# *Recast frequency and the acquisition of English articles in a computer-mediated context*

## Hedayat Sarandi ✉

Istanbul Sabahattin Zaim University, Turkey
https://orcid.org/0000-0001-6292-1735
*hidayet.sarandi@izu.edu.tr*

## Hossein Nassaji

University of Victoria, Canada
https://orcid.org/0000-0002-5936-3901
*nassaji@uvic.ca*

## Abstract

This study examines the role of recast frequency and its effectiveness in the acquisition of English articles in a computer-mediated context. Sixty-one pre-intermediate university language learners in Turkey were randomly divided into four main groups: high frequency recast (HF), low frequency recast (LF), test control, and task control groups. The learners in the HF and LF recast groups completed five and two tasks, respectively, in a video-conferencing environment and received oral recasts on their incorrect use of English articles. Learners in the test control group only took the pre and posttests, and learners in the task control group completed five tasks without receiving feedback on the target structure. The outcome was measured through online picture description and error correction tasks. Findings showed that in the picture description task, learners in the HF group performed significantly better than those in the LF recast group and the control groups. In the error correction task, the results revealed a short-term advantage for learners in the HF group, which faded away in the delayed posttest. Significant correlations were also found between the recast frequency and learners' score improvement in the

immediate and delayed picture description tasks but not in the error correction tasks. These results suggest that recast quantity may play an important role in improving learners' accuracy of their oral production.

## 1. Introduction

Corrective feedback (CF) studies have been at the center of attention of second language (L2) acquisition researchers and language teachers (Nassaji & Kartchava, 2020; Schachter, 1991). Theoretically, these studies show whether language input, known as positive evidence, by itself is enough for L2 acquisition or if learners also need to become aware of their erroneous use of the target language, known as negative evidence (Gass, 1997; Long, 1996). From a practical perspective, CF is a common technique that teachers employ to improve language learners' accuracy; therefore, it is important to know about its effectiveness (Nassaji, 2016).

There is strong theoretical support for the claim that the frequency of exposure to language elements may affect the acquisition of those elements (N. C. Ellis, 2002, 2005, 2017). According to usage-based language learning, the human brain is capable of detecting patterns of regularity and establishing associations between language features based on the frequency of their co-occurrence in the input. Even though the probabilistic computation that the brain employs to register the existing connection is mainly implicit, form-focused instruction can also play a role in this process. The primary learning of the connections between novel language elements requires conscious attention in explicit memory before it enters subsequent implicit processing (N. C. Ellis, 2005, 2014). Some degree of noticing, at the early stages of language learning, might be necessary for the initial registration of association between language representations (N. C. Ellis, 2005, 2017). This is because second language learners are unlikely to attend language features that have little communicative value or lack salience (Schmidt, 2001).

One way that teachers can increase the likelihood of noticing these features is through recasts, one of the most frequently used feedback strategies (Brown, 2016). Of the wide range of factors that influence the effectiveness of recast, the role of frequency is understudied. Theoretically, recasts with higher frequency stand a better chance of directing learners' attention to their errors and helping them with the acquisition process. This, however, needs to be backed up by empirical research as there is no study, to date, that has examined the role of CF frequency as an independent variable in the acquisition of L2 grammar.

The issue has gained more importance when several CF studies have reported little effect for recasts during short treatment sessions (e.g., Erlam & Loewen, 2010; R. Ellis et al., 2006; Sheen, 2007). Erlam and Loewen (2010), for example, reported that recasts provided during a 1-hour interactive task did not result in learners' significant gain of French noun-adjective agreement. These findings suggest that short treatment sessions might negatively affect the quantity of recasts produced, which, in turn, reduces the likelihood of directing learners' attention to their errors (see Nassaji, 2017). The present study intends to address this issue by investigating the role of recast frequency in language learners' acquisition of English articles.

## 2. Literature review

### 2.1. CF: The theoretical underpinnings

The argument for the effectiveness of CF in L2 learners' acquisition process comes from both cognitive and socio-cultural schools of thought. From a cognitive perspective, during communication, interlocutors employ interactional modification to avoid conversational breakdown and ensure understanding. At times, this negotiation entails drawing learners' attention to existing linguistic problems and the possible adjustment required to achieve an acceptable level of understanding (Long, 1996). CF, as a part of negotiation strategies, can contribute to the acquisition process by facilitating learners' noticing of these problem areas (Schmidt, 1990). CF can also assist the acquisition process by the role it plays in L2 production. When learners are pushed to participate in language production for which their linguistic resources are not adequate, they may notice the limitations in their linguistic abilities (Swain, 1993, 1995). The CF that is provided at this stage helps learners map the suggested form with the meaning, and the modified output produced as a result is likely to be integrated into their linguistic repertoire (Mackey, 2006; Nassaji, 2016).

From a socio-cultural perspective, CF is the mediating tool that allows learners to co-construct new language knowledge through social interaction. The language features externally produced through collaboration are internalized later and become part of their linguistic repertoire. CF facilitates this process through scaffolding, a calculated step by step assistance that allows learners to pass through the stages where they no longer need other people's support and become self-regulated independent language users (Aljaafreh & Lantolf, 1994).

