttest-delayed posttest design	Recast group outperformed control group, but the beneficial effect of recasts was ascribed to the enhanced salience of their positive evidence.

Table 2 (Cont'd)

Ishida (2004)	4 undergraduate students taking Japanese courses at a US university	Japanese aspectual form – <i>te i-(ru)</i>	Time series design. Participants engaged in 8 30-min interactive activities. The first two sessions were used as pretests and the last two sessions were used as posttests.	Learners performed significantly better in the treatment periods. The high accuracy rate was retained both in the immediate and in the delayed posttests periods.
Mackey & McDonough (2006)	58 EFL college level learners in Thailand	English question forms	Pretest-treatment-posttest design.	Recast group outperformed control group in the development of question forms. Immediate repetition of recasts was not associated with question development.
Trofimovich, Ammar, & Gathbonton (2007)	32 adult Francophone English learners	English possessive determiners and lexical targets.	Pre-, post-, delayed post-test design	For all target structures, learners were statistically significantly more accurate on the immediate and delayed posttests than on the pretests, indicating the effect of recasts.
Sagarra (2007)	65 English learners of Spanish as an L2 receiving computer-delivered oral recasts	Spanish noun-adjective agreement construction	Pre-, post-, delayed posttest design	Recast group was significantly better than control group in all posttests, and participants were able to apply their newly-learned rule to new exemplars.
Erlam & Loewen (2010)	50 English L1 learners of French from a US university	Noun-adjective agreement of French	Pretest-treatment-posttest-delayed posttest design	No difference between the recast groups and the control groups were found, indicating neither implicit nor explicit recasts were beneficial.

Table 3 Studies Comparing Recasts with other Feedback

Studies	Participants	Target Structures	Type of CF Examined	Research Design	Results
Carroll & Swain (1993)	100 adult L1-Spanish ESL learners in Canada	Dative alternation	Recasts, Explicit correction	Pre-, post-, delayed-post tests.	Implicit negative feedback and explicit feedback both led to learning, but explicit metalinguistic feedback outperformed other types of feedback.
Havranek (2002)	207 L1 German learners of English at six different age and proficiency levels	No focused, preplanned target structure	Explicit and implicit types of corrective feedback	Tailor-made individualized tests	Recasts were the least successful corrective feedback. Often learners did not even realize that they have been corrected. Recasts without learner contribution were least
Lyster (2004)	179 fifth-grade learners from intact classes of French as a second language	Grammatical gender in French	Recasts and prompts	Pre-, treatment, post-, delayed posttest design	Recasts were not as effective as prompts in leading to change. Recast group did not differ from control group. However, this difference was only shown in written test but not oral tests.

Table 3 (Cont'd)

Ammar & Spada (2006)	64 ESL learners from 6 primary schools classes in Canada	Third person singular possessive determiner	Prompts and recasts	Pretest-posttest design	Prompts were more effective than recasts. Recasts facilitated L2 development depending on the learners' proficiency levels and on the target structure.
Loewen & Philp (2006)	12 intact ESL classes with 118 students in in New Zealand	There were no target structures.	Recasts and other focus-on-form strategies	Tailor-made individualized tests measuring learning	Recasts and other forms of corrective feedback led to learners' provision of successful uptake and language development. However, successful uptake did not predict gains in posttests.
Ellis, Loewen, & Erlam (2006)	Three ESL classes of lower-intermediate students (n = 34)	English past tense	Recasts and metalinguistic feedback	Pre-test, immediate posttest, and delayed posttest design	In imitation test, recast group did not outperform control group, although there was a tendency towards a significant difference. Metalinguistic feedback outperformed recasts in all tests.

Table 3 (Cont'd)

Sheen (2007)	99 ESL learners from 6 intact classes	English article	Recasts and metalinguistic correction	Pre-, post-, delayed posttest design	Metalinguistic correction was more effective than recasts, which showed no significant difference from control group in the delayed posttests.
R. Ellis (2007)	34 ESL learners from three classes in New Zealand	English past tense and comparative	Partial recasts and metalinguistic feedback	Pre-, post-, and delayed posttest design	Metalinguistic feedback was the only corrective feedback that promoted acquisition of both target structures.
McDonough (2007)	106 EFL learners from a college in Thailand interacting with 6 native English speakers	Past tense	Recasts and clarification requests	Pre-, post-, delayed post-test design	Both clarification requests and recasts were effective. There was no significant difference between clarification requests and recasts.
Loewen & Nabei (2007)	66 EFL learners from two intact classes in a university in Japan	Question formation	Metalinguistic feedback, recasts, and clarification requests	Pre- and post-test design (there is no delayed posttest)	There were no significant differences among the groups' post-test scores.
Ammar (2008)	64 ESL learners from 3 primary schools in Canada	Third person possessive determiners	Prompts and recasts	Pretest-treatment-posttest-delayed posttest design	Recasts were not as effective as prompts. Proficiency is a factor mediating the effect of feedback.

Table 3 (Cont'd)

Lyster & Izquierdo (2009)	25 adult learners of French as a second language	French grammatical gender	Recasts and prompts	Pre-, post-test, delayed posttest design	There was no significant difference between prompts and recasts in promoting learning.
Nassaji (2009)	42 adult ESL learners	There was no preplanned target structure.	Recasts and elicitations	Tailor-made individualized tests	There was a higher degree of immediate postinteraction correction for recasts than for elicitations. The effect of recasts and elicitations was related to explicitness.
Yang & Lyster (2010)	EFL learners in three intact classes in a university in China	Regular and irregular past tense	Prompts and recasts	Pre-, post-, delayed post-test design	Prompt group outperformed recasts.
Adams, Nuevo, & Egi (2011)	71 adult ESL learners from 10 intact classes in the US	English past tense and locatives	Recasts and explicit correction	Pre-, post-, delayed post-test design	No effect was found for recasts and explicit correction in past tense, while recasts were the only corrective feedback that was related to the learning of locatives.
Goo (2012)	95 EFL learners from three intact classes in a Korean university	That-trace filter	Recasts and metalinguistic correction	Pre-, post-, and delayed post-test design	There was no difference between the recasts group and the metalinguistic feedback group.

2.3.3. Factors that affect the effects of recasts: target structures and intensity of recasts

In consonance with Mackey's call for research that examines how recasts are effective in leading to learning, the studies presented in Table 1, Table 2 and Table 3, as well as many others, did come up with an array of factors that might affect the effect of recasts. These factors are mainly of three types. First, there are factors related to learners themselves, including (1) the proficiency level (e.g., Ammar, 2008; Ammar & Spada, 2006; Mackey & Philp, 1998; Nicholas et al., 2001; Philp, 2003), (2) individual differences in aptitude (e.g., DeKeyser, 1993; Sheen, 2008b), working memory (e.g., Gass, Behney, & Uzum, in press; Goo, 2012; Mackey et al., 2002; Révész, 2012; Saggara, 2007; Trofimovich et al., 2007), and anxiety (e.g., Sheen, 2008a), and (3) Prior knowledge of the learner (e.g., Gass, 1988, 1997; Schmidt, 1993b, 2001). The second type of factors is related to recasts per se, including (1) target structures of recasts (e.g., Carpenter et al., 2006; Iwashita, 2003; Kim, 2008; Kim & Han, 2007; Mackey et al., 2000), (2) various characteristics of recasts that render them more or less explicit, such as length, segmentation, intonation, stress, and number of changes (Chaudron, 1977, 1988; Loewen & Philp, 2006; Lyster, 1998b; R. Ellis & Sheen, 2006; Sheen, 2006), (3) intensity of recasts (Erlam & Loewen, 2010; Han, 2002; Mackey & Philp, 1998; Mackey & Goo, 2007; R. Ellis et al., 2001a; Sheen & R. Ellis, 2011). Finally, there are factors concerning the environment in which recasts are provided, including (1) peer relationship (Adams et al., 2011; Révész, 2012), (2) contexts of instruction (Li, 2010; Sheen, 2004; R. Ellis, 2010; Lyster & Mori, 2006), and (3) classroom or laboratory settings (Foster, 1998; Gass, Mackey, & Ross-Feldman, 2011; Han, 2002; Li, 2010; Lyster, 1998a).

Of the many factors that may mediate the effect of recasts, three of them are of particular interest to the current study, namely, target structures of recasts, intensity of recasts, and

individual differences in working memory. This chapter will focus on the first two factors, while working memory will be talked about in Chapter 4.

Target structures of recasts have long been found to be a factor affecting the effect of recasts. As Long (2007, p. 112) points out, “recasts or other delicate, unobtrusive forms of corrective feedback work satisfactorily for some linguistic targets, for example, meaning-bearing items, better than others, but that more explicit, more intrusive intervention is required for communicatively redundant, acoustically non-salient forms.” This has been proved to be the case by evidence from research that examined the relation of recasts to learning (e.g., Iwashita, 2003; Leeman, 2003; Lyster, 1998b; Sheen, 2006) and from research that directly explored learners’ noticing of recasts through retrospective methods such as stimulated recall (Carpenter et al., 2006; Gass & Lewis, 2007; Kim, 2008; Kim & Han, 2007; Mackey et al., 2000). These studies showed that, overall, learners are better at noticing lexical and phonological recasts than morphosyntactic recasts during interaction.

Mackey et al. (2000) was one of the earliest studies which found that learners’ perception of interactional feedback differed in terms of target structures. In their study, Mackey et al. examined ESL and IFL (i.e., Italian as a foreign language) learners’ noticing of interactional feedback including recasts. Learners first participated in interactive activities with native- or near-native-speaking interlocutors, during which they were provided with feedback on their production of various target forms. Then they engaged in a stimulated recall interview, in which they watched the video of their interactive activities and were asked to report their perception of the feedback they received during the completion of the activities. The researchers found that the learners, regardless of their L2, were more accurate in perceiving recasts that targeted phonological and lexical errors than those that targeted morphosyntactic errors.

Carpenter et al. (2006) specifically examined L2 learners' perception of recasts. In their study, Carpenter et al. asked their ESL participants to view video clips of NS-NNS interaction that included both recasts and non-corrective repetitions. One group watched the clips that showed learners' non-target-like utterances followed by NS responses, while the other group watched the same clips excluding the learners' initial non-target-like utterances. In consistent with Mackey et al. (2000), Carpenter et al. found that phonological and lexical recasts were significantly better recognized than morphosyntactic recasts.

Kim and Han (2007) examined Korean EFL learners' perception of recasts that they received in classroom activities. The researchers employed both written and oral stimulated recall to tap into learners' perception of recasts. They also found that learners were more accurate in recognizing the gap between the target-like and non-target-like forms for phonological and lexical recasts than for morphological and syntactic recasts. Kim (2008) took a step further by examining whether target structure was a predictor of the learners' recognition of the gap in recasts. Kim categorized target structure of recasts into morphosyntactic structures and lexical and phonological structures. Results of logistic regression test showed that target structure was a significant predictor of learner noticing of the gap of recasts, indicating that recasts that targeted lexical/phonological errors were better recognized by learners than morphosyntactic errors.

The findings from these interactionist studies, therefore, suggest that the corrective function of corrective feedback, especially recasts, can be better perceived or noticed by learners when they target lexical and phonological errors than when they target morphological and syntactic errors. The variation in perceiving morphosyntactic errors, on the one hand, and lexical and phonological errors, on the other, can be explained in different ways. In her article, Han (2007)

provides a summary of explanations. The first explanation, according to Han, is that lexical and phonological items carry more communicative value than morphosyntactic items; therefore, lexical and phonological items are more salient than morphosyntactic items, and they, in turn, are easier to be noticed by learners (Bardovi-Harlig, 1987; Carpenter et al., 2006; Goldschneider & DeKeyser, 2001; Mackey et al., 2000). Secondly, due to their communicative value, phonological and lexical recasts are more likely to be accompanied by negotiation of meaning, which adds to their noticeability (Mackey et al., 2000). Finally, lexical and phonological recasts tend to be shorter than morphosyntactic recasts. Since shorter recasts are more salient and easier to process (Philp, 2003; R. Ellis & Sheen, 2006; Sheen, 2006), lexical and phonological recasts may be more noticeable than morphosyntactic recasts.

N. Ellis (2006a, 2006b; N. Ellis & Sagarra, 2010) provides another explanation from the perspective of associative learning. According to N. Ellis, learning form-meaning connections requires mental effort. However, due to the limited cognitive resources needed to respond to these demands, learners have to select which aspects of the input to process. One factor that determines what input to select is cue salience. Morphosyntactic elements such as grammatical particles and inflections are of lower salience in the language stream than lexical cues such as adverbial temporals. In addition, morphosyntactic elements are less reliable in that they may have more than one form-meaning mappings. The low salience and low reliability of morphosyntactic elements, therefore, make morphosyntactic cues less noticeable in input. Furthermore, N. Ellis argues that when two cues are presented together in input and they jointly predict an outcome (e.g., *yesterday* and past tense – *ed*), the more salient cue will be associated with the outcome and the less salient one will be overshadowed or *blocked* so that it may not be attended to by the learner. According to N. Ellis, many grammatical meaning-form relationships

are not only low in salience, but they are also redundant in the understanding of the meaning of an utterance. These factors jointly block subsequent noticing and learning of grammatical cues (e.g., past tense – *ed*).

N. Ellis's view is consistent with VanPatten's (1990, 1996, 2006) input processing theory. According to VanPatten, L2 learners are limited in their attentional capacity. In addition, learners' limited attentional resources must be allocated to the processing of referential meaning before anything else when they are involved in communicative exchanges, and in this process, learners tend to give priority to the processing of lexical items rather than to grammatical items. When they can allocate attention to the processing of morphology during communicative exchanges, they tend to process more meaningful morphology before less or non-meaningful morphology. In VanPatten's view, instructional intervention is needed in order to increase learners' odds of attending to morphological and syntactic elements of the L2.

The aforementioned explanations shed some light on why learners have different perception of recasts that are provided to different types of target structures. Given the differential effects of recasts on different structures of language, it may be better to take into account the type of structures that are targeted by recasts when examining the effect of recasts. In so doing, we are able to know "which classes of problematic target language features can be addressed successfully via implicit negative evidence and which, if any, require more explicit treatment" (Long, 2007, p. 110). Moreover, this is of both theoretical and pedagogical significance. Based on the findings of previous studies, the current study examines learners' noticing of recasts by separating lexical and phonological recasts from morphosyntactic recasts.

Examining recasts according to the target structures is especially important for studies that examine recasts that target learner errors extensively and incidentally, as they tend to include a larger variety of linguistic structures. However, as shown in Table 2 and Table 3, so far most studies that examined the effect of recasts on learning focused on a limited number of predetermined language features. The intensity and focus of linguistic forms is considered to make recasts more salient, thereby making it easier for learners to attend to the forms involved in recasts (Han, 2002; Loewen, 2011; Long, 2007; Lyster, 1998b; Mackey & Goo, 2007; R. Ellis & Sheen, 2006). According to R. Ellis and Sheen (2006), the use of recasts on focused, limited, and predetermined linguistic features is not conducive to solving the theoretical problem of the role of recasts. Therefore, more research is warranted that investigates recasts that are incidental and extensive rather than preplanned and intensive. In recent years, there have been some studies that examined incidental and extensive recasts (Loewen, 2004, 2005; Loewen & Philp, 2006; Nabei & Swain, 2002; Nassaji, 2009). However, these studies did not tease apart their target structures of recasts, thereby making it impossible to judge whether the effect of recasts was brought about by lexical and phonological recasts, or morphosyntactic recasts, or both. In addition, there has been a lack of studies that tap into learners' perception of recasts targeting learner errors that incidentally arise in interaction.

The above empirical evidence and theoretical explanations justify the separation of two broad categories of target structures of recasts: morphosyntactic recasts, on the one hand, and lexical and phonological recasts, on the other. In so doing, we can have a better understanding as to what aspects of the L2 recasts are effective for. However, it is noted that this way of separating target structures is coarse-grained and exploratory. Take the category of morphosyntactic recasts for example. There have been studies providing evidence that different

morphosyntactic features led to different learning outcome through interactive feedback (Long et al., 1998), suggesting that these features, although in the same category (i.e., morphosyntax), differ in their tendency to draw learners' attention.

2.4. Debate over the effectiveness of recasts

2.4.1. Debate 1: Are recasts effective in promoting noticing?

According to the Interaction Approach, corrective feedback is facilitative of learning because they tend to draw learners' attention to the mismatch between their erroneous utterance and the target-like reformulation (i.e., noticing the gap). In other words, noticing the form targeted in the corrective feedback is the first step towards learning (Gass, 1988, 1997, 2003; Long, 1996, 2007; Schmidt, 2001; Schmidt & Frota, 1986). Therefore, empirical studies on recasts, as a rule of thumb, commonly relate their findings to whether or not learners have noticed the corrective function of recasts.

With respect to the effect of recasts in promoting learner noticing, there have been two contrasting views. One view holds that recasts promote noticing (Doughty, 2001; Long, 1996, 2007; Long & Robinson, 1998). According to Long (1996), recasts are provided in the context in which both the learner and the interlocutor share a joint attentional focus, so that the learner may have little problem in understanding the message. In addition, the context provides a condition that is conducive to the noticing of recasts, because it was the learner's own utterance that is erroneous. According to VanPatten (1990, 1996, 2004), L2 learners are limited in their cognitive capacity and the processing resource is first allocated to meaning rather than form. Since a recast keeps the meaning of the erroneous utterance constant, the contingency of meaning may free the limited attentional resource that is otherwise used for semantic processing. As a consequence,

more attention can be drawn to the processing of forms. Furthermore, since a recast juxtaposes the learner error and the target-like reformulation (i.e., positive evidence), this makes it more likely for the learner to notice the form-meaning mismatch. Long's view is consistent with Saxton's (1997, 2000) view about the role of recasts in first language acquisition. According to Saxton's Direct Contrast Hypothesis, corrective recasts work, and work better than positive evidence, because they can inform the learner not only that the form modeled in the recast is grammatical, but also crucially that their own form is ungrammatical¹¹.

In Doughty's (2001) view, the advantage of recasts to keep meaning constant and to juxtapose positive evidence and the learner's erroneous form affords the learner a *cognitive window* which triggers a series of micro-processing in the learner's working memory, for example, noticing the gap, rehearsing and maintaining the information contained in the recast, and retrieval of information in long-term memory. Doughty's view implies that individual differences in learners' working memory may be a potential factor that affects the effect of recasts in promoting noticing. Kormos (2006) also points out that the detection of error and/or the target-like reformulations of an error which is then rehearsed in short-term memory can leave a trace in long-term memory. This may assist in the proceduralization of declarative knowledge and avoids fossilization of erroneous knowledge on linguistic forms.

Other researchers (Lyster, 1998a, 1998b, 2004; Lyster & Ranta, 1997; Panova & Lyster, 2002), however, cast doubts on the positive role of recasts in promoting noticing. Lyster and colleagues argue that the implicitness and the multiple functions of recasts render recasts

¹¹ The role of negative evidence and positive evidence is also debated in L1 acquisition. Saxton attributes children's L1 development to their use of negative evidence. However, Nelson (1980), argues that recasts do not necessary involve negative evidence; that is, recasts are effective due to the positive evidence they provide.

ambiguous. For one thing, due to the implicitness of recasts, the negative evidence contained in recasts may not be transparent to the learner. Therefore, it is likely that the learner may fail to recognize the corrective function of recasts. For another, the functions of recasts to convey meaning and to provide negative and positive evidence may confuse the learner, and may lead the learner to perceive the recast as repetition of the same meaning or as another way of saying the same thing. Recasts may become more ambiguous when they are used together with other non-corrective interactional strategies such as repetitions and confirmation checks, or when the teacher does not give the learner an opportunity to reflect and process the information involved in recasts but instead continues with a new topic. Given these reasons, Han (2002, p. 550) considers recasts as “among the least clear and direct forms of negative feedback”. A consequence of the ambiguity of recasts is that learners are not able to recognize the corrective function of recasts and/or locate the error (Carroll, 1999, 2001). Some studies (e.g., Carpenter et al., 2006; Kim & Han, 2007; Mackey et al., 2000) did find that learners failed to perceive recasts as correction, especially when recasts targeted morphological and syntactic errors; instead, participants tended to notice the content or meaning of morphosyntactic recasts.

As mentioned previously, most empirical studies on recasts attempted to link recasts with learning, and they just assumed a role of noticing in associating recasts and learning without exploring noticing per se. To resolve the debate concerning the effect of recasts in promoting noticing, there is a need for studies that directly tap into learners’ perception of recasts. In addition, given the multi-componential and multi-functional nature of recasts, the measure of learners’ perception of recasts should be precise enough to capture what component(s) or function(s) of recasts that learners may attend to. In recent years, the introduction of retrospective data-collection methods into interaction research (e.g., Gass & Mackey, 2000) has

led to some research that examined learners' noticing of corrective feedback. However, such studies are small in number (e.g., Egi, 2007a, 2007b, 2010; Gass & Lewis, 2007; Mackey, 2006; Mackey et al., 2000). Rather, most studies (e.g., Lyster, 1998a, 1998b; Lyster & Ranta, 1997; R. Ellis et al., 2001a; Sheen, 2004; Panova & Lyster, 2002) measured learners' noticing of recasts indirectly through uptake, although, as revealed in the following section, it is controversial whether uptake is a legitimate measure of noticing.

2.4.2. Debate 2: Is uptake a sign of noticing?

As mentioned in the last section, most studies on recasts have measured noticing of recasts indirectly by means of uptake. The legitimacy of uptake as a sign of noticing is a controversial issue. Uptake is "a student's utterance that immediately follows the teacher's intention to draw attention to some aspect of the student's initial utterance" (Lyster & Ranta, 1997, p. 48). A wide array of learner responses is recognized as uptake, including learners' correct reformulation of their errors, partially correct reformulation, and simple acknowledgment of the feedback. Based on the quality of these responses, Lyster and Ranta further categorized them into two types, repair and needs-repair. The former refers to the correct reformulation of an error following feedback; while the latter refers to other responses such as acknowledgment, same error, different error, partial repair, hesitation, and off-target¹².

The all-inclusive nature of uptake is criticized by Long (2007). He argues that some types of uptake, such as hesitation and off-targets, are unrelated to the feedback, so they have nothing to do with the effectiveness of feedback, but "to do with the rules of classroom discourse" (p. 100).

¹² According to Lyster and Ranta (1997), *same error* is the learner's repetition of his/her initial error; *different error* neither corrects nor repeats the initial error; *off target* circumvents the teacher's linguistic focus; and *partial repair* refers to uptake that corrects only part of the initial error.

The categorization of uptake into repair and needs-repair is also deemed problematic (Adams et al., 2011; Mackey, 2007a, 2012; Mackey & Abbuhl, 2005). Mackey (2007a, 2012) uses modified output instead of uptake. What distinguishes modified output from repair is that modified output can be more or less target-like than the original erroneous learner utterance (Mackey, 2007a, 2012; Swain, 1995), while repair is only target-like reformulation of an error. In other words, modified output includes both repair, and partial repair which Lyster and Ranta (1997) categorize as needs-repair. Mackey (2007a, p. 22) argues that “the process of modifying one’s output is as important as the product.” Therefore, partial repair may also indicate that the learner has noticed and processed the recast. The current study adopts the concept of modified output as a special type of uptake. In other words, a learner’s responses to recasts can be categorized into either modified output or non-modified output.

Swain (1985, 1995, 2005) points out that modified output is a type of *pushed output* that occurs when learners are pushed to process language syntactically rather than semantically. This happens when corrective feedback is provided to whatever linguistic errors in the learner’s language production. The corrective feedback may draw the learner’s attention to the gap between what he/she said and what the targetlike form should be. The ensuing search of the learner’s own linguistic knowledge in memory may result in a modification or consolidation of the existing knowledge, or even a construction of new knowledge. Therefore, modified output can be a consequence and a reflection of the learner’s noticing and processing of linguistic knowledge. To put it another way, modified output is a way of hypothesis (re)testing (Gass, 1997; Skehan, 1998; Swain, 1985, 1995). As to L2 learners who have had declarative knowledge about the rule of language use, noticing the gap may also trigger their reflection on the metalinguistic function of their language (Swain, 1995). All these benefits of modified output suggest that

modified output is an indication that noticing of form has occurred as a result of recasts or other types of corrective feedback.

However, some researchers claim that recasts are not likely to elicit modified output or uptake. Some classroom observation studies (e.g., Lyster & Ranta, 1997; Panova & Lyster, 2002) provide evidence that recasts are the least likely to lead to learner uptake. Lyster and Ranta argue that recasts are ambiguous due to their implicitness and multiple functions, which in turn attenuate their function as corrective feedback. Therefore, learners are less likely to produce uptake following recasts because they fail to notice the corrective function of them. However, other classroom observation studies (R. Ellis et al., 2001a; Sheen, 2004) have provided evidence that contradicts the above two studies, as they found that other classroom contexts such as New Zealand ESL and Korean EFL can yield a much higher rate of learner uptake. Braid (2002) and Oliver (1995) also point out that uptake to recasts is constrained by the opportunities that recasts can give learners to produce uptake, but this does not mean that learners failed to notice them. As these studies demonstrate, some recasts were followed by topic continuation; while some recasts were not appropriate for uptake because they required learners to give acknowledgment or confirmation of information. In a word, it is still inconclusive as to whether recasts are less effective in eliciting learner uptake or modified output.

Another controversy over the modified output following recasts concerns the quality of processing. Categorized as input-providing corrective feedback which supplies the target-like reformulation, recasts differ from output-pushing corrective feedback which withholds a target-like reformulation and instead requires learners to self-repair. According to Lyster (2004, 2007), input-providing feedback such as recasts can only lead to learners' repetition of the targetlike reformulation, while output-pushing corrective feedback can lead to self-repair, which requires a

deeper level of processing due to an effort to reanalyze interlanguage representations and to attend to the retrieval of alternative forms. Lyster (1998b, 2004, 2007; Ranta & Lyster, 2007) endorses DeKeyser's (1998, 2006, 2007) skill learning theory, which emphasize the importance of building up declarative knowledge in learners' memory by teaching them grammar explicitly, and proceduralizing and automatizing the declarative knowledge through meaningful practice¹³. Lyster argues that output-pushing corrective feedback, rather than input-providing recasts, are more facilitative of assisting learners in the transition from declarative knowledge to procedural knowledge. However, this view has not been empirically testified.

There have been some studies that examined the relationship between uptake and learning. However, these studies are few and they have provided mixed findings. For instance, Loewen (2005) found that successful uptake was a predictor of learning through a variety of focus-on-form techniques including recasts. McDonough (2005) also found that successful uptake to clarification requests, a type of output-pushing corrective feedback, predicted EFL learners' development in English question formation. It is noted that in McDonough (2005), clarification requests were the only type of corrective feedback examined. When they examined the relationship between uptake and learning through recasts from the same data in Loewen (2004), however, Loewen and Philp (2006) found that successful uptake to recasts was not a predictor of learning.

Given the paucity of research, a conclusion cannot be drawn that modified output to recasts are not as beneficial as modified output to output-pushing feedback. First of all, modified output to recasts is not always overt, that is, audible to the listener. It can also be covert in the form of

¹³ More details of the Skill Learning Theory are provided in Chapter 3.

private speech (Ohta, 2000) or even inner rehearsal (Philp, 2003). Second, since modified output to recasts is optional, learners may choose not to provide modified output, especially when recasts are not appropriate or do not provide an opportunity for modified output. Third, learners' modified output may not be always immediately following recast; instead, they may be delayed (Mackey & Philp, 1998; Mackey & McDonough, 2006). Finally, as long as the learner notice the corrective function of recasts, rather than mimicking the reformulation without noticing (Gass, 2003), recasts may be effective, because, regardless whether it is responded with modified output or not, noticing triggers the necessary cognitive mechanisms and processes that benefit learning.

2.5. Summary

As a summary, recasts have been the type of corrective feedback that has attracted much attention in the interactionist research. They are also the type of corrective feedback that raises much debate over their effect on promoting noticing and uptake, due to the mixed empirical findings from studies discussed in the previous sections. However, most of these studies, although admitting the role of noticing of recasts as an essential step towards learning, only used this concept as a post hoc explanation of their findings. There has been very little research to date that has examined noticing as an independent variable.

To tackle the problems on whether recasts promote noticing and whether uptake is related to noticing of recasts, there is a need for studies that employ retrospective data-collection methods to directly elicit learners' reports of their perception of recasts. In so doing, researchers can not only find out whether or not learners can notice recasts and what components of recasts they can notice, but also examine the relationship between noticing of recasts and learners' production of modified output. Furthermore, as mentioned previously, care must be taken that when exploring learners' noticing of recasts, target structures of recasts should be taken into account, given the

discrepancy in their tendency to draw learners' attention. The current study makes an attempt to employ introspective measures to examine EFL learners' noticing of recasts and its relationship to their modified output. The importance of noticing in SLA and L2 interaction is delineated in Chapter 3.

CHAPTER 3 NOTICING AND RECASTS

3.1. The Noticing Hypothesis

3.1.1. Clarification of related terms

The Interaction Approach establishes the effectiveness of recasts and other interactional feedback on the condition that the learner must notice their corrective function (Gass, 1988, 1997, 2003; Long, 1996, 2007; Pica, 1994; Schmidt & Frota, 1986). Based on this assumption, the current study aims to examine L2 learners' noticing of recasts and its relation with their modified output in response to recasts. As a starting point, then, it is necessary to clarify what noticing is and how it is related to attention.

To define noticing is no easy task, especially when it is entangled with other similar terms such as attention, consciousness, and awareness. Given the multiple meanings of *consciousness* and the ambiguity that results from these meanings, Schmidt (1994b) distinguishes between consciousness as attention and consciousness as awareness¹⁴. Consciousness as attention, as Schmidt (2001) contends, is not a monolithic system, but instead refers to a variety of mechanisms such as alertness, orientation, and detection¹⁵. According to Tomlin and Villa (1994), alertness refers to a general readiness to deal with incoming stimuli; orientation refers to a specific aligning of attention to language form and meaning; while detection is the cognitive registration of sensory stimuli.

¹⁴ Schmidt (1994b) has also distinguished *consciousness as intention*. Consciousness of intention refers to the fact that learning can take place without any particular intention to learn. In other words, learning can take place incidentally. However, incidental learning does not necessarily imply learning without awareness.

¹⁵ According to Robinson, Mackey, and Gass (2012), attention as a construct also includes other mechanisms such as suppression and inhibition.

Detection is considered to be the most important attentional mechanism because only when information is detected can it be available for other cognitive processing, such as retention of information in memory and formation of hypotheses (Posner & Petersen, 1990; Tomlin & Villa, 1994). Schmidt (2001) further distinguishes between two types of detection, viz. detection without awareness and detection with awareness. Awareness is “a particular state of mind in which an individual has undergone a specific subjective experience of some cognitive content or external stimulus” (Tomlin & Villa, 1994, p. 193). According to Allport (1988), awareness can be determined by whether the following three conditions are met: (1) the individual must show some behavioral or cognitive change as a result of the experience, (2) he/she must be able to report awareness of the experience, and (3) he/she must be able to describe the experience. In other words, detection with awareness is a private and subjective experience of an individual’s own existence and environment (Schmidt, 1990a), and it is reportable (Schmidt, 2001). In contrast, detection without awareness is a kind of subliminal perception, a registration of information without an individual’s being aware of it (Schmidt, 1995a).

Consciousness as awareness, then, is synonymous with detection with awareness. It is also what Schmidt refers to as noticing. Schmidt (1994b) defines noticing as the “registration (detection) of the occurrence of a stimulus event in conscious awareness and subsequent storage in long term memory” (p. 179). The definition of noticing indicates that noticing is a part of the attentional system and they are “flip sides of the same coin” (Schmidt, 1995b, p. 18). Schmidt (2001) further points out that the attentional system is limited in capacity and attention is selective in nature. VanPatten (1990, 1996) concurs with Schmidt and argues that in meaningful communication, learners cannot simultaneously attend to both form and meaning; rather, they

may direct their attentional resource first to meaning, then to those communicatively redundant linguistic forms, and finally to those less salient forms.

The attentional system controls access to noticing (Baars, 1988, 1997, 2002; Baars & Franklin, 2003, 2007; Schmidt, 2001). According to Baars (2002), automatic processing consumes no or very little attentional resource; however, when existing skills and routines are inadequate, or when new information sets in or errors occur (Dehn, 2008), effortful, conscious, and controlled attention (i.e., noticing) is required. In addition, attention is closely related to working memory because it is working memory that controls and allocates attentional resources (Baars, 2002; Baddeley, 1986, 2000, 2007; Cowan, 1999, 2003, 2005; Robinson, 2003). According to Robinson (2003), the allocation of conscious attention is crucial for a stimulus to enter working memory, which is also the site where all other processing and storage in long-term memory take place.

3.1.2. The Noticing Hypothesis

It is argued in psychology that learning without some degree of attention to what is to be learned is impossible (Baars & Franklin, 2003; Schmidt, 2001). In the field of SLA, researchers tend to concur that attention is necessary for input to become intake (Gass, 1988, 1997; Schmidt, 1990, 1993a, 1993b). What is controversial, though, is whether noticing is necessary for learning.

Schmidt (1990a, 2001) argues for the role of noticing in second language learning by proposing the Noticing Hypothesis. In his early version of the Noticing Hypothesis, Schmidt maintains that noticing is the necessary and sufficient condition for the conversion of input to intake. In his later version of the Noticing Hypothesis, Schmidt (1995b, 2001) takes a less strong stance, holding that “SLA is largely driven by what learners pay attention to and become aware

of it in target language input” (1995b, p. 721). According to Schmidt (2010, p. 736), noticing “largely determines the course of language development, including the growth of knowledge (establishment of new representations) and the development of fluency (access to those representations).”

Many researchers, especially those in the area of interaction, stick to Schmidt’s position on the role of noticing in SLA. For example, Gass (1991) points out that “nothing in the target language is available for intake¹⁶ into a language learner’s existing system unless it is consciously noticed” (p. 136). Robinson (1995a, 2001, 2009) points out that learners must consciously notice input before it is further processed. Swain (1985, 1995) also suggests that one function of output is to move learners’ attention from meaning to form. Based on these views, Long (1996), in his updated Interaction Hypothesis, lays an emphasis on the role of noticing (i.e., selective attention) in connecting interaction and learning.

Schmidt (2001) identifies two levels of noticing. One is awareness at the level of noticing, and the other is awareness at the level of understanding. Awareness at the level of noticing is limited to the conscious registration of attended specific instances of language, that is, “elements of the surface structure of utterance in the input rather than underlying rules” (Schmidt, 2001, p.5). However, awareness of understanding is a higher level of awareness that concerns the “recognition of a general principle, rule or pattern” (Schmidt, 1995, p. 29). Schmidt (1995b, 2001, 2010) proposes that, although awareness at the level of understanding is facilitative of learning, it is not necessary since it is “involved in contrasts between explicit learning (i.e.,

¹⁶ Intake is a term that was first coined by Corder (1967). It refers to that particular amount of an input that a learner has successfully processed to build up internal understanding of L2. It is the input that L2 learners retain, store, and relate to existing knowledge. Schmidt (1993a) posits that intake consists of those stimuli that have received focal attention.

learning on the basis of conscious knowledge, insights, and hypotheses) and implicit learning (i.e., learning based on unconscious processes of generalization and abstraction)” (Schmidt, 1995b, p. 11)¹⁷.

In contrast to Schmidt, however, Tomlin and Villa (1994) contend that learning can take place without conscious awareness. As afore-mentioned, detection can take place with and without awareness. Tomlin and Villa agree with Schmidt that detection is the necessary mechanism of the attentional system that allows for other further processing and for ultimate learning. However, they depart from Schmidt in that detection does not require noticing and detection without awareness can also lead to learning.

Robinson (1995a, 2003) proposes another model as an attempt to mediate between the two views held by Schmidt and Tomlin and Villa. Subscribing to Cowan’s (1988, 1995) embedded processing model of working memory, Robinson (2003) distinguishes between detected input and focally attended input. According to Robinson, input is detected via peripheral attention and stored in the sensory register. Each sensory system has a sensory register, or sensory store, which receives and briefly holds all of the external and internal stimuli (Cowan, 1997). Some detected input is then selected via focal attention from the stimulus array. Selection is at the same time a response to control processes such as attentional allocation policy, which is operated with the involvement of conscious awareness. The noticed input is then sent from working memory to long-term memory. Therefore, noticing, as defined by Robinson, is “detection with awareness and rehearsal in short term memory.” (p. 296)

¹⁷ Schmidt (2001) claims that what learners must pay attention to is what he terms *surface elements*, which he refers to as instances of language. Abstract rules or principles of which instances may be exemplars can be acquired implicitly or unconsciously (Schmidt, 1995b).

Despite the controversy among researchers, the Noticing Hypothesis has achieved mainstream status in SLA (Dörnyei, 2009). The current study, like other interaction research, is supportive of Schmidt's and Robinson's views of noticing. As shown in the following section, the positive role of noticing in learning has been evidenced by studies in both psychology and SLA.

3.2. Consciousness in the Global Workspace Theory

One essential and widely-accepted approach to conscious learning from cognitive psychology, which lends support to Schmidt's Noticing Hypothesis, is the global workspace theory (GWT) of consciousness (Baars, 1988, 1997, 2002, 2007; Baars & Franklin, 2003, 2007). This model is most relevant to the present study because of its accounts of both conscious processing and its relation to working memory, which is another focus of the current study.

According to the GWT, all significant learning is evoked by conscious contents, but the learning process itself and its outcomes may be unconscious (this is similar to the two levels of noticing proposed by Schmidt). Conscious processing of stimuli goes beyond the local scale and leads to overall global activation, which allows for the participation and cooperation of various sensory systems and higher-level processing networks. Therefore, the GWT provides a principled prediction for the role of consciousness in learning. Baars (2002) continues to argue that, at any given time, only one input can be the focus of conscious processing, because the conscious input is focused and directed by executive control in working memory, which is limited in capacity. In addition, with new stimuli keeping coming in, the previously unconscious input is likely to be activated and become the focus of attention. This view fits well with Cowan's (1999, 2005, 2007) working memory model, which is delineated in the next chapter.

Based on the GWT, Baars (2002) put forward 7 predictions about consciousness. The following are predictions that are most relevant to the Noticing Hypothesis: (1) Consciousness enables comprehension of novel information, such as new combinations of words. Learning requires the integration of multiple sensory inputs which can only be realized by conscious processing. Information that an individual is conscious of enables learning to take place because consciousness triggers a variety of different brain mechanisms. So far there has been no robust evidence for long-term learning of unconscious input. Even implicit learning involves conscious attention at least to the target stimuli; (2) Working memory depends on conscious elements such as conscious perception (i.e., detection with awareness), inner speech, and visual imagery. (3) Selective attention enables access to conscious contents, and vice versa¹⁸. These predictions reveal a clear relationship and interaction between noticing, working memory, and learning.

3.3. Explicit learning, implicit learning, and SLA

The controversy over whether learning is a conscious or unconscious process is isomorphic with the controversy over implicit or explicit learning (Schmidt, 1994b)¹⁹. Explicit learning and implicit learning are distinguished on the basis of the involvement of noticing and awareness in the process (DeKeyser, 1997, 2003, 2007; Schmidt, 1994b). For example, R. Ellis (2009) refers to explicit learning as involving the memorization of a series of successive facts, which makes heavy demands on working memory. Consequently, explicit learning takes place consciously and results in knowledge that is represented in explicit form. In contrast, implicit learning proceeds

¹⁸ Other predictions include: (1) voluntary control is enabled by conscious goals and perception of results; (2) consciousness enables access to “self”: executive interpretation in the brain; (3) conscious information enables many types of learning, using a variety of different brain mechanisms; (4) conscious perception involves more than sensory analysis.

¹⁹ Some researchers use other terms to refer to conscious learning. For example, Bialystok (1981) uses *active* learning, while McLaughlin (1990) uses *controlled* learning.

without making demands on the executive function of the working memory or the central attentional resources. When implicit learning occurs, the learner remains unaware of the learning and thus cannot verbalize what they have learned.

According to R. Ellis (2005, 2006), knowledge gained through implicit learning is procedural and is held unconsciously, while explicit knowledge is declarative and is held consciously, thus explicit knowledge is verbalizable and is typically accessed through controlled and effortful processing when it is used. However, explicit knowledge is not systematic and is often characterized as imprecise, inaccurate, and inconsistent (see also DeKeyser, 1998, 2003, 2007; R. Ellis, 2004b). These characteristics of explicit knowledge, thus, leaves open the possibility of an active role for corrective feedback²⁰.

To date, there has been no conclusive answer to the question of whether all learning requires awareness and explicitness in psychology and SLA (DeKeyser, 1998; Schmidt, 2001). As mentioned in Chapter 1 and elsewhere, there have been some researchers who believe that L2 learning is an unconscious and implicit process (e.g., Krashen, 1985, 1994; Schwartz, 1993; Tomlin & Villa, 1994; Truscott, 1998). A few experimental studies in the field of SLA have also provided evidence that learning without awareness is feasible (e.g., Leung & Williams, 2012; Williams, 2005; Williams & Lovatt, 2003). For example, Williams, in a series of experiments with native speakers of English learning pseudo-Italian, found that the learning of semantically redundant agreement rules correlated strongly with various measures of memory, while the semantically non-redundant rules for making plural on the noun or person on the verb did not

²⁰ Besides corrective feedback, explicit learning takes other forms, ranging from form-focused instruction (Doughty & Williams, 1998; Lightbown & Spada, 2006), input enhancement (Sharwood-Smith, 1993), output enhancement (Swain, 1995), to input processing instruction (VanPatten, 1990, 1996, 2004).

correlate with these memory measures. Williams interpreted the correlations between learning and memory as evidence of implicit learning. Williams' other studies also suggest that form-meaning mappings can be learned implicitly.

However, most studies in SLA support the importance of explicit learning. Schmidt's Noticing Hypothesis claims that noticing, although not understanding, is required for learning. In addition, even if understanding (e.g., generalization of rules) can take place implicitly, it must first depend on instances that is noticed in the input (Baars, 2003; Schmidt, 2010). Robinson's (2001, 2002b) Fundamental Similarity Hypothesis also states that, since cognitive maturity, critical period effects, and existing L1 knowledge make it impossible for L2 learners to access the implicit L1 acquisition mechanisms, the general cognitive abilities that contribute to focal attention (i.e., noticing) and rehearsal in short-term memory are implicated in L2 learning. Any learning conditions, including implicit learning condition, may involve noticing and rehearsal in various degrees. The fundamental similarity theory is consistent with Bley-Vroman's (1989, 1990, 2009) Fundamental Difference Hypothesis, which claims that SLA is best characterized by more explicit, general problem-solving strategies.

From the perspective of empirical evidence, DeKeyser (2003) concludes that "there is very little hard evidence of learning without awareness" (p. 317). This conclusion is made based on the numerous studies that have specifically investigated the role of implicit and explicit L2 learning (e.g., de Graaff, 1997; DeKeyser, 1997; Hama & Leow, 2010; Leow, 1997, 2000; Leow & Morgan-Short, 2004; Robinson, 1996, 1997; Rosa & Leow, 2004; Rosa & O'Neil, 1999). All these studies have provided evidence that explicit learning is superior to implicit learning. Norris and Ortega (2000), in their meta-analysis, provide evidence that explicit instruction, including corrective feedback, is more advantageous than implicit instruction. However, it is noted that

explicit knowledge is not the ultimate goal for L2 learners (DeKeyser, 2007). Rather, what L2 learners should achieve is automatic knowledge to which they can have access in a fast, spontaneous, and effortless way (DeKeyser, 2003). According to DeKeyser's (1998, 2006, 2007) strong interface position, explicit knowledge can become implicit and automatic through practice.

Admittedly, conclusion is far from being drawn regarding the debate over implicit and explicit learning in SLA. However, given the accumulating evidence that points to the advantage of explicit learning over implicit learning, explicit learning is considered the primary way of L2 development (Schmidt, 1995b). The current study, following other interactionist researchers, adopts Schmidt's Noticing Hypothesis and the important role of explicit learning in SLA.

3.4. DeKeyser's Skill Learning Theory

3.4.1. Overview

As mentioned previously, Schmidt's Noticing Hypothesis has achieved a mainstream status in the field of SLA, and most studies on explicit and implicit learning tend to provide evidence for the superiority of explicit, conscious learning to implicit, unconscious learning. In addition, researchers tend to agree that knowledge resulting from explicit learning can be converted into implicit or automatic knowledge (DeKeyser, 1998). Based on these features of L2 learning, DeKeyser (1998, 2006, 2007a) proposes the Skill Learning Theory to account for how L2 learners progress in their language learning from an initial stage to advanced proficiency. More importantly to the current study, this theory places corrective feedback in a crucial position in the process of L2 development (Lyster, 2007; Ranta & Lyster, 2007).

The Skill Learning Theory is based on Anderson's (1982, 1993) ACT-R theory, a model of how various skills move from initial declarative stage to increased automaticity through

proceduralization²¹. According to DeKeyser, by means of observation and/or transmission in verbal form from an expert, a learner can acquire declarative knowledge, which usually consists of some relevant facts and guidelines about the skill so that the learner can develop a rough mental approximation of it. The learner depends on declarative knowledge to interpret and rehearse when the skill is tested in some early trials which typically imposes a heavy load on the working memory since the use of knowledge requires conscious awareness and effort. The second stage of DeKeyser's theory is the procedural stage. On this stage, the learner acts on the declarative knowledge and turns the knowledge from *knowledge that* into *knowledge how* (DeKeyser, 2006, p. 98). At this stage, the learner shifts from relying on declarative facts to procedural knowledge since he/she has developed efficient procedures of performing the skill. However, this process of proceduralization takes a lot of time and practice on the part of the learner. Moreover, the knowledge at this stage is not fine-tuned so that it is still error-prone and requires a lot of attentional resources. In DeKeyser's view, practice is the only way to decrease the time required for retrieving the knowledge, to reduce the occurrence of errors, and to require attentional resources. The last stage is the automatic stage, at which the continuous practice results in improved performance of a skill. Learners at this stage may differ in their level of automaticity of knowledge, which in turn determines the level of the involvement of cognitive mechanisms and processes.

²¹ Anderson's ACT-R theory is a model of how various skills move from initial declarative stage to increased automaticity through proceduralization. Anderson distinguishes three stages of skill learning: declarative stage, procedural stage, and automatic stage. The three stages differ in the nature of the knowledge represented in the learner and the way the knowledge is used.

3.4.2. The Skill Learning Theory and the Interaction Approach

As illustrated above, in the process of moving from the initial declarative stage to the final automatic stage, learners' use of knowledge at these different stages is not systematic and is error-prone. Corrective feedback, therefore, can play an important role at these stages of skill learning (Lyster, 1998b, 2004, 2007; Ranta & Lyster, 2007). However, Lyster (2004, 2007) argues that not all corrective feedback is equally effective in facilitating learning in the three stages of skill learning. Rather, output-pushing corrective feedback is more likely to assist learners in the transition from declarative knowledge to procedural and automatic knowledge. According to Lyster, prompts, such as clarification requests, repetitions, metalinguistic clues, and elicitation, have the advantage over recasts of providing learners with the opportunity to practice in the form of modified output. In addition, modified output is the result of deeper processing which is conducive to the modification and restructuring of learners' previous imprecise knowledge. Recasts, on the other hand, lead to less deep processing because they provide positive evidence. Although learners may repeat the positive evidence, it is less useful than the modified output learners provide in response to prompts. Given these reasons, Lyster (2007) argues that recasts may help learners to gain new declarative knowledge rather than assist them to proceduralize their old knowledge.