## 2.2. Recasts

Recasts are defined as reformulations of learners' erroneous utterances with target-like forms while the focus on meaning is still preserved (Long, 2007). Recasts have "semantic transparency" (Goo & Mackey, 2013, p. 130). They are the target-like forms of what learners have just produced. The temporal juxtaposition of recasts and learners' erroneous utterances also increases the likelihood of form and function mapping. This allows learners to direct their available attentional resources toward the language areas that they have difficulty in expressing (Goo, 2020; Goo & Mackey, 2013).

Recasts supply positive evidence (what is acceptable), but they can also supply negative evidence (what is not acceptable) when learners manage to interpret their purpose as corrective (R. Ellis & Sheen, 2006). They are also reported as the most frequently used feedback technique in several studies (e.g., Akiyama, 2017; Bao, 2019; Brown, 2016; Fu & Nassaji, 2016; Lee, 2013; Lyster & Ranta, 1997; Nassaji & Kartchava, 2020; Panova & Lyster, 2002; Sheen, 2004; Yoshida, 2010). The marked preference for recasts might be related to their versatile operationalization that allows for the adjustability of the implicit/explicit force of these strategies. When operationalized in an implicit manner, recasts, compared to other CF strategies, create less interruption in communication flow (Long, 2007). Teachers often opt to use recasts with insecure language learners who do not like to be embarrassed by the obtrusive correction of their errors (Roothooft, 2014). This enables teachers to avoid triggering negative emotional reactions from learners while correcting their errors. On the other hand, several linguistic and situational factors may increase recast salience and make their corrective purpose evident. Recasts are easier to notice when they are stressed, short, contain fewer changes, follow other feedback moves (Egi, 2007; Loewen & Philip, 2006), and provided immediately after the errors (Asari, 2017). By manipulating the linguistic and contextual features of recasts language teachers can adjust their implicit/explicit force and respond to the classroom dynamics and individual needs of their students. This also justifies why recasts are most frequently used by language teachers.

## 2.3. Recasts effectiveness: Learning contexts and outcome measures

The studies that have examined the role of recasts in the acquisition process have been carried out in classrooms, laboratories, and, more recently, in computer-mediated contexts. In classroom contexts, the effectiveness of recasts is usually compared with other more explicit or output-pushing feedback strategies

(i.e., prompts). Overall, the findings of these studies show that learners who received recasts made greater improvement than learners who did not receive any feedback (e.g., Doughty & Varela, 1998; Goo, 2012; Loewen & Nabei, 2007; Rassaei, 2020), and that prompts generally, but not conclusively, led to more morphosyntactic improvements than recasts (e.g., R. Ellis et al., 2006; van de Guchte et al., 2015; see also Goo, 2020; Lyster & Saito, 2010; Lyster et al., 2013; Nassaji, 2016).

In laboratory contexts, recasts have turned out to be more effective because, in these contexts, the intervening variables are easier to control and recasts can be supplied in an intensive manner (Lyster et al., 2013). The findings of the studies in these contexts show that overall recasts benefit L2 acquisition (e.g., Carroll & Swain, 1993; Iwashita, 2003; Kim, 2021; Long et al., 1998), and the facilitating effect of recasts may vary depending on target structures (e.g., Ishida, 2004; Iwashita, 2003; S. Li, 2014; Long et al., 1998), and individual factors such as cognitive readiness (e.g., Mackey & Philp, 1998), working memory (e.g., Kim et al., 2015; Mackey & Sachs, 2012; Sagarra & Abbuhl, 2013), and language analytical ability (e.g., Kim, 2021).

The role of recasts in the acquisition of L2 grammar has also been studied in computer-mediated contexts (e.g., Loewen & Erlam, 2006; Kourtali, 2022; Kourtali & Borges, 2023; Monteiro, 2014; Rassaei, 2017; Sauro, 2009; Yilmaz, 2012). It is important to mention that recasts in these contexts were supplied in different modalities (oral, text-based, or both). Several studies have examined the effects of text-based recasts provided in the SCMC (synchronous computer-mediated communication) environment on L2 grammar. For example, Loewen and Erlam (2006) investigated the effects of recasts and metalinguistic feedback (information on learners' errors without giving correct forms) on the acquisition of the simple past tense in a synchronous chatroom setting. They found no positive effects for either type of feedback in timed or untimed grammaticality judgement tests (TGJT/UGJT). To account for the findings, the researchers argued that the overlap between learners' turns during their interaction made it difficult for the instructors to provide feedback immediately after the errors, which, in turn, made it difficult for learners to detect the focus of correction. Sauro (2009) compared text-based recasts with metalinguistic information on learning English zero articles by Swedish learners. The results showed a short-term benefit for the metalinguistic group over the recast and control groups, but the differences disappeared over time. Yilmaz (2012) compared the effects of text-based recasts and explicit correction on the acquisition of locative and plural Turkish morphemes in the face-to-face and SCMC environment. The results revealed the supremacy of explicit correction over recasts regardless of communication mode. He also found that both feedback strategies worked better on the salient target structure (Turkish plural) than on the non-salient structure (Turkish locative).