Lyster's view about the role of recasts in skill learning is contradictory to that of other researchers (e.g., Han, 2002; R. Ellis, 2007; R. Ellis & Sheen, 2006) who maintain that recasts "act more favorably on linguistic forms that are in the process of being proceduralized than on forms that are at the onset of developing knowledge" (Han, 2002, p. 552). Moreover, as mentioned in Chapter 2, the effect of recasts is largely determined by whether learners can notice the gap between what they said and what was reformulated. Noticing the gap may trigger other

attentional resources and working memory mechanisms that lead to the occurrence of form-comparison, retrieval of long-term representations, and modification of knowledge. More importantly, modified output may take different forms, including private speech (Ohta, 2000), internal rehearsal (Philp, 2003), and even delayed modification (Mackey & McDonough, 2006). Finally, it is pre-mature to conclude that recasts do not promote modified output, because they have been found to lead to a relatively high percentage of modified output in some contexts (e.g., R. Ellis et al., 2001; Sheen, 2004) rather than others (e.g., Lyster & Ranta, 1997).

It is worth noting that the practice that learners need to proceduralize their knowledge should be completed in meaningful communication. Lightbown (2008) argues that when a language form is learned in isolation, it is not readily available for use in communicative interaction. Lightbown suggests that learning to use language or practicing language forms in a communicative context may improve the ability to retrieve it in similar contexts. More importantly, feedback provided on learners' erroneous forms while they are engaged in communicative interaction is likely to be most effective because it matches classroom learning processes to the processes that will be used outside the classroom. In contrast, corrective feedback that teachers provide during decontextualized grammar practice may only be remembered in similar contexts, such as discrete-point grammar tests, but it is of little or no help when learners want to retrieve the corrected form in a communicative context (Lightbown, 2008; Yang & Lyster, 2010). This is an important point, especially in foreign language contexts, where the target language is learned as knowledge (Fang, 2012) and meaning-based practice is relatively rare (Doughty & Williams, 1998; Mackey & Silver, 2005).

3.5. Measuring noticing

3.5.1. Major methods of measuring noticing in SLA

Noticing of forms occurs when learners realize that they do not know the necessary forms to express a given meaning (Schmidt, 1990b). It can also occur when forms are made salient through a variety of corrective feedback (Gass, 1997, 2003; Long, 1996, 2007; Pica, 1994, 1997; Schmidt & Frota, 1986). However, whether recasts are explicit enough to make the form salient for the learner to notice has been a controversial issue in interaction research.

One way to tap into this issue is to measure learners' noticing of recasts directly. Research in SLA mainly employs two types of data-collection methods to measure learners' noticing of L2 input: indirect methods and direct methods. Indirect methods are based on Allport's (1988) first criterion on consciousness, that is, a demonstration of some behavioral or cognitive change due to subjective experience of stimuli. The measure of learner uptake in response to recasts, then, is a type of indirect measure of noticing. Many classroom studies on interaction measured learner uptake as a sign of noticing (e.g., Lyster & Ranta, 1997; R. Ellis et al., 2001; Sheen, 2004). However, the use of uptake as a measure of noticing is controversial (see Chapter 2) and it may threaten the internal validity of a study (Leow, 2000).

In contrast to indirect methods, direct measures of noticing tap into learners' perception of language by means of introspective methodology in the form of verbal reporting²². Data collected in this way come from learners' own statements about their own perception of information (Gass & Mackey, 2000). Introspective methodology can be either on-line (i.e.,

²² In recent years, SLA researchers have begun to utilize eye-tracking technique as a measure to investigate L2 learners' noticing and learning of linguistic forms. Eye-tracking is a direct measure that monitors the timing and location of each fixation during visual study (Godfroid, 2012; Godfroid, Housen, & Boers, 2010).

concurrent) or off-line (i.e., retrospective). On-line introspective methods such as think-aloud collect data at the same time as learners are doing the task. Off-line introspective methods collect data after the task. These methods include diaries (e.g., Mackey, 2006b; Schmidt & Frota, 1986), questionnaire (e.g., Mackey, 2006b; Robinson, 1997), immediate verbal report (Egi, 2007a, 2007b; Philp, 2003), and stimulated recall (e.g., Egi, 2007a, 2007b; Mackey, 2006b; Mackey et al., 2000; Kim & Han, 2007).

In recent years, more and more researchers have employed introspective methods to examine learners' cognitive processes in L2 learning. In interaction research, the use of introspective methods help researchers to better understand the processes involved in learning, especially learners' cognitive processes such as their attention to various types of linguistic input (Jourdenais, 2001).

3.5.2. Stimulated recall

Stimulated recall was the method that the current study employed to explore learners' perception of recasts. As a retrospective method, stimulated recall is used "to prompt learners' recollections of their thoughts at the time they originally performed a task or participated in an event" (Mackey, 2012, p. 27). Compared with other off-line methods, such as diaries and questionnaires, stimulated recall is better because reports from diaries and questionnaires takes places a day or even several days after the task is done, therefore the information reported by learners may not come from their working memory and it may be problematic in its validity. In addition, Robinson et al. (2012) point out that what learners report in their diaries may not be the information that they were aware of, but stimulated recall may provide guidance as to what to report. Stimulated recall is also considered to be advantageous over on-line methods such as think-aloud in interactional research, because the attempt to verbalize experience while thinking

aloud may distract the learning activities, thereby reducing the faithfulness as records of what learners are aware of. Furthermore, stimulated recall is considered to be less intrusive than immediate verbal report (Egi, 2007a, 2007b; Philp, 2003), which is conducted during interaction and thus might cause cognitive overloads (Egi, 2004; Yoshida, 2010).

However, as a retrospective method, stimulated recall is not without problems. The utmost concern is the validity of this method (Ericsson & Simon, 1993; Gass & Mackey, 2000; Jourdenais, 2001). The validity of stimulated recall and other verbal reports is a two-pronged issue: reactivity and veridicality. Reactivity is concerned with whether verbal reports affect participants' task performance; while veridicality is concerned with whether the verbal protocols accurately reflects participants' cognitive processes. Since stimulated recall interview is usually carried out after a task is completed, reactivity does not seem to be a problem to this method. However, the veridicality of stimulated recall protocols is the major source of debate. According to Ericsson and Simon (1993), verbal reports are likely to be valid if cognitive processes are verbalized while they are still fresh in short-term memory. Therefore, whether verbal reports are veridical or not depends on whether they are collected within the critical moments (Robinson et al., 2012) when information recently attended to is still retained in working memory and directly accessible for report. Ericsson and Simon (1993) predict that high accuracy of verbal reports occurs when they are collected within 0.5 to 10 seconds after a task is completed. Immediate verbal reports, as employed by Philp (2003) and Egi (2007a, 2007b), tend to be collected within this time span, but it seems unlikely for stimulated recall since most interaction tasks usually last tens of minutes or longer.

To mitigate the veridicality problems of stimulated recall, researchers have proposed a variety of solutions. According to Ericsson and Simon (1993), the presentation of recall cues,

such as a video presentation of participants' interaction activity (see also Gass & Mackey, 2000), can help to reduce the veridicality of stimulated recall. When recall cues are presented in the same way as they were presented in the task, recall may be more valid (Egi, 2004). This being said, caution should still be exercised as participants may still reconstruct or manipulate their thoughts at the time of recall (Gass & Mackey, 2000), and their comments might be second thoughts after they view or hear the task they completed (Kim & Han, 2007). Second, when eliciting learners' information concerning their noticing of input or other cognitive processes, the interviewer must limit their prompt questions to only attended-to information. The question should have a focus and it should be open-ended, with the help of recall cues (Jourdenais, 2001). The interviewer should also restrain from asking questions that orient learners to *invent* strategies that the learner feels appropriate to report rather than what they actually did during task completion (Jourdenais, 2001, p. 357). Thirdly, stimulated recall can be conducted as soon as possible after the task in order to reduce the time interval between task completion and the stimulated recall. Fourthly, as suggested by Ericsson and Simon (1993), learners' verbal reports will be more valid if they are trained to provide more complete and accurate verbal reports of their experience and behaviors. A good training, according to them, is based on a clear and precise instruction. During the training, the instructions should be read out to participants, indicating the detail for carrying out the stimulated recall interview. Finally, there is the problem of what language to use during stimulated recall. Some research on ESL learners' perception used English as the medium because of the different L1 backgrounds of the learners (e.g., Mackey, 2002; Mackey et al., 2000). This might be a limitation since learners may not be able to articulate their perception in their L2 due to their language proficiency (Gass & Mackey, 2000).

3.6. Studies on noticing and interaction

In recent years, there has been an increased amount of research that has employed introspective methods to examine learners' perception of interactional feedback they received. A summary of studies that used introspective methods in interactionist research is presented in Table 4.

As can be seen from Table 4, of all the studies listed, there have been only a few that examined specifically learners' perception of recasts (Bao et al., 2011; Egi, 2007a, 2007b, 2010; Kim & Han, 2007; Nabei & Swain, 2002; Philp, 2003). Other studies, on the other hand, examined a variety of interactional feedback including recasts (Gass & Lewis, 2007; Mackey et al., 2000; Roberts, 1995). Therefore, caution is needed when the results are interpreted. In addition, given the small number of studies that focused on recasts, only some tentative conclusions can be drawn.

Some studies investigated the relationship between noticing of corrective feedback and L2 development (e.g., Egi, 2007a; Mackey, 2006a; Nabei & Swain, 2002). In Mackey (2006a), three data-collection tools, journal, stimulated recall, and exit questionnaire were employed to measure ESL learners' noticing of corrective feedback. Results indicated a positive relationship between learners' reporting of noticing feedback, which was operationalized as learners' awareness of the gap between their linguistic errors and the target-like production, and their L2 development in one of the target structures, question formation, but not other structures (i.e., past tense and plurals), suggesting an interaction between noticing of feedback and linguistic targets. Egi (2007a) examined Japanese L2 learners' noticing of recasts and its relation with their L2 development. By means of stimulated recall and immediate verbal reports, Egi operationalized learners' perception of recasts in terms of content, negative evidence, positive evidence, and both

negative and positive evidence. Consistent with Mackey (2006a), this study also found a relation between learners' noticing of recasts as positive evidence or both positive and negative evidence and their post-test outcomes. Nabei and Swain (2002), in their case study of one Japanese EFL learner's perception of recasts, also found that learners' noticing the corrective nature of recasts was related to her gains in the posttests. The establishment of the relation between noticing of recasts and their benefits for L2 development is encouraging and justifies the need for more studies in this line.

Other studies centered on learners' perception of recasts and other corrective feedback and various factors that might affect learners' noticing. Most studies revealed evidence that learners were able to notice the corrective function of recasts and/or the gap involved in the feedback, albeit the difference in the rate of noticing. For example, Roberts (1995) found that participants were able to identify 35% of the instances of corrective feedback as correction, but they could only identify what the feedback corrected 21% of the time. Nevertheless, Kim and Han (2007) found that their Korean EFL participants could perceive more than 58% of the recasts provided by their teacher as correction of their errors, and they could recognize the gap in 40% of these recasts. Philp (2003) yielded similar results to Kim and Han, reporting that 60 to 70% of recasts provided to question-form errors were noticed by her participants.

An important finding from these studies is that learners' noticing of recasts is affected by an array of factors. These factors include linguistic structures that were targeted by corrective feedback, with morphosyntactic features being less likely to be noticed than lexical and phonological features (Carpenter et al., 2006; Egi, 2007a; Gass & Lewis, 2007; Kim & Han,

2007; Mackey et al., 2000)²³. This indicates that it is necessary to tease apart the target structures when considering learners' perception of corrective feedback. Besides, characteristics of recasts that were examined in these studies, for example, length of recasts (Egi, 2007a, 2007b; Philp, 2003), number of changes (Philp, 2003), and intonation (Bao et al., 2011), were also found to affect learners' perception of recasts as corrective.

To date there have been only two studies that examined the relationship between noticing of recasts and learners' uptake (Egi, 2010; Bao et al., 2011). However, these studies produced conflicting findings. Egi (2010) found that Japanese L2 learners' uptake and modified output were both related to their noticing of recasts as corrective feedback and to their noticing of the gap. In contrast, Bao et al. (2011), based on their classroom observation, did not find a relation between noticing of recasts and uptake. In addition, they found that learners' reports of noticing recasts from stimulated recall was inconsistent with their noticing of recasts through uptake, suggesting a discrepancy between what they noticed and what they produced immediately following recasts. Given the mixed findings, more research is necessary to unravel the relationship between learners' noticing of recasts and their uptake and modified output in response to recasts.

²³ Egi (2007b) contradicts other studies in that this study found that Japanese L2 learners demonstrated a similar pattern in their noticing of morphosyntactic and lexical recasts. Egi ascribes the finding to the limited, focused morphosyntactic structures that recasts targeted.

Table 4 Studies on Noticing and Corrective Feedback

Studies	TS	PS	CF	Method	Results
Roberts (1995)	No specific target structures	To examine how much error correction EFL students noticed and understood	Different types of corrective feedback, including recasts	Stimulated recall which only three students participated in. The prompt was a video of 50-minute classroom activities. SR took place several days after the video-taping.	With regard to recasts, the participants could notice about 38% of them, and understand only 25%. Lower-proficiency level learners were more apt than higher-proficiency level learners at identifying error correction.
Mackey, Gass, & McDonough (2000)	No specific target structures	To explore ESL and IFL learners' perception about negotiation for meaning and recasts	Different types of interaction feedback including recasts	Stimulated recall that took place immediately after the video-taping of 15-20-minute NS-learner interaction	Both ESL and IFL learners recognized much more lexical and phonological feedback than morphosyntactic feedback.
Nabei & Swain (2002)	No specific target structures	To examine an adult Japanese EFL learner's awareness of and development from recasts provided in classroom activities	recasts	Stimulated recall that was conducted several times after the completion of tasks	Accurate perception of recasts as correction led to better performance on the immediate post-test. Stimulated recall was found to be a learning process itself.

Table 4 (Cont'd)

Philp (2003)	English question formation	To examine the extent to which ESL learners notice the form of recasts of their errors	Recasts	Immediate recall of recasts	Level of proficiency, length of recasts, and change in recasts were all factors that significantly affect learners' noticing of recasts.
Mackey (2006a)	Question formation, past tense, and plurals	To examine the relationship among ESL learners' noticing of feedback, target structures, and L2 development.	Interactional feedback including recasts	Stimulated recall, diaries, and uptake charts	There was a positive relationship between learner noticing and learning of question forms, but not past tense and plurals.
Carpenter et al. (2006)	No specific target structures	To explore ESL learners' perception of the corrective nature of recasts, and the relation of nonlinguistic cues to recast recognition	Recasts	Stimulated recall	Learners were more accurate at identifying recasts when they heard the original utterances of the learner. However, access to the learner error did not guarantee correct recognition of recasts. Learners were more accurate in identifying lexical rather than morphosyntactic recasts.

Table 4 (Cont'd)

Gass & Lewis (2007)	No specific target structures	To examine the perception of feedback by heritage and non-heritage IFL learners	Different corrective feedback including recasts	The same as Mackey et al. (2000)	Learners perceived phonological and lexical feedback more accurately than morphosyntactic feedback. Negotiation occurred more to lexical errors, while recasts occurred more for morphosyntactic errors.
Egi (2007a)	Morpheme – <i>te</i> , and morphological changes of – <i>te</i> , classifiers, tense.	To examine the relationship between Japanese L2 learners' perception of recasts and their L2 development.	Recasts	Immediate verbal report and stimulated recall which took place a day after the task completion.	Learners performed significantly better in the short term when they interpreted recasts as positive evidence or both negative and positive evidence. This effect was more apparent in lexical recasts.

Table 4 (Cont'd)

Egi (2007b)	Morpheme – <i>te</i> , classifiers, tense, word order.	To examine the relationship between Japanese L2 learners’ perception of recast and target structures of recasts, on the one hand, and length and number of changes of recasts, on the other.	Recasts	The same as Egi (2007a)	There is no significant relationship between linguistic targets and learners’ perception of recasts, suggesting learners notice morphosyntactic and lexical errors in the same manner. Length of recasts is a significant factor affecting learner noticing.
Kim & Han (2007)	No specific target structures	To explore the relationship between teachers’ intent for recasts and Korean EFL learners’ perception, considering such variables as type of addresses, target structures, and characteristics of recasts.	Recasts	Stimulated recall with learners and teachers immediately after classroom interaction, but waiting time varied.	There was a significant relationship between teachers’ intent and learners’ interpretation for recasts. Learners noticed the gap in lexical recasts significantly more than morphosyntactic recasts.

Table 4 (Cont'd)

Egi (2010)	No specific target structure(s)	To examine the relationship between Japanese L2 learners' perception of recasts and uptake	Recasts	Stimulated recall which was conducted the next day after the task completion	There is a significant relationship between learners noticing the gap and uptake and a significant relationship between noticing the gap and modified output.
Bao, Egi, & Han (2011)	No specific target structure	To compare the rates of noticing by means of uptake and stimulated recall and to examine the effect of characteristics of recasts on ESL learners' noticing of recasts.	Recasts	Stimulated recall day(s) after video-taping classroom interaction.	There was a vast discrepancy in terms of noticing between uptake and stimulated recall, indicating the uptake may not reflect learner noticing, especially in a classroom setting. Intonation was the only characteristics of recasts to predict noticing.

Notes: TS = Target Structure(s); PS = Purpose of the study; CF = Type of corrective feedback examined; IFL = Italian as a foreign language

3.7. Summary

Noticing is an important first step towards L2 learning through interaction (Gass, 1997; Schmidt & Frota, 1986). Recent decades have witnessed an increasing interest in examining learner noticing of corrective feedback and its relation to learning and uptake. Most studies in this line have provided evidence of learners' noticing of corrective feedback. They have also revealed some factors that might affect learners' noticing. However, because studies in this line are still small in number, there is a need for more research before a conclusion can be drawn.

In addition, caution should be exercised when the findings of these studies are interpreted, due to the different methods these studies took. First and foremost, most studies in this line examined noticing of recasts and other types of corrective feedback, which makes it hard to tease apart the effect of recasts. For example, Mackey et al. (2000) found that learners were more likely to identify the corrective function of corrective feedback that targeted lexical and phonological errors than feedback targeting morphosyntactic errors. However, as the authors revealed, one of the reasons for this discrepancy was that most lexical and phonological errors were corrected through more explicit types of corrective feedback while most morphosyntactic errors were corrected by recasts. Second, as shown in Table 4, these studies differ in whether they had predetermined a focused and limited target structure(s). The intensity and focus of predetermined target structures in some studies but not others may make recasts more salient and thus more noticeable to learners. Thirdly, different studies appear to have different operationalizations of noticing, which, in turn, affects their findings. Some studies operationalized noticing simply as noticing or not noticing the corrective nature of corrective feedback, without delving into the locus of the feedback (e.g., Nabei & Swain, 2002; Philp, 2003), some operationalized it in a rigid way by categorizing it into the different components of recasts (e.g., Egi, 2007a, 2007b), while other studies took an eclectic stance. That is, they took account of the multi-componential nature of recasts but did not go deeper to the various components of them; instead, they categorized learners' perception into perception of the content and/or the location of their error and/or reformulation (e.g., Bao et al., 2011; Egi, 2010; Gass & Lewis, 2007; Kim & Han, 2007; Mackey, 2006a; Mackey et al., 2000). Finally, these studies differ in terms of the administration of stimulated recall. Some studies conducted stimulated recall immediately after the task completion (e.g., Gass & Lewis, 2007; Mackey et al., 2000),

while other studies did it hours, a day, or even days after the treatment or task completion (e.g., Roberts, 1995; Kim & Han, 2007). The long waiting time for stimulated recall in some studies made the validity of learner perception problematic.

Regardless of their limitations, the studies presented in Table 4 all shed some light on learners' perception of recasts and other corrective feedback and its relationship to L2 development. Since the current study aims to examine learners' perception of recasts and its relation to their modified output, the previous studies have provided much profound insight on its research design.

CHAPTER 4 WORKING MEMORY, NOTICING, AND RECASTS

4.1. Language aptitude and working memory

4.1.1. Working memory: An essential component of aptitude

The last two chapters focus on recasts and noticing of recasts. An important point is that recasts, as well as other types of corrective feedback, are facilitative of L2 learning only when learners can notice the gap between their non-targetlike production and the targetlike form (Doughty, 2001; Gass, 1997, 2003; Schmidt, 2001; Robinson, 2003; Robinson et al., 2012; Schmidt & Frota, 1986). In other words, noticing the gap is the prerequisite for the effect of recasts on language development. Given the essential role of noticing, it is important that recasts be salient enough to prompt learner noticing.

In Chapter 2, an array of factors were presented that might affect the noticeability of recasts, ranging from learner factors, environmental factors, and characteristics of recasts per se. According to Schmidt (2001, p.6), the allocation of attention is “the pivotal point at which learner-internal factors (including aptitude, motivation, current L2 knowledge, and processing ability) and learner-external factors (including the complexity and distributional characteristics of input, discoursal and interactional context, instructional treatment, and task characteristics) come together.” Allocation of attention is the starting point of a process in which input is gradually converted into intake. Different processes and mechanisms are triggered when a specific input is noticed and they work together for long-term memory storage of the processed input to occur (Doughty, 2001; Robinson, 2003; Schmidt, 1995b).

Closely related to the allocation of attention and other ensuing processes or mechanisms is learners’ working memory capacity (Baars, 2003; Doughty, 2001; N. Ellis, 2005; Robinson,

1995a, 2001, 2003). As mentioned in Chapter 3, Baars (2002) proposes 7 separate predictions of consciousness, all of which involve working memory. Due to the important role working memory plays in attention allocation and in language processing, this concept has drawn recent attention in SLA, and it has also become an important variable in interactionist research in recent years (Gass & Mackey, 2006a, 2006b; Mackey, 2007a, 2007b, 2012).

Integrating the gist of a variety of working memory models, Miyake and Shah (1999) define working memory as “those mechanisms or processes that are involved in the control, regulation, and active maintenance of task-relevant information in the service of complex cognition, including novel as well as familiar, skilled tasks” (p. 450). To put it simply, working memory is “the temporary storage and manipulation of information that is assumed to be necessary for a wide range of complex cognitive activities” (Baddeley, 2003, p. 189). As a capacity-limited cognitive system, working memory consists of multiple mechanisms or subsystems.

Working memory is considered to be an essential part of foreign language aptitude (Dörnyei, 2009; Miyake & Friedman, 1998; Robinson, 2002a, 2005; Sawyer & Ranta, 2002; Skehan, 2002). It is noted, however, that only in recent decades has working memory been incorporated as a part of foreign language aptitude. Although memory is a component of language aptitude (Carroll, 1981; Carroll & Sapon, 1959)²⁴, in the early stage of the development of the construct of language aptitude, it was understood as short-term memory. The function of short-term memory was to store information passively, which differs from working memory in that working memory

²⁴ Carroll and Sapon’s (1959) foreign language aptitude is composed of 4 abilities: phonemic coding ability, grammatical sensitivity, inductive language learning ability, and rote learning ability (i.e., associative memory). Associative memory was the form of memory that was dominant in psychology at the time when Modern Language Aptitude Test (MLAT) was developed.

is responsible for both actively processing and passively storing of information. Skehan (1998, 2012) has adapted Carroll's model by relating it to an information-processing theory of language acquisition²⁵. In addition, Skehan's model has recognized the advantage of working memory over the traditional concept of short-term memory. Despite the important role of working memory, however, Robinson (2002a) cautions that working memory alone cannot be equated with language aptitude; rather, learning outcome is affected by not only various components of aptitude, such as language analytic ability and phonemic coding ability, but also the interaction of these components (see also Dörnyei, 2009).

4.1.2. Current development of aptitudinal research

The latest development of aptitudinal research in SLA is represented by two models proposed by Skehan and Robinson: Skehan's (2002, 2012; Dörnyei & Skehan, 2003) Information-processing Model and Robinson's Aptitude Complex and Ability Differentiation Model of Aptitude (Robinson, 2002, 2007). What is common in these two models is that both models have emphasized the role of working memory in learners' noticing of forms.

Robinson's model identifies an array of *aptitude complexes*, that is, combinations of cognitive abilities that are related to different processing under different L2 instructional conditions. Learners' strength or weakness in one or more abilities in these aptitude complexes are related to their learning from a particular instructional technique. Robinson takes recasts as an example to illustrate how the combination of aptitudinal abilities affects the learning outcome under instructional conditions. According to Robinson, the aptitudinal abilities involved in

²⁵ Skehan (1998) views aptitude as consisting of only 3 components: (1) auditory ability (i.e., phonetic coding ability), (2) memory ability; and (3) linguistic ability (i.e., the combination of both grammatical sensitivity and inductive language learning ability).

recasting are (1) noticing the gap between the recast and the learner's prior erroneous utterance, and (2) memory for contingent speech. These two abilities are each affected by a combination of domain-neutral primary abilities such as perceptual speed and pattern recognition (in the case of noticing the gap) and working memory (in the case of memory for contingent speech). Individual differences in these abilities will influence learning through recasting.

Skehan's model, based on an information-processing perspective of language learning, proposes that each information-processing stage of SLA corresponds to the involvement of different components of aptitude or a combination of these components. The first two stages of language processing are *noticing* and *registration of input and patterning the input to facilitate further analysis and generalization*²⁶. According to Skehan, the *noticing* and *registration* stage involves aptitudinal abilities (i.e., aptitude batteries) such as working memory and the phonemic coding ability, another component of aptitude. *Patterning the input to facilitate further analysis and generalization*, on the other hand, is affected by learners' individual differences in working memory, grammatical sensitivity, and language analytic ability.

4.2. Models of working memory

4.2.1. Working memory: An account of the attentional mechanism

Working memory has become a key research target in SLA because it comprises mechanisms that are responsible for attention and conscious awareness (i.e., noticing), the driving force of L2 learning (Robinson, 2003; Sawyer & Ranta, 2002). Working memory also serves as a temporary cognitive arena where other components of aptitude, such as phonemic

²⁶ Skehan's model includes 7 stages of language learning. Besides noticing and pattern identification, the other five stages are: extending, complexifying, becoming accurate, creating a repertoire and achieving salience, and automatizing rule-based language and achieving fluency lexicalizing.

coding ability, grammatical sensitivity, and memory ability, are integrated (Dörnyei, 2009; Schmidt, 2001). If it is the case that noticing plays a central role in SLA, then working memory capacity, due to its relationship with attention, is an important factor that mediates learners' noticing of forms of the L2.

The process in working memory that is related to attention is the central executive. The central executive either “controls the selective attention needed to maintain focus and inhibit information that might distract from or interfere with successful task executive” (in multi-componential models of working memory) or “is synonymous with working memory” (in unitary models of working memory)” (Juffs & Harrington, 2011, p. 140). Different models of working memory, be it multi-componential (e.g., Baddeley, 1986, 2007; Baddeley & Hitch, 1974) or unitary (e.g., Cowan, 1988, 1997, 2005; Engle, Kane, & Tuholski, 1999; Kane & Engle, 2000; Kane, Conway, Hambrick, & Engle, 2007), refer to the central executive as the most important part of working memory that controls and manipulates attention. These models generally concur in the essential role of the central executive, although they differ in terms of the specific functions of the central executive that they are focused on. Nevertheless, the central executive, despite its importance, is the most complex and the least understood (Baddeley, 1986, 1996).

Baddeley's (Baddeley, 1986, 2007; Baddeley & Hitch, 1974) multi-componential model of working memory is the most influential model of working memory. This model consists of a central executive and two subsidiary systems specialized for temporary storage of phonologically based materials (i.e., the phonological loop) and of visuospatial material (i.e., the visuospatial sketchpad). The phonological loop is further divided into a passive phonological store and an active articulatory rehearsal. Information that enters the phonological store is represented in a phonological code and it decays with time (about 2 seconds) and is never retrievable, but the

rehearsal process serves to refresh the store before it fades away. Although Baddeley does not clarify whether attention is involved in phonological store and rehearsal, Baars (1988, 2002) points out that rehearsal is a conscious process, which has been adopted by Robinson (1995a) in his definition of noticing. The central executive offers the mechanism for controlling various processes in working memory. It coordinates between the two subsystems, controls the encoding of stimuli and the retrieval of information, switch attention, as well as manipulate materials that were held in the phonological store or visuospatial sketchpad. One important feature of the central executive is that it is limited in capacity.

Most SLA research on working memory bases their study on Baddeley's model and deems it a system of storage and processing. It is noted, however, that the central executive in Baddeley's model functions only as a processing system without the ability to store information. In this regard, Baddeley's model is different from that of Daneman and Carpenter (1981), which proposes that the limited capacity of working memory leads to a trade-off between resources that can be allocated for storage and processing and that the executive control is responsible for both functions. Daneman and Carpenter developed a reading span test to directly measure storage and processing of working memory. Baddeley (2000, 2003) later proposes a new component to his working memory model, the episodic buffer, as a compensation for the lack of storage function in the central executive. The episodic buffer, according to Baddeley, is a capacity-limited, domain-general, and conscious system which mainly serves as a storage device (Baddeley, 2010). The central executive process in Daneman and Carpenter's model, then, is a combination of the central executive and episodic buffer in Baddeley's model (Cowan, 2003, 2005).

Cowan (1995, 1999, 2001, 2005) proposes a model of working memory, the Embedded-process model, that emphasizes the relation of working memory to attention and consciousness

and the mutual interdependence between working memory and long-term memory. This model posits that long-term memory is the only memory-storage system, and working memory is that part of the long-term memory that is activated. Therefore, working memory is embedded in long-term memory and it is responsible for both memory and processing. Cowan's model distinguishes between two levels of long-term memory activation. Stimulated by either internal or external stimuli, a large set of long-term memory elements are aroused in an activated state. These activated elements are not limited in capacity, but they are outside the focus of attention (i.e., conscious awareness) and they can be lost within 3 to 30 seconds due to decay or interference. The other level of activation is focus of attention. Focus of attention, in contrast to the lower-level activation, is limited in capacity (approximately around 4 chunks). Elements in the lower-level activation can move in and out of focus of attention, depending on the needs of the ongoing task. Working memory, according to Cowan (1999, 2001), corresponds to that part of activated long-term memory within focus of attention, which is synonymous with consciousness (Baars, 2002). According to Cowan, information in focus of attention can receive deeper and more extensive perceptual and conceptual analysis because it has access to long term memory information. In addition, information in focus of attention is assumed not to decay and can be encoded into long-term memory. As a result, new information that needs to be learned must enter focus of attention so that it can be encoded and stored in long-term memory (Robinson, 2003). Cowan suggests that the role of the central executive is to direct focus of attention to the information needed, and to monitor responses to keep from reentry the information that has been selected and continue to search for relevant information.

4.2.2. Factors affecting the functions of working memory

Chapter 2 and Chapter 3 have presented a variety of factors that might affect the noticing of recasts and in turn, the effect of recasts on learning. Working memory capacity is one of the factors that might constrain L2 learners' attention to recasts because the central executive process is the system where capacity-limited attentional resources are controlled, manipulated, and inhibited. It is assumed that, everything else being equal, individuals with greater working memory capacity tend to attend to more information because of their size of focus of attention (Cowan, 1997, 2005) or their ability to maintain task-relevant information and to inhibit task-irrelevant information (Kane et al., 2007). Nevertheless, given the many functions of the central executive, factors other than the working memory capacity can also contribute to the execution of these functions.

Many of the central executive functions, such as selective attention, attention control, attention suppression, and inhibition, are susceptible to individual differences in working memory capacity, which can be determined by their performance in storing and processing information simultaneously during task completion (e.g., reading span). It can also be affected by knowledge and skill base (i.e., schemata) represented in the individual's long-term memory (Dehn, 2008; Cowan, 1995, 2005; Chen & Cowan, 2009) because it is related to retrieval of long-term memory elements. Automatic and implicit knowledge that is firmly entrenched in long-term memory does not require attentional resources from working memory because it can be activated, retrieved, and processed automatically (Baars, 2002; Baars & Franklin, 2007; Baddeley, 1986, 1996, 2007). However, when automated activation, retrieval, and processing are insufficient, working memory is needed to initiate an effortful and conscious search so that retrieval of information can be conducted and ensuing restructuring, modification, or encoding

become possible. Effortful involvement of working memory happens, for example, when there is novel information that cannot automatically “call for” long-term memory knowledge base (Andrade, 2001; Cowan, 1988), when there is a task that demands interruption of an action that is already in progress (e.g., learners’ utterances are interrupted by recasts), and when the knowledge base or schemata of the learner is weak and error-bound (e.g., L2 learners’ declarative or proceduralized knowledge of language rules). As mentioned earlier, some SLA researchers (e.g., Gass, 1988, 1997; Schmidt, 1993a, 2001) have emphasized the role of prior knowledge (i.e., long-term memory representations of linguistic knowledge) in affecting learners’ noticing of forms. Learners’ familiarity with prior knowledge, then, might affect the allocation of attentional resources in working memory when they receive recasts, as this type of corrective feedback is provided mainly in response to knowledge that learners have already known (R. Ellis & Sheen, 2006). In other words, the more familiar a learner is with some prior knowledge, the less attentional resource he/she will need to retrieve it from long term memory. Familiarity with prior knowledge, then, makes it faster for learners to retrieve the relevant knowledge and to compare the mismatch between their errors and the reformulations provided in recasts (Lyster, 2007).

In addition, some executive functions such as attention switch can be triggered by environmental changes. According to Gilchrist and Cowan (2010), elements that enter the focus of attention may come from either an internal or an external source. Internal source refers to information that is contained in long-term memory, while external source refers to information from the outside environment. Attention that is allocated to specific external sensory information occurs not only through filtering through the central executive, but also through orienting to changes in environmental stimuli. Gilchrist and Cowan point out that whether an element gains

access to the focus of attention is dependent on various features of this element. Cowan (2001) emphasizes that the change in environment can either assist or counteract the function of the central executive. He claims that the detection of discrepancy between the neural representation of ongoing stimulation and the new input can assist the central executive, while a lack of stimulating cues (e.g., monotonous intonation or stress) are counteracting the central executive and fail to attract attention. This point is consistent with interactionist researchers' finding that the noticing of recasts is affected by different characteristics of recasts. These features include, as mentioned previously, perceptual salience, target structures, rule complexity, communicative value, and various characteristics of recasts per se (e.g., segmentation, length, intonation, stress, and so forth). In other words, these features may in part determine the extent to which working memory is involved in affecting learners' noticing of recasts.

4.3. Measuring working memory

The above discussion of relevant literature establishes that the central executive is the working memory process that is related to attention, and that the central executive (or central executive plus the episodic buffer in Baddeley's model) is responsible for both storage and processing of information. In addition, since storage and processing share the same capacity-limited attentional resources in the central executive, the allocation of attention to one (e.g., processing) mechanism may affect allocation of attention to the other (e.g., storage) (Daneman & Carpenter, 1980).

In this light, a measure of working memory capacity needs to engage both storage and processing simultaneously. To date, researchers on working memory have developed some span tasks, such as reading span (Daneman & Carpenter, 1980) and operation span (Turner & Engle, 1989), to measure learners' simultaneous storage and processing of information. In an operation

span test, participants need to verify arithmetic operations and try to remember words presented after each equation. These tasks are thought to provide a close approximation to everyday complex cognitive tasks such as language comprehension and mathematic calculation (Daneman & Carpenter, 1980). As a result, working memory span tasks have been found to correlate with intellectual aptitudes better than tests that measure only passive storage (e.g., non-word repetition task that measures the phonological loop) (Engle et al., 1999; Conway et al., 2005). Individual differences in working memory span tasks may also predict how well an individual carries out various central executive processes and functions such as control of attention, inhibiting and filtering out irrelevant information (Cowan, 2005; Kane et al., 2007).

The reading span task is the most widely-used measure of working memory capacity (Cowan, 2008; Engle et al., 1999). In a typical reading span task, participants are required to read several sets of sentences in their native language or their second language. The number of sentences is different in each set, ranging from two, three, four, to five sentences. The sentences in each set are presented one at a time. When the participants are reading the sentence, they have to judge whether the sentence is acceptable in its sense. Judging the acceptability of a sentence is considered to be a measure of participants' processing of information. In addition, they have to remember the last word of the sentence. After all the sentences in one set have been read, the participants are required to give as many of the last words of the sentences in the set as they can remember. This is a measure of the participants' ability to store information. After recalling the last words of the sentences in the set, the participants continue with the next set of sentences with the same procedure. However, studies employing reading span test to measure working memory capacity differ in whether participants' L1 or L2 should be used for the sentences in a span test (e.g., Gass & Lee, 2011; Sagarra, 2007), although working memory is generally considered to be

language-independent (Osaka & Osaka, 1992; Osaka & Groner, 1993). They also differ in how they score span tasks (Conway, Kane, Bunting, Hambrick, Wilhelm, & Engle, 2005). These issues are important and will be further discussed in Chapter 5.

4.4. Working memory and the effect of recasts

Working memory has drawn more and more attention of SLA researchers in recent decades. Its relationship with attention and consciousness has been assumed to play an important role in L2 processing and learning (Gass & Mackey, 2006b; Juffs & Harrington, 2011; Mackey, 2007a, 2012; Miyake & Friedman, 1998; N. Ellis, 2005; Robinson, 1995a, 2002, 2005; Robinson et al., 2012; Sawyer & Ranta, 2001; Williams, 2012). Researchers in this area have mainly explored how phonological short-term memory (i.e., the phonological loop) and working memory capacity affect the different aspects of L2 learning, such as general L2 development, vocabulary learning, writing, grammar learning, and reading comprehension (for a summary see Juffs & Harrington, 2011; Martin & N. Ellis, 2012; Williams, 2012). Most of these studies have provided a correlation between working memory and L2 processing and learning.

In recent years, working memory has also become an important target in interaction research (Long, 2007; Mackey, 2007a, 2007b; Williams, 2012). Most studies in this line have examined the relationship between working memory and learning, noticing, and uptake of recasts. In addition, most of these studies included span tasks to measure learners' central executive capacity. Table 5 presents these studies, including the purpose, target structure(s) being examined, working memory tests being used, method of scoring, and the results.

As shown in Table 5, studies in this line are generally interested in tapping into the relationship between working memory and (1) L2 learners' language development through

recasts and other types of corrective feedback (e.g., Gass, Behney, & Uzum, in press; Goo, 2012; Mackey et al., 2002; Révész, 2012; Sagarra, 2007; Trofimovich, Ammar, & Gatbonton, 2007); (2) L2 learners' ability to notice the corrective nature of recasts (e.g., Mackey et al., 2002; Trofimovich et al., 2007); and (3) L2 learners' tendency to provide modified output (e.g., Mackey, Adams, Stafford, & Winke, 2010; Sagarra, 2007).

With regard to studies that focus on the relationship between working memory and learning through recasts, most studies have provided evidence that working memory correlated and/or predicted the effect of recasts on learning (Goo, 2012; Mackey et al., 2002; Sagarra, 2007), that is, high-span learners generally outperformed low-span learners in benefiting from recasts. These studies ascribed the role of working memory (1) to the extent to which it can actively maintain relevant information contained in recasts in an accessible state for use while processing meaning during interaction, and (2) to the extent to which working memory can control attention to relevant information while inhibit irrelevant, interruptive information (Goo, 2012). For example, Goo (2012) investigated how working memory capacity, measured through both reading span and operation span, affect intermediate-level Korean EFL learners' learning of *that*-trace through recasts and metalinguistic feedback. Learners in this study were assigned to recast, metalinguistic feedback, and control group. The participants in the two experimental groups engaged in two one-way information gap activities and received either recasts or metalinguistic feedback when errors about *that*-trace occurred. The control group only took the test without engaging in the treatment. Goo found that both recasts and metalinguistic feedback benefited the learning of *that*-trace. He also found that the two working memory tests predicted learning through recasts but not learning through metalinguistic feedback, indicating the contribution of working memory to

the noticing of recasts, which are implicit in nature. Mackey et al. (2002) and Sagarra (2007) also reported findings that were consistent with Goo.

In contrast to the studies mentioned above, some studies came up with findings showing that working memory did not play an important role in affecting learning through recasts or other corrective feedback. Révész (2012) examined the relationship between phonological short-term memory, working memory capacity, and the learning of English past progressive through recasts by Hungarian beginning-level EFL learners. This study differed from Goo (2012), Mackey et al. (2002), and Sagarra (2007) in that Révész employed three outcome tests (i.e., grammaticality judgment task, written test, and oral production tests) to measure the effect of recasts and to examine the relationship of each of the outcome tests to learners' phonological short-term memory and working memory capacity. Révész found that participants with higher scores in phonological short-term memory showed more substantial development on the oral test, while those with higher scores on working memory capacity exhibited greater gains on the written tests and grammatical judgment test (GJT). According to Révész, phonological short-term memory, rather than working memory capacity, was correlated with learners' performance in oral test because it enabled learners to maintain the information in recasts in short-term memory, thereby facilitating the proceduralization of L2 knowledge. In contrast, working memory capacity was correlated with learners' performance in written tests because it was more likely to develop learners' metalinguistic, declarative knowledge based on grammatical information contained in the feedback.

Gass et al. (in press) examined the relationship between two learner internal capacities: working memory capacity and inhibitory control, and learning of Italian grammatical gender through corrective feedback by English learners of Italian as a foreign language. The researchers

employed an L1-English reading span as a measure of working memory capacity and a Stroop test in both English and Italian as a measure of their inhibitory control. The participants were divided into two groups based on their learning outcome through interaction, and differences between these two groups were considered in terms of working memory and inhibitory control. Gass et al. found that the two groups of participants were not different in working memory capacity, which suggested that working memory was not related to learning outcome. This finding was attributed to the selection of less complex linguistic structures that were targeted by interactive feedback. However, the group of participants who learned more through interaction was found to be significantly better than the group that learned less through interaction with regard to inhibitory control, indicating the importance of learners' ability to suppress information.

There have been to date only two studies that aimed at examining the relationship between working memory and learners' noticing of recasts (Mackey et al., 2002; Trofimovich et al., 2007). Mackey et al. (2002) investigated the relationship between working memory capacity, noticing of recasts, and learning of English question formation through recasts. In this study, thirty Japanese EFL learners completed (1) interactive tasks in which their errors on question formation were recast; (2) pre-, post-, delayed post-test to measure gains in question formation; (3) L1 and L2 listening span and non-word repetition task to measure working memory capacity and phonological short-term memory; and (4) stimulated recall interview and an exit questionnaire as a means to elicit their noticing of recasts. Participants were divided into high, middle, and low groups for each of the memory tests, and a composite score²⁷ was obtained

²⁷ In Mackey et al. (2002), there were three working memory tests: non-word repetition test, an L1 and an L2 verbal working memory tests. The researchers converted each participant's scores for each memory test into z-scores and obtained a composite score by adding the z-scores together.

based on all the three working memory tests. They were also divided into *more noticing* and *less noticing* groups based on their stimulated recall data. Mackey et al. found a near-significant correlation between noticing and the composite score of working memory, but individual memory tests were not related to noticing. Trofimovich et al. (2007) explored the relationship between working memory (both working memory capacity and phonological short-term memory), analytic ability, and attention control on noticing of recasts and learning via recasts of three target structures: English possessive determiners, intransitive verbs, and transitive verbs. They found that these aptitudinal measures did predict gains of learning, but none of them was related to noticing. Trofimovich et al. attributed their finding to the saliency of recasts and the measure of noticing employed in their study. It may also be due to the working memory test they used to measure working memory capacity (i.e., letter-number sequencing test).

Table 5 Studies on the Effect of Working Memory on Recasts

Studies	PS	TS	WM Test	Scoring	Results
Mackey et al. (2002)	To examine the relationship between working memory, Japanese EFL learners' noticing of recasts, and their learning outcomes	English question formation	PSTM: Non-word recall WMC: L1 and L2 listening span	Listening span: one point for correct recall of a last word, 1 point for correct judgment of acceptability and grammaticality. Composite scores for all three WM tests	The relationship between noticing of recasts and composite scores of WM approached significance. There was no relationship between WM and L2 development.

Table 5 (Cont'd)

Trofimovich et al. (2007)	To explore the association between various aptitudinal factors (i.e., WM, PSTM, analytic ability, attention control) and English learners' noticing of recasts.	Three target structures: English possessive determiners, intransitive verbs, and transitive verbs	L1 Letter-Number Sequencing Test, and L2 non-word recognition (Gathercole et al., 2001).	The number of correct responses (out of 21) in the Letter-number Sequencing subtest.	There were no correlations between the WM tests and noticing, on the one hand, and production accuracy, on the other.
Sagarra (2007)	To examine the relation between WM, learners' modified output, and L2 Spanish learners' learning computer-based recasts.	Spanish noun-adjective agreement	Reading span tests adapted from Waters and Caplan (1996)	1 point was given per sentence if the semantically judgment was correct, the final word of the sentence was recalled correctly, and the reading time for the plausibility judgment was between 300 and 5000 ms.	There was a correlation between working memory and all the posttest gains. Working memory was also related to the amount of target-like modified output for gender/number agreement.
Mackey et al. (2010)	To examine the relationship between Spanish L2 learners' working memory capacity and modified output to recasts and other corrective feedback.	No specific target structure	L1 English listening span test adapted from Daneman and Carpenter (1980)	One-half point was given for a correct judgment of plausibility and one-half point for a correct judgment for grammaticality. 1 point was given for correct recall of the last word of a sentence.	There was a significant positive relationship between WM and amount of modified output, indicating that high-span learners produce more modified output.

Table 5 (Cont'd)

Goo (2012)	To examine how individual differences in WMC constrain the effect of recasts and metalinguistic feedback in Korean EFL learners' learning	that-trace filter in English	Reading span task in L1 Korean in which learners judged whether sentences were correct and recall the consonants following the sentences. Operation span carried out to ensure construct validity	Processing part: 1 point was given to each correct recall and 0 for incorrect recall Recall part: a partial-credit load scoring procedure	Both recasts and metalinguistic feedback are effective in leading to learning. WMC significantly predicted the beneficial effects of recasts on learner performance, but it did not predict performance through metalinguistic feedback.
Révész (2012)	To examine whether PSTM and/or WM capacity relate to different types of measures of Hungarian L2 learners' learning through recasts	Past progressive of English as a foreign language	PSTM: Serial repetition of sequences of auditory input WMC: a Hungarian version of the L1 reading span test	Reading span was indicated by the maximum number of sentences participants could read while correctly repeating the final words. The storage part was not included in the scoring.	Participants who received recasts did significantly better than those in the control group; participants with higher PSTM showed more substantial development on the oral tests, whereas participants with higher WM were observed to exhibit greater gains on the written tests.

Table 5 (Cont'd)

Gass, Behney, & Uzum (in Press)	To examine whether working memory capacity and inhibitory capacity were related to Italian-L2 learning from conversational interaction.	Agreement in Italian	Reading span task and Stroop Test.	Partial-credit load scoring (i.e., giving credit for each correct recall only when plausibility judgment was correct).	Working memory capacity was not related to learning of agreement through interaction, but inhibitory capacity was related to learning of agreement.
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Notes. PS = Purpose of the study; TS = Target structure.

4.5. Summary

To sum up, due to the small number of studies on the relation between WM and interaction-driven L2 learning and the mixed findings previous studies revealed, more studies are warranted that examine the relationship between noticing of recasts and individual differences in working memory. In addition, these studies are not without limitations. First, as can be seen in Table 5, almost all of these studies have included a limited number of pre-determined target structure(s) for recasts. As mentioned previously, the intensiveness and focus of predetermined target structures may add to the noticeability of forms. Therefore, there is a need for studies that recasts are provided in an incidental and extensive manner. Second, there have been very few studies on the relation between working memory and noticing of recasts, which is one topic that the current study sets out to address. Thirdly, although all these studies used span tests to measure learners' storage and processing ability, they differ so much in terms of the administration of the tests (e.g., L1 or L2 span) as well as the scoring procedure, making it difficult to compare their findings. Fourthly, some studies, due to the small sample, did not provide convincing data analysis, thereby mitigating the robustness of their findings. Finally, as more and more studies found that

type of target structures is an important factor that affect learner noticing, it appears that studies examining noticing and learning of recasts need to tease apart types of target structures for analysis.

CHAPTER 5 METHOD

5.1. Research questions

5.1.1. Statement of problems

The previous chapters are focused on the review of relevant literature. The Interaction Approach has claimed that, in meaning-focused communication, recasts and other corrective feedback serve to briefly draw learners' attention from meaning to form (Doughty, 2001; Gass, 1997, 2003; Long, 1996, 2007; Long & Robinson, 1998; Pica, 1994; Schmidt, 2001). By noticing the gap between what the learner said and the targetlike form, the learner can proceed with a range of cognitive processes in his/her working memory that work together to lead to language development (Doughty, 2001; Robinson, 2003).

However, whether or not recasts promote noticing has been a controversial issue. Some researchers are skeptical about the noticeability of recasts, given that recasts (1) are implicit; (2) are multi-componential; (3) are similar to other non-corrective interactive strategies such as repetition and confirmation check; and (4) provide reformulation that does not encourage deeper processing (Lyster, 1998a, 1998b, 2004, 2007; Lyster & Ranta, 1997).

An important solution to the debate over the noticeability of recasts is to examine whether or not the learner attends to recasts. However, most studies to date have measured noticing of recasts indirectly through the amount of uptake that learners provided in response to recasts (e.g., Lyster & Ranta, 1997; R. Ellis et al., 2001; Sheen, 2004). Uptake to recasts is considered to be an unreliable measure of noticing, because they are not only optional, but also constrained by various discoursal situations. Therefore, methods that directly tap into learners' perceptions of recasts are warranted, including introspective methods such as stimulated recall and eye-tracking

technique. In recent years, there have been an increasing number of studies that investigated learners' noticing of corrective feedback by means of introspective data-collection methods. However, many of these studies examined the noticing of corrective feedback in general (e.g., Gass & Lewis, 2007; Mackey, 2006a; Mackey et al., 2000; Roberts, 1995). There have been a few studies that specifically tackled the noticing of recasts, but most of them were focused on a limited number of predetermined, focused target structures for recasts (e.g., Egi, 2007a, 2007b; Philp, 2003). Recasts that focused on a limited and predetermined number of target structures may be better noticed than recasts that are provided extensively and incidentally, due to their focus and intensity. Long (2007) has called for more research that explore the noticing and benefit of recasts that are extensive and incidental during communication. In addition, there is a need for studies that examine the relationship between noticing and uptake. Although uptake may not be a guarantee of learner noticing, it is worth investigation from both theoretical and empirical perspectives (R. Ellis & Sheen, 2006). As far as the author knows, so far there have been only two studies that delved into this issue (Egi, 2010; Bao et al., 2011)²⁸, and they yielded conflicting findings.

Previous literature has identified a variety of factors that may affect the noticing of recasts. Among these factors is type of target structures. There have been studies that provided evidence that, everything else being equal, learners are much better at noticing the corrective function of recasts that targeted lexical and phonological errors than noticing the corrective function of recasts that targeted morphosyntactic errors (e.g., Carpenter et al., 2006; Kim, 2008; Kim & Han, 2007; although see Egi, 2007b), indicating that language structures differ in their complexity,

²⁸ An unpublished dissertation by Kim (2008) has also tackled the relationship between noticing the gap and repair.

communicative value, and perceptual salience (Mackey et al., 2000; Schmidt, 2001). Therefore, to better understand how recasts are related to noticing, it is necessary to tease apart the structures that are targeted by recasts.

Finally, noticing as a cognitive mechanism is closely related to working memory, because the central executive system in working memory is responsible for the control and manipulation of attention (Baars, 2002, 2003; Cowan, 1999, 2007). Individual differences in working memory capacity, therefore, may influence learners' noticing of recasts (Mackey et al., 2002). Although there has been an increasing interest in the relationship between interaction and working memory, to date there have been very few studies that examined working memory capacity and noticing of recasts (Mackey et al., 2002; Trofimovich et al., 2007). Most studies have laid their emphasis on the link between working memory and learning through recasts (e.g., Goo, 2012; Mackey & Sachs, 2012; Révész, 2012; Sagarra, 2007). Given the crucial role that noticing plays in the effectiveness of recasts and the association between noticing and working memory capacity, more research is needed that explores the relationship between working memory capacity and noticing of recasts.

5.1.2. Research questions and hypotheses

To shed some light on the debates over the noticing of recasts and its relation to uptake, the current study attempts to address the following important issues: (1) whether L2 learners can notice the corrective function of recasts and, if so, whether their noticing differ in terms of the types of structures that recasts target; (2) how L2 learners' noticing of recasts is related to their uptake in response to recasts; and (3) whether L2 learners' individual differences in their working memory capacity affect their noticing of recasts. The current study differs from relevant previous studies in that (1) recasts in the current study are provided extensively and incidentally;

(2) learners' noticing of recasts, as well as its relation to uptake and working memory capacity, are analyzed by separating types of target structures of recasts into morphosyntactic recasts and lexical and phonological recasts.

More specifically, the current study attempts to address the following 4 research questions:

Research question 1: Do Chinese EFL learners perceive recasts as (a) corrective feedback without noticing the gap; (b) corrective feedback with noticing the gap; and (c) responses to content and other information?

Research question 2: Is there any difference between the Chinese EFL learners' noticing of recasts targeting morphosyntactic errors and their noticing of recasts targeting lexical and phonological errors?

Research question 3: Is there any relationship between Chinese EFL learners' noticing of recasts and their modified output in response to recasts?

Research question 3-A: Is there any relation between Chinese EFL learners' noticing of recasts that target their morphosyntactic errors and their modified output in response to recasts?

Research question 3-B: Is there any relation between Chinese EFL learners' noticing of recasts that target their lexical and phonological errors and their modified output in response to recasts?

Research question 4: Is there any relation between Chinese EFL learners' individual differences in their working memory capacity and their noticing of recasts?

Research question 4-A: Is there any relation between Chinese EFL learners' individual differences in their working memory capacity and their noticing of recasts that target morphosyntactic errors?

Research question 4-B: Is there any relation between Chinese EFL learners' individual differences in their working memory capacity and their noticing of recasts that target their lexical and phonological errors?

Based on theoretical accounts and previous empirical findings, the following hypotheses are made:

Hypothesis 1: Previous studies reported that participants did in fact notice the corrective nature of a proportion of corrective feedback (Egi, 2007a; Gass & Lewis, 2007; Mackey et al., 2000). Based on these findings, it is hypothesized that Chinese EFL learners can report their perception of recasts as corrective feedback, and they can also notice the gap between their own error and the target-like reformulation entailed in recasts. However, given the implicit and multi-componential nature of recasts, these learners will also report their perceptions of some recasts as content or other information irrelevant to the corrective nature of recasts, and learners may not be able to notice the gap involved in recasts although they may realize that they made errors. In other words, although they recognize some recasts as corrective feedback, they are not able to locate the error or the reformulation of recasts.

Hypothesis 2: Studies have provided evidence that learners differed in their noticing of corrective feedback targeting morphosyntactic errors and corrective feedback targeting lexical and phonological errors (Iwashita, 2003; Kim & Han, 2007; Mackey et al., 2000). Recasts that target learners' phonological and lexical errors are more likely to be noticed because they have

more communicative value and greater perceptual salience than recasts that target morphosyntactic errors. Based on these findings, it is hypothesized that learners can notice recasts as corrective feedback (i.e., recognizing only the corrective function of recasts and/or noticing the gap) of lexical and phonological recasts better than morphosyntactic recasts.

Hypothesis 3: As mentioned in Chapter 2, the current study examined the relationship between noticing of recasts and learners' provision of modified output, a special type of uptake. Modified output differs from repair (Lyster & Ranta, 1997) and successful uptake (R. Ellis et al., 2001a) in that modified output represents the learner's attempt to modify their error regardless of whether they are more or less target-like. Modified output is considered to be related to noticing and learning (Gass, 1997, 2003; Mackey, 2007a, 2007b; 2012; Pica, 1994; Swain, 1995, 2005). Therefore, it is hypothesized that modified output that follows recasts is more likely to be related to learners' perception of recasts as correction (i.e., noticing the corrective function of recasts and/or noticing the gap) rather than their perception of recasts as content or other information irrelevant to the corrective nature of recasts. Furthermore, learners' production of modified output is related to their perception of recasts as corrective feedback rather than content conveyance regardless of the target structures of recasts.

Hypothesis 4: The central executive of working memory is the system that controls attention and coordinates other important functions that enable the storage and processing of information. However, the extent to which working memory capacity plays a role in affecting learner noticing is mediated by various factors such as cues in environment and an individual's prior knowledge (Cowan, 2005). Given the more communicative value and perceptual salience of recasts that target lexical and phonological errors than recasts that target morphosyntactic errors, it is hypothesized that learners with higher working memory capacity are more likely to

notice the corrective function of recasts that target morphosyntactic recasts than learners with lower working memory capacity; while learners with higher working memory capacity are not different from learners with lower working memory capacity in their noticing of the corrective function of recasts that target lexical and phonological errors.

5.2. Method

5.2.1. Chinese EFL context

The current study was carried out in the context of English-as-a-foreign-language (EFL) in China. As mentioned previously, most interaction studies have been conducted in contexts such as Canadian immersion programs, ESL contexts in New Zealand, Australia, and the U.S., and foreign language context in the U.S. (e.g., Leeman, 2003; Long et al., 1998; Zyzik & Polio, 2008). Relatively little research has been conducted in foreign language context in other countries such as China (Yang & Lyster, 2010). Context of language instruction and learning is considered to be an important factor that may influence the nature of interaction in a communication-based classroom (Fujii & Mackey, 2009; Sheen, 2004). Therefore, as an important model of SLA, the Interaction Approach needs to be empirically tested in diverse L2 learning contexts (Mackey, 2012; Mackey & Silver, 2005).

In China, as well as in many other Asian countries, English is the *de facto* lingua franca (Baker, 2012). The environment of English teaching and learning in China is both similar with and different from that of other countries or regions. For example, Doughty and Williams (1998) have summed up the similarity among English foreign language learners in general. According to Doughty and Williams, learners of English as a foreign language do not have sufficient input available to them; learners have had years of explicitly metalinguistic instruction, but they have

limited meaning-focused input. In addition, they have very few opportunities to produce and practice their interlanguage in meaningful communication.

The Chinese EFL environment also has its own characteristics. In recent decades, the Chinese government has been highly committed to the teaching and learning of English, and has taken great length to reform English language teaching by introducing a range of national syllabi (Hu, 2005). The latest national English syllabus (2000) issued by the National Education Committee lays an emphasis on the development of EFL learners' all-round ability to use English. In addition, teaching approaches such as communicative language teaching (CLT) and task-based language teaching (TBLT) have been included in the guidance of the new curriculum with an expectation to promote learners' competence. However, the dissemination of new teaching methods in EFL classes in China has met with various problems. First of all, interaction tasks might be regarded as *imported* activities that do not fit well in cultures that emphasize the role of the teacher as the central authority (Nunan, 2003)²⁹. Hu (2002) has reported empirical evidence about the contradiction between Chinese culture of learning and the implementation of CLT and TBLT. Secondly, the implementation of CLT and TBLT has been constrained by form-oriented examinations in Chinese education system, especially those high-stake examinations such as the college-entrance examination and college English test (CET). These form-oriented tests may demotivate teachers who are otherwise enthusiastic to apply CLT and TBLT in their classroom practice (Fang, 2012). Moreover, EFL learners may also be demotivated in their attempt to develop their communicative competence of their L2. Thirdly, the culture of learning in China also affects how Chinese learners learn English. Liu (2002) found that Chinese English

²⁹ It is noted that, given regional diversity resulting from economic and educational conditions in China, it may not be appropriate to describe EFL teaching and learning throughout China as homogenous and unchanging.

learners were inactive in their language classrooms, probably due to their face-saving strategies and their tendency to avoid confrontation. Cortazzi and Jin (1996) also reported that in classrooms, Chinese learners are disciplined, attentive, taking notes, and clinging to memorization. This way of learning has been found to lead to learners' unwillingness to communicate in EFL classrooms (Peng, 2007). Given these reasons, Chinese EFL learners may demonstrate a different pattern in their noticing of recasts and their production of modified output in response to recasts.

5.2.2. Participants

5.2.2.1. Chinese college EFL learners

A total of 60 adult Chinese EFL learners participated in the current study. All of these participants were second-year English majors from the English Department of a university in the south of China. All participants were native speakers of Mandarin and 55 of them were from the same province where the school is located, suggesting that these participants were similar in their English learning background. As English majors, these participants took approximately 15 hours of English-related classes every week, such as intensive reading, extensive reading, listening comprehension, grammar, and English literature. The participants had oral English class for only one semester, and the teachers of oral English classes were native speakers of English from Britain and the U.S.

All the participants filled out a background questionnaire (See Appendix A). Of the 60 participants, 5 were male and 55 were female. The ages of these participants ranged from 18 to 23 years old, with an average age of 19 ($SD = 1.11$). Their average length of formal English education was 8.4 years, ranging from 4 to 14 years ($SD = 2.39$). In the semester when the

experiment was conducted, all of the participants had begun taking classes of Japanese as a second foreign language. None of these students had an experience of staying in an English-speaking country or region.

Two months before the experiment was conducted, all second-year students in this Department, including the participants of the current study, took the nation-wide College English Test (CET-4). The test measures English learners' skills in listening comprehension, reading comprehension, writing, grammar rules and vocabulary, and translation. The total score for the CET-4 was 100. A speaking test session would be given at another time several months later, but only those students whose scores exceeded 80 could take the test. The average CET-4 score for these participants was 63($SD = 4.27$), with the lowest score being 57 and the highest score being 76. In the background questionnaire, the participants were asked approximately how many hours per week they spent in practicing their oral English with other students, and they needed to select from among 5 choices the choice that fitted them the best: (1) less than one hour; (2) 1-2 hours; (3) 3-4 hours; (4) 4-5 hours; (5) more than 5 hours. Results show that more than 75.8% of the participants selected choices (1), indicating that most participants spent less than 1 hour in their extracurricular meaningful language practice.

Learners whose scores approach or pass 60 in the CET-4 are considered intermediate-level English learners. The current study selected participants from this proficiency level because they were able to carry out interactive activities in their L2 English, but their L2 production was not always accurate, thereby providing a necessary context for recasts to occur. All the 60 students volunteered to participate in the study. They were first required to complete an informed consent form (See Appendix B for the Consent Form). As compensation for their participation, the participants were paid at a rate of RMB 20 Yuan per hour.

5.2.2.2. Non-Native-Speaking interlocutor

Participants in most interaction studies were interacting with either native-speaking teachers or native-speaking interlocutors (Adams et al., 2011). In some studies, native-speaking interlocutors “feign noncomprehension in the same way that teachers in classrooms do when they want to elicit a particular type of response” (Mackey, 2006b, p. 376). Interlocutor relationship is considered to affect the production and perception of corrective feedback (Adams et al., 2011; Egi, 2007b; Swain, 2005). For example, Mackey, Oliver, and Leeman (2003) examined the effects of two interlocutor factors: age of the interlocutor and the language background of the interlocutor (native-speaking vs. non-native-speaking) on the amount of interactional feedback, opportunities for modified output, and amount of modified output. They found that native-speaking interlocutors in the adult age group provided significantly more interactional feedback than their non-native-speaking counterparts. However, in the same adult group, they found that non-native-speaking interlocutors provided significantly more opportunities for learners to produce modified output, indicating a more didactic orientation of the non-native-speaking interlocutors.

The use of non-native speaking interlocutors, according to Mackey (2006b), is “a new move” in interaction research and can “open the door to different sorts of interaction, providing researchers with opportunities to gain insights into various aspects of learners’ mental representations and processing.” (p. 376). Given the fact that few studies examined foreign language learners’ interaction with non-native-speaking interlocutors, and the fact that Chinese EFL learners have very few opportunities to communicate with English native speakers, the researcher of the current study, a native speaker of Chinese, acted as the interlocutor to engage in meaningful interaction tasks with individual participants. The researcher has received an MA

degree in linguistics and applied linguistics, and is a current PhD candidate in the field of second language studies. The researcher also had had a seven-year experience of teaching English as a foreign language at various Chinese universities.

5.3. Operationalizations

Recasts are operationalized as a non-native-speaking interlocutor's reformulation of all or part of an EFL learner's utterance that contains at least one error within the context of meaning-based activities (Sheen, 2006, p. 365). The following is an example of a recast taken from the data of the current study.

Example 3

P: In front of the girl, there *are* a desk.

R: There is a desk.

P: There is a desk.

As specified in the operationalization of recasts, recasts are provided in response to learner utterances that at least involve one non-targetlike form. In other words, repetition or confirmation check of a learner's accurate utterance cannot be considered a recast. In addition, a recast must be provided implicitly without adding other linguistic cues, such as a repetition of the error (Doughty & Varela, 1998)³⁰. In EFL contexts, participants tend to use their L1 Chinese to represent meaning they did not know how to express in English. In the current study, this is not

³⁰ In Doughty and Varela (1998), a repetition of error was provided before a corrective recast. The operationalization of recasts in this way makes it hard to identify the effect of recasts.

considered a recast but a student-initiated focus-on-form episode (R. Ellis et al., 2001b). For example,

Example 4

P: I see some fish in the [hesitate], ah, *yúgang zěnmē shuō* (How to say “yúgang” in English)?

R: *fish tank*.

P: oh, I see some fish in the fish tank.

The current study investigated recasts as the only type of corrective feedback. However, as evidenced in many studies (e.g., Han, 2002; R. Ellis, 2007), the provision of a single type of corrective feedback may increase the likelihood of learners’ noticing of its corrective intention. Therefore, when engaging in interactive activities with the participants, the researcher also provided some other types of corrective feedback in addition to recasts, in order to minimize the salience of recasts. The other types of feedback (e.g., clarification requests, repetition, elicitation) will be detailed in the section of data coding.

The linguistic structures that recasts targeted during interaction were categorized into two types. One is morphosyntactic recasts; and the other is lexical and phonological recasts. Morphosyntactic recasts are operationalized as recasts that target errors concerning tense, agreement, plurality, articles, gerunds, relativization, word order, conjunction, auxiliary verbs, modals, comparatives, passive voice, question formation, and so forth (Lyster, 1998a; Kim & Han, 2007). Lexical and phonological recasts are operationalized as recasts that target errors

concerning (1) word choice, preposition³¹, collocations, derivatives (i.e., lexical recasts), and (2) pronunciation of words (i.e., phonological recasts) (Kim & Han, 2007). The recast episode in Example 3 is an example of morphosyntactic recasts. Example 5 below is an episode of lexical and phonological recast. In this example, the learner made an error (*in the teacher's back*), and was later reformulated by the interlocutor as *behind*.

Example 5

P: The blackboard is *in the teacher's back*.

I: The blackboard is behind the teacher?

P: Yes.

Uptake is operationalized as an EFL learner's reactive utterance that immediately follows the non-native-speaking interlocutor's recast in response to the learner's initial erroneous utterance (Lyster & Ranta, 1997, p. 48). The current study follows other researchers (e.g., Adams, et al., 2011; Egi, 2010; Mackey & McDonough, 2006) by categorizing uptake into either modified output or non-modified output. Modified output is operationalized as learners' reactive utterance following recasts that involves the process of reformulating their original erroneous utterance in response to recast (Mackey, 2012, p. 16). This includes both repair and partial-repair in Lyster and Ranta's categorization of uptake. Non-modified output is operationalized as an EFL learner's reactive utterance following recasts that does not involve any attempt to

³¹ Previous studies differed in how they categorized prepositions. Some studies classified prepositions as morphosyntactic structures (e.g., Adams, 2003; Adams et al., 2011; Lyster, 1998a), while others (e.g., Adams, 2007; Kim, 2008; Kim & Han, 2007) categorized them into lexical items. The current study classified preposition use as lexical structure because they are more lexically based (Adams et al., 2011).

reformulate or rephrase the original error, such as repetition of the same error and acknowledgment. Example 6 shows a recast episode that involves modified output that equals a repair, while Example 7 shows one that involves modified output that is a partial repair. In Example 6, the learner reformulated her erroneous utterance (i.e., *sitting*), while in Example 7, the learner just reformulated part of the error that the recast targeted (i.e., *on his left hand*).

Example 6

P: They are *sit* on the chair.

I: They are sitting on the chair.

P: Sitting.

Example 7

P: There is a book shelf *in his left hand*.

I: on his left hand side?

P: on his left hand, yeah.

Example 8 is an example that illustrates a non-modified output. In this example, the learner just showed her acknowledgement of the recast provided to her. Acknowledgement to recasts is considered to be ambiguous since it is not clear what the learner has attended to.

Example 8

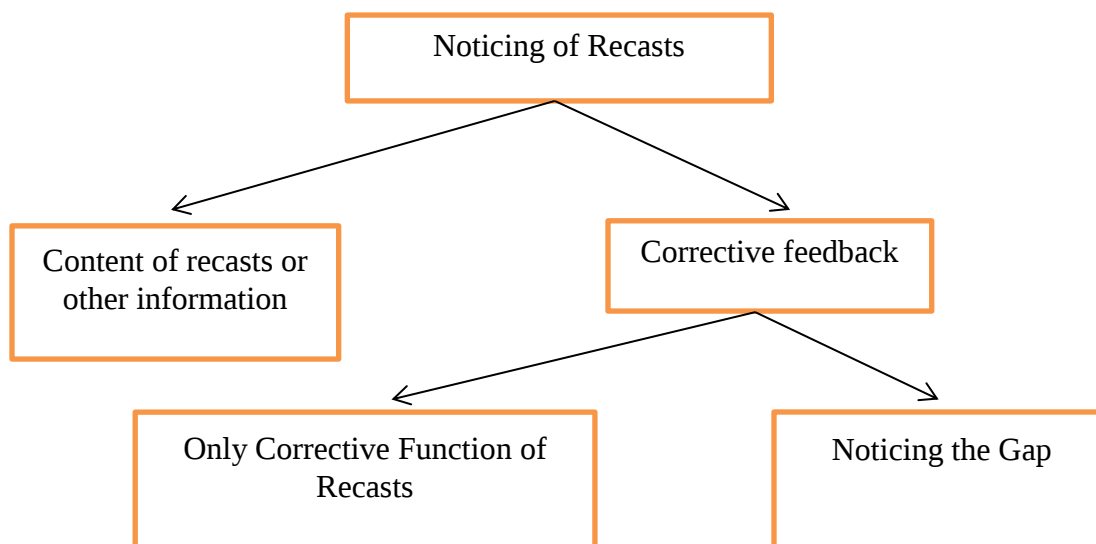
P: and *have a bag on the desk*.

I: oh, there is a bag on the desk?

P: Um.

Noticing of recasts is operationalized as an EFL learner's verbal report indicating that the learner had noticed the recast at the time when it occurred. Learners' verbal reports were elicited through stimulated recall interviews. As mentioned in Chapter 3, researchers differ in how they operationalized noticing of recasts. Some studies simply operationalized it as noticing or not noticing the corrective nature of recasts (e.g., Nabei & Swain, 2002; Philp, 2003), while others delved into learners' noticing of various components of recasts, viz., content, negative evidence, positive evidence, and both negative and positive evidence (e.g., Egi, 2007a, 2007b). There have also been some studies that took an eclectic approach by categorizing learners' perception of recasts into content of the recast, the locus of the error, and/or the reformulation of the recast (e.g., Bao et al., 2011; Gass & Lewis, 2007; Kim & Han, 2007; Mackey, 2006). The current study follows this eclectic approach by categorizing noticing of recasts into noticing of (1) the content of recasts or other information irrelevant to the corrective nature of recasts; (2) only the corrective function of recasts; and (3) the gap between the error and the reformulation (Egi, 2010; Mackey, 2006). Figure 1 summarizes the noticing of the different information of a recast.

Figure 1 Operationalization of Noticing of Recasts



Note. For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this or dissertation.

Noticing the content or other information of recasts is operationalized as learners' reports indicating that they understand the recast as the non-native-speaking interlocutor's response to the conversational content, such as confirmation of the previous learner utterance (Egi, 2007a), or that they noticed forms that were not targeted by recasts. Noticing only the corrective function of recasts is operationalized as a learner' verbal report indicating that the learner has perceived the recast as intending to correct the error(s) in his/her utterance, but the learner failed to report what that error was and/or what the reformulation was. Noticing the gap is operationalized as a learner's verbal report that indicates the learner not only interpreted the recast as corrective feedback, but he/she could also locate the error and/or the reformulation of the error³². Noticing the content or other information, noticing only the corrective function of recasts, and noticing the

³² In the current study, noticing the gap subsumes learners' awareness at the level of noticing and at the level of understanding.

gap between the error and the reformulation are illustrated through Example 9, Example 10, and Example 11, respectively.

Example 9

P: He is giving *apple* to the boy.

I: He is giving an apple to the other boy.

P: apple to the other boy, yes.

Stimulated Recall:

P: *You repeated what I said.*³³

Example 10

P: On the board, there *is* two English words.

I: There are two.

P: There are two English words.

Stimulated Recall:

P: *When I was speaking, I was concentrating on the content, so I always made mistakes.*

Example 11

P: There is some fish in a *water tub*.

³³ Learners' perception of recasts in stimulated recall interview was reported in their L1 Chinese. The stimulated recall episodes presented in this paper were the English translation.

I: A fish tank?

P: Yeah, fish tank.

Stimulated recall:

P: *You said fish tank, and I realized that tub is not appropriate; tub is something where you take a bath.*

Since the current study focuses on the relationship between noticing and working memory capacity, working memory is operationalized as EFL learners' ability to recall verbal input while simultaneously processing the input for meaning. Working memory capacity was measured by means of an L1 Chinese reading span test (Cui & Chen, 1996; Daneman & Carpenter, 1980).

5.4. Materials

5.4.1. Treatment tasks

The current study has one treatment session, which lasted approximately 32 minutes for each individual participant ($m = 31.96$, $SD = 3.18$). During the treatment, the researcher acted as an interlocutor and engaged in meaningful interactive tasks with individual participants. The interactive activities were carried out in a quiet meeting room of the English Department. The researcher interlocutor and the individual participant sat face to face at a desk. The whole interaction was audio- and video-recorded for future transcription and coding.

Interactive tasks are useful and essential instruments for examining the relationship between the various components of interaction and SLA (Mackey, 2012). Tasks are also considered to influence the provision of interactive feedback, uptake, and the noticing of feedback (Gass, 1997; Robinson, 2005, 2007, 2011). For example, Gass, Mackey, and Ross-Feldman (2011) found that,

regardless of classroom or laboratory settings, different tasks are significantly different in leading to the total amount of negotiation for meaning among learners.

There have been various ways to categorize interactive tasks (Bygate, Skehan, & Swain, 2001; Plough & Gass, 1993; R. Ellis, 2003). First, tasks can be either focused or unfocused. Unfocused tasks are not designed with the use of a specific form in mind (R. Ellis, 2003), so learners can choose whatever L2 forms to complete the task. Focused tasks, on the other hand, have predetermined linguistic feature(s) that learners are supposed to make use of when completing the tasks. Tasks can also be categorized into one-way or two-way information exchange tasks (Doughty & Pica, 1986; R. Ellis, 2003). In a one-way task, all the information is held by one learner and the learner conveys the necessary information to the other in order to fulfill the task. Therefore, the talking is dominated by the learner who holds the information. In a two-way task, on the other hand, both learners hold part of the information for the task and they have to exchange the information and interact with each other to successfully complete the task. Whether two-way or one-way tasks lead to more interactional feedback and modified output has been debated (Gass & Varonis, 1985; Pica, 1987; Pica & Doughty, 1985; Shehadeh, 1999). Tasks that are most frequently used in interaction research include picture description, spot-the-differences, story completion, and jigsaw tasks (Mackey, 2012).

The interactive tasks that were employed in the current study were three unfocused one-way information exchange tasks. The tasks were unfocused because the current study did not intend to investigate any specific predetermined target structure. Rather, it examines learners' noticing of recasts that were provided extensively and incidentally in response to the errors that learners made during their interaction. In other words, recasts were provided during task completion regardless of the structure. The current study used one-way information exchange tasks on the

ground that there was only one treatment session that lasted a relatively short period of time, and that one-way information exchange tasks might result in more interaction between the learner and the researcher interlocutor (Gass & Varonis, 1985; Iwashita, 1999). Table 6 is a brief summary of the tasks that were used in this study.

Table 6 Treatment Tasks

Tasks	focus	Task type	Description
Introducing Yourself	Unfocused	One-way	Participants provided information about their personal information such as their hometown, their hobby, etc.
Classroom Scene	Unfocused	One-way	Participants described what they saw in a picture of a classroom, including the lay-out and the things the teacher and students were doing.
Travel Itinerary	Unfocused	One-way	Participants planned a trip to different places in or around the city in which their university was located.

The first task is called *Introducing Yourself*. The interlocutor had a piece of paper on which there was a list of topics that the interlocutor wanted to know about the participant. These topics included the participant's hometown, life on campus, hobbies, favorite movies or TV programs, reading habit, favorite course or teacher, and so forth (see Appendix D for detailed topics and Instruction on how to carry out this task). The interlocutor asked the participant about these topics one by one, and the participant was asked to describe each topic in detail. If the participant could not do it or if he/she was not willing to respond, the interlocutor would move on to another topic. This task would take about 10 minutes, so not all of the topics would be touched upon in the treatment.

The second task is called *Describing Classroom Scene*. In this task, the participant was presented a picture of a classroom (see details about instruction and the picture of the classroom

in Appendix E). This picture illustrates a classroom scene before the class begins. A teacher and her students are doing different things, for example, writing on the blackboard, playing computers, cleaning the fish tank, eating, chatting, and so forth. The participants were required to describe (1) where the different things are in the classroom, for example, desks, books, bookcase, fish tank, flowers, computers, and so on; (2) where the students and the teacher are; and (3) what the teacher and the students doing. The participants were asked to describe the classroom in detail. The participants were given 1 minute to plan the task. When they were describing the picture, they were asked to hold the picture in such a way that the interlocutor could not see it because the interlocutor would draw a picture based on the participant's description.

The last task is called *A Travel Itinerary*. In this task, the participant was provided with a map of the city where their university was located. On the map, a number of famous places of interest in or near the city were marked with their names and a simple picture of their major tourist attraction (For details of the instruction and the map see Appendix F). The participant was asked to suppose that a friend of his/hers who had not been to this city was coming to visit him/her. The friend planned to stay with him/her for about a week. During his/her friend's stay in the city, the participant had to make a plan on where to go for sightseeing. The participant then told the interlocutor the plan. Before the description, the participant was given two minutes to plan what to say, and a list of questions were provided in the instruction to assist the planning, for example, where to go, what they can see in those places, what they can do in those places, how they get to those places, how long they would stay in those places, and so on. After the brief planning, the participant was required to describe his/her itinerary in detail. Since the participants had been to at least some of the places of interest marked on the map in the two years of their

study in the university, one of the focuses of this task was to ask them to describe their experience in the places they had visited.

After the three tasks had been designed, they were first piloted to students of similar proficiency in English to that of the participants. The purpose of the pilot test was three-fold: to clarify the comprehensibility and appropriateness of the instructions, to estimate the length of time needed to finish the tasks, and to guarantee that the tasks are not too difficult for the participants to complete. Then the tasks were shown to two teachers of the participants. The purpose was to ensure the appropriateness of the tasks from the perspective of teachers and to make sure that the participants had done similar activities in class so that they were familiar with how to carry out similar interactive tasks.

When completing the tasks, the interlocutor provided recasts in response to the participants' morphosyntactic, lexical, and phonological errors. However, in order to conceal the intention of the study, and to minimize the saliency of corrective feedback that resulted from only one type of corrective feedback (i.e., recasts), the researcher also provided some other types of corrective feedback when errors occurred, for example, clarification requests, repetition of error, and elicitation. In addition, negotiation for meaning was also presented on occasions where communication breakdown took place, although participants did not make any errors in form. In short, the interlocutor tried to make the interaction occur as naturally as possible, although the treatment was conducted in a laboratory setting.

In each treatment session, the interlocutor began with the task *Introducing Yourself*, but the topics in this task were counterbalanced. The other two tasks were also counterbalanced to mitigate task effect. The video- and audio-recorded treatment was played back to the participants

in the following stimulated recall interview immediately after the interactive tasks and it was later transcribed and coded for data analysis.

5.4.2. Measuring noticing of recasts: Stimulated recall interview

As mentioned in Chapter 4, stimulated recall has gained more popularity over other types of noticing-elicitation methods in that data from stimulated recall can be more accurately and more promptly gathered than diaries and questionnaires, and that they are less distractive of task completion than on-line methods such as think-aloud and immediate verbal reports. However, some limitations of stimulated recall interview may negatively affect the validity of data. These limitations include (1) veridicality issue concerning when stimulated recall is given after the task, (2) the language (i.e., L1 or L2) that is used to report noticing; (3) the prompt that is used as a cue to stimulate memory; (4) the questions that the interviewer asks the participant to elicit noticing report; and (5) the training participants receive.

The interviewer of the stimulated recall was the researcher of the current study. To maximize the validity of the participants' noticing data, the administration of stimulated recall interviews took into account the above-mentioned limitations. Immediately after the treatment tasks, I copied the video- and audio-recorded interaction data into a laptop, which took no less than 5 minutes. This was followed by the stimulated recall interview with the participant. In keeping the time interval between interactional tasks and stimulated recall sufficiently short, the participants might report their perception of recasts which might still be fresh in their working memory. At the beginning of the stimulated recall interview, the participant was asked to read a written instruction of the interview (see Appendix G for details of the stimulated recall instruction and the English translation of it). The instruction was in the participants' L1 Chinese so that they can have a better comprehension of what they were going to do. After the reading, I

then explained orally the whole process of stimulated recall and intermittently asked the participant whether he/she has understood or whether he/she had any questions about what to do. This was followed by a practice of stimulated recall. I played the first 3 to 4 minutes of the recorded treatment data and paused on several occasions to ask what the participant was thinking at the time when they occurred during the interaction³⁴. After confirming that the participant knew what to do, I played the rest of the video-recorded interaction and used it as cues to elicit the participant's perception of recasts. The whole stimulated recall interview was done in L1 Chinese so that the participants would not have any problem in expressing themselves. In the interview, I paused the video after episodes in which recasts were provided, and asked the participant to recall their thoughts at the time when the interaction was going on. To conceal the intention of the stimulated recall, I also paused the video on occasions where other types of corrective feedback were provided or where there was only meaning negotiation. The participant could also stop the video at any time if he/she wanted to describe his/her thought at a point of interaction. The prompt questions were only limited to the information that the participant had attended to. Below is an example of a stimulated recall episode which was translated into English.

Example 12

P: There are two *computer* on the long table.

I: Oh, two computers on the table?

P: Yes, two computers.

³⁴ During the practice, the interviewer did not pause the video at any recast episodes; instead, the episodes were mainly concerning the content or other types of corrective feedback than recasts.

Interviewer: (Paused the video) What were you thinking right then?

P: I made an error about English plural. I forgot to add a plural – s, and you corrected me.

Interviewer: OK, let's continue to watch the video.

Sometimes participants would ask the interviewer to pause the video and told about their thought on specific occasions, but this was rare. There were a total of 1,853 stimulated recall episodes, meaning that each participant had an average of 30.88 episodes (SD = 6.25). The whole stimulated recall interview was audio-recorded for future transcription and coding.

5.5. Instruments

5.5.1. Working Memory Test

5.5.1.1. Description of the Reading Span Test

Reading or listening span tasks are normally used in interaction research to measure individual differences in working memory capacity (Goo, 2012; Mackey et al., 2002; Révész, 2012; Sagarra, 2007). Most reading and listening span tasks have been adapted from Daneman and Carpenter (1980). In a reading span test, participants read sets of sentences which range from 2 to 5 sentences and try to recall the last word of each sentence at the end of each set (Daneman & Carpenter, 1980). Reading span tasks as a measure of individual differences in executive attention are related to the extent to which individuals carry out various central executive processes such as updating focus of attention, inhibition of irrelevant information, and attention switching (Cowan, 2005). Further, because reading span tasks provide a close approximation to everyday complex cognitive tasks, there have been empirical evidence indicating that they are a

better predictor of complex cognitive abilities (Conway et al., 2005; Cowan, 2008). In light of the predictive power of working memory span tasks, Kane et al. (2007) pointed out that the executive attentional processes engaged primarily by span tasks are responsible for the predictive utility of working memory span tasks.

One problem that SLA researchers are faced with is whether span tests should be measured in participants' L1 or L2. Many previous psychological and SLA studies have found a correlation between L1 and L2 working memory tests (e.g., Mackey et al., 2002; Miyake & Friedman, 1998; Osaka & Osaka, 1992; Osaka, Osaka, & Groner, 1993; van den Noort, Bosch, & Hugdahl., 2006) and argued that working memory is language independent. However, L2 proficiency may be a factor that interact with working memory capacity and lead to a difference between L1 and L2 working memory tests (French, 2006; Gass & Lee, 2011; Sagarra, 2007; Williams, 2012), especially when the participants are non-advanced learners of an L2 (Goo, 2012). According to Just and Carpenter (1992), because the processing of sentences in a reading span task may drain the working memory resources that are otherwise available for storage of sentence-final words, participants' reduced performance in an L2 reading span can be expected. There have been some studies that provided evidence for the interaction between L2 proficiency and L2 working memory span (e.g., Gass & Lee, 2011; van den Noort et al., 2006). For instance, van den Noort et al. (2006) found that the functional working memory capacity of their participants was larger in their L1 compared to the L2 and it was larger in the L2 compared to their L3, suggesting that the storage capacity in the native language would be larger than in a foreign language. Gass and Lee (2011) also found that, although there is a relationship between their participants' L1 and L2 working memory scores, a lack of linguistic knowledge on the part of the L2 learners prevented their full access to their working memory capacity. On account of

this finding, Gass and Lee concluded that the proficiency level of an individual may influence his/her ability to inhibit information as well as his/her performance on an L2 working memory test. Therefore, the use of L2 working memory tests needs to take into consideration the proficiency level of the participants.

Following Gass and Lee's (2011) suggestion, the current study measured EFL learners' working memory capacity by means of a reading span test in their L1 Chinese. The reading span test was adapted from Cui and Chen (1996). Cui and Chen designed their Chinese L1 reading span based on Daneman and Carpenter (1980). This test has been used extensively in the field of education and psychology in China to assess L1 Chinese participants' working memory capacity.

The reading span test consisted of 56 sentences (see Appendix H for a sample of 15 Chinese sentences and their English translation). All of the sentences are compound sentences with the length of 14 to 16 two-character Chinese words. The final word of each sentence is a concrete noun which consists of two Chinese characters, as Mackey et al. (2010) suggest that abstract words may affect the difficulty to recall (also see Turner & Engle, 1989). The current study differs from most previous studies (e.g., Goo, 2012; Mackey et al., 2002; Mackey et al., 2010; Sagarra, 2007) in measuring learners' processing of sentences. Previous studies usually measured processing by asking participants to judge the semantic acceptability of the sentences, or the grammaticality of the sentences, or both. In the current study, learners' processing of sentences was measured by means of their comprehension of the meaning of the sentences. Each sentence is followed by a simple sentence as a measure of learners' comprehension (see Appendix J for a sample of comprehension sentences). After reading this simple sentence, the participant had to judge whether the meaning of this sentence matched the meaning of the test sentence. Of all the 56 comprehension items, half of them match the meaning of the test

sentences and half of them do not match the meaning of the test sentences. The recall words do not appear in the comprehension sentences in order not to increase the participants' likelihood of storing the words in the working memory. The following is an example of a test sentence and a comprehension sentence. In this example, the meaning of the comprehension sentence matches the meaning of the test sentence.

Example 13

Test sentence: 研究人员已经证明，自行车由法国工程师发明，推翻了传统的观点。

(Translation: Researchers have provided evidence that the bicycle was invented by a French engineer, which dismissed the traditional view.)

Recall word: 观点 (view)

Comprehension sentence: 法国工程师发明了自行车。(A French engineer invented the bicycle).

5.5.1.2. Administration of the Reading Span Test

The working memory test was implemented with the academic software E-prime 1.1, a Windows-based software that is widely used in psychology (MacWhinney, James, Schunn, Li, & Schneider, 2001). The 56 sentences were grouped randomly into 16 sets of sentences with 2 to 5 sentences in each set. There are 4 sets of 2 sentences, 4 sets of 3 sentences, 4 sets of 4 sentences, and 4 sets of 5 sentences. It is noted that when distributing all the sentences to different sets, no sentence-final words in a set were semantically related to each other (Mackey et al., 2010). Each sentence was followed by a comprehension sentence as a measure of sentence processing. At the

end of each set of sentences, the participants had to recall and write down the last words of all the sentences in the set. Table 7 presents a sample of one set of the reading span test which made up of two test sentences.

Table 7 A Sample of the Working Memory Test (with set size of 3 sentences)

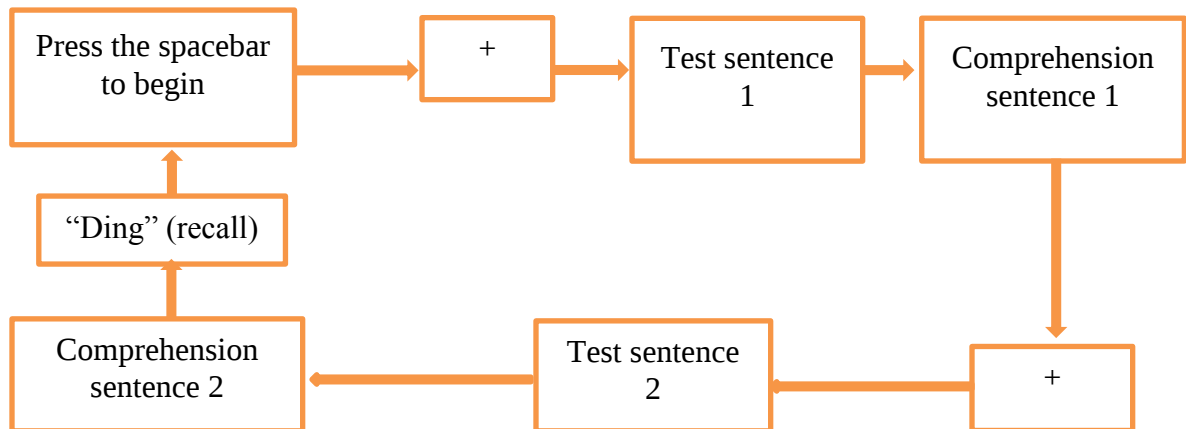
Test sentences	Comprehension sentences	Last words
1. 明代出现的中国纸牌促成了西方桥牌的出现，也影响了它的某些打法。(Chinese playing cards, which appeared in the Ming Dynasty, helped shaped the rules of western bridge card game as well as its rules.)	桥牌受到了中国纸牌的影响。(Bridge cards is influenced by Chinese playing cards.)	打法 (rules)
2. 几家法国公司提供了建造大亚湾核电厂所用的结构设计、技术和资金。(Several French companies provided the structural design, technology, and funding for the construction of Dayawang Nuclear Plant.)	大亚湾核电厂采用了德国的技术。(Da Ya Wan Nuclear Plant used German technology.)	资金 (fund)
3. 克服通货膨胀不仅要靠货币政策，还必须实行物价和工资方面的改革。(What are needed to overcome inflation is not only monetary policies, but also the reform on prices and wage system.)	只用货币政策就能克服通货膨胀。(The use of currency policy can help inhibit inflation.)	改革 (reform)

The participants did the reading span test individually in the same meeting room where they did the interactive activities with the researcher. Before the task, instructions were given in the learners' L1 Chinese on how to complete the span test (see Appendix I for the instruction). The learners were told that their performance on the recall and the comprehension task was equally

important. All the sets of sentences were presented in an ascending order³⁵; that is, the test first presented 2-sentence set, followed by 3-, 4-, and 5-sentence sets. Two sets of sentences had been used as practice before the real test began. Each set of practice sentences consisted of 2 sentences. The task began with a fixation cross [+], which remained on the center of a computer screen for 1000 milliseconds. Then a test sentence was presented in the center of a computer screen for 6000 milliseconds. Next, the sentence was removed from the screen and a comprehension sentence was presented for 6000 milliseconds, and the participant was required to judge whether the comprehension sentence matched the test sentence by pressing the key that was labeled *yes* or *no*. After the judgment, a fixation cross [+] was displayed for 1000 milliseconds. Then a second test sentence was presented for 6,000 milliseconds, followed by a second comprehension sentence which stayed on the screen for 6000 milliseconds. When all the sentences in one set were presented and all the comprehension tests were finished, the participants would hear a “ding” sound, signaling the end of the set and reminding them to write down all the last words of all the sentences that they could recall on an answer sheet. The order of the last words that the participants wrote down did not influence the scoring. The participant could continue by pressing a key on the keyboard. The whole test took approximately 35 minutes. Figure 2 demonstrates how to carry the one two-sentence set size reading span test.

³⁵ Some studies (e.g., Gass & Lee, 2011; Goo, 2012) randomized set sizes in order to prevent learners from guessing the number of sentences or the number of recall items in the following set.

Figure 2 A Sample of a Set Size of Two Sentences in the Reading Span Test



5.5.2. Exit Questionnaire

Immediately after the completion of the study, the participants did an exit questionnaire (see Appendix K for the detail of the questionnaire). The exit questionnaire was designed to examine whether the participants were aware of the purpose of the interaction. There were also some questions that asked about their teachers' use of corrective feedback as well as their attitudes toward corrective feedback. The participants were also asked for their comments on the stimulated recall interview.