Kourtali and Borges (2023) investigated the effects of immediate and delayed text-based recasts in the SCMC environment on learning semantic and morpho-syntactic features. The findings showed a short-term benefit for the delayed recasts on semantic errors, and no benefits for either recast type on morphosyntactic errors. Similarly, Kourtali (2022) found that text-based recasts in the SCMC environment had no effects on learning English third person "-s." Overall, these studies suggest that in a computer-mediated environment, learners may not benefit from text-based recasts as much as they do from more explicit CF strategies, and that written recasts are less effective when they are directed at non-salient language features.

The studies that have looked at the effects of oral recast, relevant to the current research, are rather limited in number. Monteiro (2014) examined the effects of recasts and metalinguistic feedback during Skype video-conferencing on English as a foreign language (EFL) learners' acquisition of the simple past tense. The results showed that both feedback groups and a task-only control group made a substantial gain in their implicit and explicit knowledge of the target structure, with no significant differences between the study groups. The researcher argued that in video-conferencing the target structures become more salient and easier to notice by learners, hence the effectiveness of both feedback types. Rassaei (2017) compared the effects of recasts during a laboratory face-to-face interaction with Skype video-conferencing on the acquisition of English articles. He found that recasts in both conditions led to a significant gain in learners' performance on the oral production and error correction tasks, with no significant differences between the two recast groups on both measures. The researcher argued that the didactic nature of interaction in the video-based and face-to-face instruction made learners aware of the corrective intent of the recasts, which led to their effectiveness. Obviously, the low number of studies on the effects of oral recasts in computer-mediated settings underscores the need for further research in these contexts.

Earlier studies have indicated that the effects of recasts may also interact with the measurement types employed. In a meta-analysis, for example, Lyster and Saito (2010) found that oral CF had a larger effect size for measures that involve free language production than measures that require the use of specific language features or metalinguistic judgment. In Hassanzadeh et al.'s (2019) study, the group that received multiple recasts outperformed the single recast group on the elicited imitation test, but not on the written UGJT. Révész (2012) investigated the role of recasts on learning the past progressive tense knowledge by Hungarian learners and found that the impact was greater in the oral production task than in the written production and UGJT. Ahn and Kim (2016) examined the effects of recasts on the acquisition of Korean causative structures by Chinese university

students and found that recasts were more beneficial in learners' performance on the elicited imitation test than on the UGJT (see also Révész & Han, 2006; Zhao, 2015). Nassaji (2017) also found that the effects of recasts were more pronounced in the oral picture description task than in the written storytelling task. While the findings of the studies above suggest that the effects of recasts are better reflected in language tests that are likely to gauge the implicit knowledge of test takers, Rassaei's (2022) findings showed that this may not always be the case. In a recent meta-analysis of 24 classroom- and laboratory-based recast studies, he found no significant effect size differences between language tests that are likely to tap into implicit and explicit knowledge, suggesting that recasts might be equally effective in developing both types of knowledge.

## 2.4. Feedback frequency

In SLA literature feedback frequency is closely associated with feedback intensity. According to R. Ellis (2001), in intensive feedback a single pre-selected target structure is corrected repeatedly on several occasions. This is usually contrasted with extensive feedback, where there is no pre-selected target structure, and instructors may draw learners' attention to various language features. The role of feedback intensity can hence be addressed from two perspectives: in terms of pre-selection of a certain target structure and in terms of frequency of correction made (Kamiya, 2015). While the effects of pre-selection of target structures have already been the subject of some experimental studies (e.g., R. Ellis et al., 2008; Kamiya, 2015; Nassaji, 2017; Sheen et al., 2009), there is a paucity of studies on the role of frequency as an independent variable.

Several studies have found that recasts, when provided for a short duration, may not be effective in promoting learners' knowledge of target structures (e.g., R. Ellis, 2007; R. Ellis et al., 2006; Loewen & Nabei, 2007; Nakatsukasa, 2016; Sheen, 2007, 2008). In most of these studies, recasts have been compared with other CF strategies (usually prompts); however, for the sake of relevance, we mainly focus on comparing recast groups with control groups. In R. Ellis et al.'s (2006) and R. Ellis's (2007) studies, the treatment consisted of two tasks, each lasting 30 minutes, and the recast groups did not significantly perform better than the control groups on any measures. In Sheen (2007), the treatment comprised two tasks, each lasting 30-40 minutes, and the recast group again did not demonstrate statistically better performance than the control group on any measures. Sheen (2008) examined the interaction between anxiety and the effectiveness of recasts, and the treatment consisted of two tasks, each lasting 30 minutes. The findings showed that the combined performance of learners in the

low and high anxiety recast groups did not significantly surpass the combined performance of learners in low and high anxiety control groups. In Sarandi and Çelik's (2019) study, the treatment consisted of three tasks, each lasting 30 minutes. Even though the recast group outperformed the control group on the oral measure in the immediate posttest, the positive effect of the recasts was not maintained in the delayed posttest. Nakatsukasa (2016) compared regular recasts with recasts accompanied by gestures. The treatment consisted of two tasks that took about 30 minutes to complete. The findings revealed that the regular recast group outperformed the control group only on the immediate posttest of the oral production task. No differences were reported between the regular recast group and the control group on the grammar test or the delayed posttest of the oral production task. In Loewen and Nabei's (2007) study, the treatment consisted of two sessions each lasting 30 minutes, and the recast group outperformed the test-and-task control groups on the TGJT, only one of the three measures used in the study. No significant differences were recorded between any CF groups and the control groups in the UGJT and oral production test. It is interesting to observe that in some of these studies (e.g., Loewen & Nabei, 2007; R. Ellis, 2007; R. Ellis et al., 2006; Sarandi & Çelik, 2019; Sheen, 2007), the researchers referred to the briefness of the treatment as a shortcoming of their studies and/or underlined the possibility of having different outcomes had a longer treatment been employed.

There are also some studies where recasts were provided for a longer period and turned out to be more effective. In Ammar and Spada's (2006) study, the treatment consisted of 11 sessions that took about 330-495 minutes. The findings showed that the recast group performed significantly better than the control group on the picture description task in both posttests (see also Ammar, 2008). In Han's (2002) study, the treatment consisted of eight sessions spread over four weeks, and the findings showed that recast groups did significantly better than the control group in an English simple past tense consistency test. Other longitudinal studies have also provided evidence that recasts supplied for a longer period might be more effective. Wacha and Liu (2017), for example, examined the effects of paraphrased, elaborated, and standard recasts on the acquisition of the English simple past tense by university students in Thailand over nine-week feedback sessions. In a paraphrased recast, the entire sentence, including learners' errors, is reproduced using different structures and lexical items. In an elaborated recast, the instructor first provides some contextual information on the learners' erroneous production, which is then followed by a recast. The findings showed that temporal fluctuations in the data of learners (an indicator of developmental transition) occurred for the paraphrased and elaborated recasts between the 3rd and 5th weeks and for the standard recasts

between the 6th and 8th weeks. The researchers recommended that future recast studies be conducted "over long-enough periods of time" (p. 212).

Further evidence for the effectiveness of CF frequency in the acquisition of L2 grammar has been reported through studies with correlation analyses. McDonough and Mackey (2006), for example, found that the frequency of recasts predicted Thai EFL learners' ability in the new question making in English. The more recast learners received, the more developmentally advanced questions they produced. Similar findings were also reported with regard to the structures of other languages. Ishida (2004), for example, also reported a positive correlation between recast frequency and the accuracy of Japanese "-te i-(ru)" form production.

While the studies reported above suggest that the frequency of recasts may mediate their effectiveness, there are other studies whose findings show that recasts, despite their short introduction over limited treatment sessions, turned out to be effective (e.g., Goo, 2012; Mackey & Philp, 1998; McDonough, 2007). In Goo's (2012) study, the treatment consisted of two tasks that each took 20 minutes, and the findings indicated that recasts and metalinguistic CF were equally effective in the acquisition of English that-trace filter. In Mackey and Philp's (1998) study, the treatment consisted of three sessions, each lasting 15-20 minutes, and the findings showed that most learners in the recast group who were at the right developmental levels moved forward to the next stages of question making in English. McDonough (2007) compared the effects of recasts and clarification requests (words that demand clarification, such as, "again?" and "pardon?") in the emergence of simple past activity verbs. The treatment consisted of three sessions, each lasting 20 minutes. The findings showed that both recasts and clarification requests had a positive impact on learners' production of unique simple past activity verbs, and there was no difference between the two feedback types. There are also studies whose findings reported very limited effectiveness for the recasts despite their relatively longer treatment. Lyster (2004), for example, examined the effects of recasts and prompts on the acquisition of grammatical gender in French. The treatment consisted of six sessions that spread over five weeks and took about 8-10 hours. The findings showed that the recast group performed only marginally better than a form-focused-only group (a control group that received form-focused instruction with no CF).

Several reasons can account for the conflicting findings above. First, recast studies that have been conducted in laboratory settings are likely to produce more positive results (see Han, 2002; Mackey & Philp, 1998; McDonough, 2007 above) as the intervening variables are easier to control, and the corrective nature of recasts is easier to notice, making the length of intervention a less determining factor. Second, the nature of target structures may interact with recast effectiveness. Non-salient language features, such as third person "-s," may require

a longer treatment and more instances of recasts (e.g., Sarandi & Çelik 2019), as opposed to salient features, such as temporal adverbs. Third, the versatile nature of recasts allows for their different operationalization, resulting in recasts with different amounts of implicit or explicit force. It is likely that studies that employ explicit recasts produce more positive results as the corrective intent of these types of recasts is easier to notice (see Doughty & Varela, 1998; Zhao, 2015). Fourth, the control groups used in the recast studies are of two types: test-control comparison groups and task-control comparison groups. The former groups only take the pretest and posttests, whereas the latter groups additionally receive treatments with no feedback. Arguably, the studies that have included task-control comparison groups may stand a better chance of taking care of the exposure effect and offer a better judgment of the effectiveness of CF. In Erlam and Loewen (2010) and Monteiro (2014), for example, recast groups failed to outperform the task-only control groups despite their considerable progress from the pretest to posttest because the task-only control groups made a similar amount of improvement as well. Fifth, recasts can have more effect on L2 development when learners do not confuse them with comments on content and succeed in recognizing their corrective intent. Egi (2010), for example, found that recasts resulted in greater frequency of uptake, repair, and modified output when learners were aware of their corrective force. Finally, the learning context may interact with the effectiveness of recasts. Research shows that learners in different learning contexts (e.g., Chinese students) may have different attitudes towards CF and become more responsive to implicit CF such as recasts (H. Li, 2018; Zhao & Ellis, 2022).