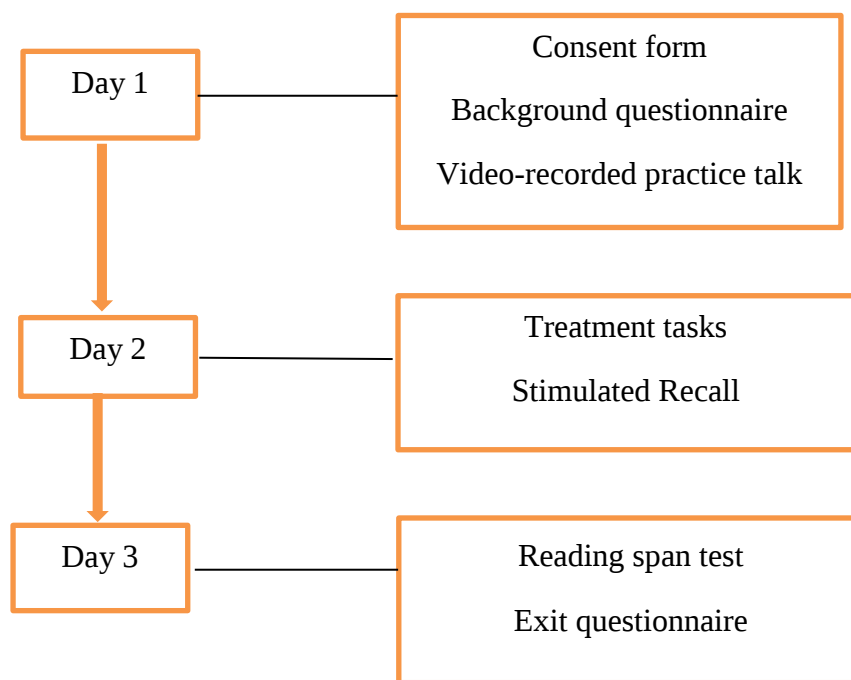
5.6. Procedure

The current study takes as its focus Chinese EFL learners' noticing of recasts and its relationship to types of target structures of recasts, learners' modified output in response to recasts, and their individual differences in working memory capacity. The effect of recasts on language development was not explored. Although the ultimate goal of interaction research is to connect interaction with learning, it is equally important to examine learners' noticing of recasts and to explore the various factors that affect learners' noticing of recasts. As some researchers

(e.g., Gass, 1988, 1997, 2003; Schmidt, 1990a; Schmidt & Frota, 1986) point out, noticing is an essential step toward learning, although noticing does not guarantee that learning will take place.

The purposes of the current study underscore the importance of two designing features: the interaction between the participants and the researcher interlocutor and the employment of stimulated recall to collect noticing data. The previous sections have described in detail how the interactive activities and the stimulated recall were carried out. The entire procedure of data collection is illustrated in Figure 3 below.

Figure 3 Procedure of the Study



The whole experiment was conducted over the course of approximately 6 weeks. Each participant met the researcher three times individually. The researcher went to individual classes to introduce the experiment and asked students to participate. On the first day of meeting, participants filled out a consent form and a background questionnaire. Then they did a 10-minute

practice talk with the researcher. The conversation was video-recorded and was deleted shortly after the completion of the talk. In the conversation, the researcher asked the participants to introduce their school in their L2 English. The purpose of the practice talk is two-fold: (1) to make the participants familiarized with the researcher and with the way to engage in communicative tasks. At meetings with some of the teachers of the English department, the teachers suggested that, before the experiment began, a practice talk be given to the participant because they did not practice English often. This was also shown in the participants' response to one of the questionnaire items in the background questionnaire, that is, how much time they usually spent every week in meaningful English communication. More than 75.8% of the participants replied that they practiced English after class for less than one hour every week; (2) to reduce the anxiety and nervousness of the learners when their conversation was video- and audio-recorded.

On day 2, the researcher and the individual participant did the three treatment tasks together. On completion of the tasks, the researcher first saved the data from the digital video and audio recorder to the computer, while the participant could take a break. This took less than five minutes and was immediately followed by a training of how to carry out stimulated recall interview. If the participant did not have any questions concerning how to do it, then the stimulated recall interview continued. The stimulated recall was audio-recorded for future transcription and coding.

On day 3, the researcher and the participant met again and the participant was asked to do a reading span test. The participant was first instructed to do the test by reading the instruction, asking questions, and doing a practice test of two blocks of reading span. After the reading span test was finished, the participant did an exit questionnaire.

5.7. Coding of data

5.7.1. Coding of recast episodes

The researcher of the current study transcribed all the interaction data and the stimulated recall data. Since the stimulated recall interview was conducted in the participants' L1 Chinese, the stimulated recall data were then translated into English after they were transcribed. After the transcription was finished, the researcher listened to the recorded interaction and stimulated recall again, in order to ensure the accuracy of the transcription. If any part of the data could not be clearly identified, this part was discarded.

Two sample transcripts from two participants are presented in Appendix L. As mentioned earlier, the interlocutor provided recasts and other types of distracting corrective feedback during the completion of interactive tasks whenever it was appropriate. Other than that, there was no criterion as to what errors to correct. As shown in the sample transcripts, not all learner errors were corrected. In some cases the participants spoke very fast, which prevented the interlocutor from correcting them. In other cases, learners made linguistic errors that were too long to be corrected. For example, when they used *although* and *but*, or *because* and *so* together in one sentence, I deemed it inappropriate to correct them due to the length of the utterance. There were also cases in which I ceased from recasting in order to make correction less intense.

The coding began with the interaction data. The method of coding is illustrated in Figure 4 below. The first round of the coding involved the interaction between the interlocutor and the individual participant. All interactions were coded into a three-turn episode which began with a participant utterance, followed by a researcher interlocutor's response, which was followed by the participant's reactive response (Gass & Varonis, 1994; Lyster & Ranta, 1997). Learner-

initiated moves concerning linguistic forms were not included. The interlocutor's response could be either corrective feedback or meaning negotiation. In other words, the participant's utterance that triggered the interlocutor response could be either correct or erroneous in language use.

The interaction episodes were then coded into corrective feedback episodes and non-corrective feedback episodes. Corrective feedback episodes were those interaction episodes in which the triggering learner utterance contained at least one error in the use of L2 form, while non-corrective feedback episodes were those interaction episodes in which there was no error(s) in linguistic form. As mentioned in the section of treatment task, although the participant was mainly provided with recasts in response to their linguistic errors, some other types of corrective feedback were also provided in order to conceal the intention and to reduce the salience of recasts. The other types of corrective feedback included clarification requests, elicitation, and repetition. Clarification requests were defined as the corrective feedback that indicates to learners either that their utterance has been misunderstood by the interlocutor or that the utterance is ill-formed in some way and that a repetition or a reformulation is required (Lyster & Ranta, 1997). The following example illustrates the provision of a clarification request.

Example 14

P: There are some fish in *the* glasses box.

I: What?  Clarification request

P: A glasses box.

Elicitations refer to the corrective feedback that the interlocutor used to directly elicit the correct form from the participants. The interlocutor usually elicited the participants to complete

their own utterance by repeating the learner utterance and pausing at the point where an error occurred. For example,

Example 15

P: When I *six years*, my mother bring me to my grandma's home.

I: When you...  Elicitation

P: six years old.

A repetition refers to the interlocutor's repetition of the participants' erroneous utterance. When using this type of corrective feedback, the interlocutor usually repeated only the erroneous part of the utterance. This is shown in Example 16.

Example 16

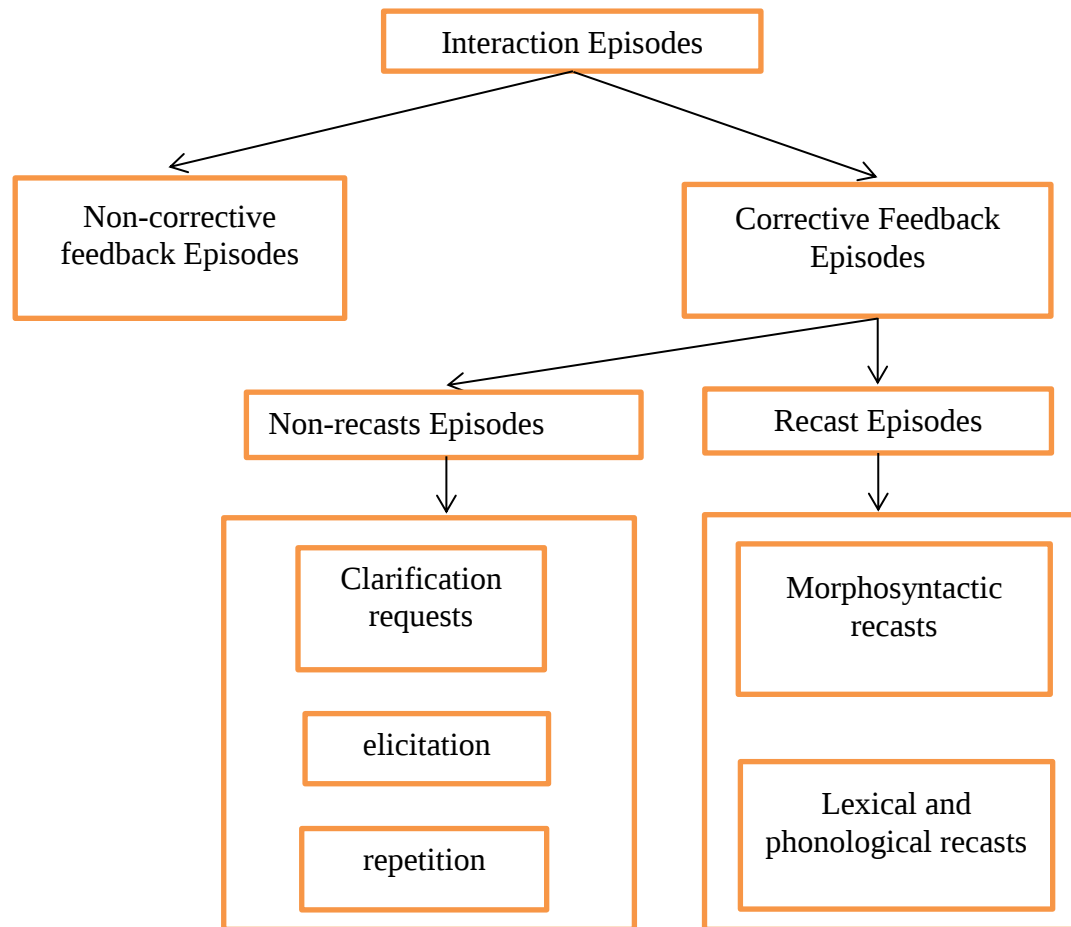
P: *In my left hand*, there are two girls.

I: In your left hand?

P: On my left hand, there are two girls.

As mentioned previously, recasts were operationalized as the interlocutor's reformulation of the erroneous utterance without changing the original meaning. The corrective feedback episodes were coded into either recast or non-recast episodes (i.e., other corrective feedback). The recasts episodes were then further coded into morphosyntactic recasts and lexical and phonological recasts based on the operationalizations of these two types of recasts. The episodes that involved other types of corrective feedback than recasts were excluded from further data analysis.

Figure 4 Coding of Recasts



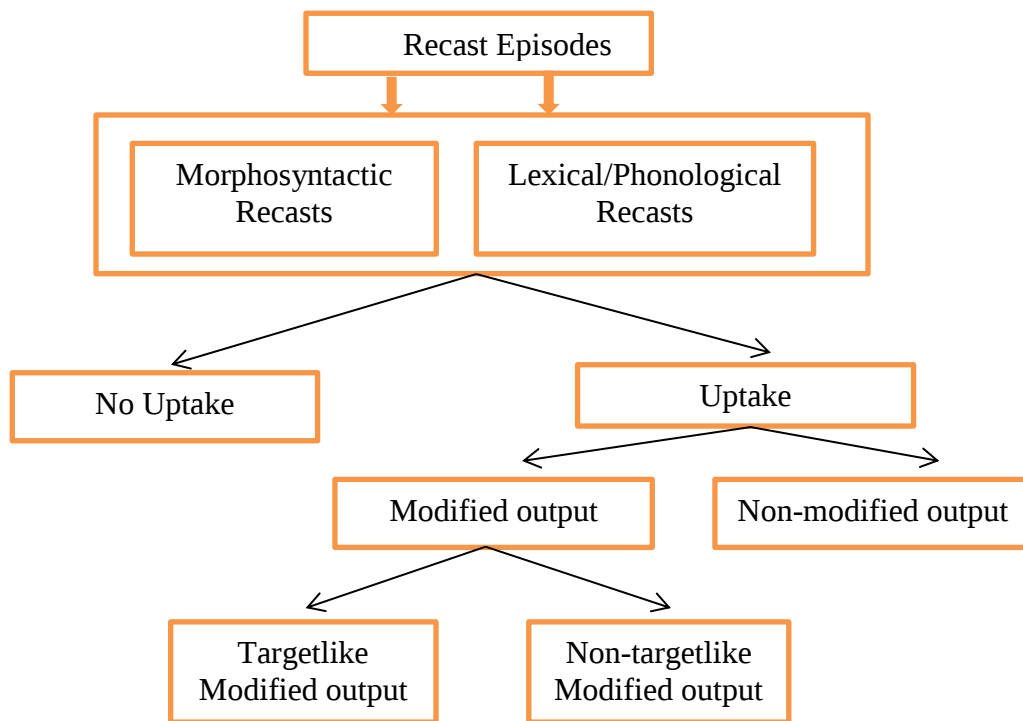
5.7.2.Coding of modified output

After the coding of corrective feedback into non-recast episodes and recast episodes, the recast episodes were further coded according to learners' uptake in reaction to recasts. Figure 5 demonstrates how uptake was coded.

As mentioned in the Procedure section, the interlocutor provided corrective feedback and provided the opportunity for the participant to take the turn. As a result, the participant might choose either to continue with the original or a new topic, to keep silent, or to respond to the recast. A recast, therefore, is first coded into either a recast with uptake or one with no uptake.

The category of *no uptake* included topic continuation and silence on the part of the participant. while uptake included such participant moves as acknowledgment, repair of error, partial repair of error, repetition of the same error, another way of saying the same thing without modifying the error, repair of other errors that were not corrected in a recast, hesitation, and so forth (Egi, 2007a; Lyster & Ranta, 1997). Uptake was then further coded into modified output, which consisted of repair of error(s) and partial repair of error(s), and non-modified output, which consists of other uptake moves that indicated no sign of reformulation of error(s) (Egi, 2010; Mackey et al., 2010). There were episodes that the learner both acknowledged and modified the error. In this case, the recast episode was coded as modified output. Modified output was further coded into targetlike and non-targetlike modified output, based on whether the participant's modification of their error(s) was targetlike or non-targetlike. Example 6 and Example 7 in the section of Operationalization in this chapter demonstrate the coding of modified output and non-modified output, respectively. Recasts that had no uptake were excluded from data analysis.

Figure 5 Coding of Modified Output



5.7.3. Coding of stimulated recall protocols

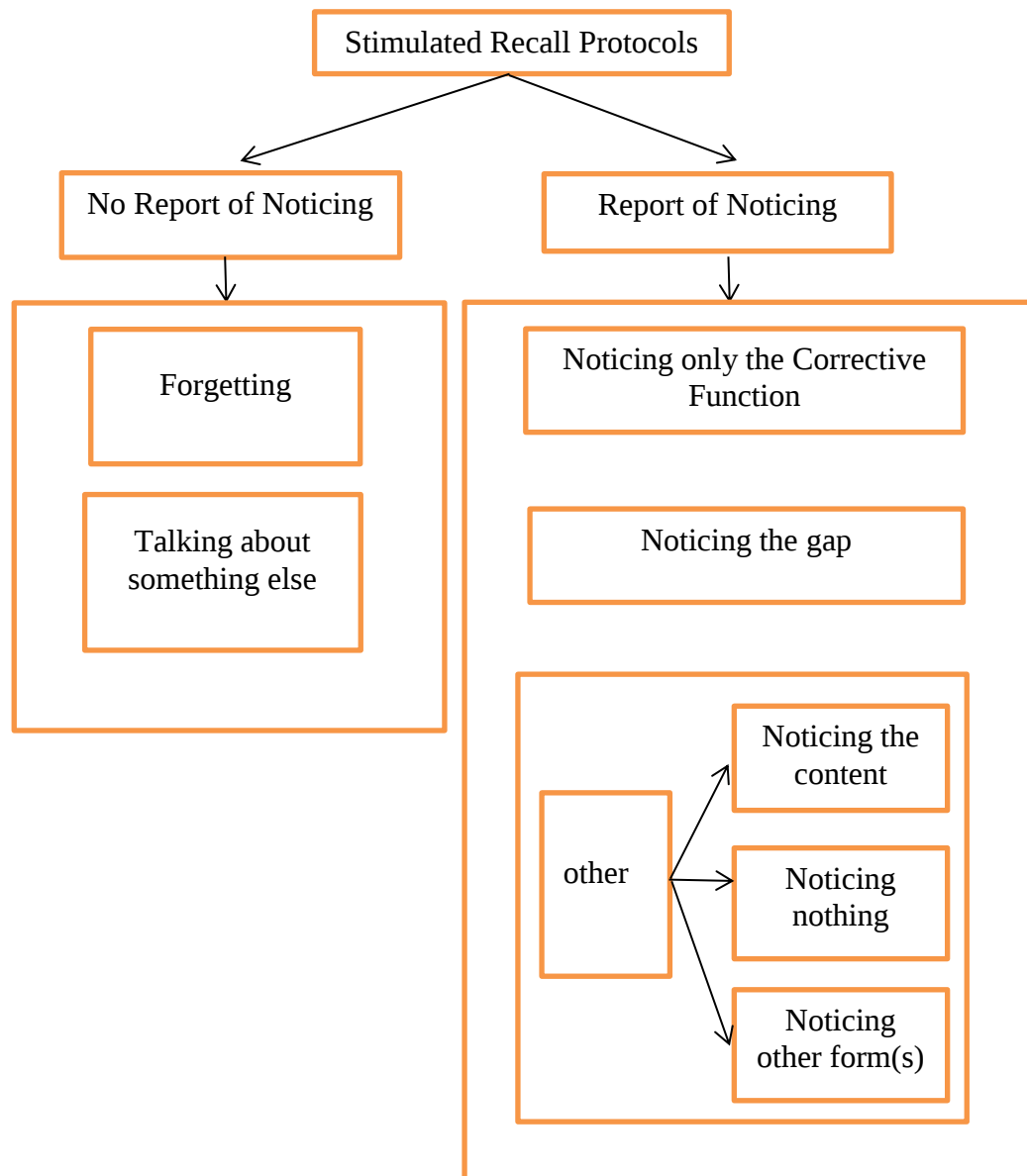
After the recasts with uptake were identified, only the recasts which the participants recalled in the stimulated recall interview were further coded, and those that were not recalled were excluded for further analysis. In the section of Operationalization, EFL learners' noticing was categorized into noticing only the corrective function, noticing the gap, and noticing the content or other information.

Appendix M presents the full stimulated recall data for the same two participants as in Appendix L (Sample Interaction Transcripts). Each set of stimulated recall data covers not only the recast episodes to which the participant had reported their perceptions. In other words, other interaction episodes (i.e., episodes involving negotiation for meaning and other types of corrective feedback) were also included in the data. The episodes identified from the transcripts

were numbered for the sake of convenience. The italicized part of each stimulated recall episode is the learners' report of their perceptions of recasts. Since I asked almost the same question each time (e.g., *What were you thinking then?* or *What were you thinking after I stopped talking?*), the question I asked for each episode was not presented in the data. Therefore, what the data present are only the participants' reports. It is noted that the stimulated recall interview was conducted in the participant's L1 Chinese. The participants' report was translated into English later (in brackets following the Chinese reports). As shown in the data, not all the recast or corrective feedback episodes were selected for stimulated recall.

The coding scheme for the noticing data is shown in Figure 6. First of all, the data were coded into *no report of noticing* and *report of noticing*. *No report of noticing* refers to the stimulated recall episode in which the participant (1) forgot and (2) reported something that has nothing to do with either the content or the form of recasts. The category of *Report of Noticing* refers to learners' report of noticing the various features of recasts, including (1) noticing the content, (2) noticing only the corrective function, and (3) noticing the gap. A stimulated recall episode was coded as *noticing the content* if the participant perceived a recast as (1) a repetition of the meaning of the previous student utterance, or (2) a comment on the meaning or topic of the utterance (Egi, 2007a). A stimulated recall episode was coded as *noticing only the corrective function* if the participant reported his/her perception of the recast as corrective feedback but did not further identify the error and/or the reformulation contained in the recast. A stimulated recall episode was coded as *noticing the gap* if the participant could identify (1) the error that was targeted by the recast, (2) the correct reformulation of the error, or (3) both the error and the correct reformulation.

Figure 6 Coding Schemes for the Stimulated Recall Protocols



Example 17 shows that a learner was talking about something that had nothing to do with the recast.

Example 17

P: They *are talk* about something.

I: They are talking about something?

P: Yes, maybe.

Stimulated recall

I: What were you thinking right then?

P: *I am very nervous, I have been nervous all the time. I saw from the video that I was frowning.*

Sometimes the participants reported that they (1) noticed form(s) that were not targeted by recasts, or (2) noticed nothing in a recast. These two types of reports were combined with the category of *noticing the content* and were put under a new category: *other*. This category, then, included noticing the content as well as other information that was irrelevant to the corrective nature of recasts (i.e., noticing nothing and noticing forms that were not targeted by recasts). Example 18 shows that a learner attended to other forms of her utterance that was not targeted by recast. In this example, the learner did not notice the error that was recast (i.e., *because of*); instead, she attended to past tense, which was not the target of the recast.

Example 18

P: but *because* the war, they have to be divided.

I: because of the war.

P: because of the war, they have to be divided.

Stimulated recall

P: *I was thinking that I did not use the tense correctly.*

Example 19 indicates the learner's failure to notice anything.

Example 19

P: The teacher's table is *in front of* the class.

I: In the front of the class.

P: In the front of the class. There are a boy and a girl.

Stimulated recall

P: *I was thinking of nothing.*

There were cases in which the learner reported that they had recognized recasts as (1) both content and corrective feedback, or (2) both corrective feedback and the gap between recasts and their error(s). Reports in (1) were coded as corrective feedback, and those in (2) were coded as noticing the gap. When the stimulated recall episodes were coded, each episode was assigned to only one of the above categories. When there was more than one category involved in one episode, the following coding hierarchy was employed: noticing the gap > noticing the corrective function of recasts > other > no reporting of noticing, with higher hierarchy levels overriding lower levels. Following Egi (2010), the current study excluded the recast episodes which the participants reported as not remembering or as something that had nothing to do with recasts, because they were regarded as “weak evidence for either supporting or denying the noticing of recasts” (Egi, 2010, p. 9).

5.8. Interrater reliability

The researcher coded all the interaction episodes with regard to types of corrective feedback, target structures, modified output, as well as the stimulated recall protocols. For the inter-rater reliability of the coding process, approximately 20% of all the corrective feedback data ($n = 347$) and 20% of the entire recast episodes with the participants' stimulated recall protocols ($n = 312$) were coded by an independent rater. The rater had a master degree in second language acquisition and had taught English as a foreign language for 8 years in a Chinese university. A training session was provided to the rater before she coded the data. The researcher of the current study first introduced briefly the study to the rater, and then explained the various types of corrective feedback, target structures, modified output, target-like and non-target-like modified output, and noticing of recasts. Finally, the researcher and the rater practiced coding of 10 recasts episodes with stimulated recall protocols and had a further discussion of the coding. The corrective feedback data and the recast data were randomly selected and the recast data included both morphosyntactic and lexical and phonological recasts. Two types of inter-rater reliability measures were employed to assess the consistency in coding: simple agreement and Cohen's *Kappa*. Cohen's *Kappa* was used due to its sensitivity to categorical data (Orwin, 1994; Field, 2005). Following Orwin (1994), *Kappa* values that were less than .40 were interpreted as poor consistency, values between .40 and .59 were considered to be fair, values between .60 and .74 were considered to be good in consistency, and values between .75 and 1 were considered to be excellent in consistency. Table 8 is a summary of the results of the interrater reliability tests. As shown in the table, high values of Cohen's *Kappa* were obtained for all the data sets. These values ranged from .84 to .97, which were considered to be excellent inter-rater reliability. The

corrective feedback episodes and the recast episodes on which the two raters did not agree were excluded from the data analysis.

Table 8 Inter-rater Reliability

Data	Simple agreement (%)	Cohen's <i>Kappa</i>
Types of corrective feedback (recasts vs. other types of corrective feedback)	99.4%	.97
Types of Recasts (morphosyntactic vs. Lexical/phonological)	98.1%	.95
Uptake (modified output vs. non-modified output)	97.0%	.92
Noticing of recasts (Content vs. Corrective Function vs. noticing the gap vs. others)	92.6%	.84
Target-like Modified Output (Target-like vs. Non-target-like)	98.0%	.91

5.9. Scoring of the Reading Span Test

In working memory tests such as a reading span test, there are two sources of data, one from the processing part and the other from the storage part of the test. As mentioned in Chapter 4, SLA studies differed in the scoring methods that they employed for sentence span tests. For example, Mackey et al. (2002) gave 1 point for a correctly recalled word regardless of whether or not the participant correctly judged the grammaticality of the sentence. They gave another 1 point for correct judgment of the grammaticality of a sentence. Sagarra (2007) took another scoring method by awarding 1 point per sentence only if the semantically plausibility judgment was correct and if the reading time for the plausibility judgment was between 300 and 5000 milliseconds. Révész (2012) scored only the recall of final words because the participants were

able to answer the comprehension questions correctly 98% of the time³⁶. Goo (2012), on the other hand, awarded 1 point for a participant's correct processing of a sentence, but used a partial-credit unit scoring (Conway et al., 2005) for the storage component of the reading span test. Different scoring procedure across studies may lead to different results and thus affect how data are interpreted.

Conway et al. (2005) identify four types of scoring methods for working memory tests: partial-credit unit scoring, all-or-nothing unit scoring, partial-credit load scoring, and all-or-nothing load scoring. Conway et al. suggest that the partial-credit unit scoring has advantages over the other three types of scoring because it follows established and sound procedures from psychometrics. The current study follows Conway et al.'s guideline and took a partial-credit unit-weighted method to score the participants in their reading span test. This method was also adopted by Sagarra (2007) and Gass and Lee (2011)³⁷.

In the current study, a participant's reading span was indicated by the maximum number of sentences that the participant could comprehend while correctly repeating the final words. One point was awarded for each sentence-final word only when the participant could accurately judge whether the meaning of the comprehension sentence and the test sentence matched. The order of

³⁶ In the reading span test in Révész (2012), each set of sentences involved only one comprehension sentence. And this comprehension question was presented when all the test sentences in the set were presented. The presentation of the comprehension question was then followed by writing down the last words of the test sentences in the set. In the working memory test adopted in the current study, each test sentence had a comprehension sentence.

³⁷ According to Conway et al. (2005), "if accuracy on the processing component of the task falls below a certain level (typically, 85%), the entire data set for that subject is discarded" (p. 775). Gass and Lee (2011) consider these guidelines not straightforward, given the large numbers that would have to be eliminated from the dataset due to their failure to reach the 85% level.

recalling in each set did not affect the scoring. Since there were 56 sentences in total, the total number of points for a participant was 56.

The next chapter will present the results from the empirical study.

CHAPTER 6 RESULTS

6.1. Statistical Analyses

This chapter presents the results for each of the 4 research questions. Two types of statistical analyses were performed. First of all, descriptive statistics were calculated for data from the interlocutor-participant interaction, the stimulated recall interview, and the working memory test. Then, inferential statistics were calculated in order to examine (1) whether there was any relationship between the target structures of recasts and the participants' noticing of recasts; (2) whether there was any relationship between the participants' modified output in response to recasts and their noticing of recasts; and (3) whether there was any relationship between the participants' noticing of recasts and their individual differences in their working memory capacity. The following is a detailed explanation of the statistical analysis.

6.1.1. Descriptive analysis

There were several types of data that were calculated for their raw frequencies and percentages.

(1) Interaction Data

(a) As mentioned in Chapter 5, the coding of interaction data began with the coding of interaction episodes, which were composed of three moves (the triggering participant move, the reactive interlocutor move, and the responding participant move). Then the interaction episodes were further coded into episodes into those that contained at least one linguistic error and those that were accurate in language use. The episodes that contained error(s) were corrective feedback episodes and they were coded into their different types of corrective feedback (clarification

requests, repetition, elicitation, and recasts). Only recast episodes of which the participants reported their perception were analyzed.

(b) The frequencies and percentages of the recast episodes were further calculated according to their modified output (modified output vs. non-modified output) and target structure (morphosyntactic recasts vs. lexical and phonological recasts).

(2) Stimulated Recall Episodes

(a) The stimulated recall episodes were first calculated according to whether the participants had not reported their noticing (e.g., forgetting, reporting something that had nothing to do with either the content or the corrective features of recasts) or had reported their noticing (i.e., noticing only the corrective function, noticing the gap, and other).

(b) Then the episodes that the participants reported their noticing were calculated according to whether they showed recognition of the corrective feature of recasts (including noticing only the corrective function and noticing the gap) and whether they showed other (i.e., content, noticing nothing, or noticing forms that were not targeted by recasts).

(c) The episodes that showed recognition of the corrective features of recasts were further calculated according to the frequency and percentages of noticing only the corrective function and noticing the gap.

(3) Working Memory Test

The participants' scores of the working memory test were calculated based on the scoring criteria designated in the last chapter.

6.1.2. Inferential statistics

The current study addressed four research questions. The first research question asked about whether Chinese EFL learners attended to recasts and if so, what they noticed. For this question,

only descriptive statistics were reported, including the number of no reporting of noticing and reporting of noticing. The number and percentage of noticing only the corrective function, noticing the gap, and noticing other, were reported. Besides, the reporting of noticing would be reported according to the target structures.

The second research question asked about the relationship between target structures and noticing. The raw frequency and percentage of noticing for the two types of target structures (i.e., morphosyntactic and lexical/phonological structures) were tallied. Then Pearson's Chi-square (χ^2) analyses were performed on the raw frequencies to find out whether there was any difference between the two types of structures in their noticing.

Research question 3 asked about the relationship between the participants' modified output and their noticing of recasts. The recast data were first divided into recasts in response to morphosyntactic structures and recasts in response to lexical and phonological structures. Then the frequencies of modified output and non-modified output were tallied for both types of structures. Two Pearson's Chi-square tests were performed for the two types of structures. Furthermore, to examine whether the quality of modified output made a difference in terms of learners' noticing of recasts, the current study presented the frequencies of the target-like modified output (i.e., repair) with non-target-like modified output (i.e., partial repair) for the two types of structures, and then Chi-square tests were performed.

Research question 4 asked about the relationship between the participants' noticing of recasts and their working memory capacity. The participants' scores in their reading span test were first counted. Then the percentage of noticing the gap to the total number of stimulated recall episodes was calculated, and the percentage of noticing the corrective features of recasts

(including both noticing only the corrective function and noticing the gap) was calculated for each participant. These data were calculated separately for morphosyntactic recasts and lexical/phonological recasts. Finally, simple regression test was performed to examine whether working memory capacity was predictive of the participants' ability to notice the corrective intention and notice the gap of recasts.

Table 9 shows the dependent and the independent variables of the present study.

All inferential statistics were performed using SPSS 20. An alpha level of $p < .05$ was set for all chi-square tests and the simple regression tests. When the χ^2 value was found to be significant (i.e., the dependent variable was related to the independent variable), Cramer's V was examined to estimate the degree of strength of the association. Chi-square test has two measures of the strength of association, one is Phi (Φ), and the other is Cramer's V. Phi is used when the degree of freedom (df) = 1. In other words, Phi is used for strictly dichotomous variables such as target structures (morphosyntactic vs. lexical/phonological) and modified output (modified output vs. non-modified output). Cramer's V was used when the degree of freedom (df) > 1, that is, variables that had more than two levels, such as noticing (noticing only the corrective function, noticing the gap, and other). When both variables have only two categories, Phi and Cramer's V are identical. However, when variables have more than two categories, Cramer's V is the most useful (Field, 2005). Therefore, this current study used Cramer's V as a measure of adequate effect size.

The performance of Chi-square should meet the assumption that the expected frequencies are greater than 5, or at least up to 20% of expected frequencies below 5 (Field, 2005). In the current study, all Chi-square statistical tests met this assumption.

Table 9 Independent Variables and Dependent Variables

Independent Variables	Dependent Variables
Question 2	
Target structures	Noticing
- Morphosyntactic recasts	- Noticing the gap
- Lexical/phonological recasts	- Noticing only the corrective function
	- Other
Question 3-A Morphosyntactic recasts	
(1) Modified output	- Noticing the gap
- Modified output	- Noticing only the corrective function
- Non-modified output	- Other
(2) Quality of modified output	
- Target-like modified output	
- Non-target-like modified output	
Question 3-B Lexical/phonological recasts	
(3) Modified output	- Noticing the gap
- Modified output	- Noticing only the corrective function
- Non-modified output	- Other
(4) Quality of modified output	
- Target-like modified output	
- Non-target-like modified output	
Question 4 – A	
Working memory test scores	Morphosyntactic recasts
	- Percentage of noticing the gap
	- Percentage of noticing the corrective intention
Question 4 – B	
Working memory test scores	Lexical/phonological recasts
	- Percentage of noticing the gap
	- Percentage of noticing the corrective intention

6.2. Results for Research Question 1

Research question 1 asked whether Chinese EFL learners noticed recasts, and if so, what aspects of recasts they noticed.

Before the results are reported, a brief description of the interaction and recall data is necessary. With regard to the interaction data, the database included a total number of 2,093 interaction episodes. Among these interaction episodes were 1,892 episodes ($m = 31.5$) which involved erroneous learner utterances and which encompassed various types of corrective feedback, including clarification requests, elicitation, repetition, and recasts. Of the 1,892 episodes, there were 1,785 episodes to which the participants had provided their introspective comments during the stimulated recall interview. Eleven of the 1,785 episodes were discarded due to inter-rater disagreements. As shown in Table 10, 86.3% of the corrective feedback episodes were recast episodes ($n = 1530$), while 13.7% were other types of corrective feedback ($n = 244$). The results were graphically presented in Figure 7.

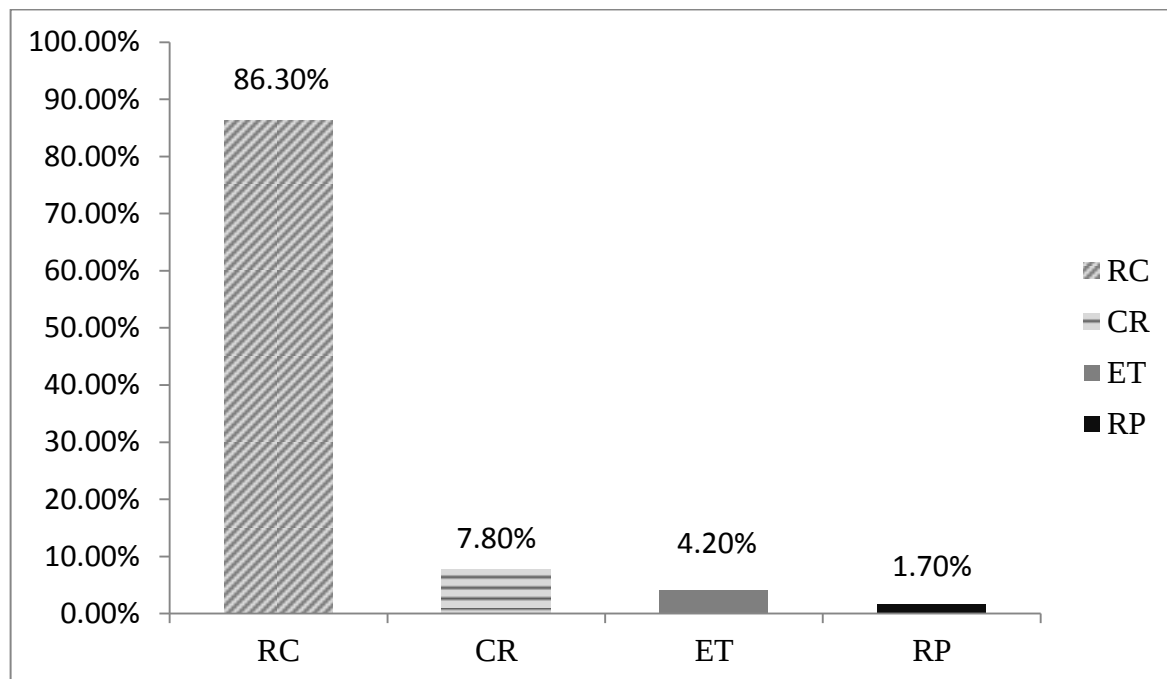
Table 10 Feedback Types of Stimulated Recall Episodes

Feedback Types	N	M	SD	Percentage
Recasts	1,530	25.5	3.79	86.3%
Clarification requests	139	2.31	0.83	7.8%
Elicitation	74	1.23	0.69	4.2%
Repetition	31	0.51	0.67	1.7%
Total	1774	29.6	4.29	100%

Note. N = raw frequency; M = mean frequency of corrective feedback provided to each participant; SD = standard deviation for M frequency; percentage = percentage of each type of corrective feedback to the total number of corrective feedback episodes.

Of the 1,530 recast episodes, 32 of them were eliminated from analysis due to inter-rater disagreement, leaving a total of only 1,498 episodes.

Figure 7 Feedback Types of Episodes Involving Stimulated Recall



Note. RC = Recasts; CR = Clarification requests; ET = Elicitation; RP = Repetition

6.2.1. Noticing data

The analysis of learners' noticing of recasts focused on the 1,498 recast episodes to which participants provided modified output and stimulated recall reports. Descriptive statistics indicated that for 1,420 of the recast episodes, the participants had reported noticing of various kinds (i.e., content, noticing nothing, noticing other forms that were not targeted by recasts, noticing only the corrective function, and noticing the gap), while there were 78³⁸ episodes to which participants showed no reporting of noticing (i.e., forgetting or reporting nothing related to the content or the corrective intent of the recasts). Table 11 and Figure 8 present these results.

³⁸ When the first draft was submitted, there were just 31 episodes that were coded as no reporting of noticing. Based on the comments of one of the committee member, the episodes were coded a second time, and 47 episodes were eliminated. In this second coding, the interrater reliability was calculated using simple agreement, which was 97%.

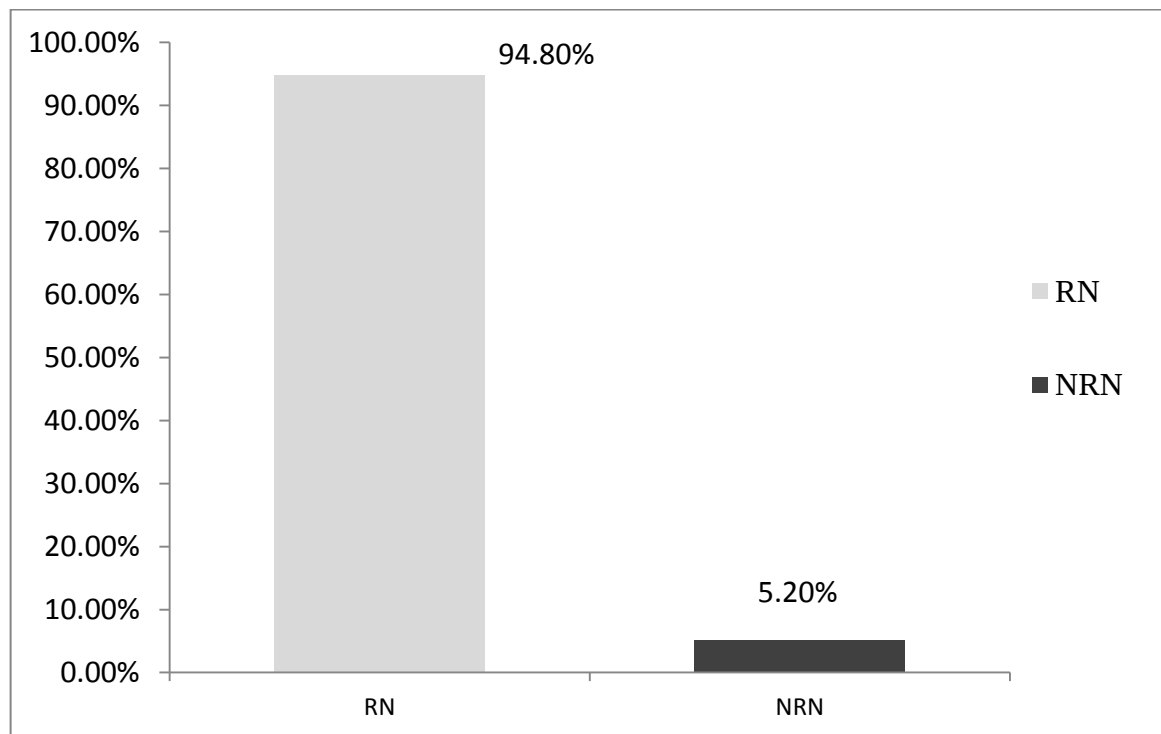
Appendix N presents the number of recasts provided and the distribution of noticing of the recasts for each individual participant.

Table 11 Noticing of Recasts

	N	M	SD	Percentage
No Report of noticing	78	1.30	4.41	5.20%
Report of noticing	1,420	23.67	1.13	94.8%

Note. N = raw frequency; M = mean frequency; SD = Standard deviation of mean frequency.

Figure 8 Noticing of Recasts according to Reporting of Recasts and No Reporting of Recasts



Note. RN = Report of noticing; NRN = No reporting of noticing

The 78 episodes to which the participants provided no report of noticing were eliminated from data analysis because these episodes were weak in their strength to tell whether or not they have noticed anything about the recasts. In addition, when coding the stimulated recall data, it is

important that the coders categorize the data without any inference or guess, but directly from what the participants reported.

6.2.2. Noticing of recasts

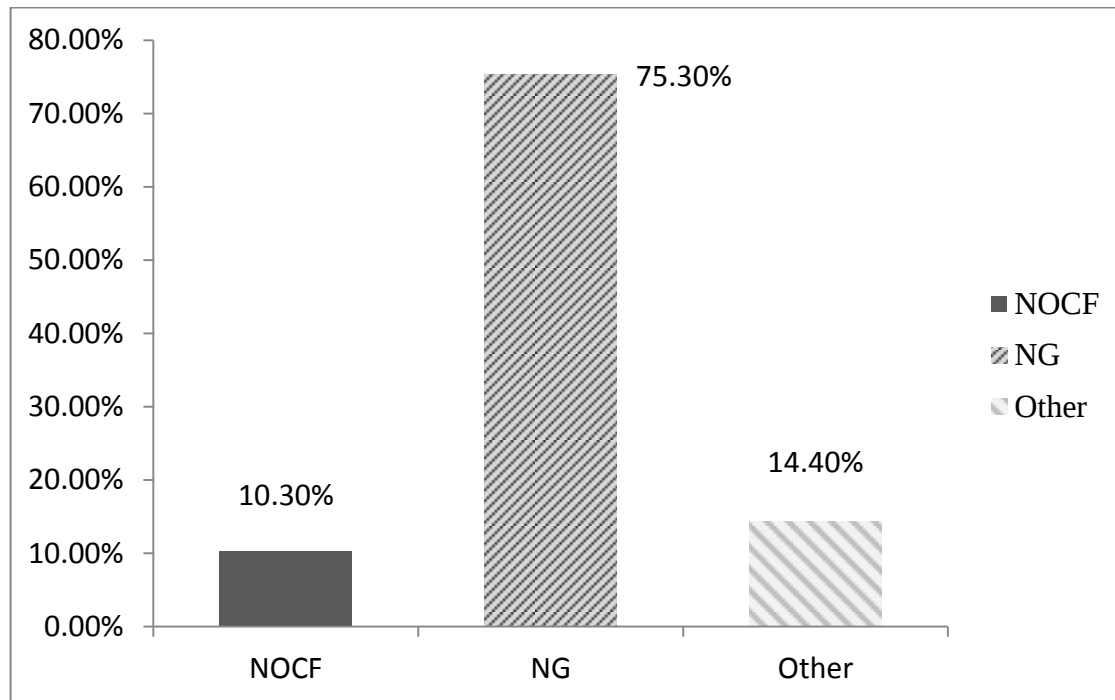
The final number of recast episodes that were included in data analysis was 1,420. As mentioned previously, there were three categories of noticing recasts: (1) noticing only the corrective function of recasts; (2) noticing the gap; and (3) other. Table 12 shows the results of the participants' noticing of recasts. The results indicated that 10.3 % (n = 146) of the time the participants noticed only the corrective function of recasts. That is, they realized that there was an error in their utterances, but they failed to spot the error or the correct reformulation involved in the recasts. On the other hand, 75.3% (n = 1,069) of the time the participants reported that they had noticed the gap. In other words, the learners could either spot the error, or report the correct reformulation, or both the error and the target-like reformulation. Finally, 14.4% (n = 205) of the time the participants noticed *other* (i.e., the content, did not notice anything, or noticed the forms that were not targeted by recasts). Figure 9 illustrates the results of the noticing of the various aspects of recasts.

Table 12 Noticing of Different Components of Recasts

Categories	N	M	SD	Percentage
Noticing only the corrective function	146	2.43	0.77	10.3%
Noticing the gap	1,069	17.81	3.40	75.3%
Other	205	3.42	2.53	14.4%
Total Number of Episodes	1,420	23.67	4.11	100%

Note. N = number of frequency; M = Mean frequency for each participant; SD = Standard deviation for the mean; Percentage = percentage of number of noticing in each category to the total number of recast (n = 1,420)

Figure 9 Noticing of Various Aspects of Recasts



Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap

Finally, the noticing of recasts was examined according to the structures that were targeted by recasts. Of the 1,420 episodes, there were a total number of 791 recasts that were provided in response to morphosyntactic structures, while there were 629 recast episodes that were provided in response to lexical or phonological errors. Table 13 shows the participants' noticing of morphosyntactic recasts and Table 14 shows their noticing of lexical and phonological recasts. Table 13 indicates that for morphosyntactic recasts, the participants noticed the gap 70.3% ($n = 556$) of the time, noticed only the corrective function 12.8% ($n = 101$) of the time, and noticed *other* 16.9% ($n = 134$) of the time. Table 14 indicates that the participants could notice the gap of lexical and phonological recasts 81.6% ($n = 513$) of the time, while they noticed only the corrective function of recasts 7.2% ($n = 45$) of the time, and they noticed *other* of the recasts 11.3% ($n = 71$) of the time.