Unfortunately, not all the experimental studies reported above have provided information on the number of recasts employed during the treatment sessions, making it difficult to compare their findings based on frequency. However, the existing data suggest that the number of recasts provided per treatment session may vary considerably both in classroom-based studies and computer-based studies. For example, in Nakatsukasa's (2016) classroom-based study, the average number of regular recasts was 9.5 per class, while in Nassaji's (2017) study, it was 161 and 166 for intensive and extensive recast groups, respectively. In Sauro's (2009) SCMC study, the average number of text-based recasts was 2.77, while in Yilmaz's (2012) SCMC study, it was 15.50 and 13.75 depending on the target structures. Nakatsukasa (2016) found no long-term effect for the regular recasts over a control group, whereas Nassaji (2017) found a significant advantage for the extensive recast group over a control group in the oral picture description and GJT. In a similar fashion, Sauro (2009) found no significant advantage for the recast group over the control group on any of the measures used in the study, whereas Yilmaz (2012) reported that the recast group performed better than the control group on the oral production and comprehension tasks.

To sum up, despite some contradictory findings, the bulk of studies reported above suggest that frequency of occurrence can be a factor in recast effectiveness. However, there is a lack of experimental research that would examine the role of recast frequency as an independent variable, especially in computer-mediated contexts, where the number of recast studies is relatively few and online English language teaching is becoming more popular. In light of the discussion above, the present study aims to address the following research question:

*What is the effect of oral recast frequency on the acquisition of English language articles in a computer-mediated context?*

## 3. Methodology

### 3.1. Participants

The participants included volunteer L2 learners who were studying in the English preparatory program of a foundation university in Istanbul. The learners needed to achieve at least a B2 level, according to the CEFR, in a language test prepared and administered by the university in order to be eligible to enroll in their own programs. The participants were selected from the learners at a B1+ level. An earlier pilot study showed that the majority of learners at this level had the language proficiency required for the task completion, and at the same time, they had difficulties using the target structure. The learners' age varied between 18 and 23, with a mean age of 19.21. The nationality of most learners was Turkish; however, there were learners of other nationalities as well (Afghan: 2, Greek: 2, Jordanian: 2, Palestinian: 2, Syrian: 2, Ethiopian: 1, Indonesian: 1).

The original number of learners was 72. However, 11 learners who scored more than 80 in the pretest of the picture description task were removed from the data analysis to avoid ceiling effects. Of the remaining 61 learners, nine learners also scored more than 80 in the pretest of the error correction task and were removed from the analysis of this test. As a result, 61 (41 female, 20 male) learners completed the picture description task (16 in the HF group, 16 in the LF group, 12 in the task control group and 17 in the test control), and 52 (35 female, 17 male) learners completed the error correction task (14 in the HF group, 13 in the LF group, 12 in the task control group and 13 in the test control group). During the treatment sessions the learners in the experimental groups were put into groups of two or four. The HF group consisted of six subgroups, of which two groups involved four and four groups involved two learners (Group 1: *N* = 4, Group 2: *N* = 4, Group 3: *N* = 2, Group 4: *N* = 2, Group 5: *N* = 2, Group 6: *N* = 2).

The low frequency group consisted of five subgroups, with three groups involving four and two groups involving two learners (Group 1: $N = 4$, Group 2: $N = 4$, Group 3: $N = 4$, Group 4: $N = 2$, Group 5: $N = 2$). The task control group consisted of four subgroups (Group 1: $N = 4$, Group 2: $N = 4$, Group 3: $N = 2$, Group 4: $N = 2$). The original plan was to have four learners in each subgroup, but the busy schedule of learners made it difficult to have the same number of learners in each group. No subgroups were formed for the learners in the test control group because they did not receive any treatment. They received the pretest and posttests only.

## 3.2. Data collection instruments

The change in the learners' knowledge of the target structure was measured using two language tests, a picture description task and an online error correction task. For the picture description task, four stories were prepared for each testing session. Each story consisted of four pictures with some words below them to help learners with their descriptions. The pictures related to four stories were taken from Muranoi (2000), and the pictures related to the other four stories were created by the researchers. The first four stories were employed in the pretest and the delayed posttest, and the second four stories were employed in the immediate posttest. Before each testing session, learners carried out an example task to learn about the procedure. The tasks were completed online through video-conferencing, and the oral interactions between the learners and the researcher were video-recorded. The pictures were piloted with learners of the same proficiency level before being used in the study.

The error correction task consisted of 26 statements, of which 8 targeted the definite article "the," 8 targeted indefinite articles "a" and "an," and 10 were used as distractors. Of the 16 statements, 14 were adapted from Sheen (2008), and two statements were added by the researchers. Each statement had two related sentences. Since Google Forms lacks an underlying feature, asterisks were used at the beginning and the end of the statements to indicate the sentences that contained errors. Learners were instructed to identify and correct errors in sentences marked with asterisks. A modified version of the test was created by making slight changes to the nouns and names of places. The first version was used as the pretest and the delayed posttest, and the second version was used as the immediate posttest. Examples of items used in the error correction task are provided below:

1. We rented a boat last summer. Unfortunately, boat hit another boat and sank (*).
2. (*) Is your brother geography teacher? I want to ask him a question.

The sentences were presented through an online Google Forms questionnaire. Pilot studies with volunteer learners were also carried out to ensure that they had no problems understanding the statements. Before the onset of the study, learners worked on two example sentences to familiarize themselves with the process. Learners were permitted to complete the task at their own pace. Because of the hectic schedule of learners and the coincidence of the timing of the delayed posttest with the end of the module exam of the learners in the test control group, the decision was made not to apply the delayed posttest for the error correction task in this group.

## 3.3. Target structure

The English definite article "the" and indefinite articles "a" and "an" were chosen as the linguistic target for the study. The choice was made on the basis of the complex nature of this structure and the difficulty that learners usually experience with using it. The correct use of articles in English is determined by noun countability as well as the speakers' consideration of the specificity of references, and hearers' knowledge of this (Butler, 2002; Huebner, 1983, 1985). Failure to have a clear understanding of these aspects may lead to a wrong article choice by learners, especially those whose native languages do not possess an article system (Butler, 2002). Articles also lack saliency. They are usually unstressed and difficult to notice in speech (Master, 2002), which makes them more difficult to acquire. In the Turkish language, there are no definite articles, and Turkish speakers use other linguistic properties such as word order, stress, and accusative case suffix to specify definiteness (Dede, 1986). As for the indefinite articles "a" and "an," the Turkish word *bir* meaning *one* in English is used, but its utilization is less often compared to indefinite articles in English because its use in certain contexts (e.g., non-specific and non-referential) is only optional (Öztürk, 2005). These features add to the challenges of mastering English articles for learners with a Turkish L1 background. Due to the multiplicity of the functions that articles serve in English, the present study only examined learners' use of this structure for two functions: the use of indefinite articles (a/an) for first mentioning of unspecified countable entities and the definite article (the) for anaphoric mentioning of entities that have already been introduced.

## 3.4. Treatment sessions

Five communicative tasks were developed by the researchers for the treatment sessions. Each task consisted of two versions of a single narrative story with minor

differences between them. The story length varied from 161 to 280 words. The reason for producing two versions of each story was to create an information gap and to establish expected outcomes for learners' interactions (see R. Ellis, 2003 for task features). For the first version, the first and second stories were taken from Sheen (2007). The first story was originally adapted from "The Fox and the Crow" fable (http://read.gov/aesop/027.html), and the second story was written by Sheen (2007). The contents of both stories were, however, changed to include more instances of article use and to make their language fit the level of the learners. The last story was taken from Rassaei (2017) with minor modifications. The other two stories in version A and all five stories in version B were written by the researchers themselves. Attempts were made to have a similar number of definite and indefinite articles in both versions of each task. An online corpus analysis (https://www. lextutor. ca/vp/eng) of the stories showed that 94.00% of the words used in version A stories and 94.61% of the words used in version B stories belonged to the 2000 most common English words.

One of the researchers conducted the treatment and feedback sessions. The whole process was carried out through the Microsoft Teams platform. Groups of four or two learners participated in each treatment session at a time, depending on their availability. In each treatment session, learners were paired up and provided with either version A or B of the story. They were then sent to virtual chatrooms and asked to read the stories, tell the stories to their peers, and find the similarities and differences between the stories. Learners were then recalled to recount the story to the researcher and other participants. They were also asked to discuss the similarities and differences between the version A and B of the story, their preference for each version, and their opinions about the moral behind each story. Meanwhile, they received oral recasts on the errors they made with the use of articles. Learners' errors on language features other than the target grammar were ignored. In subgroups with two participants, each learner told the entire story (version A or B), whereas in subgroups with four participants, the learners took turns and each learner told only half of the story. The treatment sessions were recorded on the researcher's computer for subsequent analysis, which was usually carried out a couple of days later. There was no recording of the learners' interaction with their partners inside the chatrooms, but the researcher could visit the rooms to ensure that learners were following the procedure. Example 1 shows how recasts were given to learners' errors. As can be seen, most recasts were partial, unstressed, and declarative. However, their repeated use of the target structure may have revealed their corrective force to learners and made them less implicit (see Sarandi, 2016).

**Example 1**

L: Then crow flew to a nearby tree
R: the crow flew
L: Right the crow… and then fox saw him
R: A fox saw him.
L: Oh yes a fox saw him.