Table 13 Noticing of Morphosyntactic Recasts

Noticing	N	M	SD	Percentage
Noticing only the corrective function	101	1.68	4.01	12.8%
Noticing the gap	556	9.27	2.84	70.3%
Other	134	2.23	0.91	16.9%
Total	791	13.18	4.25	100%

Note. N = number of frequency; M = Mean frequency for each participant; SD = Standard deviation for the mean; Percentage = percentage of number of noticing in each category to the total number of morphosyntactic recast (n = 791)

Table 14 Noticing of Lexical/Phonological Recasts

Noticing	N	M	SD	Percentage
Noticing only the corrective function	45	0.75	3.11	7.2%
Noticing the gap	513	8.55	1.46	81.6%
Other	71	1.18	3.01	11.2%
Total	629	10.48	3.20	100%

Note. N = number of frequency; M = Mean frequency for each participant; SD = Standard deviation for the mean; Percentage = percentage of number of noticing in each category to the total number of morphosyntactic recast (n = 629)

The noticing of morphosyntactic recasts and of lexical/phonological recasts are illustrated in

Figure 10 and Figure 11.

Figure 10 Noticing of Morphosyntactic Recasts

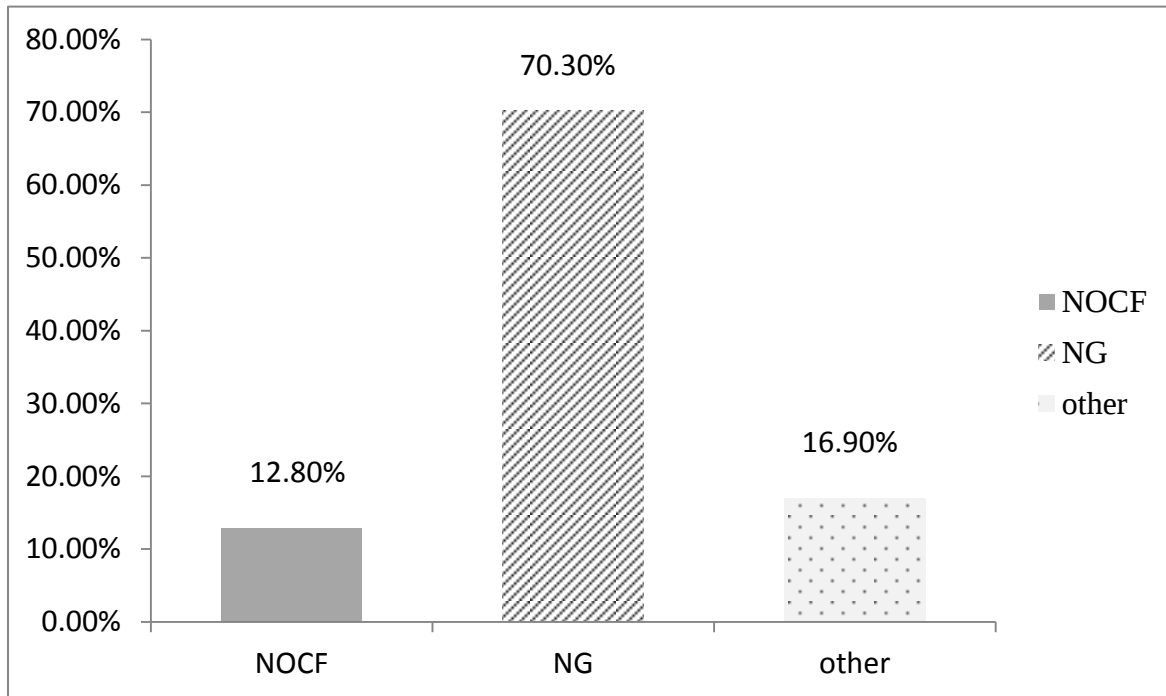
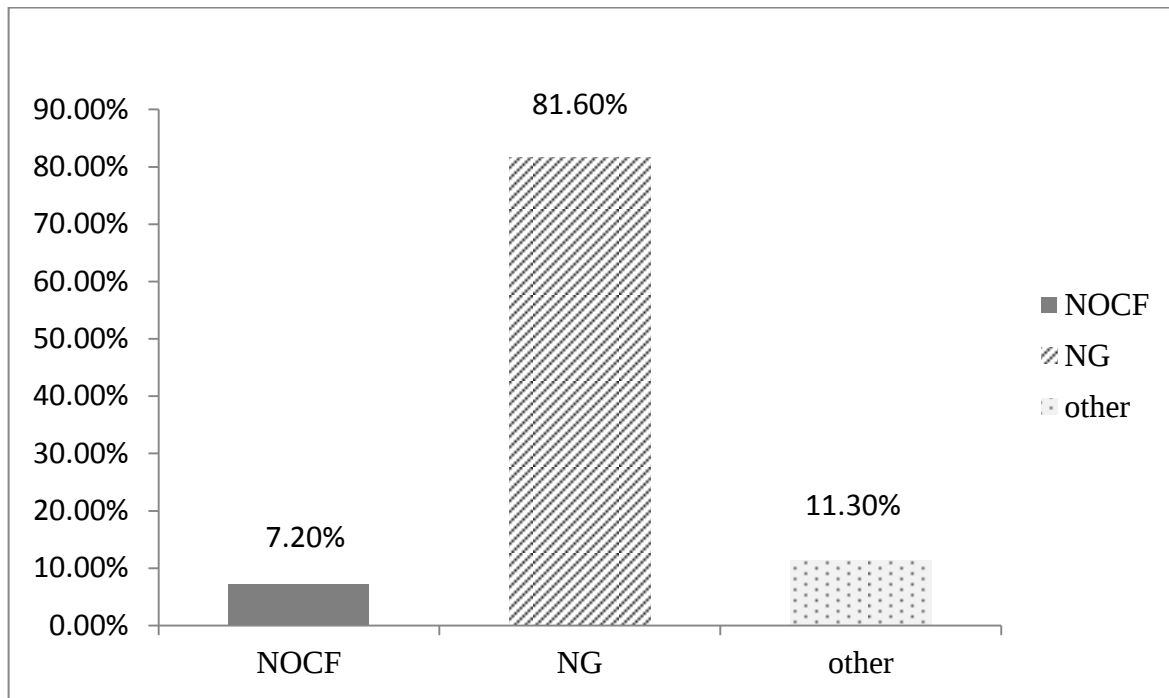


Figure 11 Noticing of Lexical/Phonological Recasts



Note. NOCF = Noticing only the corrective function; NG = Noticing the gap

6.2.3. Summary of results

Hypothesis 1 of the current study predicts that learners would report noticing of recasts and their noticing of recasts would vary in terms of the different components of recasts, such as their content, their corrective function (i.e., negative evidence), and the gap between their error and the reformulation of recasts. The results confirmed the hypothesis by showing that participants could recognize the corrective function of recasts and the gap for more than 80% of the time. When the participants oriented their attention to the corrective features of recasts, they were more likely to attend to the gap (70.3% for morphosyntactic recasts and 81.6% for lexical and phonological recasts) than to only the corrective function of the recasts (10.3% for morphosyntactic recasts and 7.2% for lexical and phonological recasts). In other words, the participants could interpret most recasts as a combination of positive and negative evidence, rather than as negative evidence alone. Finally, when learners' noticing of recasts was separated according to target structures (morphosyntactic vs. lexical/phonological errors), the learners could notice the gap of morphosyntactic recasts about 70% of the time, and they could notice the gap of lexical and phonological recasts about 80% of the time. When the episodes of noticing the gap and noticing only the corrective function of recasts were combined, the percentages reached 82% for morphosyntactic recasts and 87% for lexical and phonological recasts, respectively.

6.3. Results for Research Question 2

6.3.1. Descriptive and inferential statistical analysis

Research question 2 asked whether there is a relationship between Chinese EFL learners' noticing of recasts and the structures that were targeted by recasts. Target structures were categorized into morphosyntactic structures and lexical and phonological structures. As

mentioned in section 6.2., there were a total of 791 morphosyntactic recasts and 629 lexical and phonological recasts.

Table 15 Target Structures and Noticing of Recasts

	Morphosyntactic Recasts				Lexical/Phonological Recasts				Total
	N	M	SD	%	N	M	SD	%	
NOCF	101 ^a	1.68	4.01	12.8%	45 ^a	0.75	3.11	7.2%	146
NG	556 ^b	9.27	2.84	70.3%	513 ^b	8.55	1.46	81.6%	1069
Other	143 ^a	2.23	0.91	16.9%	71 ^a	1.18	3.01	11.2%	214
Total	791				649				1420

$$\chi^2 (df = 2, n = 1420) = 24.41 \text{ } p = .000, \text{ Cramer's } V = .13$$

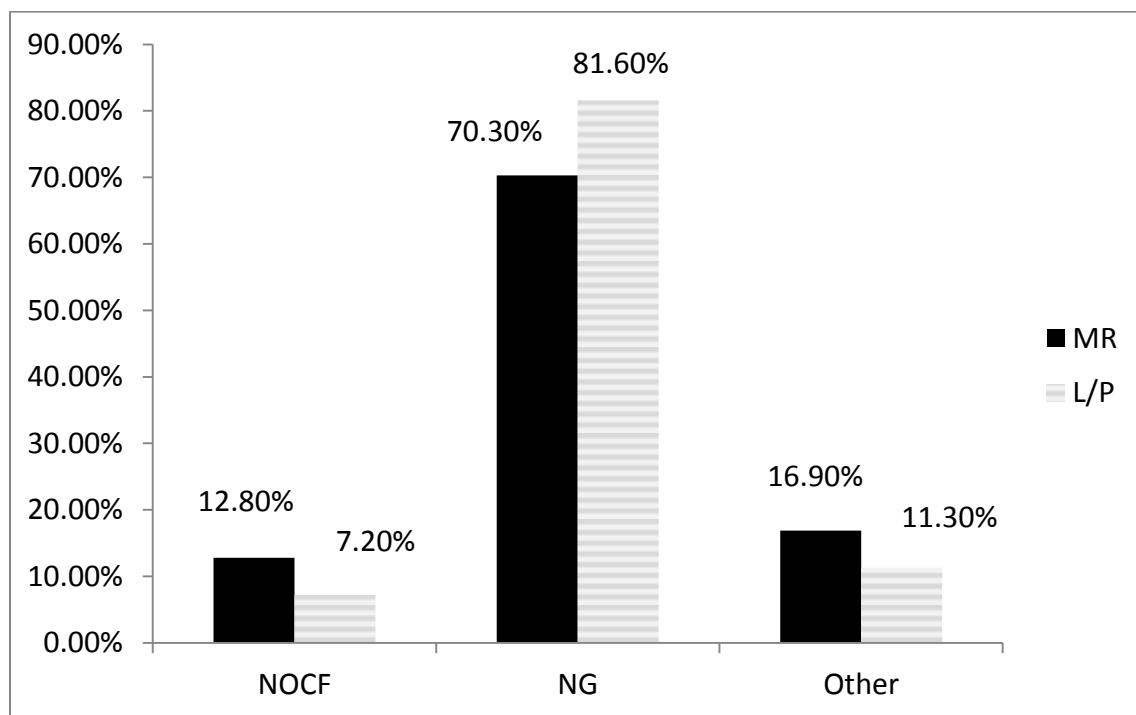
Note. NOCF = Noticing only the corrective function; NG =Noticing the gap; N = raw frequency; M = Mean frequency; SD = Standard deviation; Cell marked with a and b contributed to a significant difference (a means that adjusted residual values is bigger than 2, and b means the adjusted residual values is smaller than -2)

Table 15 shows the mean frequencies, standard deviations, and percentages of morphosyntactic and lexical and phonological recasts across the three noticing categories of noticing only the corrective function, noticing the gap, and other. Figure 12 graphically illustrates the results. Since both variables were categorical in nature, raw frequencies were submitted to a Pearson's chi-square analysis in order to determine whether the proportion of morphosyntactic recasts and lexical and phonological recasts differed significantly across the three levels of noticing.

The Chi-square analyses indicated that there was a significant relationship between the students' noticing of recasts and the structures that were targeted by recasts ($\chi^2 = 24.41$; $df = 2$; $p = .000$, Cramer's $V = .13$). Adjusted residual revealed that the participants were significantly

more likely to perceive morphosyntactic recasts as *other* (n = 143 or 16.9% of the morphosyntactic recasts) than to perceive lexical and phonological recasts as *other* (n = 71 or 11.3% of the lexical and phonological recast episodes). In addition, the participants were significantly more likely to notice only the corrective function of morphosyntactic recasts (n = 101 or 12.8% of the morphosyntactic recasts) than that of lexical and phonological recasts (n = 45 or 7.2% of the lexical and phonological recasts). Finally, the residual value revealed that the participants were significantly more likely to notice the gap of lexical and phonological recasts (n = 513 or 81.6% of the lexical and phonological recasts) than that of morphosyntactic recasts (n = 556 or 70.3% of the morphosyntactic recasts).

Figure 12 Percentage of Noticing of Recasts and Target Structures of Recasts



Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap; MR = Morphosyntactic recasts; L/P = Lexical/Phonological recasts.

6.3.2. Summary of results

With regard to research question 2, it was hypothesized that participants would notice the corrective nature (including both noticing only the corrective function and noticing the gap) of lexical and phonological recasts more than that of morphosyntactic recasts, because morphosyntactic recasts and lexical and phonological recasts differed in their salience due to factors such as perceptual salience, structural complexity, communicative value, and so forth. This hypothesis was partially confirmed, in that (1) participants noticed the gap of lexical and phonological recasts significantly more than that of morphosyntactic recasts, (2) they were more likely to notice morphosyntactic recasts as *other* (i.e., content, noticing nothing of morphosyntactic recasts, or noticing other forms of recasts that were not targeted by morphosyntactic recasts); and (3) they were more likely to notice morphosyntactic recasts as corrective feedback than lexical and phonological recasts, although they failed to locate the error, recognize the target-like reformulation, or both.

6.4. Results for Research Question 3

6.4.1. Descriptive and inferential statistical analysis

Research question 3 asked whether there is a relationship between Chinese EFL learners' noticing of recasts and their production of uptake in response to recasts. In the current study, uptake was operationalized as learners' response to recasts that immediately followed the recasts. They were categorized into modified output and non-modified output, with the former encompassing both the repair and the partial-repair that were identified by Lyster and Ranta (1997). Non-modified output consisted of other responses that indicated no intention to reformulate the error, such as acknowledgment, repetition of the same error, and so forth.

Research question 3 was further divided into two sub-questions, according to the structures that were targeted by recasts. Research question 3-A asked about the relationship between participants' modified output and their noticing of morphosyntactic recasts. Research question 3-B asked about the relationship between participants' modified output and their noticing of lexical and phonological recasts. The separation of target structures in data analysis was deemed necessary due to their difference in terms of the salience and their likelihood to influence how learners' perceive them. Both descriptive and inferential statistical analysis were employed to address these two sub-questions

6.4.1.1. Descriptive and inferential statistical analysis (Research Question 3-A)

Research question 3-A asked whether there is a relationship between learners' noticing of morphosyntactic recasts and their production of uptake (modified output vs. non-modified output). Table 16 shows the raw frequencies, mean frequencies, and percentages of recasts with modified output and non-modified output across the three categories of noticing of recasts. A graphical representation of the pattern found was presented in Figure 13.

Table 16 indicates that, in all of the 791 morphosyntactic recasts episodes, participants provided modified output to 441 of them. This accounted for 55.8% of the total number of morphosyntactic recasts episodes. There were 350 morphosyntactic recast episodes to which participants did not provide modified output, which accounted for 44.2% of the total number of recast episodes.

As shown in Table 16, the result of the chi-square analyses demonstrates that the relationship between the participants' noticing of morphosyntactic recasts and their production of uptake was significant, $\chi^2 = 27.66$; $df = 2$; $n = 791$; $p = .000$; Cramer's $V = .19$. For morphosyntactic recast

episodes that participants produced modified output for, the participants could notice the gap 77.8% of the time (n = 343), while for recast episodes that participants did not produce modified output, they could notice the gap only 60.9% of the time (n = 213). In contrast, when participants noticed morphosyntactic recasts as *other*, they were significantly less likely to produce modified output (n = 80 or 22.9% of the time) than to produce modified output (n = 54 or 12.2% of the time). Finally, similarly to the case of noticing *other*, when participant noticed morphosyntactic recasts as *noticing only the corrective function of recasts*, they were also significantly less likely to produce modified output (n = 57 or 16.2% of the time) than to produce modified output (n = 44 or 10.0% of the time).

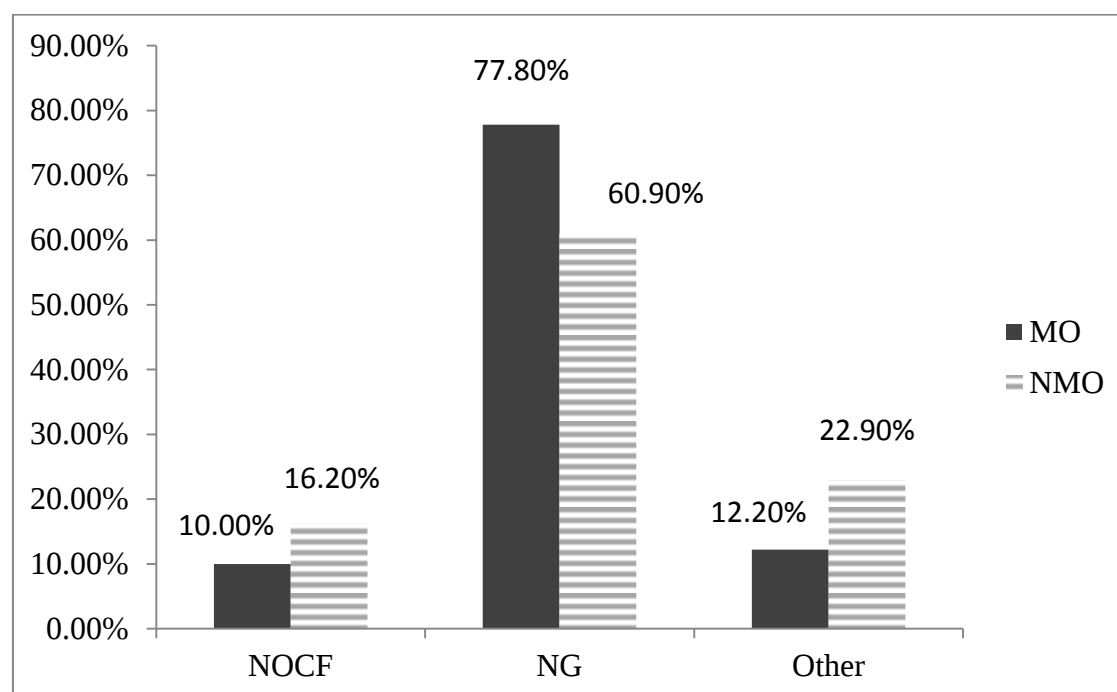
Table 16 Modified Output and Noticing of Morphosyntactic Recasts

	Modified Output			Non-Modified Output			Total
	N	M	%	N	M	%	
NOCF	44 ^b	0.73	10.0%	57 ^b	0.95	16.2%	101
NG	343 ^a	5.72	77.8%	213 ^a	3.55	60.9%	556
Other	54 ^b	0.90	12.2%	80 ^b	1.33	22.9%	134
Total	441			350			791

$$X^2 = 27.66; df = 2; N = 791; p = .000; \text{Cramer's } V = .19$$

Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap; N = raw frequency; M = mean frequency; % = Percentage of noticing. a = adjusted residual value that is bigger than 2; b = adjusted residual value that is smaller than -2

Figure 13 Noticing of Morphosyntactic Recasts and Production of Modified Output



Note: MO = Modified output; NMO = Non-modified output; NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap.

6.4.1.2. Descriptive and inferential statistical analysis (Research Question 3-B)

Research question 3-B asked whether there is any relationship between participants' noticing of lexical and phonological recasts and their production of modified output. Table 17 shows the raw frequencies, mean frequencies, and percentages of lexical and phonological recasts with or without modified output across the noticing categories. Figure 14 offers a graphical representation of the pattern found.

As shown in Table 17, descriptive statistical analysis indicates that, out of a total of 629 lexical and phonological recast episodes, the participants produced modified output for 452 of them. This accounted for 71.7% of the total number of lexical and phonological recasts (451/629). On the other hand, there were 177 lexical and phonological recast episodes to which

the participants did not provide modified output. This accounted for 28.1% of the total number of lexical and phonological recast episodes.

Table 17 Modified Output of Lexical/Phonological Recasts and Noticing of Recasts

	Modified Output			Non-Modified Output			Total
	N	M	%	N	M	%	
NOCF	26 ^b	0.43	5.8%	20 ^b	0.33	11.2%	46
NG	383 ^a	6.38	84.7%	130 ^a	2.17	73.5%	513
Other	43 ^b	0.72	9.5%	27 ^b	0.45	15.3%	70
Total	452			177			629

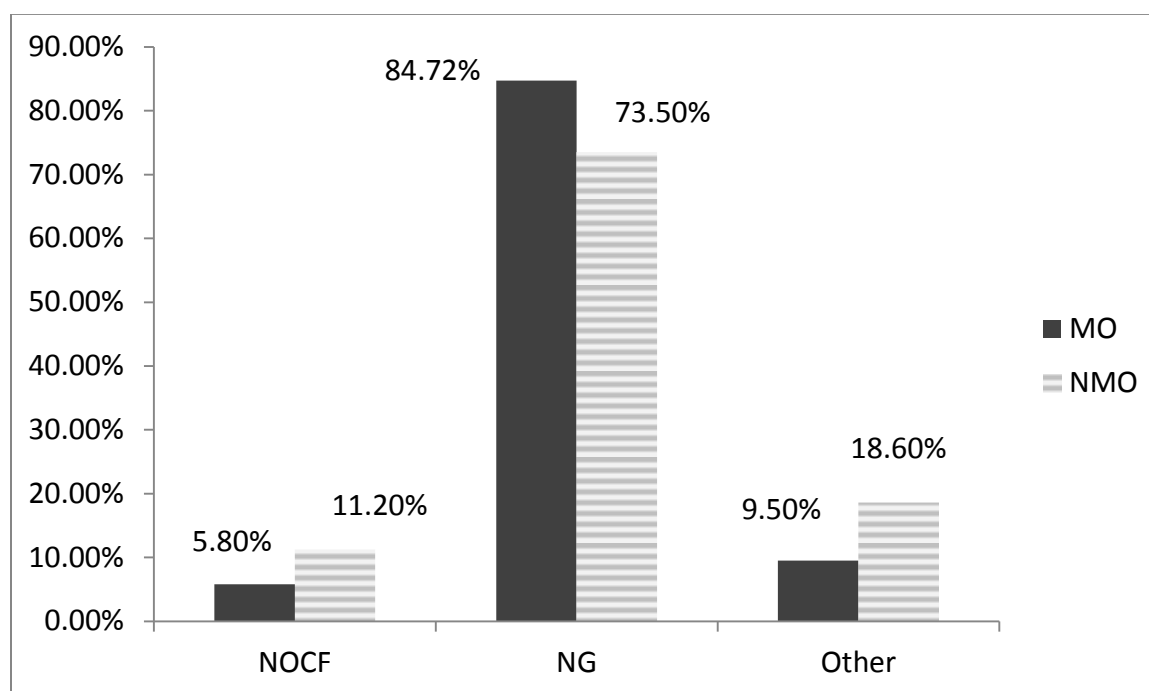
$$\chi^2 = 11.12; df = 2; p = .000; \text{Cramer's } V = .09; n = 629.$$

Note. N = raw frequency; M = Mean frequency; % = percentage of frequency; a = adjusted residual value that is bigger than 2; b = adjusted residual value that is smaller than -2. NOCF = Noticing of only the corrective function of recasts; NG = Noticing the gap.

The relationship between the noticing of lexical and phonological recasts and participants' production of modified output was significant, as demonstrated by the results of the chi-square analysis, $\chi^2 = 11.12$, $df = 2$, $p = .000$, Cramer's $V = .09$, $n = 629$. In addition, as indicated by the adjusted residual values, there were significant differences between each of the three noticing categories and the provision of modified output. First, the participants were significantly less likely to provide modified output to lexical and phonological recasts when they noticed them as *other*. In this category, learners did not provide modified output 15.3% of the time ($n = 27$), while they provided modified output only 9.5% of the time ($n = 43$). Similarly, when they noticed only the corrective function of the lexical and phonological recasts, they were significantly less likely to provide modified output ($n = 20$ or 11.2% of the time) than to provide modified output ($n = 26$ or 5.8% of the time). In contrast, when the participants reported that they

had noticed the gap of the lexical and phonological recasts, they were significantly more likely to produce modified output (n = 383 or 84.7% of the time) than not to produce modified output (n = 130 or 73.5% of the time).

Figure 14 Noticing of Lexical/Phonological Recasts and Production of Modified Output



Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap; MO = Modified output; NMO = Non-modified output.

6.4.2. Summary of results (Research Question 3-A and 3-B)

With regard to research question 3, it was hypothesized that modified output that follows recasts is more likely to be related to Chinese EFL learners' perception of recasts as corrective feedback (i.e., noticing only the corrective function of recasts or noticing the gap) rather than their perception of recasts as content or others. It was further hypothesized that, regardless of whether recasts targeted morphosyntactic or lexical and phonological errors, learners' production of modified output was related to their perception of recasts as corrective feedback rather than content or others. The results of chi-square analyses suggested that the hypothesis was partially

supported. The results supported the hypothesis in that (1) the more likely the participants noticed the gap of recasts, the more likely they would provide modified output; (2) the more likely the participants noticed only the content or other features which had nothing to do with recasts, the more likely they would not provide modified output; and (3) the above two findings were the same regardless of the target structures of the recasts. The result that did not support the hypothesis is that, when the participants noticed only the corrective function of recasts, regardless of target structures, they were more likely not to provide modified output than to provide modified output.

6.4.3. Noticing of recasts and the quality of modified output

As mentioned earlier, modified output was operationalized as the participants' attempt to modify their error as a reaction to the recasts that they received. Modified output was coded into either repair, which was the participant's target-like reformulation of the error, or partial-repair, which was the participant's partially target-like reformulation of the error. To examine whether the quality of modified output was related to learners' noticing of recasts, the current study compared the participants' target-like and partially target-like modified output. The analysis was also conducted by separating the target structures of recasts.

6.4.3.1. Noticing of morphosyntactic recasts and the quality of modified output

This section aims to address whether there is a relationship between learners' noticing of morphosyntactic recasts and the quality of modified output. Modified output was categorized into target-like and partially-target-like modified output. Table 18 summarizes the raw frequency, mean frequency, and percentage of frequency. Figure 15 offers a graphical presentation of the findings.

Descriptive statistics shows that the participants provided modified output to 449 morphosyntactic recast episodes. Of the 449 recasts, the participants provided target-like modified output 85.7% of the time (n = 385) while they provided non-target-like modified output only 14.3% of the time (n = 64).

Table 18 Noticing of Morphosyntactic Recasts and the Quality of Modified Output

	Target-like Modified Output			Partially Target-Like Modified Output			Total
	N	M	%	N	M	%	
NOCF	31 ^b	0.52	8.2%	13 ^b	0.22	20.3%	44
NG	304 ^a	5.06	80.6%	40 ^a	0.67	62.5%	344
Other	42	0.70	11.2%	11	0.18	17.2%	53
Total	377			64			441

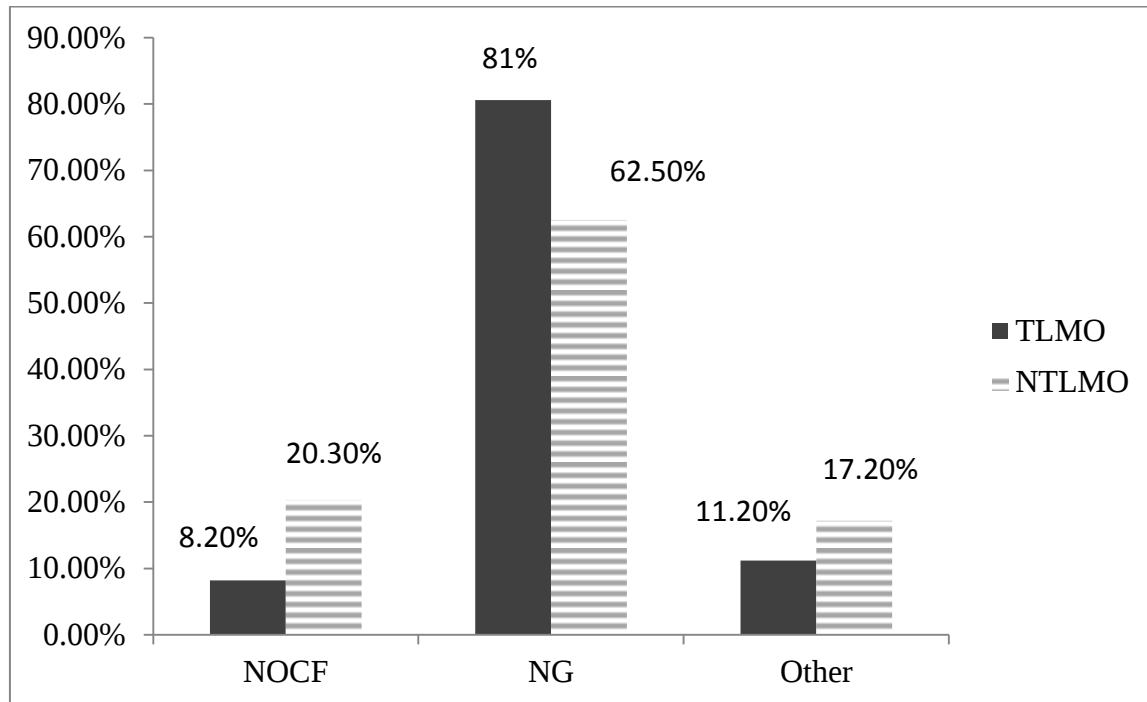
$$\chi^2 = 11.99; df = 2; p = .002; \text{Cramer's } V = .17.$$

Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap; N = raw frequency; a = adjusted residual value that is bigger than 2; b = adjusted residual value that is smaller than -2. M = Mean frequency; % = Percentage of frequency.

The results of the chi-square analysis showed that the relationship between noticing of morphosyntactic recasts and the quality of modified output was significant, $\chi^2 = 11.99$, $df = 2$, $p = .002$, Cramer's $V = .17$. Adjusted residual values indicated that the differences came from only the categories of *noticing only the corrective function of recasts* and *noticing the gap*, while there was no difference in the category of *noticing other*. This suggests that when the participants perceived morphosyntactic recasts as meaning or other features that had nothing to do with recasts, they provided similar percentages of target-like (n = 42 or 11.2% of the time) and non-target-like (n = 11 or 17.2% of the time) modified output. On the other hand, when they noticed only the corrective function of recasts, they were more likely to provide partially target-like

modified output (n = 31 or 8.2% of the time) than to provide target-like modified output (n = 13 or 20.3% of the time). In contrast, when they noticed the gap of the morphosyntactic recasts, the participants were significantly more likely to provide target-like modified output (n = 304 or 80.6% of the time) than to provide non-target-like modified output (n = 40 or 62.5% of the time).

Figure 15 Noticing of Morphosyntactic Recasts and Quality of Modified Output



Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap; TLMO = Target-like modified output; NTLMO = Non-target-like modified output.

6.4.3.2. Noticing of lexical/phonological recasts and the quality of modified output

This section addresses the relationship between noticing of lexical and phonological recasts and the quality of modified output. First, the lexical and phonological recast episodes were singled out from the data. Then the data were tallied according to whether they were followed by target-like or partially-target-like modified output. The total number of lexical and phonological recasts was 452.

Table 19 presents the raw frequencies, mean frequencies, and the percentage of frequency.

Figure 16 offers the graphical representations of the pattern found.

Table 19 Noticing of Lexical/Phonological Recasts and Quality of Modified output

	TLMO			NTLMO			Total
	N	M	%	N	M	%	
NOCF	19	0.32	5.7%	7	0.12	5.6%	26
NG	277	4.61	84.5%	106	1.77	85.5%	383
Other	32	0.53	9.8%	11	0.18	8.9%	43
Total	328			124			452

$$\chi^2 = .089; df = 2; p = .96; \text{Cramer's } V = .01.$$

Note. NOCF = Noticing only the corrective function of recasts; NG = Noticing the gap; TLMO = Target-like modified output; NTLMO = Non-target-like modified output; N = raw frequency; M = Mean frequency.

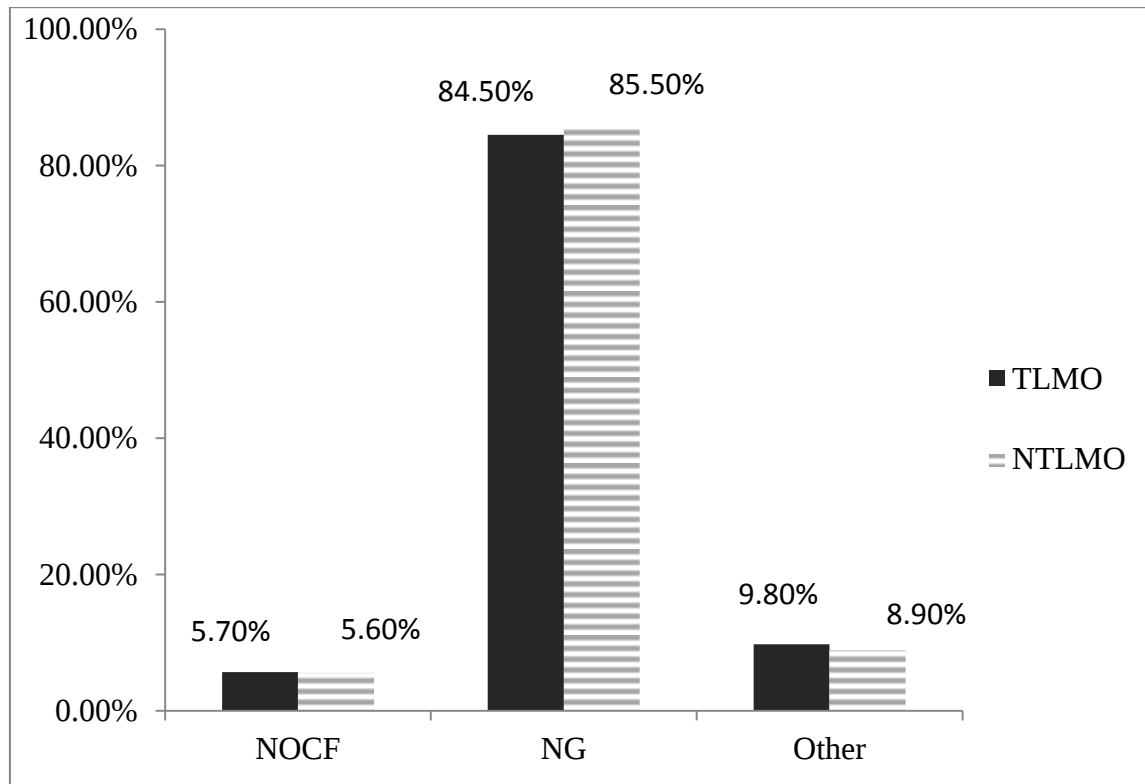
Descriptive statistics from Table 19 shows similar results as those for morphosyntactic recasts. Participants provided a total of 336 target-like modified output, accounting for 72.7% of a total of 462 lexical and phonological recast episodes. On the other hand, they provided partially-target-like modified output to 126 lexical and phonological recasts, which accounted for 27.3% of the total number of recasts.

The results show that when the participants noticed the gap involved in lexical and phonological recasts, they were more likely to provide non-target-like modified output (n = 106 or 85.5% of the time) than target-like modified output (n = 277 or 84.5% of the time). When they only noticed the corrective function of recasts, they were similar in their production of target-like (n = 19 or 5.7% of the time) or non-target-like modified output (n = 7 or 5.6% of the time).

When they noticed the content or other features of the recasts, they provided more modified

output (n = 32 or 9.8% of the time) than non-target-like modified output (n = 11 or 8.9% of the time). However, the relationship between the noticing of lexical and phonological recasts and the quality of modified output was not significant, as demonstrated by the results of the chi-square analysis, $\chi^2 = .089$, $df = 2$, $p = .95$, Cramer's $V = .01$. This suggests that the participants' perception of lexical and phonological recasts were similar when the produced modified output regardless of the linguistic well-formedness of their modification.

Figure 16 Noticing of Lexical and Phonological Recasts and Quality of Modified Output



Note. TLMO = Target-like modified output; NTLMO = Non-target-like modified output

6.4.4. Summary of results

The relationship between noticing of recasts and quality of modified output varied in terms of the structures that were targeted by recasts. In the case of morphosyntactic recasts, the

participants provided significantly more target-like modified output than non-target-like modified output. However, they provided more non-target-like modified output than target-like modified output when they only noticed the corrective function of morphosyntactic recasts. On the other hand, when they were not able to recognize recasts as corrective feedback, their provision of modified output followed the same fashion regardless of the quality.

In the case of lexical and phonological recasts, there was no relationship between the quality of modified output and the participants' noticing of this type of recasts. That is, it made no difference on noticing of recasts whether or not the participants provided target-like modified output.

6.5. Results for Research Question 4

6.5.1. Descriptive statistics

Research question 4 asked whether there was any relationship between Chinese EFL learners' noticing of recasts and their individual differences in working memory capacity. The participants' working memory capacity was measured by means of their L1 reading span. Table 20 presents the descriptive analysis of the participants' scores in the reading span test. It is noted that the total score for the test was 56. As the table shows, the average score of the working memory test was 26.82 (SD = 7.71). The maximum score was 43, while the minimum was 11.

Table 20 Descriptive Statistics for the Working Memory Test

	n	Mean	SD	Min	Max
WM Score	60	26.82	7.71	11	43

Note. n = the total number of participants; Mean = Mean score of the reading span test; SD = standard deviation of working memory scores; Min = Minimal score of the reading span test; Max = The maximal score of the reading span test.

As discussed earlier, each participant's stimulated recall data were coded into three categories: *noticing only the corrective function of recasts*, *noticing the gap*, and *other*. In addition, the learners' noticing data were separated based on the target structures of recasts (i.e., morphosyntactic vs. lexical/phonological). Then, two proportional scores were calculated for each of the two types of recasts. First, the proportional scores were calculated by dividing the number of each participant's noticing the corrective nature of recasts (noticing only the corrective function + noticing the gap) by the total number of morphosyntactic or lexical and phonological recasts. Second, the other group of proportional scores was calculated by dividing the number of each participant's noticing the gap of recasts by the total number of morphosyntactic or lexical and phonological recasts. Table 21 presents the two types of proportional scores for morphosyntactic recasts and Table 22 presents the two types of proportional scores for the lexical and phonological recasts.

Table 21 Proportional Scores of Noticing the Corrective Nature and Noticing the Gap of Morphosyntactic Recasts

Proportional Scores	n	M	SD	Max	Min
Noticing the Corrective Nature of Recasts	60	.82	.13	1	.44
Noticing the Gap	60	.71	.16	1	.29

Note. n = the total number of participants; Mean = Mean proportion scores; SD = standard deviation of proportional scores; Min = Minimal proportional scores; Max = the maximal proportional scores.

Descriptive statistics in Table 21 indicates that, in the case of morphosyntactic recasts, the participants could recognize the gap involved in recasts on an average of 71% of the time, while they could identify these recasts as corrective feedback rather than content or others on an average of 82% of the time.

Descriptive statistics in Table 22 reveals that, in the case of lexical and phonological recasts, the participants could notice the gap on an average of 79.0% of the time, while they could notice the corrective nature of these recasts (noticing the gap + noticing only the corrective function) on an average of 87% of the time.

Table 22 Proportional Scores of Noticing the Corrective Nature and Noticing the Gap of Lexical/Phonological Recasts

Proportional Scores	n	M	SD	Max	Min
Noticing the Corrective Nature of Recasts	60	.87	.11	1	.50
Noticing the Gap	60	.79	.12	1	.50

Note. n = the total number of participants; Mean = Mean proportion scores; SD = standard deviation of proportional scores; Min = Minimal proportional scores; Max = The maximal proportional scores.

In order to determine whether learners' WM test scores in their reading span predicted the amount of noticing the gap or noticing the corrective nature of recasts during interaction, the current study employed simple linear regression analysis as the inferential statistical test. Data analyses began with the relationship between noticing of morphosyntactic recasts and working memory capacity, which was then followed by the analysis of the relationship between noticing of lexical/phonological recasts and working memory capacity. Each type of analyses involves two analyses, one was concerning the proportional scores of noticing the gap, the other was concerning the proportional scores of noticing the corrective nature of recasts (i.e., noticing the gap + noticing only the corrective function of recasts).

6.5.2. The relationship between noticing morphosyntactic recasts and working memory capacity

A simple linear regression was run for the proportional scores of noticing the gap and noticing the corrective nature (noticing the gap + noticing only the corrective function of recasts) of morphosyntactic recasts. Table 23 presented the results of the regression analysis.

As can be seen in Table 23, there was no significant relationship between the participants' working memory scores and their noticing of the corrective nature of morphosyntactic recasts (noticing only the corrective function of recasts + noticing the gap), $\beta = .15$, $t(1, 58) = 1.12$, $p = .27$, $R^2 = .02$. The value of the standardized coefficient β is .15, meaning that each increase of one standard deviation for working memory scores predicted an increase of about less than a quarter of a standard deviation for noticing. The R^2 value, which measures the effect size, shows that only 2% of the variation in noticing of the corrective nature or morphosyntactic recasts can be explained by variation in working memory. These results indicate that the participants' working memory scores did not predict their noticing of morphosyntactic recasts.

Table 23 Regressions: Working Memory and Noticing of Morphosyntactic Recasts

	<i>n</i>	<i>R</i>	R^2	β	<i>F</i>	<i>t</i>	<i>p</i>
Noticing the Corrective Nature of Recasts	60	.15	.02	.15	1.25	1.12	.27
Noticing the gap	60	.11	.01	.11	.66	.82	.42

Table 23 also reveals that the relationship between learners' working memory scores and their noticing the gap of recasts was not significant, either, $\beta = .11$, $t(1, 58) = .82$, $p = .42$, R^2

= .01. The R^2 value shows that only 1% of the variation in the noticing of the gap involved in morphosyntactic recasts can be explained by variation in working memory.

6.5.3. The relationship between noticing lexical/phonological recasts and working memory capacity

Table 24 presents the results of the simple linear regression analysis for both the noticing of the corrective nature and the gap of lexical and phonological recasts. As can be seen in Table 24, there was no significant relationship between the participants' working memory scores and their noticing of the corrective nature (noticing only the corrective function of recasts + noticing the gap) of lexical and phonological recasts, $\beta = .20$, $t(1, 58) = 1.53$, $p = .13$, $R^2 = .04$. The value of β is .20, indicating that each increase of one standard deviation in working memory scores predicted about one-fifth standard deviation increase in their noticing of the corrective nature of recasts. The R^2 value is .04, indicating that this model accounted for only 4% of the variation in noticing the nature of recasts.

Table 24 Regressions: Working Memory and Noticing of Lexical/Phonological Recasts

	<i>n</i>	<i>R</i>	R^2	β	<i>F</i>	<i>t</i>	<i>p</i>
Noticing the Corrective Nature of Recasts	60	.20	.04	.20	2.33	1.53	.13
Noticing the gap	60	.09	.008	.09	.44	.66	.51

There was also not a significant relationship between the working memory scores and the participants' noticing of the gap of lexical and phonological recasts, $\beta = .09$, $t(1, 58) = .66$, p

$\beta = .51, R^2 = .008$. The β value suggests that each increase of one standard deviation in working memory scores predicted about one-tenth standard deviation increase in their noticing of the gap of recasts. The effect size of .008 indicates that this model accounted for less than 1% of the variation in noticing the gap of lexical and phonological recasts.

6.5.4. Summary of results

With regard to research question 4, the current study hypothesized that participants with higher working memory scores were more likely to notice the corrective function of morphosyntactic recasts than participants with lower working memory scores, while there was no difference between participants with high working memory scores and those with low working memory scores in noticing the corrective function of the lexical and phonological recasts. The results of simple linear regression tests indicated that (1) there was no significant relationship between working memory scores and the noticing of morphosyntactic recasts, in terms of both noticing the corrective nature of morphosyntactic recasts (i.e., noticing only the corrective function of recasts + noticing the gap) and noticing the gap. (2) There was no significant relationship between working memory scores and noticing the corrective nature of lexical and phonological recasts, in terms of both noticing the corrective nature of recasts and noticing the gap. The results found in the current study, then, imply that working memory capacity did not play an important role in learners' noticing of recasts. Therefore, the hypothesis was only partially supported.

In the next chapter, the findings will be discussed in relation to each research question of the study.

CHAPTER 7 DISCUSSION AND CONCLUSION

This chapter will discuss the findings of the study with regard to the research questions. First of all, some explanation for the findings about the Chinese EFL learners' noticing of recasts during meaningful communication will be provided (research question 1). Then the difference between target structures in leading to noticing (research question 2) will be considered. And then, the findings regarding the relationship between learners' provision of modified output and their noticing of recasts will be discussed (research question 3). Finally, there will be discussion about the relationship between learners' working memory capacity and their noticing of recasts (research question 4).

Following the discussion of the findings, theoretical and pedagogical implications of the study will be addressed. Then some limitations of the study and areas for future research will be considered. The chapter ends with a conclusion of the contributions of the current study to our understanding of recasts, noticing of recasts, and their relation to working memory capacity.

7.1. Research Question 1

Research question 1 asked whether Chinese EFL learners noticed recasts during communicative interaction and if they did, what aspects of recasts they noticed (i.e., noticing only the corrective function of recasts, noticing the gap, and other).

Descriptive analysis was conducted to seek answers to this question. Results indicated that the participants reported noticing 94.8% of the recasts during task-based communicative interaction. With regards to the different aspects of noticing, the participants reported that they had noticed the gap in 75.3% of the recasts. For 10.3% of these recasts, the participants reported that they perceived them as corrective feedback, but failed to identify the errors or the target-like

reformulations. The participants perceived 14.4% of the recasts as *other* (i.e., content, noticing nothing, or noticing other forms that were not targeted by recasts).

These findings supports Hypothesis 1, which states that Chinese EFL learners could report their perception of recasts as corrective feedback, and they could also notice the gap between their own error(s) and the target-like reformulation entailed in recasts. The findings, therefore, provide additional support to the Interaction Approach that recasts, as an important component of interaction, can promote learner noticing of forms during meaningful interaction (Gass, 1997, 2003; Gass & Mackey, 2006a; Long, 1996, 2007; Mackey, 2007a, 2007b, 2012; Mackey, Abdulle, & Gass, 2012). If it is the case that noticing is the first step towards learning (Doughty, 2001; Gass, 1997, 2003; Long & Robinson, 1998; Schmidt, 2001, 2010; Schmidt & Frota, 1986), then these findings are encouraging in that L2 learners' noticing of recasts could lead to their learning of the forms that are targeted by recasts.

In addition, the findings of the current study were consistent with previous studies that examined noticing by means of introspective data-collection methods (Bao et al., 2011; Carpenter et al., 2006; Egi, 2007a, 2007b, 2010; Gass & Lewis, 2007; Kim, 2008; Kim & Han, 2007; Mackey, 2006a; Mackey et al., 2000; Philp, 2003). Most of these previous studies were conducted in ESL context or foreign language learning environment in the U.S, except Kim (2008) and Kim and Han (2007)³⁹. Since the current study was conducted in a foreign language learning environment in China, albeit in a laboratory setting, it makes an additional contribution to the Interaction Approach and suggests that the Interaction Approach is also applicable to the EFL context such as that in China.