To investigate the effect of different amounts of exposure to recasts, learners in the HF and LF groups completed a different number of story tasks. The learners in the LF group completed two story tasks (the first and second stories) in one session held on a single day, whereas the learners in the HF group completed five story tasks in two sessions held on two consecutive days (the first and second stories on the first day and the remaining three stories on the second day). The learners in the task control group also completed five story tasks, but the feedback that they received was directed to aspects other than grammatical structures, such as pronunciation and vocabulary. The tasks in the LF feedback group took roughly 50 minutes to complete, and the tasks in the HF feedback group and task control feedback group took roughly 120 minutes to complete. The learners in the test control group only participated in the pretest and posttests without completing any story tasks.

## 3.5. Testing procedure

The same researcher that administered the treatment sessions also collected the pretest and posttests data. The process was conducted for each learner individually. They first completed the online picture description task via Microsoft Teams video-conferencing. It took each learner 4-5 minutes to complete the picture description task. This was followed by the online error correction task administered through an online Google Forms questionnaire. A link to the questionnaire was sent to each learner and instructions were given on how to complete the questionnaire. The researcher asked learners to take the test at their own pace, but he was also available online in case they had any questions. It took each learner 15-25 minutes to complete the error correction task. The same procedure was also applied both for the immediate posttest, conducted the day following the last treatment session, and the delayed posttest, administered three weeks later. Because of learners' timing issues, the delayed posttest for the error correction task was not carried out for the test control group. The data analysis for the error correction task of this group was hence limited to the pretest and first posttest only.

## 3.6. Scoring

In scoring the picture description task, we computed an accuracy ratio for each learner. We calculated the number of correct uses of English articles and divided it by the total number of obligatory occasions. The similarity in the number of obligatory contexts across tests is notable, with 45 contexts for both the pretest and delayed posttest (comprising 22 indefinite and 23 definite contexts) and 48 for the posttest (23 indefinite and 25 definite contexts). Given the naturalistic nature of the task, controlling students' production was not possible. However, it is crucial to highlight that the slight difference in the number of obligatory contexts between the pretest and posttest was uniform across all groups. This uniformity across groups suggests that the slight discrepancy in the number of obligatory contexts is unlikely to significantly impact the results of the group comparisons. However, to further address the slight differences in the test items, the scoring results were converted into percentages. For the error correction task, learners received 1 point for correcting items with article errors and 0 points otherwise. The total score for each learner was then divided by the total number of obligatory contexts, and the result was expressed as a percentage.

## 3.7. Data analysis

To address the research question, the data were entered into SPSS version 21, and the following analyses were applied. First, the frequency distribution of recasts for each subgroup was calculated. Then, descriptive statistics for the picture description and error correction tasks were computed. This was followed by one-way ANOVAs, ANCOVAs, and a Welch's ANOVA, with Bonferroni and Games-Howell post-hoc comparisons to detect the significant differences between the groups. Finally, Pearson product-moment correlations between the recast frequency and the changes in learners' accuracy scores on both measures were calculated.

To assess normality, skewness and kurtosis values were computed. For the picture description task skewness was .298 and kurtosis was -.865, and for the error correction task skewness was .271 and kurtosis was -.831, suggesting that the data were normally distributed within the accepted range of -1 and +1 (see Tabachnick & Fidell, 2013). Regarding the reliability of the measures, Cronbach's alpha was .882, .958, and .952, for the pretest, posttest, and delayed posttest scores of learners on the picture description task, respectively. Inter-rater reliability was calculated for 80% of the data on the picture description task, and it was .99. For the error correction task, Cronbach's alpha was .805, .901, and .901, for the pretest, posttest, and delayed scores, respectively.

## 4. Results

Table 1 displays the number of subgroups and the frequency of recasts learners received during the treatment sessions. As shown in Table 1, even though recasts were not distributed equally in the groups, the learners in the HF group received more recasts than those in the LF group.

**Table 1** The frequency of recasts delivered to experimental groups

| HF group | Recast freq. | LF group | Recast freq. |
|---|---|---|---|
| Subgroup H1 ($N$ = 4) | 47 | Subgroup L1 ($N$ = 4) | 23 |
| Subgroup H2 ($N$ = 4) | 62 | Subgroup L2 ($N$ = 4) | 24 |
| Subgroup H3 ($N$ = 2) | 40 | Subgroup L3 ($N$ = 4) | 31 |
| Subgroup H4 ($N$ = 2) | 39 | Subgroup L4 ($N$ = 2) | 17 |
| Subgroup H5 ($N$ = 2) | 42 | Subgroup L5 ($N$ = 2) | 34 |
| Subgroup H6 ($N$ = 2) | 47 | | |
| Average | 46.16 | | 25.80 |

Table 2 shows the descriptive statistics for the picture description task (PDT). As shown in Table 2, the average scores of the LF group ($M$ = 54.29) were considerably higher than the other study groups ($M$ = 35.92, $M$ = 29.20, and $M$ = 35.87 for the HF and task control and test control groups, respectively). Table 2 also displays that the mean scores of both the experimental groups and the control groups, to a lesser degree, increased in the immediate posttest. The rising trend was more noticeable in the HF group, with a mean increase of 36.22, compared to the LF group which had a mean increase of 8.54. The mean increase in the control groups was noticeably small, with 0.16 and 3.65 for the task and test control groups, respectively. The delayed posttest results showed a small rise in the average scores of the learners in the HF and LF groups, with a mean increase of 1.95 for the HF group and 0.71 for the LF group. There was also some increase in the performance of the learners in both the task and test control groups between the immediate posttest and the delayed posttest, with a mean increase of 9.82 for the task control group and 6.53 for the test control group.