³⁹ These two studies were conducted in Korean EFL classroom settings.

One explanation for the findings is that the current study was carried out in a laboratory setting. Laboratory settings have long been considered to be facilitative of drawing learners' attention from meaning to form (Egi, 2007a; Han, 2002; Li, 2010; Lyster, 1998a; Mackey, 2007a, 2012; Mackey & Goo, 2007; Nicholas et al., 2001). Li's (2010) meta-analysis of corrective feedback shows that the effect of corrective feedback in a laboratory setting is much greater than that in a classroom setting. According to Li, one of the reasons for the greater effect of corrective feedback in laboratory setting is that, in a laboratory setting, there was less distraction than a classroom setting and corrective feedback was directed toward individual learners. In a classroom setting, the distraction, lack of individual attention, together with the focus of meaning, especially in those immersion or ESL classroom settings, may make it less likely for the learner to recognize the corrective intention of recasts (Chaudron, 1988; Long, 1996; Nicholas et al., 2001).

In the same vein, Han (2002) argues that individualized attention in a laboratory setting makes it "akin to a clinic to which students went for symptomatic treatments" (p. 568), thereby promoting the noticeability of recasts. Likewise, Mackey (2012) suggests that, in a laboratory setting, students may be more likely to attend to form than in meaning-focused classrooms, because (1) they are more aware of the fact that their performance is under scrutiny, and (2) learners will operate in "test-taking mode" which leads to attention to form. Lyster (1998a, 1998b; Lyster & Ranta, 1997) also postulates that the highly controlled interaction in laboratory settings is a way of decontextualization, which is facilitative of an explicit focus on form on the part of the learner. Learners' noticing of recasts is further enhanced when interaction in a laboratory setting allows for only a limited number of language features to be targeted (as in Egi,

2007; Philp, 2003), because the focus of recasts makes the corrective intention of recasts more salient than that in a classroom setting.

The way in which recasts were provided is another reason that led to learners' noticing of recasts. As mentioned in Chapter 5, in the current study, the interlocutor provided not only recasts, but also other types of corrective feedback (e.g., clarification requests, elicitation, and repetition) in order to conceal the purpose of the study. However, the distribution of the various types of corrective feedback varied. Recasts accounted for 86.3% of all the corrective feedback provided, while the other three types of corrective feedback occupied only a small proportion of the total amount of corrective feedback: clarification requests accounted for 7.8%, elicitation, 4.2%, and repetition, 1.7%. The amount of recasts that was controlled in a laboratory setting thus made it more consistent and more salient for learners to recognize their corrective nature.

One finding of the current study is that the current study yielded a higher rate of noticing of recasts than that of previous studies. The participants in the current study could notice the gap of more than 70% of the recasts, and notice only the corrective function of more than 10% of the recasts. In other words, they could identify the corrective nature of more than 80% of the recasts. In the case of morphosyntactic recasts, the participant could notice the gap of 70.3% of the recasts, and notice only the corrective function of 12.8% of the recasts. In the case of the lexical and phonological recasts, they could notice the gap of 81.6% of the recasts and notice only the corrective function of 7.2% of the recasts. These results indicate that the percentages of noticing the corrective nature of recasts are high for both types of target structures.

In comparison with the current study, Mackey et al. (2000) revealed a lower percentage of recast noticing. This study investigated ESL and IFL (Italian as a foreign language) learners'

noticing of corrective feedback. They found that ESL learners could recognize the corrective nature of feedback that targeted lexical and phonological errors more than 60% of the time, while they recognized the corrective nature of that morphosyntactic feedback only 13% of the time. Similar findings were obtained for the IFL learners, with the percentages of their noticing of feedback reaching 60% for lexical items and only 24% for morphosyntactic items. The percentages of recast noticing were also low in Roberts' (1995) study. Roberts examined ESL classroom interaction and reported that learners could notice the gap of only 23% of the recasts that they received. Egi (2007a) investigated the noticing of recasts by English L1-learners of Japanese as a foreign language, and also found a relatively higher percentage of noticing. Egi reported that learners' could notice the gap (i.e., positive evidence or both positive and negative evidence) for about 50% of the time, they noticed the negative evidence of recasts for about 35% of the time, while they noticed the content of recasts for about 20% of the time.

One explanation to the high percentage of noticing recasts concerns the use of task type (R. Ellis, 2003; Williams, 1999). In the current study, all the interaction tasks were one-way information exchange tasks. During interaction, the participant held all the information and he/she was responsible for conveying the information to the interlocutor. The interlocutor did not engage in information exchange; rather, he gave some comments, negotiated meaning, and provided corrective feedback. Therefore, the recasts provided to the learners should be no different from their original meaning, thus were transparent to the learners. Since very little attentional resources needed to be allocated to meaning, the corrective nature of them could be recognized relatively more easily by learners (VanPatten, 1990, 1996).

Different instructional contexts that learners experience can also be ascribed to the high proportions of noticing of recasts by the Chinese EFL participants (Chaudron, 1988; Doughty &

Williams, 1998; Li, 2010; Lyster, 2007; Lyster & Mori, 2006; Sheen, 2004). In other words, the participatory structures and learners' experience in their classroom context can affect their perception of recasts. Li's meta-analyses revealed that studies that were conducted in foreign language contexts showed greater effect of corrective feedback than second language context, probably because learners in foreign language contexts have a more positive attitude towards error correction than learners in second language context (see also Loewen, Li, Fei, Thomson, Nakatsukasa, Ahn, & Chen, 2009). This positive attitude towards error correction might also influence EFL learners' performance in their meaning communication in laboratory settings. This view is supported by Sheen's (2007) study that found a correlation between learners' attitudes and their learning of English articles through corrective feedback. In addition, EFL learners' perception of corrective feedback is also influenced by their classroom experience. In Chinese EFL classroom context, learners are accustomed to explicit metalinguistic instruction, which is the result of an emphasis on form-learning in classroom teaching as well as form-oriented examinations such as college-entrance examination and college-English tests (Nunan, 2003; Fang, 2012). Moreover, the instruction that treats language as knowledge and examinations that are form-oriented may influence teachers' teaching practice, for example, teacher-centered instruction and the provision of corrective feedback. Learners' experience in such classroom context may influence their sensitivity to forms and corrective feedback, and this sensitivity can also be conducive to their noticing of recasts in a laboratory setting.

The influence of instructional contexts has been highlighted in Lyster's (Lyster, 2007; Lyster & Mori, 2006) Counterbalanced Hypothesis, which proposes that uptake as well as learning through corrective feedback may be determined in part by the context of instruction that the learner is involved in. In light of this hypothesis, the findings of the current study are

consistent with those of two classroom studies that investigated Korean EFL learners' noticing of recasts (Kim, 2008; Kim & Han, 2007). Kim (2008) and Kim and Han (2007) both provided evidence of great rate of noticing the gap of recasts by Korean EFL learners. Kim (2008) examined college EFL learners' noticing of recasts in 8 classes in a Korean university, and found that the learners could notice the gap of 51% of the recasts. Kim and Han (2007) also reported the Korean EFL learners could notice the gap of approximately half of the recasts they received. Given that the study was conducted in classroom setting, the percentages were rather high. The high rate of noticing in EFL context in Korea and China may not be surprising because the Korean EFL context is similar to that of China in terms of (1) grammar-based examinations and (2) students' lack of motivation for developing communicative competence (Li, 1998).

Learners' previous knowledge of the forms that were targeted by recasts can also explain the likelihood that learners could notice the corrective nature of recasts (DeKeyser, 2000; Gass, 1997; Schmidt, 1990a, 2001; Schmidt & Frota, 1986). For example, Schmidt and Frota (1986) reported that the grammatical constructions that were noticed by the learner were those that had been taught in class. According to Gass (1988, 1997), apperception⁴⁰ is the process in which "newly observed qualities of an object are related to past experience" (Gass, 1988, p. 201). In other words, noticing the gap between the targetlike reformulation in a recast and the learner's own non-targetlike form enables the learner to integrate what they noticed with their prior knowledge. It is also the case that the extent to which the learner is familiar with the prior knowledge may

⁴⁰ According to Gass (1988), to apperceive is "to perceive in terms of past perceptions" (p. 201). Apperception is not equivalent to noticing because apperception refers to an internal cognitive act which identifies the form as being related to some prior knowledge which has been stored in our experience.

partially determine the extent to which they could notice the gap between the target-like reformulation of recasts and their own errors (Gass, 1997).

Unlike some previous studies (e.g., Egi, 2007a, 2007b; Philp, 2003), the current study did not predetermine any target structures for recasts; rather, recasts were provided extensively and incidentally. Even so, the learners could notice the gap of around 70% of the morphosyntactic recasts and more than 80% of the lexical and phonological recasts. In addition, the stimulated recall data showed that the learners had metalinguistic knowledge for the forms that were targeted by recasts. In other words, learners' noticing of recasts, in this case, could be a higher-level of noticing, i.e., noticing at the level of understanding (Schmidt, 2001). This level of noticing, although not necessary for learning to take place, is more beneficial for learning. Given that the learner was on the stage of proceduralizing their knowledge, the provision of recasts and the learner's noticing of the gap regarding the practice of a form could help the learner to strengthen, modify, and automatize the knowledge. The following are some examples demonstrating learners' metalinguistic knowledge of L2 forms.

Example 20

P: In front of the girl, there are *a desk*.

I: There is a desk.

P: There is a desk.

Stimulated Recall

P: *Plural form, plural form. I used plural form here.*

Example 21

P: He *writed* a lot of poems and passages.

I: He wrote.

P: Yeah, he wrote a passage about there.

Stimulated Recall

P: *I wanted to use past tense then, because he wrote the passage in the past. First I wanted to use “was”, but later I used “writed”, in fact the correct form is “wrote”.*

Example 22

P: We have so *many* free time.

I: So much.

P: Yeah, so much free time to dominate by ourselves.

Stimulated Recall

P: *I made a mistake on “so much” and “so many”. “Time” is an uncountable noun, so I could not use “many” to modify it. I should have used “much”.*

The learners' familiarity of linguistic forms and their metalinguistic knowledge of these forms might be related to their classroom instruction of their L2 as knowledge (Doughty & Williams, 1998). A *post hoc* study of the data showed that the most commonly recast forms in the current study were tense, agreement, aspects, gender, *there be* structure, locative preposition, third-person singular, plural form, and articles. Approximately 76% of the recasts were provided in response to learner errors in these forms. These linguistic features were listed in the national

syllabus (2000) issued by the National Education Committee for both secondary- and tertiary-level English instruction. Therefore, it is no surprise that the participants had a good command of the rules concerning these forms.

Learners' precise knowledge of the linguistic features that were targeted by recasts, or, in other words, their declarative knowledge of these features, made it easier for them to notice the gap involved in the recasts. However, it is worth asking why the learners made errors on these forms that they were familiar with. This can be explained by DeKeyser's (1998, 2007) skill learning theory. According to DeKeyser, once a learner has declarative knowledge of a rule, he/she may act on this knowledge and turn it into procedural knowledge. However, the proceduralization takes a lot of time and practice on the part of the learner. In addition, the knowledge at this stage is not fine-tuned so that it is still error-prone and requires a lot of attentional resources. Therefore, corrective feedback is needed to make sure that the learner is proceduralizing his/her knowledge in an accurate way. Furthermore, it is important that practice needs to be done in a meaningful and communicative context, because learning to use language forms in a communicative context may improve the ability to retrieve it in similar contexts (Lightbown, 2008). In the same vein, feedback provided on learners' erroneous forms while they engage in meaning-based practice is likely to be most effective because it matches classroom learning processes to the processes that will be used outside the classroom. In contrast, corrective feedback that teachers provide in a decontextualized grammar practice may be remembered in similar contexts, such as discrete-point grammar tests, but it is of little or no help when learners want to retrieve the corrected form in a communicative context (Lightbown, 2008; Yang & Lyster, 2010).

In the EFL context in which the current study took place, it appeared that the participants did not have sufficient meaningful language practice. This can be clarified in terms of the time that the participants spent in engaging in extracurricular oral practice of their L2 English. The participants' response to one question item in the background questionnaire revealed that most participants (75.8%) spent an average of less than 1 hour per week in their out-of-class language practice. These participants' lack of interest in meaningful L2 practice might be related to the form-oriented examinations (Fang, 2012). Given their limitations, the form-oriented tests such as the CET could not bring about a substantial change in language teaching and learning, despite the emphasis that recent national syllabi have laid on communicative language teaching and task-based language teaching (Yu, 2005). To pass their test, college students may cater to memorizing vocabulary and grammatical rules and doing mock tests rather than developing their overall communicative competence (Zhang, 2005).

Therefore, the learning of the target language as knowledge, the measure of this knowledge in discrete-point form-oriented tests (Fang, 2012), and teacher-centered classroom teaching, may lead to a lack of interest in meaning-based practice in the EFL context. The lack of practice, in turn, makes it hard for the learner's declarative knowledge to be proceduralized. When the participants in the current study engaged in meaningful practice (i.e., interactive tasks) with the interlocutor, they kept making errors in their use of linguistic forms, despite their mastery of the declarative knowledge of these forms. A scrutiny of the interaction data shows that some participants repeated the same error on some individual linguistic features on different occasions, such as past tense, agreement, third-person singular, and so forth. The following three examples were from the same participant and they illustrate the same error in part of speech. The participant used the adverbial form where an adjective should be used. After being corrected

twice, the participant still used the wrong part of speech. Indeed, every time she received the recast, she could notice the gap, as revealed by her stimulated recall report. The learner's reports of her perception show that she did have the relevant knowledge, but the knowledge was far from being proceduralized.

Example 23

P: I think the name is *beautifully*.

I: The name is beautiful.

P: Yeah.

Stimulated recall

P: *I used adverb, but it should be an adjective.*

Example 24

P: I think it is *beautifully*.

I: It is beautiful.

P: Yeah.

Stimulated Recall

P: *I used the adverb again.*

Example 25

P: I think *Zhangjiajie* is very *beautifully*.

I: *Zhanjiajie* is beautiful?

P: Yeah.

Stimulated recall

P: *I don't remember how many times I have used an adverb in the position where an adjective should be used.*

The participants' ability to notice the gap of a great percentage of recasts indicates that the forms that recasts targeted were those that the participants were familiar with but have not proceduralized, suggesting that recasts are beneficial for knowledge that learners may have acquired to some extent (R. Ellis & Sheen, 2006). The learners seemed to have declarative knowledge of these forms, but a lack of meaningful practice made it hard for the forms to be proceduralized and for errors to be corrected, thereby preventing the learners from targetlike production. Révész's (2012) study demonstrated the importance of recasts in facilitating the proceduralization of declarative knowledge during meaning-based activities. In her study, Révész measured learning by means of three tests, grammatical judgment test (GJT), written test, and an oral production. Révész found that recasts had the greatest impact on gain scores on the oral production tests, while less on written production test, and the least on GJT tests. Révész argues that oral production tests required learners to deploy procedural knowledge; therefore, recasts proved to be more effective in leading to gains in participants' procedural than declarative knowledge of the target structure. In other words, recasts play an important role in learners' acquisition of targetlike procedural knowledge.

The interaction data of the current study also show that, besides promoting accurate proceduralization of declarative knowledge, recasts could also help participants to notice and

modify their non-targetlike generalization of linguistic knowledge. Example 26 shows that the participant mistaken *brother-in-law* for *cousin*, and reported that she took it for granted that *brother-in-law* meant 表兄弟 (i.e., *cousin* in English) in Chinese.

Example 26

P: Jane Eyre lived in her aunt's house. Her *brother-in-law* was not kind to her.

I: Her cousin?

P: Cousin?

I: Yes, cousin.

P: Cousin

Stimulated recall

P: *Does cousin refer to the child of her uncle? I used brother-in-law before. I don't know.*

Recasts in the current study were not just provided to forms that the participants had knowledge of. Instead, in some cases, the participants could also notice from recasts something that was new to them, suggesting the flexibility as a type of corrective feedback. In example 27, the participant did not know the word for *calendar*; instead, she used *date book*. The recasts that followed it drew her attention to the reformulation (i.e. *calendar*).

Example 27

P: There is a *date, date, date book*.

I: There is a calendar.

P: Calendar in the, in the, on the wall, near the door.

Stimulated recall

P: I saw a calendar on the wall, but I didn't know how to say it in English. Then you gave me the right word for it.

In some cases, participants could not only notice the gap between what they knew and what the targetlike form was, but immediate learning might have taken place as a result of noticing the gap. This indicates that learners could indeed notice and learn new knowledge through recasts. In Example 28, the participant did not know how to say *fish tank*, and used *fish tub* instead. Her later stimulated recall report indicates that she used *fish tub* as a way to test her hypothesis. Example 29 shows a recast episode that occurred several moves after the recast presented in Example 28. In this example, the participant used *fish tank* in her utterance, suggesting that the learner had incorporated this lexical item in her memory.

Example 28

P: A *fishing tub* ...

I: Oh, a fish tank.

P: Oh, fish tank, a fish tank is on the shelf.

Stimulated Recall

P: Yes. I was thinking about how to say fish tank in English. At the beginning, I thought of using "puddle", and then I realized it was not the right word. Finally I used the word "tub", but I know it is not right, either. You told me how to say it.

Example 29 (from the same participant; several moves after Example 28)

P: There are two *glass* near the fish tank.

I: There are two glasses near the fish tank.

P: Yeah.

Stimulated recall

P: *I should say “two glasses” rather than “two glass”.*

7.2. Research Question 2

Research question 2 asked whether there was a relationship between Chinese EFL learners' noticing of recasts and the target structures of recasts (morphosyntactic structures vs. lexical and phonological structures). Results show that learners could notice the gap in lexical and phonological recasts more than they did in morphosyntactic recasts, while they noticed only the corrective function of morphosyntactic recasts more than lexical and phonological recasts. With regards to noticing the gap, the participants could notice the gap of morphosyntactic recasts 70.3% of the time, while they could notice the gap of lexical and phonological recasts 81.6% of the time. With regards to noticing only the corrective function of recasts, the participants could notice only the corrective function of morphosyntactic recasts 12.8% of the time, while they could notice only the corrective function of lexical and phonological recasts 7.2% of the time. In addition, the participants noticed other information (i.e., content or other information unrelated to noticing of recasts) of morphosyntactic recasts 16.9% of the time, while the percentage was 11.3% for lexical and phonological recasts, suggesting that the learners were more likely to perceive

morphosyntactic recasts as meaning or other information about recasts than lexical and phonological recasts.

Lexical and phonological recasts, therefore, led to more noticing of the gap than morphosyntactic recasts. The same finding has been reported in other studies that examined learner noticing by means of introspective methods (Carpenter et al., 2006; Gass & Lewis, 2007; Kim & Han, 2007; Kim, 2008; Mackey et al., 2000). There has been only one study (Egi, 2007b) that did not find a difference between noticing of morphosyntactic recasts and lexical recasts. In her study, Egi (2007b) found that the learners interpreted lexical and morphosyntactic recasts in similar patterns. Egi (2007b) differed from the current study and other studies mentioned above in that Egi's study provided recasts to only two types of morphosyntactic structures. The frequent and consistent provision of recasts that focused on only two morphosyntactic structures, according to Egi, might affect the salience of the recasts, thereby making the morphosyntactic structures as noticeable as lexical recasts.

The finding of the current study and others supports the view that the effectiveness of recasts differ "depending on the area of language (e.g., pronunciation or grammar)" (Nicholas et al., 2001, p. 752). In Carpenter et al.'s (2006) study, the researchers asked two groups of ESL learners to view video clips of NS-NNS interactions that included both recasts and noncorrective repetitions. One group watched the clips that contained learners' nontargetlike utterances and NS responses, while the other group watched the same clips which contained only NS responses. Carpenter et al. found that the group that watched clips including both non-targetlike utterances and NS responses outperformed the other group, but only when the recasts targeted phonological and lexical errors. Kim and Han (2007) also showed that Korean EFL learners reported recognizing the gap between the targetlike and non-targetlike forms more accurately for

phonological and lexical recasts than for morphological and syntactic recasts. In their study, they showed that phonological recasts led to recognition of gap at a rate of 90%, followed by lexical recasts at 55%, the morphological recasts at 48%, and the syntactic recasts at 31%.

The likelihood of lexical and phonological recasts to provoke more noticing of the gap than morphosyntactic recasts may be explained in terms of learners' natural inclination to give priorities to meaning when they processed the input they received (Mackey et al., 2000; Kim & Han, 2007; VanPatten, 1990, 1996). According to VanPatten (1990), the attentional system is limited in capacity, and attention is selective. Consequently, in meaningful communication, learners may direct their attentional resource first to lexical meaning, then to meaningful morphology, and finally to those communicatively redundant and less salient morphology. With regards to recasts, it is possible that the learner has to process the content of the recasts, and then move forward to process other aspects of them, such as the gap between what they said and what the recasts reformulated. However, noticing the gap or the corrective function of recasts may not be achieved due to learners' limited capacity in attention, and learners' processing of recasts may not continue after they have processed the meaning or content of the recasts. Because of the priority of meaning processing and limited capacity in attention, it is not surprising that learners may just interpret some recasts as content instead of corrective feedback. Mackey et al. (2000) and Kim (2008) yielded findings that support this view. Mackey et al. (2000) showed that their participants noticed only the semantic content of approximately 38% of all the morphosyntactic recasts. The current study, likewise, also found that the participants noticed the content or other information of more morphosyntactic recasts (18.4%) than lexical and phonological recasts (12.4%). In light of these findings, Long (2007) points out that recasts may work better for meaning-bearing items than for communicatively redundant, acoustically non-salient forms.

As the following examples show, participants failed to notice the corrective intent of morphosyntactic recasts but interpreted them merely from the perspective of semantic meaning. In example 30, the participant made an error in agreement, but she did not notice the erroneous part of her utterance; instead, she interpreted the recasts as content. In Example 31, the student had an error in aspect. However, the student seemed to be concentrating on the content and missed the reformulation of the recasts as well as her own error.

Example 30

P: You know in my province Hunan, there *is* four rivers, famous.

I: There are four rivers?

P: Um, yes.

Stimulated recall

P: *It's like ... you asked me about the rivers. I wanted to tell you some details about them. I wanted to tell you only the four famous rivers. I wanted to tell you that the Li River is very important to me, so I wanted to tell you this river first.*

Example 31

P: *The blackboard has a word "environment".*

I: There is a word on the blackboard.

P: There is a word.

Stimulated recall

P: I was thinking that in the picture, there are two words on the blackboard, rather than one.

Since meaning or content is a component of recasts, the priority to meaning processing is considered by Lyster (1998a; Lyster & Ranta, 1997; Panova & Lyster, 2002) as one of the sources of the ambiguity of recasts. According to Lyster, learners may fail to recognize the corrective nature of recasts, because they refer to the recasts as another way of saying the same thing or as a repetition of the original utterance. Regarding recasts as content, therefore, blocks learners' deeper processing of recasts.

Another explanation for the different noticeability of lexical and phonological recasts versus morphosyntactic recasts is the communicative value in these two types of structures. Mackey et al. (2000) and Carpenter et al. (2006) point out that learners could report a higher percentage of noticing the gap in lexical and phonological recasts than in morphosyntactic recasts because lexical and phonological items carry more communicative value than morphosyntactic forms. The more communicative value of lexical and phonological recasts, in turn, lead to more saliency than morphosyntactic recasts, and hence more noticeability (Carpenter et al., 2006; Han, 2008; Kim & Han, 2007; Lyster, 1998b; Mackey et al., 2000). According to Nicholas et al. (2001), communicative value of a linguistic item is relevant to the question of whether production and/or comprehension problems with the item would result in a communicative breakdown. Items with high communicative value are more likely to be noticed because a failure to comprehend the item may cause a communication breakdown, while items with low communicative value may go unnoticed as failure to comprehend the items would not disrupt the flow of communication. In other words, the choice of a wrong word to represent a meaning and the mispronunciation of a word may convey greater communicative value than a

morphosyntactic error that does not cause communication breakdown because they are redundant (e.g., third person singular, agreement, aspect, etc.) (Doughty & Williams, 2008; Mackey et al., 2000). Due to their different communicative value, lexical and phonological recasts and morphosyntactic recasts may also differ in the amount of attentional resources that is needed for noticing the corrective function of them (DeKeyser, 2012).

The difference in communicative value may also lead to different degree of learner involvement in negotiation (Kim & Han, 2007; Long, 2007; Mackey et al., 2000). Long (2007) has suggested that implicit feedback such as recasts may be relatively less effective when it targets non-salient, communicative redundant forms. Mackey et al. (2000) further argue that morphosyntactic recasts induced little negotiation between learners and their interlocutors. The lack of learner involvement makes it less likely for some important information processing to take place on the part of the learner. As a result, the learner cannot focus his/her attention on the linguistic features of the language (Egi, 2007a; Gass, 1997; Kim & Han, 2007; Mackey et al., 2000). On the other hand, the communicative value of lexical and phonological structures encourages the involvement of negotiation because the learner is responsible for fixing the communication breakdown which results from the error they made on the choice of words or pronunciation of words. Therefore, the learner's attention is easier to be drawn to the lexical or phonological item that caused the communication breakdown. This explains why learners were more accurate in recognizing the gap involved in lexical and phonological recasts, as illustrated in the following two examples. In these two examples, the participants could recognize their mispronunciation of words (i.e., stress of the word *mountain* and mispronunciation of the word *hug*) in their own utterances.

Example 32

P: The village is on the top of a [*mounTAIN*].

I: Oh, it is on the top of a [MOUNtain].

P: Yes, ah, [MOUNtain].

Stimulated recall

P: *My village is on the top of a mountain. You may feel a little strange. Indeed, my pronunciation of the word “mountain” is problematic, too. But I knew you could understand even though I mispronounced it.*

Example 33

P: They [*huge*] each other.

I: Hug?

P: Ah, yes, they hug each other.

Stimulated recall

P: *拥抱 (“hug” in English) is pronounced as [hʌg], not [ˈhjuːdʒ]. Huge is another word. They have different meanings.*

The difference between noticing of morphosyntactic and lexical and phonological recasts can also be attributed to the sensitivity that the learner has on these two types of structures (Robinson et al., 2012). During sentence processing, learners tend to be less sensitive to morphological items than lexical items (N. Ellis, 2006a, 2006b). This may be related to the difference in their perceptual salience, which has long been recognized in the SLA literature

(Bardovi-Harlig, 1987; Goldschneider & DeKeyser, 2001). In addition, since a learner utterance may involve more than one cue that serve the same form-meaning mapping (e.g., *yesterday* and *-ed*), the more salient cue can be more likely to be noticed. As a consequence, the noticing of the more salient cue will block the noticing of other cues (N. Ellis, 2006a, 2006b; N. Ellis & Sagarra, 2010). For example, the learner's noticing of *yesterday* in an utterance may block his/her noticing of the morphological form *-ed*. Another reason, according to N. Ellis (2006a), might be that learners may fail to attend to certain morphological or syntactic forms that are not available in their L1. For example, since Chinese does not have tense marker, agreement, and articles, L1 Chinese speakers may find it hard to notice the redundant morphological and syntactic structures and to acquire them.

Finally, the characteristics of recasts per se might contribute to the differential effects of morphosyntactic and lexical and phonological recasts in promoting noticing the gap. One of the characteristics of recasts is length of recasts. Philp (2003) and Egi (2007a) both examined length of recasts and its relationship to learners' noticing of recasts. Both studies found that length of recasts was significantly related to learners' accuracy in noticing the corrective nature of recasts. It is natural to expect that lexical and phonological recasts are shorter than morphosyntactic recasts. Because lexical and phonological recasts target individual words, phrases, or pronunciation of individual words, teachers or interlocutors tend to segment these items out from the whole utterance when they correct them. However, this may not always be the case for morphosyntactic recasts, because the correction of a morphological or syntactic structure may take more than one individual word. For example, when the learner made an error in word order, this whole erroneous utterance was likely to be repeated in a recast. Likewise, when an error

concerning subject-verb agreement occurred, the subject and the verb were likely to appear together in the recast.

Longer recasts tend to be more difficult to process in the learner's working memory. As Philp (2003) argues, longer recasts may need more attentional resources because they take more time and effort to rehearse, process and store, thus they are more difficult than shorter recasts to be kept in working memory (see also Cowan, 1988; Baddeley & Logie, 1999). Another shortcoming of longer recasts is that the learner may find it harder to locate the target of recasts (Carroll, 1999, 2001; Nicholas et al., 2001). Failure to locate the error makes it improbable for recasts to take effect. This may explain in part why the participants in the current study noticed only the corrective function of morphosyntactic recasts significantly more than lexical and phonological recasts. Given that the current study was conducted in a laboratory setting, learners might be more likely to treat their interlocutor's response to their utterances as a means to correct their errors. However, this could not help them to locate their errors. As a result, although they could recognize morphosyntactic recasts as corrective feedback, they still could not notice the gap, that is, identify their own errors or the target-like reformulations.

7.3. Research Question 3

Research question 3 addresses the relationship between noticing of recasts and learners' uptake in response to recasts. In the current study, uptake was categorized into modified output and non-modified output, because partial repair, a type of uptake that Lyster and Ranta (1997) coded as a part of needs-repair, is also likely to reflect learners' effort to modify their error as a reaction to recasts (Adams et al., 2011; Egi, 2010; Gass, 1997; Mackey, 2007a, 2012). Research question 3 was further divided into two sub-questions. Question 3-A asked about the relationship

between noticing of morphosyntactic recasts and modified output; while question 3-B asked about the relationship between noticing of lexical and phonological recasts and modified output.

The results indicate a similar pattern for morphosyntactic and lexical and phonological recasts in terms of modified output. First of all, regardless of target structures, the participants produced significantly more modified output than non-modified output when they noticed the gap. In other words, for recasts that were followed by modified output, it was significantly more likely that learners could notice the gap (in 77.8% of the modified output instances for morphosyntactic recasts and 84.7% of the modified output instances for lexical and phonological recasts). Second, regardless of target structures, the learners were more likely to notice only the corrective function of recasts when they did not produce modified output than when they produced modified output. Finally, for both morphosyntactic and lexical and phonological recasts, when the learners noticed *other* (i.e., the content or other information in recasts), they produced significantly less modified output.

These results suggest that learners' production of modified output is positively related to noticing the gap of recasts. However, when they noticed only the corrective function of recasts without being able to locate the error and/or target-like reformulation, or when they noticed only the content or other information of recasts that were irrelevant to their corrective nature, they tended not to produce modified output. The results, then, lend further support to Mackey et al. (2000), Egi (2010), and Kim (2008). Mackey et al. (2000) conducted a post hoc study to examine the relationship between learners' uptake and their perception of corrective feedback. They found that, for 66% of the feedback episodes with participants' modified output, their stimulated recall comments showed that they could identify the linguistic focus of the corrective feedback targeted. However, for 89% of the feedback episodes where participants did not provide

modified output, their comments indicated that they could not identify structures that were targeted by corrective feedback. Likewise, Egi (2010) found that for 21% of the recast episode where there was modified output, the learners' stimulated recall comments indicated that they noticed the gap of these recasts. In contrast, the learners could recognize the gap of only 8% of the recast episodes where the learners did not produce modified output. Kim (2008) also found a strong relationship between learners' successful uptake and recognition of gaps. In this study, learners could notice the gap for more than 61% of simple recasts with successful uptake and for more than 68% of complex recasts.

However, the findings of the current study were not consistent with those of Bao et al. (2011). Bao et al. found that there was no relationship between learners' noticing of recasts (measured through stimulated recall) and their uptake. The authors attributed their finding to the difference between laboratory and classroom settings. According to them, a classroom setting was characterized by the lack of individual attention and the little participatory demands, neither of which encouraged the learner to produce uptake. Therefore, uptake could underestimate learners' noticing of recasts in a classroom setting. In other words, the lack of uptake did not mean that learners had not noticed the corrective nature of recasts.

A scrutiny of the findings across these studies indicates that participants in these studies differed in the rate of noticing the gap. Bao et al. (2011) reported an uptake rate of 14.3%. Egi (2010) reported a percentage of noticing the gap for 21% of the recasts with modified output, Kim (2008) reported a much higher percentage, 61% and 68% for simple and complex recasts, respectively. The current study reported more than 77% and 84% for morphosyntactic and lexical and phonological recasts, respectively. The percentages Kim (2008) provided and those of the current study are consistent, if the settings of study (classroom vs. laboratory setting) are

taken into account. Both the current study and Kim were carried out in East Asian EFL contexts. Similar high percentages of uptake and repair were also reported in other studies that were conducted in similar EFL contexts (e.g., Sheen, 2004). Sheen (2004) found that in Korean college EFL classrooms, learners produced uptake to 83% of the corrective feedback provided to them, while they provided repair to more than 70% of the corrective feedback. It is noted that Sheen (2004) and Kim (2008) categorized learner response to recasts into uptake and repair, while the current study categorized responses to recasts into modified output and non-modified output.

The different rates of modified output or repair across instructional settings again support Lyster's (2007; Lyster & Mori, 2006) counterbalanced hypothesis. This hypothesis suggest that, in contexts that an L2 is taught and learned as knowledge, learners were more oriented to the form of language, and thus are more likely to notice the form and to provide uptake or modified output in response to error correction than learners in the immersion contexts or other meaning-focused contexts.

The high percentages of modified output for both morphosyntactic recasts and lexical and phonological recasts reported in the current study also suggests that recasts, like other types of corrective feedback such as prompts (Lyster, 1998a; Lyster & Ranta, 1997), can promote learner uptake, especially in specific instruction contexts such as Chinese and Korean EFL contexts. In terms of lexical and phonological recasts, learners produce modified output due to the need to fix communication breakdown and the high communicative values entailed in lexical and phonological items. In terms of morphosyntactic recasts, the high rate of modified output production may be related to the Chinese EFL learning environment. First of all, as also mentioned previously, EFL learners have rich metalinguistic knowledge of linguistic forms, as a

result of form-oriented examinations and of teaching of English as knowledge. Secondly, the culture of learning and the experience of teacher-centered EFL classroom (Cortazzi & Jin, 1996; Nunan, 2003) may also contribute to the high rate of modified output production. In such a context, given the expertise and the authoritative role of the teacher, learners tend to produce the correct form following corrective feedback as a way to show that they were disciplined and attentive to what the teacher had said (Cortazzi & Jin, 1996; Peng, 2007). That is to say, although Chinese EFL learners may not be very interested in communication, they tend to respond to teachers' or other interlocutors' corrective feedback as a way to show their obedience and cooperation. This may also help to explain why learners in other similar cultural contexts (e.g., Korean EFL contexts) tend to produce more modified output than those in other contexts such as the Canadian immersion programs (Sheen, 2004).

The following examples show that the participants could notice the gap of the recasts to which they provided modified output. These two examples indicate that when the participants noticed the gap between their non-targetlike form and the targetlike reformulation, they were likely to modify their error as a reaction to the recasts.

Example 34

P: Two people are *argue* about something.

I: Two people are arguing about something.

P: Arguing about something.

Stimulated recall

P: *You pointed out that I did not say “arguing”. I said “argue” and missed the –ing form.*
I must use present progressive.

Example 35

P: One student *is catching* the fish.

I: is trying to catch the fish?

P: trying to catching the fish.

Stimulated recall

P: *I was thinking, like, he is trying to catch the fish, but he has not caught it yet.*

The association between modified output and noticing the gap indicates that modified output may be beneficial for learning (Fujii & Mackey, 2009; Gass, 1997; Lyster, 1998a, 2007; Lyster & Ranta, 1997; Mackey, 2007a, 2012; Mackey & Abbhdul, 2005; Pica, 1996), although it is not necessarily equal to learning. There have been studies that provide empirical evidence of the relationship between learning and repair or successful uptake (e.g., Loewen, 2005; McDonough, 2005; Sheen, 2006). The relationship between modified output and learning can be interpreted in different ways. First of all, modified output may be a sign that the learner has noticed the corrective nature of recasts. In other words, the production of modified output means that the learner has turned their attention from the semantic processing to syntactic processing (Gass, 1997; Lyster, 2007; Swain, 1995, 2005). Besides the focal attention to the gap of a recast, other cognitive processes or mechanisms may also be activated, for example, inhibition of irrelevant information, retrieval of previous knowledge, and retention of the correction in long-term memory, so that the learner could modify, change, or strengthen their knowledge of the form that

was targeted by the recast (Mackey, 2012; Goo, 2012). Secondly, the production of modified output can be considered to be a kind of external rehearsal (Philp, 2003) which helps the learner to retain the information. Therefore, modified output gives the learner the time to process the information from the recast he/she received. Thirdly, modified output can be considered to be the result of learner's noticing of recasts. That is, noticing of recasts triggered a variety of processes and mechanisms in working memory, and the deeper processing of recasts may lead to the production of modified output, which is a new hypothesis that the learner produces in order to test and retest it (Gass, 1997; Swain, 1995).

Since recasts were provided during meaningful interaction, learners' production of modified output can also provide an opportunity for learners to proceduralize their knowledge (Gass, 1997; Lyster, 1998a; Swain, 1995). This view conforms to DeKeyser's (1998, 2006, 2007) skill learning theory. As also mentioned elsewhere, meaningful practice of forms is necessary for the learner to proceduralize their declarative knowledge and reach the ultimate stage of fluency and automaticity. The proceduralization of knowledge is a slow and long process which is characterized by constant errors. The provision of corrective feedback can help the learner to gradually make fewer errors during their practice, and modified output following corrective feedback can be an important practice that plays a role in reducing the occurrence of errors.

However, Lyster (2004, 2007; Ranta & Lyster, 2007) argues that different types of corrective feedback might differentially effective in the proceduralization of knowledge. As Lyster points out, prompts encourage learners to produce more modified output and deeper syntactic processing, while recasts cannot because they afford both negative and positive evidence and they do not require learners to respond. The findings of the current study did not support Lyster's view. First of all, in the Chinese EFL context, as well as in other EFL context

(e.g., Kim, 2008; Kim & Han, 2007; Sheen, 2004) and ESL context (Ellis et al., 2001a), learners did produce a high rate of modified output. Secondly, the current study as well as other studies (Egi, 2010; Kim, 2008) provided evidence that modified output following recasts indicates that learners had noticed the gap of the recasts they received. The current study provided further evidence that this was the case for both morphosyntactic and lexical and phonological recasts. These findings suggest that modified output in response to recasts, as that in response to prompts, is the result of deep processing of form in learners' cognitive system. Therefore, skill learning theory can also be applicable to recasts.

As mentioned earlier, the current study only found a positive relationship between modified output and noticing the gap. In terms of noticing only the corrective function of recasts, an opposite finding was obtained. In other words, learners were less likely to notice only the corrective function of recasts where there was modified output than to notice the corrective function of recasts where there was no modified output. One explanation is that for recasts which learners provided modified output to but which they did not notice the corrective function of, the provision of modified output, as Gass (2003) emphasize, is only a parroting or repetition without any processing of form. Modified output without noticing cannot be a sign of noticing, and therefore is limited in benefiting learning. In Example 36, the learner made an error in aspect. She repeated the recast. However, in the stimulated recall interview, she reported that she did not notice anything.

Example 36

P: The two of them are *sit, sit* together.

I: two of them are sitting together?

P: Yeah, sitting together.

Stimulated recall

P: *I was not thinking about anything then.*

In Example 37, the participant made an error in the usage of preposition. The student also provided modified output after her error was corrected. However, although the student produced modified output, she did not seem to realize that she made an error, not to mention noticing the gap.

Example 37

P: *In* the right of the blackboard, two words.

I: two words on the right of the blackboard?

P: on the right.

Stimulated recall

P: *You said there were words that are on the blackboard.*

Since the current study integrated repair and partial repair into one category (i.e., modified output), it is of interest to compare whether the quality of repair made any differences in relation to learners' noticing of recasts. As far as I know, there has been only one study that has tackled this issue (Egi, 2010); therefore, the current study made a similar examination of the quality of modified output and learners' noticing of recasts. The results show different patterns between morphosyntactic and lexical and phonological recasts. With regards to morphosyntactic recasts, when learners noticed the gap, they tended to produced more targetlike modified output (80% of

the time). However, when they noticed only the corrective function of recasts, they were more likely to produce non-targetlike modified output. With regards to lexical and phonological recasts, no difference was found in the three categories of noticing. This suggests that the learners perceived lexical and phonological recasts in a similar fashion when they produced modified output regardless of the targetlikeness of the modified output. The finding in the case of lexical and phonological recasts is consistent with Egi (2010), who also found no difference in learner perceptions for cases of target-like and non-target-like modified output. The finding concerning lexical and phonological recasts may indicate that “learners could deepen their initial understanding of recasts in the process of error modifications even if the linguistic outcome was not target-like” (Egi, 2010, p. 15). As to the morphosyntactic recasts, it is possible that, because learners had already familiarized themselves with the metalinguistic knowledge of many of the forms that were targeted by recasts, they could notice the gap and re-modify the error in a target-like fashion once they received recasts. However, if they could not notice the gap involved in the recasts they received, they would produce non-target-like modified output because they were either not familiar with the form or not able to locate the error. Consequently, they would produce more non-targetlike modified output when they noticed only the corrective function of morphosyntactic recasts.

The role of uptake is one of the major debates in the area of interaction research. Some researchers argue for the positive role of uptake (e.g., Lyster, 1998a, 1998b; Lyster & Ranta, 1997; Panova & Lyster, 2002; R. Ellis & Sheen, 2006), while others play down the role of uptake (e.g., Long, 1996, 2007; Long & Robinson, 1998). In terms of uptake to recasts, the focus has been on whether recasts promote uptake (Lyster & Ranta, 1997; Sheen, 2004) and whether uptake to recasts is beneficial to learning (Loewen & Philp 2006). The debate is continuing,

given the small number of studies that examined the relationship between recasts and noticing (Bao et al., 2011; Egi, 2010; Kim, 2008; Kim & Han, 2007; Mackey et al., 2000), on the one hand, and the relationship between uptake and learning (e.g., Loewen & Philp, 2006), on the other hand. The findings of the current study support the positive relationship between modified output and noticing the gap, indicating that modified output may be potentially beneficial for L2 learning. In addition, it is suggested that when addressing this issue, it is necessary to take into consideration a variety of factors, such as context, target structure, operationalization of uptake and noticing, and characteristics of recasts.

7.4. Research Question 4

Research question 4 asked whether there is a relationship between Chinese EFL learners' individual differences in their working memory capacity and their noticing of recasts. The question was divided into two sub-questions, one was concerning the relationship between working memory capacity and noticing of morphosyntactic recasts, and the other was concerning the relationship between working memory capacity and noticing of lexical and phonological recasts. Results of simple linear regression analyses show that, regardless of target structures, learners' working memory capacity, as measured through the L1 Chinese reading span test, was not related to (1) learners' ability to notice the corrective nature of recasts (including both *noticing only the corrective function of recasts* and *noticing the gap*), and (2) learners' ability to notice the gap of recasts.

Despite the increasing interests in investigating the effects of individual differences in working memory capacity on L2 learning through interaction (Juffs & Harrington, 2011; Williams, 2012), there have been few studies that linked working memory with learners' linguistic development through recasts or other types of corrective feedback (e.g., Gass et al., in

press; Goo, 2012; Mackey et al., 2002; Révész, 2012; Sagarra, 2007). Studies have been fewer that examined how working memory capacity is related to noticing of recasts (Mackey et al., 2002; Trofimovich et al., 2007). Furthermore, these studies yielded conflicting findings. Mackey et al. (2002) found a positive relationship between noticing of recasts and working memory, while Trofimovich et al. failed to relate working memory with noticing of recasts. The findings of the current study, then, lend support to Trofimovich et al. In their study, Trofimovich et al. examined the relationship between working memory, analytic ability, and attention control, on Francophone ESL learners' noticing of recasts and learning of three target structures: English possessive determiners, intransitive verbs, and transitive verbs. They found that neither working memory capacity nor phonological short-term memory was related to noticing of recasts and production accuracy for any of the target structures. The authors attributed their findings to the high salience and predictability of the recasts that were provided to the participants during the communicative task. During the treatment, each learner utterance was followed by a native speaker response, regardless of whether or not an error occurred. Another reason was the use of working memory test. In their study, Trofimovich et al. measured learners' working memory by means of Wechsler's (1997) L1 Letter-Number Sequencing Test, which might not be related to learners' ability to maintain information in a readily accessible state and to simultaneously process incoming information (Sagarra, 2007).

Mackey et al. (2002) did find an effect of working memory on learners' noticing of recasts. In this study, Mackey et al. investigated the relationship between working memory capacity, noticing of recasts, and Japanese-L1 learners' learning of English question formation through recasts. Working memory capacity was measured through an L1 and an L2 listening span test. Noticing of recasts was measured through stimulated recall interview and exit questionnaire.

Mackey et al. found a near-significant correlation between noticing and the composite score of working memory and phonological short-term memory, although individual L1 or L2 working memory test was not related to noticing. Based on their findings, Mackey et al. suggest that high span learners were more likely to notice recasts than low-span learners. In other words, individual differences in working memory capacity may well mediate the extent to which L2 learners benefit from recasts. However, it is noted that the composite score of different memory tests blurs the effect of working memory capacity, because it was not clear what construct composite scores reflect⁴¹.

Although other studies (e.g., Goo, 2012; Sagarra, 2007) examined the relationship between working memory and learning rather than noticing, they also attributed the effect of working memory capacity to its importance in the control and manipulation of attention. For example, Goo (2012) examined how individual differences in L1 Korean English learners' working memory capacity (measured through L1 reading span test) and the role of recasts and metalinguistic feedback in their learning of English that-trace filter. Goo found that working memory was related to learning only for those who received recasts as corrective feedback, while it did not affect learning for those who received metalinguistic feedback. Goo speculated that cognitive control of attentional resources was needed for the learners to engage in cognitive comparison when they were provided with recasts. In addition, noticing the gap through a cognitive comparison is most likely to occur when a learner's initial erroneous utterance is stored in a readily accessible state so that the learner could retrieve it and compare it to the incoming target-like reformulation in a recast. High-span learners, therefore, may outperform low-span learners in their maintenance and retrieval of the previous erroneous utterance.

⁴¹ This point was made based on a comment from Susan Gass.

Much emphasis has been laid on the relation between attention and working memory in some major models of working memory (e.g., Baddeley, 1986, 2007; Cowan, 1995, 2003, 2005; Kane et al., 2007). The most important system in working memory, the central executive, is considered to be an attentional-control system in that it is responsible for all the attention-related processes and mechanisms in working memory. For example, the central executive (1) coordinates and controls the encoding of incoming information and retrieval of information from long-term memory (Baddeley, 2007), (2) maintains and recovers access to information that is closely related to tasks while inhibiting access to irrelevant information, and (3) activate or focus attention on elements of internal and external information (Cowan, 1999, 2001, 2005). Interactionist researchers have related learners' learning and noticing of recasts to their individual differences in working memory capacity (Doughty, 2001; Mackey, 2012; Philp, 2003). Therefore, it may seem to be odd that the current study and some other studies (e.g., Gass et al., in press; Trofimovich et al.) did not find a significant relationship between learners' working memory capacity and the noticing of recasts.

One possible explanation concerns the previous knowledge of the structures that recasts targeted. In the current study, recasts were provided extensively and incidentally to errors made by the learners. However, in other studies (Goo, 2012; Mackey et al., 2002; Sagarra, 2007), recasts were provided to only one predetermined target structure. Mackey et al. (2002) selected English question formation, Goo (2012) provided recasts to errors in that-filter, and Sagarra (2007) provided recasts to Spanish noun-adjective agreement. One criterion for the selection of target structures in these studies was that their participants did not master the target structure well, so that they did not have a sufficient declarative or procedural knowledge of the structure. For example, Sagarra (2007) excluded participants from data analysis who were below 25%

accuracy on a pretest of the target structure to control for previous knowledge of the target structure. Those whose scores were at or above 80% accuracy on written post-tests were also excluded to ensure that lack of knowledge of the target nouns and adjectives did not affect the results. Furthermore, the target structures of these studies may involve complex syntax. Complex syntactic structures might require more attentional resources from working memory than surface-level structures. In their study, Gass et al. (in press) did not find a significant relationship between their participants' working memory capacity and their learning outcome, and the researchers attribute their finding to the fact that the target structure, Italian gender agreement, was a surface level structure.

In contrast to the previous studies, learners in the current study appeared to be familiar with most of the structures that were targeted by recasts during the completion of interactive tasks. This can be shown by the high percentage of noticing the gap of both morphosyntactic (70.3%) and lexical and phonological recasts (81.6%). In addition, the participants' reports of their perception of recasts from stimulated recall interview also showed that when they noticed the gap of recasts, they could identify and recall the metalinguistic knowledge of the structures to which recasts were provided. This suggests that the participants had retained at least the declarative knowledge of these structures.

The degree of familiarity with previous knowledge is an important factor that mediates the effect of working memory (Cowan, 2005). According to Cowan (2005), if an individual is familiar with a long-term memory representation, then the individual may require little attentional resources in retrieving the representation to assist in the performance of a short-term memory task. Noticing the gap may require the coordination of a variety of processes or mechanisms within the control of the central executive, for example, maintaining the erroneous

utterance and the reformulation long enough to access focal attention, switching attention from meaning to form, retrieving relevant long-term memory representations, and modifying original procedural knowledge (Doughty, 2001; Gilchrist & Cowan, 2010; Révész, 2012). Given their familiarity with the knowledge of linguistic forms, whether a learner is high or low in working memory capacity may not affect their noticing of the gap of recasts because their previous knowledge has mitigated the requirement of the attentional resources. Since most studies on the relation between working memory and recasts focused on a limited number of target structures that were less familiar to the learners, the effect of previous knowledge of the target structures was not apparent. However, studies in other areas of SLA, such as L2 reading, did find the interaction between familiarity with previous knowledge and the effect of working memory on reading comprehension (see summary in Alptekin & Ercetin, 2011). As R. Ellis and Sheen (2006) point out, recasts are especially beneficial for structures that the learner has already had some knowledge of. How familiar the learner is with the knowledge of a structure, as the present study shows, may affect their noticing of the gap of recasts (Gass, 1988, 1997; Schmidt, 2001). It can also facilitate the proceduralization of this knowledge, given that noticing of the gap in recasts takes place in meaning-based interaction (DeKeyser, 2007). Révész (2012) provided empirical evidence that supports this view. In her study, Révész found that recasts were more effective in facilitating learners' development of their procedural knowledge instead of their declarative knowledge. More importantly, this finding demonstrates that, in contrast to Lyster's (2007) suggestion, recasts play an important role in proceduralizing learners' knowledge in such a way that the learner could use their knowledge more fluently, effortlessly, and accurately.

Another explanation is the interaction between working memory and the environment (Cowan, 1999, 2005; Dörnyei, 2009). The current study was carried out in a laboratory setting.

The laboratory setting created an environment in which there was less disrupting information than a classroom setting. Therefore, little attentional resources are needed to be allocated to the inhibition of irrelevant information. Learners' requirement for working memory resources may also be minimized in a laboratory environment because of the individual attention (Han, 2002), consistent provision of recasts (Trofimovich et al., 2007), and a tendency to attend to the form that was targeted by recasts (Han, 2002; Mackey, 2012). Compared with a laboratory setting, a classroom setting provides an environment that is full of interruptive cues that may distract learners' attention. The differences between a laboratory and a classroom setting, therefore, can explain why learners were more likely to notice the gap involved in recasts in a laboratory setting than in a classroom setting.

The final explanation is that working memory is only one of the many aptitudinal abilities that may affect noticing. The study of working memory is believed to help our understanding of the role of cognitive systems in SLA (Dörnyei, 2009). However, Robinson (2002) points out that working memory alone cannot be equated with language aptitude. In Skehan's (2002) information-processing model, learners' noticing of input is affected by a number of aptitudinal abilities, including working memory and phonemic coding ability. Likewise, Robinson's (2002, 2007) aptitude complex model suggests that noticing of recasts involves working memory, phonological short-term memory, perceptual speed, and pattern recognition. In addition, it is noted that aptitude is only one area of the cognitive system in SLA (Dörnyei, 2009). Factors from other areas, such as learning styles, learning strategies, motivation, anxiety, and so forth, may also affect learners' attention to recasts.

There have been some studies that found a relationship between other aptitudinal abilities and learning through interaction. For example, Révész (2012) found that learners' individual

differences in phonological short-term memory were a better predictor of learning through recasts than their working memory capacity in terms of oral test gains. Gass et al. (in press) also found that the Stroop Test, which measured learners' inhibitory ability, predicted L2 learners' learning outcome, while their working memory capacity did not. DeKeyser (1993) found that learners with high previous achievement, high language aptitude, and low anxiety benefited the most from error correction, indicating an interaction of aptitudinal abilities and anxiety in affecting learners' learning through interaction. In consistence with DeKeyser's finding, Sheen (2008) revealed that learners with high level of analytic ability benefited more from corrective feedback (i.e., recasts and metalinguistic feedback). Likewise, Sheen (2007) found that there was a significant correlation between learners' attitudes towards corrective feedback and their immediate gains, suggesting that learners' attitude can also be a factor that affects learners' learning through error correction. In short, various aptitudinal abilities may play a role in affecting learners' noticing of recasts, and their effect can also be constrained by other social and/or environmental factors (Dörnyei, 2009; Schmidt, 2001).

7.5. Theoretical implications

The current study based its theoretical framework on the Interaction Approach. The Interaction Approach asserts that the interaction that learners engage in can promote learning because interactional strategies such as corrective feedback can promote learners' noticing of the form(s) involved in meaningful messages (Gass, 1997, 2003; Long, 1983, 1996, 2007; Pica, 1994, 1996). As the most frequently used type of corrective feedback, recasts have attracted more and more attention in the research area of L2 interaction. However, researchers do not concur with regards to (1) whether recasts can promote noticing (Doughty, 2001; Long, 1996, 2007; Lyster, 1998a, 1998b, 2004; Lyster & Ranta, 1997); and (2) whether modified output in

response to recasts is a sign that learners have noticed the corrective nature of recasts (Lyster, 1998a; Lyster & Ranta, 1997; Mackey & Philp, 1998; Sheen, 2004).

The current study attempts to shed some light on these two controversial issues by examining Chinese EFL learners' noticing of recasts and its relationship to modified output. The findings of the current study reveal some important theoretical implications. First of all, the current study extends our understanding of how recasts are perceived by Chinese EFL learners by tapping into their own interpretation of recasts through their introspective reports. Furthermore, their interpretation of recasts was analyzed with regards to the different types of information they perceived of recasts. Therefore, the study made an effort to provide empirical evidence for the debate of whether recasts promote learner noticing and what information in recasts learners can notice, if they do notice recasts. The findings of the study revealed that, for more than 80% of the recasts they received, the learners could recognize the corrective nature of recasts (i.e., noticing only the corrective function of recasts + noticing the gap), and for approximately 70% of the recasts, they could notice the gap involved in recasts. The rates of noticing the corrective nature of recasts and noticing the gap were higher than those reported by some studies (e.g., Carpenter et al., 2006; Egi, 2007a; Roberts, 1995), but they were similar to those of some other studies (e.g., Kim, 2008; Philp, 2003). These findings, thus, adds supports to the view that recasts can promote learner noticing of the gap (Doughty, 2001; Long, 1996; Long & Robinson, 1998). However, since this study was carried out in the Chinese EFL context, it is possible that this context may be more conducive to learners' noticing of recasts than other learning contexts, as some researchers suggest (e.g., Li, 2010; Lyster, 2007; Lyster & Mori, 2006; R. Ellis & Sheen, 2006; Sheen, 2004). In addition, the current study differs from many previous studies that examined learners' noticing of recasts in that recasts in the current study were

provided extensively and incidentally, rather than intensively focusing on a limited number of target structures. The findings of the current study, then, may shed some extra light on how learners perceive recasts that are provided incidentally.

Detailed analyses of learners' noticing of recasts also indicated that learners' noticing of recasts was constrained by the type of linguistic structures to which recasts were provided. The findings of the current study revealed that learners were more likely to notice the gap when recasts were provided to lexical and phonological recasts than when recasts were provided to morphosyntactic recasts. The learners were also more likely to notice information irrelevant to the corrective nature of morphosyntactic than of lexical and phonological recasts. This finding, therefore, provides further empirical support to many previous studies indicating a discrepancy between morphosyntactic recasts, on the one hand, and lexical and phonological recasts, on the other, in terms of the promotion of learner noticing (Carpenter et al., 2006; Kim & Han, 2007; Mackey et al., 2000). Moreover, this finding suggests that the corrective nature of some recasts in response to morphosyntactic errors, due to their multiple components, low communicative value or saliency (Carpenter et al., 2006; Mackey et al., 2000), redundancy (N. Ellis, 2006a, 2006b), and their similarity in form to other non-corrective interaction strategies (Lyster, 1998a), may not be noticed by the learner. What the learner noticed could only be the content of recast or other forms than the one(s) targeted by recasts.

The findings of the current study also shed some light in our understanding of the relationship between learners' noticing of recasts and their production of modified output. Lyster (1998a, 1998b; Lyster & Ranta, 1997) argues that recasts are less likely to promote learner production of uptake than prompts. Lyster (1998a, 2007) further argues that uptake in response to recasts do not involve as deep a processing as prompts do. However, the current study found

that the Chinese EFL participants could not only produce a high percentage of modified output, but also notice the gap of the recasts to which they provided modified output. In other words, for the recasts where learners produced modified output, learners were more likely to notice the gap. This finding suggests a significant and positive relationship between modified output and noticing of recasts. It also suggests that learners' production of modified output is possibly the result of deeper processing. This finding, therefore, contributes to the debate over the role of modified output to recasts in that it provides empirical evidence indicating a positive role of modified output. In addition, the finding adds supports to the findings of the few studies that examined the relationship between modified output and noticing of recasts (Egi, 2010; Kim, 2008; Mackey et al., 2000; cf. Bao et al., 2011).

Finally, the current study attempted to address the role of learners' working memory capacity in affecting their noticing of recasts. The finding revealed that working memory was not related to noticing the corrective nature of recasts, on the one hand, and noticing the gap of recasts, on the other. The finding was in conflict with other studies that explored working memory and noticing (e.g., Mackey et al., 2002) and studies that examined working memory and learning through recasts (e.g., Goo, 2012; Mackey et al., 2002; Sagarra, 2007), but is in line with Trofimovich et al. (2007) and Gass et al. (in press). It suggests that when considering the role of cognitive mechanisms and noticing through corrective feedback, working memory may not be the only mechanism that affects learners' noticing. Learners' noticing of recasts might be affected by a variety of other aptitudinal components, and these components tend to interact with each other. Moreover, learners' previous knowledge of the forms that recasts are focused on, as well as the environment where recasts take place, can also mediate the effect of working memory (Baddeley, 2007; Cowan, 1999, 2005).

7.6. Pedagogical implications

The current study was conducted in a laboratory setting in the Chinese EFL context. Given the experimental nature and its specific context, one needs to be cautious in drawing pedagogical implications of the current study when they apply them to classroom settings or other pedagogical contexts.

First of all, this study suggests that, during the completion of meaning-oriented interaction learners could successfully perceive recasts as corrective feedback, and they could also successfully recognize the gap involved in recasts. In addition, this was the case regardless of the type of structures that recasts targeted. It is noted that the consistent provision of recasts and the individual attention to learner errors in a laboratory setting might render recasts more salient, thereby leading to a greater sensitivity to and noticing of the corrective function of recasts. In classroom teaching, teachers may possibly find recasts more effective if they provide this type of corrective feedback in a more consistent manner.

The culture of learning and form-oriented teaching and testing may be important contributors to the high rate of noticing the gap of recasts, because learners have had the declarative and/or procedural knowledge of the forms that recasts were focused on. Making errors when learners practice their knowledge is common because the process of proceduralization of their knowledge is error-prone (DeKeyser, 1998, 2006, 2007). To help learners develop targetlike proceduralized knowledge, corrective feedback, including recasts, should be provided when learners practice their knowledge. However, given that learners in EFL context do not have many opportunities to practice their linguistic knowledge, the proceduralization of their knowledge becomes especially slow and difficult. In addition, practice of linguistic knowledge should be meaning-oriented; decontextualized and form-oriented

practice in which EFL learners engage does not help with the proceduralization of knowledge because knowledge practice in this way is not readily accessible in meaning-oriented contexts (Lightbown, 2008). Corrective feedback, according to Lightbown (2008), should also be provided in meaning-oriented contexts, because it is likely to be most effective if it occurs when learners know what they are trying to express in meaningful communication. However, given the form-oriented and test-oriented learning, learners may be less inclined to practice and develop their communicative competence. As a result, in EFL contexts, teachers should provide more opportunities to engage students in meaning-based practice and provide corrective feedback when errors occur. Students also need to create more opportunities for meaning-based practice on their own so as to improve their proceduralization of their linguistic knowledge.

Another implication concerns the difference between morphosyntactic recasts and lexical and phonological recasts in promoting noticing the gap. With regards to the finding that morphosyntactic recasts do not lead to as much noticing of the gap as that of lexical and phonological recasts, it is suggested that, when providing recasts to learners' morphosyntactic errors, teachers need to consider using recasts that are on the explicit side of the implicit-explicit continuum. For example, they could make the recasts shorter. In so doing, recasts can be more salient so that learners could more easily notice their error or the target-like reformulation in recasts. The recasts can also be provided in a declarative rather than an interrogative form to make them more recognizable.

The current study found that modified output was related to noticing the gap of recasts. As a special form of output, modified output also functions as a way of practice that helps to make learners' use of knowledge in a more fluent and accurate way. In addition, modified output in response to recasts may provide learners with extra time so that they can have a deeper

processing of the form targeted by recasts. Finally, the provision of modified output indicates that the learner makes an attempt to test a new hypothesis as a result of processing the recasts they received. Given the role of modified output plays in promoting the effect of recasts, it is suggested that when teachers provide recasts, they should give an opportunity for the learners to respond to the recasts and also provide modified output. In other words, teachers need to encourage learners to produce modified output when they receive recasts.

7.7. Limitations of the study and directions for future research

The design of the current study presented a number of limitations. As Han (2007) points out, “any excessive concern to allege or show a relationship between an empirical study and classroom practice may be counterproductive to research and practice” (p. 391). Likewise, the findings in the current study cannot be simply generalizable to other learning environments or conditions without caution and careful consideration. First of all, the current study was conducted in a laboratory setting where the provision of recasts and other types of corrective feedback as well as the opportunities given to learners to produce uptake were tightly controlled. In addition, the learners received recasts that were relatively consistent in interaction with their interlocutor, and they received individualized attention in such one-on-one interaction. The consistent use of recasts may make recasts more salient for learners to recognize their corrective nature. In contrast, in a classroom setting, the teacher has more freedom to choose whatever corrective feedback that he/she thinks is more appropriate. Learners may not receive personalized attention from the teacher, and their attention to corrective feedback can be distracted by more environmental variables. Therefore, the implications of the current study may not be directly relevant to a classroom setting. Another limitation with regards to the generalization of findings concerns the sample of the study. The participants were all students

who majored in English as a foreign language from a college in a southern province of China. Consequently, the findings may not be applicable to learners of English from other contexts (e.g., ESL context, immersion program, or EFL contexts in other countries). They may not be applicable even to learners from colleges in other regions of China due to their cultural and economic variations (McKay, 2002). It may also not be generalized to learners of other L1 backgrounds and learners who are not receiving formal classroom instruction. Learners in different context might show different tendencies in their perception of recasts and in their learning of linguistic forms through recasts.

The second limitation concerns the monotony of the interactive tasks the current study used to elicit recast data. In the current study, the only type of tasks was one-way information exchange task. In such tasks, the learner holds all the information and transfer the information to his/her interlocutor. What the interlocutor does is to negotiate meaning and to provide recasts. This type of task, then, may make it easier for the learner to attend to the form and to produce uptake (Robinson, 2001, 2005, 2008). Future research in this line can include other types of interaction tasks.

Another limitation is that the current study did not measure the participants' learning through recasts so that it was not able to examine the effect of noticing of recasts on their learning outcome. Although noticing is an essential step towards learning, it is not equal to learning. Future research may include a measure of learning through recasts to examine the relationship between noticing and learning outcomes. However, to studies that examine noticing of and learning through recasts that target errors that occur incidentally in treatment tasks, some problems need to be considered. The first problem is that it is not likely to administer a pretest to participants since it is not possible to know before the treatment what errors learners would make.

To solve this problem, researchers of future studies could observe the class of the potential participants and determine the linguistic features in which learners commonly make errors. They can also consult the teachers of the participants about the commonly occurring errors learners make in their class (Kim, 2008). The observation and consultation with teachers can help the researcher to identify those features of language that the learners may have limited knowledge of. Then, based on their observation, they could design a pre-test that consist of a range of linguistic features and administer it to the participants. Nassaji (2009) provides an alternative to the above way of designing pre-tests. Nassaji first gave participants a task requiring them to write a passage on a topic that was similar to the topic of the following oral interaction. Nassaji used the writing task as a pre-test, and compared learners' performance in the writing task to the post-tests that were designed on the basis of the errors learners made both in the writing task and the oral interaction.

However, most studies that measured the effect of corrective feedback that were provided incidentally on learner errors did not pre-test the participants (e.g., Loewen, 2005; Nabei & Swain, 2002). Instead, they only employed tailor-made tests that were designed based on feedback learners receive on any form that occurred during interaction and administered them to the same learners after interaction. One limitation of tailor-made tests is that it is difficult to know whether the learner has really learned the forms through corrective feedback due to the lack of a pre-test (Loewen, 2005). As Loewen and Philp (2006) point out, "in the absence of pretests, such measures cannot provide information about learners' previous knowledge of the forms and, thus, cannot differentiate between the acquisition of new knowledge and the consolidation of latent knowledge" (p. 452). Given these limitations, it is suggested that future

research should find a reasonable way of pre-testing the forms that were incidentally targeted by corrective feedback in interaction.

In addition to the question of whether or not to include a pre-test, research that explores the relationship between noticing of recasts to errors that occur incidentally and learning has another problem to address. This problem concerns the validity of the post-tests, usually tailor-made posttests. In recent years, more and more studies have employed introspective methods to measure learners' perception of recasts. These methods include immediate verbal reports (e.g., Egi, 2007a; Philp, 2003) and stimulated recall (e.g., Egi, 2010; Mackey et al., 2000). These introspective methods, especially stimulated recall, have been found to provide the participants with a learning opportunity (Kim & Han, 2007; Nabei & Swain, 2002). According to Nabei and Swain (2002), stimulated recalls "are a process of comprehending and reshaping experience – they are part of what constitutes development and learning" (p. 110). If posttests are administered after stimulated recall interview, it is possible that the stimulated recall might assist the participants in recognizing the corrective features of recasts to which they had not noticed during the interaction. The second thought that occurred during the stimulated recall, therefore, may jeopardize the validity of the posttests. Given these considerations, future researchers need a careful consideration when they want to measure learning and noticing by means of introspective methods simultaneously.

Another limitation is related to the method that the current study employed to measure learners' noticing of recasts. To maximize the validity of the stimulated recall interview, the current study conducted the interview immediately after the interaction. The participants were provided with a careful training and they could use the L1 Chinese during the interview. In addition, the interviewer tried to limit the prompt questions only to the information that the

participants had attended to. However, the retrospective nature of stimulated recall makes it impossible to guarantee that what the learners reported in the stimulated recall was a real reflection of their actual thoughts at the moment when the recasts occurred during the interaction. First of all, some students may have forgotten what they were noticed about the recasts during their completion of the interaction tasks. To cater to the intention of the researcher, they might fabricate their thoughts. Secondly, what some participants reported might be their second thought they had at the time the stimulated recall interview was being conducted. In other words, what they thought at the stimulated recall interview was not the same as what they thought at the time when they received the recasts. Finally, the prompts of stimulated recall (i.e., the video of the participants' interaction) may trigger learners' noticing of recasts. That is, by watching the video, the participants could notice the corrective nature of some recasts, although they did not notice it at the time when they received the recasts during the completion of interactive tasks. As mentioned earlier, the interactive tasks lasted about 31 minutes on average. Given the limited capacity of working memory, the stimulated recall interview might be constrained in their ability to elicit learners' report of something that they might have noticed 20 or 30 minutes ago. Likewise, it may also be the case that, although the learner reported that he/she forgot or did not notice anything in the stimulated recall, it did not necessarily mean that the students did not notice the recasts at the time of task completion (Mackey et al., 2000). There are other factors that may influence learners' reports, for example, fatigue after a long time of interactive activities and stimulated recall, a lack of interest, unwillingness to articulate their experience, and so forth.

One way to resolve the limitation of stimulated recall interview, and also a way that future research can adopt, is to employ other introspective measures in addition to stimulated recall.

The triangulation of data can make learners' noticing of recasts more valid and convincing. For example, Mackey (2006a) used not only stimulated recall interview to measure learners' noticing, but also other methods such as diaries and post-study questionnaire. Kim and Han (2007) also employed both oral and written stimulated recall. Egi (2007a), on the other hand, made use of both immediate verbal reports and stimulated recall.

One feature that differentiates the current study and most previous studies is that, in the current study, the researcher interlocutor was a non-native-speaker (NNS) of English. The engagement of a NNS interlocutor in interaction with participants may shed some new lights in our understanding of learners' perception of recasts (Mackey, 2006). However, since the researcher served as the interlocutor as well as the interviewer in the stimulated recall interview, it is unavoidable that the behavior of the researcher as an interlocutor and interviewer might negatively affect the data-collection process to some extent. In addition, Fujii and Mackey (2009) found in their study that NNS interlocutors might provide ill-formed recasts to the participants, so not all recasts that NNS interlocutor generated contained positive evidence. The use of NNS-interlocutors is a new move in interaction research (Mackey, 2006), but future studies can engage their participants in interaction with their NNS peers who are similar or different in their proficiency levels. In addition, it may be important to examine the influence of ill-formed recasts, if any, on learners' L2 development.

The various characteristics of recasts have been considered to affect the salience of recasts, which in turn lead to different degrees of learner noticing or perception of their corrective function (Loewen & Sheen, 2006; Sheen, 2006). In the current study, recasts were provided to the participants without control of their characteristics, but it turned out that recasts provided to morphosyntactic recasts tended to be long while lexical and phonological recasts were relatively

shorter. Future research may examine the effects of these characteristic on learners' noticing of recasts that are incidentally and extensively provided to them.

The current study classified recasts into morphosyntactic recasts, on the one hand, and lexical and phonological recasts, on the other. Categorizing recasts in such a simple way could only provide a coarse-grained and general picture of learners' noticing of recasts. Some researchers have provided evidence that even morphosyntactic structures per se can vary in their noticeability (DeKeyser, 2005; Long et al., 1998; Mackey, 2006a). For example, Mackey (2006a) found that the participants were more likely to notice English question forms than past tense forms. The different levels of noticeability that result from types of target structures are related to an array of factors that range from perceptual saliency, communicative value, amount of meaning negotiation, to cognitive mechanisms such as working memory. To better understand the noticing of recasts, future research may seek to address the noticing of recasts that are provided to different types of target structures in more detail. In addition, the factors and interaction of various factors need to be put under scrutiny when examining the noticing of recasts.

One feature of the data in the current study is that most of them were categorical (e.g., type of target structure, modified output, and learner noticing of recasts). To address Research Question 2 and Research Question 3, I employed chi-square tests to examine whether noticing of recasts was related to types of structure and modified output. Although chi-square test is widely used to compare the expected frequency of a categorical variable to the observed frequency in the population of interest, some limitations concerning the use of this technique in the current study are worth noting. First of all, one important assumption of the chi-square test is that each participant contributes his/her data to only one cell of the contingency table (Field, 2005).

However, the data in the current study may not meet this assumption. The data in the current study were composed of recast episodes and stimulated recall episodes. Each participant contributed an average of 24 episodes (1,420 / 60). These episodes from the same participant were assigned to different cell of the contingency table, thus were not strictly independent of each other. Second, the chi-square sampling distributions depend on the degree of freedom, and it requires no assumptions about the shape of the population distribution from which the sample was drawn. Consequently, the test is sensitive to sample size. In other words, the size of the calculated chi-square is proportional to the size of the sample rather than the strength of the relationship between the two categorical variables (Field, 2005). On this ground, proportionally small differences in cell frequencies can still lead to statistically significant relation between two variables. Field (2005) suggests that, to interpret any effects from chi-square, the row and column percentages on the contingency table cannot be ignored because they may better reflect the patterns of data than frequencies.

Finally, the current study explored the role of working memory in affecting learners' noticing of recasts. Working memory is closely related to noticing because its central executive is responsible for the control and manipulation of attentional resources. The various components of working memory, such as the Phonological Short-term Memory, could be a potential contributor to the noticing of recasts (Mackey et al., 2000; Révész, 2012), and even the recall or processing components of working memory capacity can differ in their effect on noticing (Mackey et al., 2010). However, working memory is not the only cognitive process that affects noticing. Other aptitudinal components, such as language analytic ability and phonemic coding ability (Skehan, 2002), can also affect noticing. In addition, other learner internal and external factors (e.g., familiarity of prior knowledge, anxiety, motivation, and so forth) may interact with

the effect of aptitudinal components (Dörnyei, 2009). This might explain why the current study did not find a relationship between working memory capacity and noticing of recasts. Future research may need to take these issues into consideration and explore the relationship between other cognitive factors or combination of factors and learners' noticing of recasts.

7.8. Conclusion

As the focus of the current study, recasts are an important component of corrective feedback that has drawn much of interaction researchers' attention in recent decades. Like other types of corrective feedback, the effect of recasts on L2 learning depends on whether they can draw learners' attention from meaning to form during communicative interaction. However, given that recasts are implicit, input-providing, and multi-functional, there have been debates in the field of interaction research concerning whether recasts are effective in promoting learners' noticing of the gap between what they said and what the targetlike form is as well as whether recasts promote learners' production of uptake in response to recasts.

The current study aimed at extending our knowledge about noticing of recasts and its relation to target structures of recasts and individual differences in working memory capacity. The study was conducted in Chinese EFL context, which is rarely represented in interaction research. The current study found a high rate of noticing the gap entailed in recasts, thereby lending support to the view that recasts are effective in promoting noticing. The high rate of noticing the gap may be attributed to the fact that learners had a good mastery of the declarative knowledge of the forms that were targeted by recasts as well as their experience in form-oriented English instruction and testing in the Chinese EFL context. However, learners in such an instructional context need more opportunities for meaningful practice in order to proceduralize their knowledge. In so doing, they can convert their declarative and explicit knowledge to

automatic, fluent, and implicit knowledge. In addition, the provision of corrective feedback such as recasts can help learners to proceduralize their knowledge in a targetlike manner. This is an important point given that the form-oriented language instruction and testing may lead to a lack of interest in meaningful practice and overall communicative competence. In addition to the high rate of noticing of recasts, the study also found a significant relationship between learners' noticing of recasts and the target structures of recasts, thereby adding support to the claim that the effectiveness of recasts differ with regard to the type of structures that are targeted by recasts.

To shed some light on the theoretical debate over the role of uptake, the current study examined the relationship between noticing of recasts and learners' provision of modified output in response to recasts. The study provided empirical support for the claim that modified output is related to learner noticing of the gap of recasts and thus is potentially beneficial for learning.

Finally, the current study attempted to explore the relationship between L2 learners' noticing of recasts and their working memory capacity, since the central executive mechanism of working memory is considered to control and manipulate the attentional resources. However, the current study provided empirical evidence that working memory capacity was not a predictor of noticing the corrective function of recasts and noticing the gap, indicating learners' noticing of recasts might be affected by various factors, including other aptitudinal abilities, learners' prior knowledge, motivation, learning style, anxiety, and so forth.

In conclusion, the current study of recasts provides an insight into the two major controversies over recasts – noticing of recasts and uptake in response to recasts, which are of fundamental importance in explaining the connection between recasts and ultimate learning through recasts. To better our understanding of the relationship between recasts and noticing, the

current study examined two factors, viz. target structures and working memory. As the effect of recasts on learning are affected by a variety of factors, a systematic examination of these factors may provide more information as to why recasts are facilitative of learning.

APPENDICES

APPENDIX A

Background Questionnaire

Today's date: _____

Participant ID#:

Instruction: Please answer the following questions. If you need any help, please raise your hand and the researcher will come and help you.

1. First name: _____ Last name: _____

2. E-mail address: _____

3. Age: _____

4. Gender: Male ____ Female ____

5. Year in college: _____

6. Major: _____

7. How long have you been learning English? _____ years _____ months

8. Please rate your proficiency level in the following areas concerning English:

	Low					High
Reading	1	2	3	4	5	6
Writing	1	2	3	4	5	6
Listening	1	2	3	4	5	6
Speaking	1	2	3	4	5	6

9. How long do you usually spend every week in meaningful oral English practice outside class? Please mark one of the following answers.

(1) less than one hour; (2) 1-2 hours; (3) 3-4 hours; (4) 4-5 hours; (4) more than 5 hours.

10. Have you lived in or traveled to a place where people speak English?

Yes ____ No ____

If Yes, when: _____ where: _____ How long: _____

11. Besides English, have you learned any other foreign language?

Yes ____ No ____

If Yes, what language is it? _____

12. Do you have friends who speak English?

Yes ____ No ____

If Yes, please explain. Also describe how much English you speak with them if you do.

APPENDIX B

Consent Form

Participant Consent Form

I.R.B.No: _____

Michigan State University

Consent to Participate in Research

Project Name: Chinese EFL Learners' Noticing of Recasts: Its Relation to Error Types of Recasts, Uptake, and Working Memory Capacity.

Principal Investigators: Susan. M. Gass, Charlene Polio, Program of Second Language Studies, Michigan State University

Secondary Investigator and Project Coordinator: Xiaoqing Chen

Introduction

You are invited to participate in this research study. We will be investigating foreign language learning through oral communication. This form will describe the purpose of the study, its possible risks and benefits, other options available to you, and your rights as a participant in the study. The decision to participate or not is yours. If you decide to participate, please sign and date the last line of this form.

Objectives of the study: Participants of this study will carry out communicative tasks in English. The purpose of this study is to investigate the extent to which Chinese EFL learners attend to interactional feedback and the factors that affect their noticing.

Total Number of Participants: Approximately 60 people will take part in this study.

Eligibility: You are eligible to participate if you are currently full-time second-year student of the English Department.

Study Procedure: The study will consist of the following components:

1. A short bio-data questionnaire
2. A working memory test

3. One session of communicative language learning activities conducted between the secondary investigator and an English learner
4. An interview

Who can Participate: This study is designed for adult Chinese speakers who are learning English as a foreign language.

Voluntary Participation: Your participation is completely voluntary. You may withdraw from the study or decline to participate in any portion of the study at any time.

Risks: Your decision to participate in this study or not will not affect your grade in your current class or any other classes or your enrollment or standing in the university.

Compensation/Benefits: Participants who complete all testing and treatment sessions will be given 40 Yuan on the day you finish the stimulated recall. Participating in the study will also provide you with an opportunity to practice English speaking during the data-collection session. The study will also potentially help future teachers of English as a foreign language.

Confidentiality: Your data will be kept confidential and your privacy will be protected to the maximum allowable by law. Research materials and data will be kept in the locked drawer in the researcher's office at all times, as well as on password-protected computers. Pseudonyms and project-generated pseudonyms will be used in any transcripts or publications resulting from the study.

Contact Information: If you have any questions or concerns regarding this study, please contact the principal investigator, Susan M. Gass, at gass@msu.edu, or by phone (517)-353-0800, or by mail at A-714 Wells Hall, Department of Linguistics and Germanic, Slavic, Asian, and African Languages, Michigan State University, East Lansing, MI 48824. You might also contact the other principal investigator Charlene Polio, at polio@msu.edu, or by phone (517) 884-1502, or by mail at A-714 Wells Hall, Department of Linguistics and Germanic, Slavic, Asian, and African Languages, Michigan State University, East Lansing, MI, 48824. If you have any questions about the scheduling of the study, please contact the secondary investigator: Xiaoqing Chen, at chenxia6@msu.edu, or by phone (517) 355-1264. If you have any questions or concerns about your rights as a research participant, please feel free to contact Judy McMillan, Director of the Human Subject Protection Program at Michigan State University: 517-355-2180, fax: (517) 432-4503, email: irb@msu.edu, or regular mail: 207 Olds Hall, East Lansing, MI 48824

Investigator's Statement

I have fully explained this study to the participants. I have discussed the procedures and treatments, the possible benefits, the standard and research aspects of the study, and have answered all of the questions that the subject has asked.

Signature of Investigator _____

Date _____

APPENDIX C

Table 25 Transcription Key

Symbols	Meaning of symbols
P	Participant
I	Researcher Interlocutor
(hesitation)	Extra information
[]	Information that is inaudible
(...)	Pause
?	Rising intonation
.	Falling intonation
:	Lengthening of voice
[	Overlapping of speech
-	Interruption

APPENDIX D

Task 1 Introducing Yourself: Instruction

In this task, you are going to talk something about yourself. I will ask you some questions about, for example, your favorite food, readings you enjoy, and the subject you like at school, and so on. Try to say as much as you can.

Table 26 Introducing Yourself

Topic	Information about the participant
Hometown	
Favorite food	
Reading	
Music	
Vacation places	
Subject at school	
Country you like to visit	
Festivals	
Movies	
Sports	

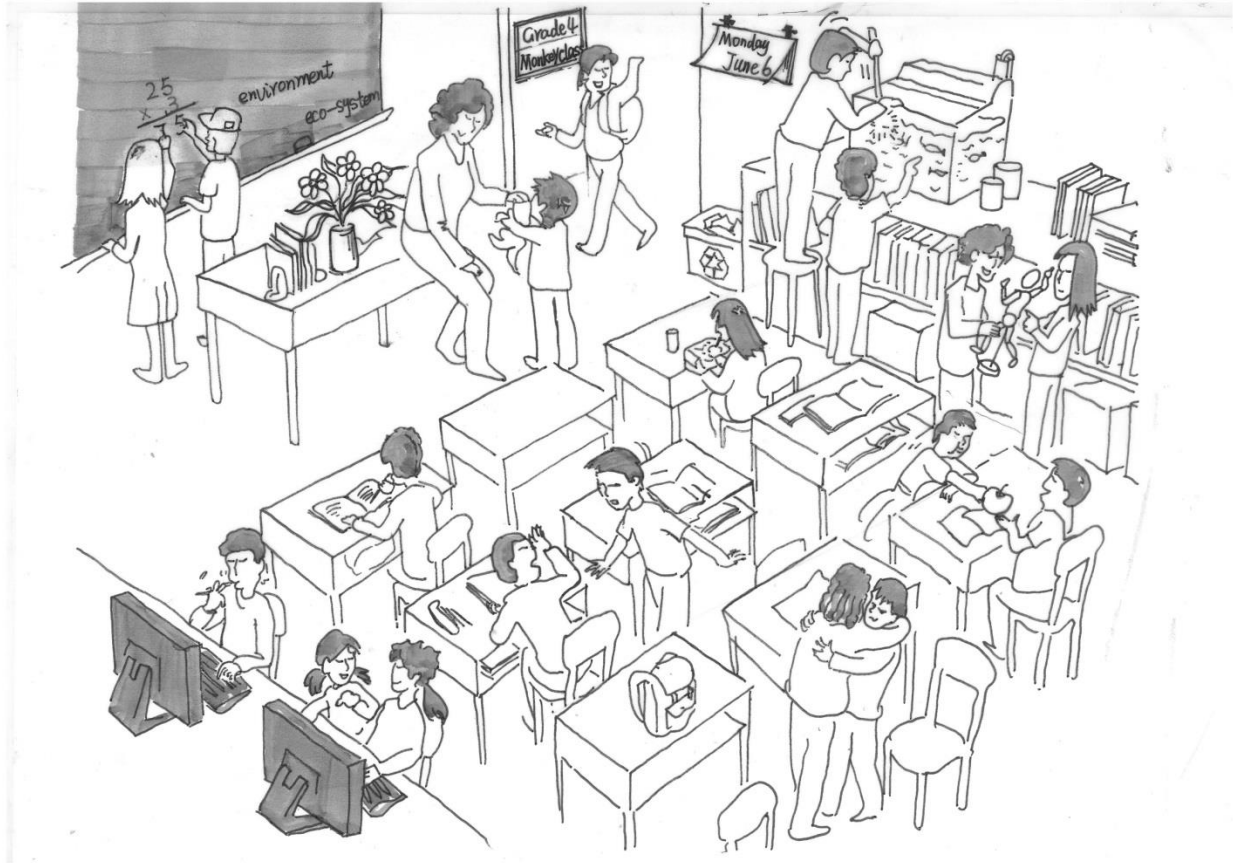
APPENDIX E

Task 2 Classroom Scene

Treatment Task 2 Describing classroom scenes

Direction: In this task you will be shown a picture. This picture is illustrating a classroom scene in which a teacher and her students are doing different things. What you need to do is to describe the picture as detailed as you can, so that I can draw a picture based on what you describe. Try to describe the picture in order. When you are describing, please hold the picture so that I won't see it. You have 2 minutes to look at the picture and plan on how to describe it.

Figure 17 Classroom Scene



APPENDIX F

Task 3 A Travel Itinerary

Direction: In this task, you are going to make a travel plan for a friend who is supposed to visit you for the first time at your school. You will be presented with a map of the city where your school is located and other places close to it. On the map are marked some famous places of attraction in and around the city. Your friend will stay with you for 7 days and you are going to take him to some of these places of interests. Now you have 3 minutes to plan your schedule.

Look at the map and think about the following questions in your plan:

1. Where do you plan to take your friend in these 6 days?
2. Why do you select these places?
3. What are the major attractions of those places?
4. How do you get to those places?
5. What can you do in those places?
6. How long do you plan to stay in those places?

APPENDIX G

Instruction of Stimulated Recall Interview

Chinese Version

有提示回忆

说明: 现在我们将一起观看我们刚才的对话的视频。在你观看视频的时候, 我会在不同时间暂停视频。每次暂停的时候, 请你用中文告诉我, 你在说话的那一刻心里在想什么。请记住, 你要告诉我的, 不是我暂停的时候你在想些什么, 而是**说话的当时在想些什么**。在你说话的时候, 我可以知道你在说些什么, 但是我不知道在你说那些话的时候, 你在想些什么。所以, 现在我们观看这段视频, 就是要你能告诉我在你刚才和我进行英语会话的时候, 你想到一些什么。记住, 不是现在在想什么。如果你想告诉我在视频的某一片断你想到了什么, 你也可以自己暂停视频。

你的想法可以多种多样, 但是请你**尽量准确地回忆说话那一刻你的真实想法**。例如, 在进行一个对话练习的时候, 你可能在想该用什么词汇, 或什么语法来描述那幅图片, 或者是我纠正了你的一个语言上的错误, 也可能是想到了对话练习的本身, 甚至是想到了与练习无关的一些事情, 等等。你的任何想法都没有对或者错, 但是必须能放映出你当时的真实想法。**如果你实在想不起来你当时想到了什么, 你就可以说“我不记得了”**。如果你**说话的当是什么也没有想, 你就说“我没有想什么”**。总之, 请你告诉我你能想到的东西, 如果你当时什么也没想, 或者你不记得你当时在想什么, 这也没有关系。

如果你现在有什么问题, 请你告诉我。

如果你理解我们要做什么，我会开始播放视频。我暂停的时候，请你用中文告诉我你在说话的那一刻想到了什么。

English Translation of the stimulated recall instruction

Instruction: Now you are going to watch the video of our conversation that we carried out just now. While you are watching, I will pause the video from time to time. When I pause the video, please tell me, in Chinese, anything that you were thinking at the time the conversation was taking place. **Remember, you are to tell me what you were thinking, not what you are thinking at the time when I pause the video.** During the conversation, I could record what you are talking about, but I did not know what you were thinking. Therefore, now I am interested in what your thoughts were when you were doing the tasks with me, not what you are thinking now. You can also pause the video if you want to tell me anything in places at which I don't pause.

Your responses can be anything, for example, the pictures you were talking about, the language you used to describe the pictures or other tasks, your opinion about the tasks, and so on. **There is no right or wrong answer, and your answer can be long or short.** If you cannot remember what you were thinking at that moment of the conversation, just tell me you don't remember or you forget. You are not obliged to say anything. For example, if you did not think of anything at the time of the conversation, you just say "I didn't think anything". In a word, **tell me what you can think of and it is all right if you were not thinking anything or you don't remember.**

If you have any question about how to do this task, you can ask me now.

If you don't have any problems, I will begin to play the video. When I pause the video, please tell me in Chinese what you were thinking at the moment the conversation was going on.

APPENDIX H

Working Memory Test: Sample Sentence Items

1. 中国印章有三千多年的历史，然而没人知道它的发明者和发明的地点。

Recall word: 地点 (place)

2. 总统已经把全部国家事务的管理工作交给了一个由精英组成的集团。

Recall word: 集团 (group)

3. 有一种自行车看起来笨拙，却很容易被辨认出来，因此不会吸引盗贼。

Recall word: 盗贼 (thief)

4. 二战以后，日本政治史上的少数执政党政权平均只有八个月的寿命。

Recall word: 寿命 (life span)

5. 美国体育商业化的成功离不开经营有方的赞助商和给予支持的观众。

Recall word: 观众 (audience)

6. 90年代的时装设计提倡反传统与反潮流，有丰富的层次及多变的款式。

Recall word: 款式 (style)

7. 月亮终于升起来，照亮了跳舞唱歌的人们，让大家有更欢快的心情。

Recall word: 心情 (mood)

8. 法律对运用高科技手段侵害公民和国家利益的犯罪尚无明细的规定。

Recall word: 规定 (rules)

9. 金庸的武侠小说誉满天下，畅销不衰，但同时也出现了大量的盗版作品。

Recall word: 作品 (works)

10. 新民谣用乡村音乐牧歌式的宁静为都市燥动的节律抹上了理想的色彩。

Recall word: 色彩 (color)

11. 考古学家在尼罗河畔新发现了一个金字塔，它是一位古代王后的陵墓。

Recall word: 陵墓 (tomb)

12. 当今的世界正处于一个难以驾驭的状态，困扰着每个西方国家的领袖。

Recall word: 领袖 (leader)

13. 信息高速公路是一种由高速度、高性能的电话、电视、计算机构成的网络。

Recall word: 网络 (network)

14. 新一代华商巨头正在香港涌现，他们的生意迅速扩展到中国其他的地区。

Recall word: 地区 (region)

15. 公司不设金融财会人员，总经理一人独揽事业运转和经营方面的业务。

Recall word: 业务 (business)

Working memory test: sentence items (English translation)

1. Chinese seal has a history of 3,000 or so years, but no one knows who invented it and where it was invented.
2. The President has authorized an elite group to take charge of the management of state affairs.
3. This kind of bicycles look awkward, but it is easy to recognize, so thieves won't be interested in it.
4. In the Japanese political history after World War II, a minority government can stay in power for an average of eight months.
5. The success of the commercialization of the US sports is attributed to the excellent operation of sponsors and supportive audience.
6. The fashion design in the 1990s advocated counter-convention and countertrend, with rich texture and diverse styles.
7. The moon rose and its light shone on those people who were dancing and singing, which made them even more cheerful.
8. Current legislation does not have a detailed regulation on crimes that take advantage of high technology to infringe on the interests of their country or other citizens.
9. Jin Yong's martial arts fictions are world-renowned and have sold very well since its publication, but at the same time, there have appeared a large quantity of pirate works.
10. The new folk music made use of the pastoral tranquility of country music to cast a layer of ideal color on the restless urban rhythm.
11. Archaeologists discovered a new pyramid along the Nile River, which is the tomb of an ancient queen.
12. The world today is reduced to an uncontrollable state, which is persecuting the leaders of western countries.

13. Information super high way refers to a web connecting telephone, television, and computer with a high speed and high performance.

14. A new generation of Chinese business tycoons are springing up in Hong Kong, whose businesses are stretching rapidly to other regions of mainland China.

15. This company has not employed any accountants, since the general manager wants to be responsible of its operations and business management.

APPENDIX I

Working Memory Test: Instruction

Chinese version

阅读广度练习 (Reading Span Task)

练习说明：该测试用来估计你的工作记忆容量。在测试进行中，你将会读到一些中文句子。这些句子被安排成两句一组，三句一组，四句一组，或五句一组。在看完每一个句子之后，会出现一个理解句，用于测试你是否理解了以上的句子，也就是说，理解句的意思和你刚才读过的句子的意思是否相符。

当一个测试句出现在屏幕中央的时候，你需要做两件事。第一，以尽可能快地速度阅读这个测试句并理解句子的意思。当这个句子消失，然后一个理解句出现在屏幕上的时候，你要阅读并决定这句话和上面的测试句在意思上是否一致。如果一致，请你按键盘上标示了“**Yes**”的键，如果不一致，请你按键盘上标示了“**No**”的那个键。

你要做的第二件事，就是在你阅读测试句的同时，**要记住这句话最后一个汉语词汇**。在你读完一组里所有句子并做完阅读理解测试的时候，你会在电脑屏幕中央看到“**Recall**”（回忆句末的词）这个单词。这时候，你必须写下所有你能记起来的以上每句话的最后一个词。这些词都是由两个汉字组成。注意，你要记住的是测试句的句末词汇，而不是理解句的句末词汇。另外，在你阅读这些句子的时候，你不能用笔把它们的句末词写下来。你只能通过大脑记住它们。

现在我们试一下该 怎么做这个练习。

测试句1:

人群喧闹着在街角处拐了个弯后就向东涌去，留下一片叫骂和烟尘。

理解句:

人群在街角向东涌去

练习的结果是：读测试句的时候，你要记住这句话最后一个词是“烟尘”。还有，理解句和测试句的意思相符。你应该按“**Yes**”键。

练习句2:

在欧洲，儿童文学经典作品安徒生童话是除圣经外发行最广的图书。

理解句:

在欧洲发行最广的是安徒生童话

练习结果：测试句的最后一个词是“图书”。理解句和测试句的意思不相符。所以你应该按“**No**”键。

练习句3:

北欧妇女素有强烈的自主精神和参政意识，她们最早进入政府的机构。

理解句:

北欧妇女最早参与政治

练习结果：测试句最后一个词是“机构”。但是，理解句和测试句的意思并不相符，所以你要按“**No**”键。

测试的过程如下：（1）你会看到一个“十”字出现在电脑屏幕中央；（2）当“十”字消失的时候，一个测试句出现在屏幕中央，你尽快阅读并理解它，同时尽可能记住句子最后一个汉语词；（3）当测试句消失，理解句出现的时候，你阅读这句话，决定两个句子意思是否相符，并按相应的“**Yes**”或“**No**”键；（4）当你听到“叮”的声音，意味着这一组句子结束，请你把你能记起来的所有该组句子的最后一个汉语词汇写下来。

接下来，我们正式开始测试。Next, we will begin the test.

Working memory test: Instruction (English translation)

Reading Span Task

Directions: This is a test to estimate your working memory capacity. In this test, you will read sentences in sets of two, three, four, or five sentences. Each sentence is followed by a comprehension sentence. You should decide whether the meaning of the comprehension sentence matches the meaning of the sentence you just read.

You will first see a cross on the screen. Then a sentence appears in the center of the computer screen. When you see this sentence, we would like you to do two things. Firstly, read the sentence to yourself as quickly as possible and try to remember what this sentence is about. Secondly, you need to remember the last word of this sentence item you read. Then a comprehension sentence will appear on the screen. This sentence is related to the sentence you just read. If you think the meaning of the comprehension sentence matches that of the previous sentence, please press the button marked Yes. If you don't think the meanings of the two sentences match, press the button marked No.

After you read all of the sentences and judge the comprehension sentences in a set, you will hear a “ding” sound. On hearing this sound, please write down the last word of each of the sentences you have just read on the paper that is presented to you. **Remember, when you are reading the sentences, you are not allowed to write down the last words of the sentences.**

You will now have a short practice session.

Practice sentence 1:

人群喧闹着在街角处拐了个弯后就向东涌去，留下一片叫骂和烟尘。

(English Translation: Turning at the corner of the street, the tumultuous crowds flocked to the east. What's left behind was curse-shouting and dust.

Comprehension sentence 1:

人群在街角向东涌去

(English Translation: The crowds flocked to the east.)

You should have marked that the comprehension sentence for practice sentence 1 is correct in meaning with that of the sentence item. And the last word is “烟尘 (dust)”.

Practice sentence 2:

在欧洲，儿童文学经典作品安徒生童话是除圣经外发行最广的图书。

(Andersen's Fables, a classic works of children's literature, has an extensive volume of circulation in Europe only next to the Bible.)

Comprehension sentence:

在欧洲发行最广的是安徒生童话

(Andersen's Fables is the most extensive volume of circulation in Europe.)

The comprehension sentence does not match the test sentence, so it is incorrect. The last word for the sentence item is “图书 (book)”

Practice sentence 3:

北欧妇女素有强烈的自主精神和参政意识，她们最早进入政府的机构。

(English Translation: Women in North Europe have long been aware of independent spirit and political participation, and they are the earliest to work in government organs.)

Comprehension sentence:

北欧妇女最早参与政治

(English Translation: Women in north Europe were the earliest in the world to participate in politics.)

The comprehension sentence is correct, and the last word for the test sentence is “机构”.

Next, we will begin the test.

APPENDIX J

Comprehension Sentences with English translation

(Note: symbol “+” means the comprehension sentence matches the meaning of the test sentence, and symbol “-” means the comprehension sentence does not match the meaning of the test sentence.)

1. - 中国印章有四千多年的历史 (Chinese seal has a history of 4,000 years)
2. + 总统不管理国家事务 (The President does not govern the country.)
3. + 容易辨认的自行车可以防盗 (Bicycles that are easy to recognize can prevent thieves.)
4. - 日本的执政党只能执政八个月 (Every Japanese ruling parties stays in power for an average of eight months.)
5. + 美国体育赞助商善于经营 (sponsors of sports in America know how to manage their business.)
6. - 90年代的时装设计师追求传统的理念 (Fashion designers in the 1990s are guided by traditional creeds.)
7. - Comprehension sentence: 星星照亮了跳舞唱歌的人们 (Star lights bathed on those who were dancing and singing.)
8. + 用高科技犯罪不受法律的约束 (High-tech crimes are not bounded by law.)
9. + 金庸的武侠小说经常被盗版 (Master Jin's martial arts fictions are always pirated.)
10. - 新民谣带有摇滚乐的风味 (The new folk music carries the flavor of rock and roll.)
11. - 新发现的金字塔里埋葬着国王 (The newly-found pyramid is the tomb of a king.)

12. + 西方的领袖们难以驾驭当今的世界 (Leaders of western countries find it hard to hold on the world.)

13. - 信息高速公路只包含电话和电视设备 (Information superhighway includes only telephone and television equipment.)

14. + 新一代华商重视在大陆的生意 (The new generation of Chinese businessmen lay emphasis on their business in mainland China.)

15. + 总经理控制公司的一切。(The general manger controls everything.)

APPENDIX K

Exit Questionnaire

1. 你认为这个实验的目的是什么？
2. 你认为我和你进行交谈的目的是什么？
3. 你觉得你的交谈对象在和你交谈的过程中，尤其是在回应你的话的时候，有没有什么特别的着重点？
4. 你在这个实验中有没有学到一些什么？你有没有注意到有关于英语的一些有趣的东西？
5. 你们在课堂上是以老师讲课为主还是以学生交际活动为主？在进行交际活动的时候，你们的老师会纠正你们的语言错误吗？你们学生之间会纠正对方的错误吗？
6. 你认为纠错是必须的吗？
7. 你对老师或同学纠正你的语言错误是什么态度？

APPENDIX L

Sample Transcripts

Sample Transcript 1

I: Where are you from, Ms Student A?

P: Yueyang.

I: So could you tell me something about your hometown?

P: Um... Yueyang is my hometown, and it is located near the Yangtze River.

I: It is located on the Yangtze River?

P: OK, yes, ah, it is a not very big but very beautiful city.

I: Ah, it's beautiful.

P: Ah, yeah. um, ah... its major, its mainly economic resources is, is, is, ah, industrial...

I: OK, so Yueyang has a well-developed industry?

P: In Yueyang, yes. And there are many people stay and, near each other. There are some big rivers and high buildings.

I: High buildings?

P: Yes.

I: In the city?

P: Yes, the city is, have, have [obvious], obvious four seasons, clear.

I: The four seasons are very obvious in Yueyang.

P: Yeah, and we live a comfortable life, not very cold, not very hot.

I: Yes.

P: It's just warm.

I: What I know about Yueyang is Yueyang Lou.

P: Yes, it is well-known by its [pri]? [pri]? [pri].

I: Oh, it is well-known for a prose?

P: Yes, sorry.

I: Or a prose written by...

P: By Fang Zhongyan.

I: Yes.

P: It has a really famous sentence, but I can't really, exactly, told you the English sentence.

I: It's OK. It is very hard to translate. It was written in very classical Chinese, right?

P: Yeah.

I: So you are a second-year student, right?

P: Yes.

I: You have been in Changde for two years.

P: Yes.

I: What do you think are the differences between Changde and Yueyang?

P: In my opinion, Changde is more clear, [clea],

I: Clean?

P: Clean. And people in Changde may be have more education, um, more, ah, educational?

I: You mean they are more educated?

P: Educated, yes. applied, more applied.

I: So they are more polite. That's what you think?

P: Yes. It's my opinion.

I: OK.

P: And, but the city, the Hunan University of Arts and Science, the quality not good than the city in Yueyang.

I: The quality of the university is not as good as that of the university in Yueyang?

P: Yes.

I: Oh, there is a ...

P: Hunan University of Industrial School? Maybe.

I: Industrial school? Is it Yueyang Teachers' College?

P: Yes.

I: So it has a new name?

P: Yes, but I don't know the exactly name, I guess.

I: I have heard of the Teachers' college in Yueyang, but I don't know if it has the same name as before.

P: Maybe it is the same. Ah, maybe...

I: What else do you want to tell me about Yueyang?

P: Um, um..

I: It is also located on Lake Dongting.

P: Yes, we, maybe belong to the east of Dongting Lake.

I: Oh, so Yueyang is on the east of Lake Dongting.

P: Yes.

I: So you must have been to the lake.

P: Yes, I have seen this lake, but my, when I was young, the lake is very big, and clean, and we can sometimes swim on...

I: We could?

P: Yeah, we could swim at the summer holiday.

I: Oh, you could swim in the lake in the summer?

P: Ah, I can't, I couldn't, but my guys, my friends can.

I: Oh, OK, but now ...

P: but today, you know, it will, it will be polluted by...

I: It is polluted

P: It is polluted.

I: So what do you think is the major reason for the pollution of Lake Dongting?

P: Um, it caused by maybe two parts. One part the government didn't guide, guide the industrialers to purify their waste water.

I: They just give off the waste water into the lake.

P: And the other part maybe the, the loca... natives, locate,

I: Local people?

P: Local people, yeah. They produce many homemade, homemade, life, life trash.

I: Oh, household trash?

P: Yes. household waste. They just pour it down to the river.

I: Ah,

P: Without any, any, any [treasures], maybe.

I: So the pollution is caused by industry as well as families.

P: Yes. And it is also, it is a common problem in our country, maybe the world. In the countryside, people don't, maybe have no idea about the trash, trash recycling. Maybe, and, and, the...

I: Take it easy.

P: OK.

I: As you know, one fact is that the lake is getting smaller and smaller. It used to be the biggest lake in China, right? but it is...

P: Not the biggest.

I: Not the biggest?

P: No, the second.

I: Oh, the second biggest, Now it is the second biggest.

P: Yes.

I: But it used to be the biggest, right?

P: Yeah.

I: It was bigger than Lake Poyang, but now...

P: Poyang is the biggest.

I: Aha. So the lake is getting smaller. What do you think is the reason for this?

P: Maybe people just farmer, farmer the land.

I: Oh, farm.

P; Farm. They have lacked of the land to produce food.

I: OK.

P: The government just use their farm land to build some high buildings, office,

I: So they drain the water?

P: Yes.

I: And construct some buildings to sell to people.

P: But today, the government has noticed the important issues. And they start to, start to make people to, make people [iMMIGRANT] to other places.

I: Immigrate?

P: Immigrate to other places so they will give more space to, ah, to restore the lake.

I: To restore it?

P: Yeah, to expanse its space.

I: OK. How do you spend your free time as a university student?

P: I am the second students, maybe on the April 16, we take, ah, took examination TEM-4

I: On April the 16th, you took TEM-4?

p: Yes, we both, second students, we took the examination.

I: first year and second year students?

P: Second year students.

I: Only the second year students.

P: Yes. After that examination, we gain more and more than before have more time to do our own self, selves' job and study.

I: To do your own things?

P: Yes. I plan to, ah, maybe, every day, my class have four classes, and afternoon we have no classes.

I: You don't have any classes in the afternoon.

P: Yeah. We go to the library to read some books and do some exercise. At night, I check on line, maybe go over the news. I will do the listening exercises online. Maybe that's it.

I: Very good. OK, now let's turn to the next task. Well, in this task, I will show you a picture. As you can see, this is a picture that illustrates a classroom.

P: Yes.

I: In this classroom, there are quite a few students, doing different things, as well as a teacher, and what I want you to do in this task is to describe what you see in this picture. You have to tell me where the different things and people are, and tell me what these people are doing. I'd like you to describe this picture in order and in detail. Please hold the picture so that I can't see it,

because I am going to draw a picture as you describe. I will give you one minute to plan your description.

P: OK, I will try.

I: Are you ready?

P: Yes.

I: Let's begin to describe it.

P: There are one student at the door, the door,

I: Where is the door?

P: In front of our picture.

I: OK.

P: the right.

I: On the right?

P: Front, on the right.

I: On the upper right of the picture?

P: Yes. She is, she is greeting to other guys. And in front of the, in front of her, there are a desk.

I: There is a desk.

P: There is a desk. and, near the desk, there is, there are a teacher and a child. They just talking.

I: They are talking?

P: Talking, they are just talking. And in front of the desk, and near the blackboard, there are two boy, ah, there are two children, one girl and one boy. They are writing on the blackboard, do some exercise about math.

I: Doing some math exercise.

P: Exercise about math.

I: What are they writing on the blackboard?

P: There are some words, one is environment and one is ecosystem. And a [calculate],

I: Calculating?

P: Calculating, yes. Twenty five, multiple, I forgot the word.

I: Multiplies?

P: OK, yeah, I got it, multiplies 3, and we got 75.

I: OK.

P: In front of the teacher and child, there are [nai] desks.

I: Nine desks.

P: Um.

I: How are the desks arranged?

P: There are three lines.

I: How many desks are there on each line?

P: Each line have, has three desks. Near the right of the classroom, and near the door, there are, cabin, also a desk, maybe.

I: Also a desk.

P: The students study at the desks. On the desk, there is a glass, glass box with some fish.

I: A fish tank?

P: Oh, a fish tank. There are some fish, and two child, two child, two children, one stand and another stand on the chair.

I: is standing on a chair.

P: Standing on a chair, and try to catch a fish.

I: He tries to catch a fish?

P: A fish. And on the children, on the two children left, right, there also two childrens.

I: There are also two children.

P: There are also two children. And they, a guy with a toy, and they chatting, they are chatting with each other. On the first line of the desks, the first one is a girl who eating food, maybe.

I: She is eating?

P: Yes. And on her, on her left, there is nobody.

I: Nobody is sitting there.

P: Yeah. And on the empty desk's, on the empty desk's left, there is a child who is writing on paper. And [beHAND]

I: Behind.

P: Behind him, maybe there is a guy who talking, talk to his right desk's classmate.

I: Who is talking to another student on his right?

P: Yes, on the right of the talking guy. And, and, ah, behind the girl who just eating, who is eating, there is a boy who turn around to her, to his classmate.

I: Who is turning around,

P: Who is turning around to his classmate, deliver, delivers apple to, to her classmate.

I: Passes an apple to his classmate?

P: Yes, passes the apple to the guy who behind her.

I: Who is behind her.

P: who is behind, and the last line, there are two people, two people, they hug with each other.

I: The two students are hugging each other?

P: Um, hugging each other. Let's come to the left of the classroom, and near the desks of third line, there are two computers. On the first computers near the second line,

I: First computer.

P: Ah, the first computer near the first line of desks, there is a guy who, who is typing, typing something. And near, near him, there is two girls, there is, there are two girls who, chatting, who are chatting something. That's it.

I: Thank you, very good. You have done a very good job. Next, I will show you a map of Changde. In this map, you are going to plan a trip. Suppose a friend of you who is from Yueyang is coming to Changde to visit you and you friend is going to stay with you for about seven days. You have a lot of time in this week and you decide to take your friend to different places in or around Changde. What I want you to do is to select some of the places on the map that you want to show your friend around. Tell me why you choose those places and what you can do in those places. Now I give you two minutes to plan your trip. Have you been to any of these places?

P: Um, three, oh, four places.

I: Are you ready. So let's begin from the first day.

P: OK. On the first day, we maybe, we will go to the Walking Street, and the poet, poet wall.

I: The Wall of Poems?

P: The Wall of Poems. Um, as I have been there several times, so I choose these two sites.

I: So you choose these two places since you have been there before?

P: Um, several time.

I: Several times?

P: Yeah. We can go shopping in the Walking Street. And there are also some, some, some park, some parks, we can take a seat and rest. There is also a street of food, and we can go to there.

I: You can go there to enjoy the food?

P: Yes. And then we will go to the wall of poems. There are some famous people who wrote or said something, we can enjoy it and think about something.

I: What?

P: Talk about something interesting.

I: Did you read the poems?

P: No, I just enjoy the way they wrote.

I: Is the wall very long?

P: Yes, which will make you tired.

I: Thousands of meters maybe.

P: Yes. On the second day we will go to the Taohuayuan.

I: Have you been to Taohuayuan?

P: Yes, of course. When I was second, ah, first year student, we, our whole class went to there.

I: Went there.

P: Yes. Unfortunately, the spring of that year coming too late,

I: came too late?

P: came too late and we go, when we get there, got there, there is no flowers.

I: There were no flowers?

P: Yes, there were just trees. It's pity, it was a pity.

I: Maybe you should have been there later.

P: Yes, on the first year, we went there again.

I: In the first year.

P: Yeah, in the first year, to see the flowers. Besides flowers, in Taohuayuan, there are mountains, you can climb. And some souvenirs we can buy some souvenirs for presents.

I: As presents.

P: As presents. Ah, there is a, also, most interesting is, you can take a boat,

I: You can go boating?

P: Yes, go boating, to across the big mountain around.

I: Cross.

P: Yes cross. Maybe that's it. The main thing is climbing the mountains. After the spring's journey, your body will, maybe will make stronger. The flowers, the green tree, and fresh air, and some building, ancient buildings, you can take photos, and experience the day of that time.

I: Very relaxed.

P: Yes, and a day passes. OK, the last day of our journey, we will go to De Shan. They are also mountains.

I: It's also a mountain.

P: Yeah, but it provides some barbeques, barbeque.

I: There are some picnic areas in the mountains?

P: Yes, there are some picnic area. We just buy some food,

I: Like meat, chicken,

P: Vegetables and some hotdogs. We can enjoy the food we by ourselves make.

I: You make the food by yourselves.

P: Yes. As you know, nowadays, each family has only one children, one child, and the parents will not let the child to do the chores.

I: They will not let the child do the chores.

P: Yes, so it is interesting, exciting to do food by ourselves. After we enjoy the food, we can take around, ah, around the mountains.

I: So you can take a walk around the mountains.

P: Take a walk, yes. And last we take bus to, to our dormitory.

I: You go back by bus.

P: It's over?

I: What about the rest of the seven days. So that's all. Good job.

P: Yes.

Sample Transcript 2

I: OK, Student B, first of all, I'd like to know something about you. Could you introduce your hometown to me?

P: Ah, OK, OK, I from Yongzhou, Hunan Province. Our hometown has a famous river, [Xiaoshui.

I: There is] a famous river in your hometown.

P: As we all know, Hunan is looked like as the Hometown of Xiaoxiang, and Xiao Shui is our, is origin from our hometown.

I: originates from

P: originates from our hometown. And I think Yongzhou is famous for its 锰 (manganese), 锰矿 (manganese ore) 怎么说? (How to say Mengkuang in English?)

I: Manganese?

P: Yes, a kind of metal. So I think...ah, 有点紧张 (I am a little nervous).

I: take it easy.

P: I think, in formal days,-

I: In the past?

P: Ah, in the past, our environment is, is very good, but now...

I: Your environment was very good in...-

P: is very good, was very good.

I: Yes.

P: But now, as, as, as we...开发怎么说? (How to say develop in English)?

I: Develop.

P: As we develop our economy, the environment is become worse, but...

I: The environment has become worse,

P: Has become worse. Even though, I like my hometown...]

I: [So you still like your hometown.

P: And today our government has taken, has taken part, has taken part some measures to protect our environment.

I: Oh, so has taken some measures.

P: Yeah, and the situation in our hometown, the environment situation in our hometown is become better and better.

I: Ah, has become.

P: Has become better and better.

I: OK, the government is doing something to protect the environment. So you are a second-year student in this university?

P: Yeah.

I: how do you like your life here?

P: How do I like my life. I think Changde is a very quiet place. I think it is very, it is very [suitABLE]

I: Suitable.

P: Suitable for people who like peace.

I: Who like a peaceful life?

P: for people who wants to live a peaceful life. I think it is not good, it's not a good place for people who, who want to, who want to ah, struggle, ah...

I: what like challenges?

P: UM, challenge. I think it's too [comFORTABLE].

I: Very comfortable.

P: Ah, very comfortable.

I: So what do you usually...

P: But, but I think the people in Changde is very, ah, is very honest, and

I: Are very honest.

P: Are very honest and, and 很纯朴怎么说? (how to say 'unsophisticated' in English?)

I: Ah, unsophisticated.

P: Unsophisticated, but a little 精明, 精明怎么讲? (how to say "shrewd" in English?)

I: Shrewd.

P: Shrewd, a little shrewd, but I think it doesn't matter, I think most people are friendly and [ka:nd].

I: Most people are friendly and kind.

P: And [ka:nd].

I: What do you usually do in your spare time?

P: Usually do, um, in former months,

I: In the previous months,

P: Yes, I got a part-time job as a tutor.

I: You taught English?-

P: I taught English to a senior one student.

I: Did you make some money.

P: Oh, it is very ... ah, how to say, though I earned more than 200 Yuan, but I got sick.

I: Oh, you got sick and you did not do it anymore?

P: Oh, yeah, I think it's too tired, and I think the distance is too long.

I: It is too far from your school?

P: It's too far. In Deshan.

I: In Deshan, so you have to take a bus.

P: It take much time, I, I, I can't ride a bike. So I must have to take a bus.

I: So you have to take [a bus.

P: Um, but it take] too much time.

I: Yes, it takes too much time.

P: And it make me very sick, and how to say,

I: So you decide not to go.

P: Decide not to go.

I: Good, so let's turn to the next task. In this task, I will show you a picture. As you can see, this is a picture of a classroom. There is a teacher and some students, there are different things in the room. The people are doing different things. What I want you to do is to describe the picture in detail. Please tell me where these teacher and students are in the classroom, what are they doing, and where are the different things located. When you are describing the picture, please hold it so that I can't see it, because I am going to draw a picture based on what you say. I will give you one minute to prepare.

P: OK. It must be difficult.

I: Are you ready?

P: Um.

I: OK, let's begin.

P: In this picture, it's grade four, the class is grade 4.

I: How do you know it's grade four?

P: In the door.

I: On the door?

P: On the door, we can see a brand.

I: You can see a sign.

P: Ah, a sign which says grade four and monkey class.

I: OK, so where is the door?

P: The door is ... ah, on the middle,

I: In the middle?

P: Ah, in the middle, a little, little, a little top.

I: OK, on the top of the picture.

P: Yes, and it says grade four and monkey, it's a monkey class. And in the class, I think it is a mess.

I: The classroom is a mess?

P: Ah, some, different people has doing, has done different things.

I: different people have, are doing different things.

P: Are doing different things. And, ah, zenme shuo (how to say).

I: You can describe the picture in order, from one side to the other.

P: The classroom, on the middle, it has nine desks.

I: There are nine desks.

P: Yes, nine desks.

I: How are the desks arranged?

P: Arranged.

I: Yeah.

P: Oh, three, ah, I don't know to say.

I: You don't know how to say it?

P: Um.

I: So there are, how many rows of desks?

P: Rows, I don't know rows.

I: How many lines of desks?

P: Oh, three, three lines of desks. And, and there is a girl on the, there is a girl are, are eating, oh, is eating something.

I: Oh, there is a girl who is eating something.

P: Yes, eating something, a girl is eating something. And on, in other place, there are two boys are eating, eating apples.

I: Oh, two boys are eating apples.

P: Um.

I: Where are the two boys?

P: Behind the boy.

I: Behind the boy?

P: No, behind the girl. And the other boy is behind the boy.

I: The other boy...

P: is behind the first boy.

I: OK. They are eating apples.

P: Yeah, yeah. Next to the two boys, there are two people are hugging.

I: There are two people who are hugging.

P: Yes, ah, hugging each other. Next to the people, there is a backpack is on the desk.

I: There is a backpack on a desk.

P: Yes, on a desk. On the desk next to the two people.

I: Oh, next to the people who are hugging.

P: Yeah. and in front of the desk which, ah, where, where a backpack stand [laugh],

I: Oh, in front of the desk where there is a backpack.

P: Yes, in front of it, two people are argue about something.

I: Oh, two people are arguing about something.

P: Um, arguing about something.

I: Are they sitting or standing?

P: One people is sitting, and one people is,

I: One person,

P: Oh, one person is standing, and one person is sitting.

I: Oh, is sitting on a chair.

P: Yeah.

I: Good, take it easy.

P: Next to this place, there are two girls are playing computers.

I: There are two girls playing computers.

P: Ah, two girls playing computers. Two girls talking are seem to be very happy.

I: They seem to be very happy.

P: to be very happy, yes. And in front of this place, a boy is also playing computer.

I: On the other side?

P: On the other side, a boy is also playing a computer, but he, he [bats], he [bats] his pen, [bat].

I: He's biting?

P: He's biting his pen. It is seems, it seems that he is think about something.

I: He is thinking about something.

P: Um, yes. Next to the, next to this place, a boy is doing his homework.

I: Where is the boy?

P: Next to the boy who are biting his pen.

I: Who is biting.

P: Who is biting his pen.

I: Oh, so next to him, a boy is doing his homework.

P: Doing his homework. OK, let's go to the blackboard.

I: Oh, where is the blackboard?

P: Next to the door.

I: Next to the door, OK. Oh, there is a blackboard next to the door.

P: yes, and a boy and a girl is, is writing something on the blackboard.

I: are writing something.

P: Are writing something on the blackboard, yes.

I: So a boy and a girl are writing something on the blackboard. What are they writing?

P: Math, math, some ah, numbers.

I: So they are writing some numbers?

P: And like some math tasks, math assignment.

I: OK. What is the math problem?

P: What problem, oh, ah, multi, multi, multiple,

I: Oh, multiply.

P: Ah, 25 multiplies 3.

I: OK, good, 25 multiplies 3.

P: Yes, behind these two people standing, standing a big desk.

I: There is a big desk standing behind these two students.

P: Yeah. And on the desk standing, standing, standing a [carp].

I: [carp]?

P: In the [carp],

I: There is a cup on the big desk?

P: There is a cup on the desk. There is a cup on the desk.

I: Aha.

P: And some flowers is in the, in the [carp].

I: Some flowers are in the cup.

P: Yes.

I: Is that a cup?

P: Is that a cup? And next to the cup is some books.

I: are some books.

P: are some books. Behind the big desk, behind the big desk, a woman, a woman, I think she must be a teacher.

I: Yeah.

P: She is giving a toy, a toy, to a little boy.

I: Oh, a teacher is giving a toy to a little boy. Where is the teacher?

P: He sits, he sits,

I: She sits

P: Yeah, she sits on the big desk.

I: Oh, she is sitting on the big desk, and she gives the toy to a little boy.

P: Um. OK, let's turn around,

I: Turn to the other side?

P: Yes. I seed a girl...

I: You saw

P: I saw a girl eating something, and on his right.

I: On her right.

P: On her right side, on her right side, two boys are, are...OK, OK, a boy is standing on a, on a chair.

I: Yes, a boy is standing on a chair.

P: On a chair.

I: What is he doing?

P: Ah, she, she is,

I: He is

P: Oh, he is, he, he uses a stick, a stick to, he, he is playing some, some fishes.

I: He's playing with some fish.

P: Fishes.

I: Fish.

P: Oh fish, some fish which, which on a sink, sink,
I: Oh in a fish tank,
P: OK, OK, fish tank.
I: So some fish in a fish tank.
P: A boy is playing the fish.
I: Is playing with the fish.
P: With the fish. And another boy is just look at, at what he was done.
I: Another boy is just watching him playing.
P: Yes, yes, look at the, the fish tank.
I: Oh, he is looking at the fish tank.
P: Um. Behind the two boys, there are, oh, two girls, they are playing robot.
I: They are playing a robot.
P: Um. Under the, over the fish tank, standing, standing a a book case.
I: Book case? Beside the fish tank, there is book case.
P: Yeah, yeah, yeah. It has many books.
I: There are many books in the book case.
P: Oh, yes. Beside, beside the book case, lie a, lie a trash can.
I: Lies a trash can.
P: That's all.
I: OK, very good.

APPENDIX M

Sample Stimulated Recall Data

Sample Stimulated Recall Data 1

1. P: Its major, ah, its mainly economic resources is, is, is industrial,
I: So industry is well developed in Yuanyang –
P: Yueyang, yes.
S: 想不起来了。
(S: I can't remember.)
2. P: It is well-known by a [pree]...pray?
I: It is well known for a prose?
P: Yeah, I am sorry.
3. P: In my opinion, Changde is more cleee, cleee,
I: Clean.
P: Clean, yeah.
4. P: And the people in Changde maybe have more education, may be more educational?
I: They are more educated?
P: Educated, yes.
S: 我想到/educated, educational 不一样的两个单词。
(S: I was thinking that Educated and educational, these were two different words.)
5. P: More applied, applied.
I: More polite.
P: Yes.
6. P: But the quality of this university is not good than the university in Yueyang.
I: The quality of this university is not as good as that in Yueyang.
P: Yes.
7. P: Maybe we belong to the east of Lake Dongting.
I: Yes, it is on the east of Lake Dongting.
P: Yes.
8. P: When I was young, the lake was very clean and we can sometimes swim,
I: We could.
P: Yeah, we could swim in the summer holiday.
S: 我注意到can. 是时态问题。
(S: I noticed the word can. I had a problem in tense.)

9. P: But you know, today, it will polluted.
 I: It is polluted.
 P: It is polluted.
 S: 我想到了, it is, 又是时态问题。
 (S: I noticed, "It is", I made an error in tense again.)
10. P: The other part is the locate, locate people,
 I: The local people.
 P: Local people, yeah.
 S: 当时我发现我说当地人说的不好, 用 local
 (S: At that time, I discovered that I did not say "local people" appropriate, I should have used "local".)
11. P: They produce many homemade trash,
 I: Much household waste.
 P: Yes, waste.
 S: 生活垃圾, 说错了。
 (S: I was wrong in expressing household waste.)
12. P: The lake become smaller maybe people just farmer the land.
 I: farm.
 P: farm.
 S: 你说完我就意识到 farmer 是名词, farm 可以做动词。
 (S: After you said, I realized that farmer was a noun, while farm could be a verb.)
13. P: The government make people immigrant to other places,
 I: Immigrate.
 P: immigrate to other places.
 S: 移民, 当时不知道发音。
 (S: Immigrate, I didn't know how to pronounce it then.)
14. P: On the April 16, we take, took an examination TEM 4.
 I: On April the 16th.
 P: Yes.
 S: 4 月 16, 我们二年级生参加了那个专四考试。
 (S: April 16, we second-year students took the TEM-4 Exam.)
15. P: After the examination, we can more than before have more time to do ourselves job.
 I: to do your own things?
 P: Yes, ah, I plan to maybe...
 S: 自己支配时间, 当时不知道完整的表述是什么。
 (S: "Do your own things", during the interactive tasks, I didn't know how to express it.)
16. P: In front of the girl, there are a desk.
 I: There is a desk.
 P: There is a desk.

S: 复数, 复数, 复数。我用了单数。

(S: Plural form, plural form, plural form. I used singular form.)

17. P: They just talking.

I: They are talking.

P: are talking. They are just talking and...

S: 当时就发现少了一个 *are*, 我不知道为什么会掉了这个词。

(S: At the time of interaction I discovered that I missed an “are”, I don’t know why I would miss it.)

18. P: They are writing and do some exercises about math.

I: Doing some math exercise.

P: About math.

S: 不知道怎么讲, 数学练习。

(S: I didn’t know how to say math problems.)

19. P: The children are calculate..

I: calculating?

P: Ah, calculating.

S: 时态没用好。

(S: Incorrect use of tense.)

20. P: Twenty five addition, no, multiple,

I: Multiplies?

P: Yeah, yeah, multiplies three, we got 75.

S: 乘是 multiply, 不是 multiple。Plus 是乘吗?

(S: 乘 is “multiply”, not “multiple”. Does “plus” also mean 乘?)

21. P: In front of the teacher and the child, there are [nai] desks.

I: Nine desks. OK, how are the desks arranged?

P: there are three lines.

S: 我忘了。

(S: I forgot.)

22. P: On the desk, there is a glass, ah, glass box.

I: There is a fish tank.

P: Yes, a fish tank.

S: 我在想鱼缸应该怎么说。讲不出这个缸, 你说是 fish tank。

(S: I was thinking how to say “鱼缸” in English. I could not express “缸”, and you said it was “fish tank”.)

23. P: Two children, one stand, and another stand on the chair.

I: Another...

P: Stands on a chair.

S: stands 单复数。

(S: Agreement of “stand”.)

24. P: and try to catch a fish.

I: He tries to catch a fish.

P: a fish.

S: 我想 fish 是集合名词。

(S: I think fish is a collective noun.)

25. P: On the children's right, there also two childrens.

I: There are also two children.

P: There are also two children. Yes.

S: 你当时一说完我就知道是那个 child 和 children, 单复数。

(S: As soon as you finished talking, I knew it was Child and Children, plural form.)

26. P: And [behand]

I: behind.

P: Behind him, maybe there is a guy.

S: 不知道怎么描述那个空座位的边上, 我也不知道, 这个人的左边, 那那个人的左边的左边呢?

(S: I didn't know how to describe beside the empty desk, I didn't know. On the left of this person, then what about on the left of the left of that person?)

27. P: There is a guy who talking to his right desk's classmate.

I: Who is talking to a guy next to him?

P: Yes, next to the talking guy.

S: 就是, 同桌。

(S: It was, “the guy sitting next to you”.)

28. P: there is a boy who turn around to his classmate.

I: Who is turning around.

P: Who is turning around to his classmate.

S: 错了, 错了, 错了。

(S: Wrong, wrong, wrong.)

29. P: Turning around and delivers apple to his classmate.

I: OK, passes an apple to his classmate.

P: Passes an apple to a guy behind her.

S: 递给他, 当时不知道怎么描述。

(S: Pass, I didn't know how to express then.)

30. P: On the first computers,

I: First computer,

P: Ah, on the first computer near the first line of desks.

S: 第一台, 就是, 我在想, 第一台, 你可以从这边数, 也可以从那边数, 所以说靠近第一排的桌子。

(S: The first computer, it's like, I was thinking, the first computer, you could count on it from this side, you can also count it from the other side, so I said the compute that was close to the first row of desks.)

31. P: There is a street of food, we can go to there.

I: you can go there to enjoy the food?

P: Yes.

S: 美食街, 然后去想把那个, 然后我又讲不出那个品尝的那个单词。

(Food street, then I was thinking of, then I couldn't think of the word for the food that I ate.)

32. P: unfortunately, the spring of that year is coming too late.

I: was coming too late.

P: Was coming too late.

S: 我想时态又错了。

(S: I was thinking that I made a mistake in tense again.)

33. P: When we get there, got there, there is no flowers.

I: There were flowers?

P: to open.

S: were, 时态错了

(S: Were, I made an error in tense.)

34. P: There are some souvenirs we can buy them for presents.

I: as presents.

P: as presents.

S: 我意识到介词用错了。

(S: I realized that I used a wrong preposition.)

Sample Stimulated Recall Data 2

1. S: In the past, our environment is very good, but now.

I: Your environment was very good?

S: is very good,

I: was very good.

S: Oh, was very good

S: 那时用的是 is, 是 was, 过去时。

(S: I was thinking that I used "is" then, it should be "was", past tense.)

2. S: The environment is become worse.

I: The environment has become worse.

S: had become worse.

S: 我想应该是完成时, has become, 我的是 is become.

(S: *I was thinking that I should have used present participial, has become, I used “is become”.*)

3. S: The environment situation in our hometown is become better and better.
I: has become
S: Ah, has become better and better.
S: 又是 *has* 和 *is*, 啊, 那个是连续性的动词, 不是瞬间动词。 (*without interlocutor's prompt*)
(S: *It was “has” and “is” again. This is a continuous verb, not momentary verb.*)
4. S: and I think it is [suTEIBLE] for people
I: suitable
S: suitable for people who like peace.
S: 我想到了, *suitable*, 第一次没读好。
(S: *Yes, I was thinking that, suitable, I didn't pronounce it well at first.*)
5. S: It is very [comFORTable]
I: Ah, very comfortable.
S: Yeah, very comfortable life.
S: 你说了以后我就觉得就是那个重音不对, [COMfortable] 和 [comFORTable]. 但我不知道用的对不对。
(S: *After I heard you speaking, I felt that my stress was wrong. [COMfortable] and [comFORTable], but I didn't know if I was correct or not.*)
6. S: But I think the people in Changde is very honest.
I: are very honest.
S: are very honest and 'hen chun pu'.
S: 我知道是 *is* 和 *are* 吧, 这个, 这个是习惯了。后面有很多是 *is* 和 *are* 分不清。就是习惯了。我们老师上课很少跟我们纠正, 他就是着重语法点, 就是分析课文, 就讲的是课文上面的东西。他不会注重这样的东西。
(S: *I knew it was the difference between “is” and “are”. I think this has become my habit. I still remember that in the following interaction I could not differentiate between “is” and “are”. I think it is a habit. In class, our teacher seldom corrects us, what he focuses is grammar, then analysis of the texts. He lays an emphasis on what is in the texts. The teacher does not pay much attention to this.*)
7. S: but it doesn't matter, I think most people are very friendly and [kend]
I: are kind, yeah.
S: Kind.
S: 我在想, 这次我就改成 *are* 了, 但是这是暂时的, 因为后来我又变了。
(S: *I was thinking that this time I used “are”, but this is only once, because later I changed again.*)
8. S: In former months,
I: in the previous months,

S: In the previous ..., I got a part-time job as a tutor.

S: 你那更地道一点, 就是 previous, 感觉

(S: I was thinking that what you said was more nativelike, that is, "previous", that is how I felt.)

9. S: so I must have to take a bus

I: so you have to take a bus

S: yes.

S: to take a bus, 不能用 take 啊?

(S: To take a bus, couldn't I use "take"?)

10. S: In the door, we can see

I: On the door,

S: On the door, we can see

S: 我想我知道那个就是我习惯用 in 了。

(S: I was thinking that I knew I was wrong, but I am used to using "in".)

11. S: We can see a brand

I: you can see a sign

S: Oh, a sign which say, which says grade 4.

S: 因为 brand 是商标吗, 我感觉门上的标牌也可以用这个词了。

(S: Because "brand" is 商标 in Chinese, I was thinking that I could use this word to express the sign on the door.)

12. S: Different people has done different thing.

I: Different people are doing different things.

S: are doing different things.

S: 我用的是完成时。我觉得还是惯性思维吧。

(S: I used perfect tense. I was thinking that this was my habitual use.)

13. S: In the middle, it has nine desks.

I: there are nine desks.

S: nine desks.

S: 你说完以后, 我就意识到我不能用 has. 要用 there is, there is

(S: After you said, I realized that I could not use "has", I needed to use "there is", there is.)

14. S: There is a girl is eating something.

I: A girl is eating something.

S: a girl is eating something.

S: eating something.

(S: Eating something.)

15. S: Next to the boys, there are two people are hugging.

I: There are two people who are hugging.

S: ah, each other, next to the boys.

S: 我当时想那个 *there be* 机构, 那个不能用非谓语动词, 多了个 *are*, 用 *hugging* 就 *ok* 了。就是我受中性思维的影响, 一直用 *there are, there are, there are*.
 (S: *I was thinking then that in "there be" structure, I couldn't use finite verb, "are" was extra. It was enough to use "hugging" without "are". This is Chinglish, I always use "there are", "there are", "there are".*)

16. S: Next to the people, there are a backpack is on the desk.

I: there is a backpack on a desk.

S: On a desk, next to the two people.

S: 也是那个原因啊, *there is*, 又一个 *is*, 真是, 都是这样的, 习惯了。

(S: *The same reason, there is, I added an "is", I was really... I always do so, it has become a habit.*)

17. S: In front of the desk which a , where a backpack stand,

I: In front of the desk where there is a backpack,

S: In front of it, two people are argue about something.

S: 我只用代词了, 不用其他的, 因为用代词很麻烦, 用一个代词就可以了。

(S: *I used only a pronoun, I did not use other words, because the usage of pronoun is complicated, it is enough to use just one.*)

18. S: Two people are argue about something.

I: two people are arguing about something.

S: arguing about something.

S: 我想到这里就 *arguing*, 我说 *argue*.

(S: *I was thinking that you used arguing, but I said "argue".*)

19. S: One people is sitting, and one people is standing.

I: One person is sitting, and one is standing.

S; Ah, one person is standing, and the other is sitting.

S: 我当时意识到那个 *people* 是集体名词, 不能用 *a* 什么什么。

(S: *I realized then that "people" was a collective noun, I couldn't put "a" before it.*)

20. S: Next to this, there are two girls are playing computers,

I: Next to the desk, there are two girls playing.

S: Um, playing computers.

S: 这个语法错误太严重了, 这个 *are playing*

(S: *I made a serious grammatical error, "are playing".*)

21. S: Two girls talking seem are talking seem to be very happy.

I: They seem to be very happy.

S: Very happy. Um.

S: 就是我看那两个人很开心吗, 就是有点犹豫, 有语法错误, 就说得很慢。很迟钝, 就是这样子。

(S: *It is like, I saw that the two people were very happy, but I was hesitant, I made grammatical errors, and I said very slowly, this was what I was thinking.*)

22. S: But he's [beting] his pen.
 I: he's biting?
 S: He is biting his, his pen.
 S: 我前面都使用现在进行时的, 现在用现在时, 感觉不好吧。
 (S: I used present progressive before this, but now I used present progressive. I was thinking that this was not appropriate.)
23. S: It seems to be, it seems that he is think about something.
 I: he is thinking about something.
 S: Um, ah.
 S: 这里说快了一点。
 (S: I spoke too fast.)
24. S: next to the boy who are, who are biting his pen.
 I: who is
 S: Oh, who is biting his pen.
 S: 当时我注意到你用了 is, who is, 这里, 我为什么用 are 了呢? 因为是 two girls, 我有点, 有点搞混淆了。
 (S: At the time of interaction, I already noticed that you used "is", who is, here, why did I use "are"? because there were two girls, I was, I was a bit confused.)
25. S: And a boy and a girl is writing something on the blackboard.
 I: are writing.
 S: are, oh, are writing something.
 S: 我当时也是习惯性思维, 就是 is 和 are 吧。
 (S: I was thinking then that I have become used to mixing "is" and "are".)
26. S: Ah, [multi], [multiplei]
 I: multiplies
 S: 25 multiplies 3
 S: 这里在想乘法怎么说, 记得不是很牢, 搞混淆了。有时候知道但是没有用过, 要想一下才可以。
 (S: I was thinking of how to say "multiply", I did not quite remember and I was confused. Sometime I know a word, but since I never used it, I need time to pick it up.)
27. S: behind these two people, standing, stand a big desk
 I: there is a big desk behind these two students
 S: ah.
 S: 我这个句子有点倒装的感觉。应该是倒装句。
 (S: The sentence felt like an inversion, it must be an inversion.)
28. S: And on the desk standing a [cu, cu, cup]
 I: there is a cup on the desk.
 S: there is a cup on the desk.

S: 又错了，倒装句。我不知道那个是不是杯子啊，有点像杯子，有点像花瓶，那个杯子感觉有点错了，但他有点像吗。

(S: I was wrong again, this was an inverted sentence. I didn't know if that was a cup, it looked like a cup, or a vase. I was thinking that I might be wrong to say it was a cup, but it looked like a cup anyway.)

29. S: Some flowers is in the cup.

I: some flowers is in the cup?

S: ah, ah.

S: 就是那个惯性思维，改不掉，很难改，尤其一紧张，很难改了。

(S: I got used to it and find it hard to change, it is hard to change, especially when I am nervous.)

30. S: Beside the cup is some books.

I: What?

S: are some books, yeah.

S: 我当时就知道又犯了一个错误，感觉自己好笨阿。

(S: I realized then that I made one more mistake, I felt that I was silly.)

31. S: he sits on the big desk.

I: He is sitting on the big desk.

S: um.

S: 我在想他看上去是坐在那上面，但是我感觉，就是生怕又出现那种错误，什么 *there is, there are* 什么什么，我要想一下，组织语法以后再讲。后来我就用进行时了，不用 *seems* 了。语法就是复杂一些。

(S: I was thinking that he seemed to be sitting there, but I felt, I was afraid I would make the same mistake, like "there is", "there are", something like that, I needed some more time to organize my grammar before I spoke. Later, I chose to use present progressive, rather than "seems". The grammar was complex.)

32. S: I seed a girl

I: you ...

S: I saw a girl eating something.

S: [I seed],我用的是 *seed*.

(S: "I seed", I used "seed".)

33. S: He is playing some fishes.

I: he is playing with some fish.

S: fishes.

S: *play some fish*, 然后那个 *play with*.

(S: *Play some fish*, then you said "play with".)

APPENDIX N

Table 27 Raw Data for Individual Participants

ID	Recasts Noticed		Recasts with Modified Output	Recasts without Modified output	Noticing Only the Corrective Function	Noticing the Gap	Other
	M	L/P					
1	15	4	15	4	3	12	4
2	9	16	17	8	5	14	6
3	12	9	18	3	3	14	4
4	14	8	9	13	0	17	5
5	22	6	17	11	3	22	3
6	17	7	13	11	3	19	2
7	8	14	5	17	3	19	0
8	12	14	14	12	3	18	5
9	13	11	21	3	2	18	4
10	15	13	20	8	4	21	3
11	12	11	13	10	2	15	6
12	18	10	23	5	6	18	4
13	11	13	17	7	1	18	5
14	15	6	11	10	0	14	7
15	9	8	7	10	0	15	2
16	14	11	19	6	7	16	2
17	10	11	13	8	0	17	4
18	10	10	14	6	3	16	1
19	9	13	11	11	1	16	5
20	13	14	16	11	6	17	4
21	7	14	13	8	0	18	3
22	15	3	10	8	5	11	2
23	14	13	13	14	3	21	3
24	12	13	23	2	2	20	3
25	17	8	11	14	3	20	2
26	17	11	18	10	3	20	5
27	16	15	23	8	2	27	2
28	12	11	17	6	2	19	2
29	14	11	11	14	6	17	2
30	15	11	16	10	1	22	3
31	16	11	19	8	7	18	2
32	9	16	22	3	2	21	2
33	16	13	18	11	3	20	6
34	13	7	9	11	2	16	2
35	17	9	15	11	5	16	5
36	13	13	12	14	1	22	3

Table 27 (Cont'd)

37	11	6	5	12	3	14	0
38	17	9	14	12	4	11	9
39	15	12	13	14	1	22	4
40	13	15	23	5	3	24	1
41	13	9	8	14	0	21	1
42	13	9	11	11	1	16	5
43	17	10	13	14	3	21	3
44	7	15	18	4	1	19	2
45	12	14	14	12	2	19	5
46	14	8	13	9	3	16	3
47	5	8	7	6	0	11	2
48	9	12	9	12	1	18	2
49	20	7	16	11	5	17	5
50	11	13	21	3	2	17	5
51	11	13	19	5	0	20	4
52	13	13	22	4	3	17	6
53	14	6	8	12	0	13	7
54	13	12	23	2	1	24	0
55	15	10	17	8	2	15	8
56	15	9	18	6	1	23	0
57	20	9	20	9	2	25	2
58	4	9	8	5	1	9	3
59	17	5	14	8	5	16	1
60	10	9	16	3	0	15	4
Total	1420		893	527	146	1069	205

Note: M = Morphosyntactic Recasts; L/P = Lexical / Phonological Recasts

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