**Table 2** Descriptive statistics for PDT

| Group | $N$ | Pretest | | Immediate posttest | | Delayed posttest | |
|---|---|---|---|---|---|---|---|
| | | $M$ | $SD$ | $M$ | $SD$ | $M$ | $SD$ |
| HF | 16 | 35.92 | 19.08 | 72.14 | 21.72 | 74.09 | 20.65 |
| LF | 16 | 54.29 | 20.57 | 62.83 | 24.21 | 63.54 | 20.92 |
| Task control | 12 | 29.20 | 15.33 | 29.36 | 18.79 | 39.18 | 16.00 |
| Test control | 17 | 35.87 | 15.96 | 39.52 | 18.48 | 46.05 | 16.71 |

*Note.* HF = high frequency, LF = low frequency, PDT = picture description task

An ANOVA showed a significant difference between the groups in learners' pretest scores on the oral production task: $F(3, 57) = 5.350$, $p = .003$, $\eta^2 = .220$. To account for the existing differences, a one-way ANCOVA was performed on the learners' posttest scores with their pretest scores used as the covariate. The immediate posttest results showed a significant difference between the three study groups, $F(3, 56) = 16.041$, $p < .001$, $\eta^2 = .462$. A subsequent Bonferroni post-hoc comparison revealed that the HF group outperformed the LF and both control groups ($p = .002$, $p < .001$, and $p < .001$, respectively). No significant differences were found between the LF group and the task and test control groups ($p = .236$, $p = .763$, respectively), nor between the two control groups ($p = 1.000$). An ANCOVA revealed a significant difference in the mean scores of learners in the delayed posttest, $F(3, 56) = 13.586$, $p < .001$, $\eta^2 = .421$. A Bonferroni post-hoc test again showed that the learners in the HF group significantly outperformed the LF ($p < .001$) and both control groups ($p < .001$, $p < .001$). There were also no significant differences between the LF and both control groups ($p = 1.000$, $p = 1.000$), nor between the two control groups ($p = 1.000$).

Table 3 shows the descriptive statistics for the error correction task (ECT). The mean scores of the learners in the HF and LF groups were similar at the onset of the study ($M = 42.82$ vs. $M = 45.19$, respectively), with the average score of the learners in the task and test control groups somewhat lower than of the learners in the experimental groups ($M = 37.43$ and $M = 33.65$ for the task and test control groups, respectively). The mean scores of all study groups improved in the immediate posttest. Once again, the upward trend was more noticeable in the HF group, with a mean increase of 44.23, followed by the LF, task control and test control groups, with mean increases of 29.21, 24.00, and 10.10, respectively. In the delayed posttest, the mean scores of both experimental groups and the task control group displayed some reduction, with a mean decrease of 6.68 for the HF, 0.85 for the LF, and 4.14 for the task control groups; all the same, the mean score of the HF group remained higher than both the LF and the task control groups. As explained earlier, because of timing issues, the participants in the test control group did not take the delayed posttest of the error correction task, and the data of these participants were limited to the pretest and immediate posttest only.

**Table 3** Descriptive statistics for ECT

| Group | N | Pretest | | Immediate posttest | | Delayed posttest | |
|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD |
| HF | 14 | 42.82 | 22.57 | 87.05 | 11.08 | 80.37 | 22.03 |
| LF | 13 | 45.19 | 19.95 | 74.40 | 24.20 | 73.55 | 29.88 |
| Task control | 12 | 37.43 | 27.03 | 61.43 | 25.53 | 57.29 | 29.53 |
| Test control | 13 | 33.65 | 23.18 | 43.75 | 27.24 | - | - |

*Note.* HF = high frequency, LF = low frequency, ECT = error correction task

A one-way ANOVA showed no significant differences between the groups in learners' pretest scores on the error correction task, $F(3, 48) = 0.657$ $p = .582$. A Welch's ANOVA was conducted on the scores of learners in the immediate posttest because Levene's test of homogeneity showed there was a significant difference of variance between the groups ($F(3, 48) = 3.14$, $p = .033$). The findings revealed a statistically significant difference between the groups, $F(3, 23.31) = 11.062$, $p <$ .001, $\eta^2 = .329$. A post-hoc Games-Howell showed that the HF group performed significantly better than the task and test control groups ($p = .027$ and $p < .001$, respectively). The results also showed that the mean differences between the learners in the LF group and the test control group approached significance ($p = .050$), but there was not a significant difference between the LF group and the task control group ($p = .646$). There was also no significant difference between the two experimental groups ($p = .443$), nor between the two control groups ($p = .359$). A one-way ANOVA was also carried out on the delayed posttest scores of learners in three groups (the HF, LF and task control groups). Findings revealed no significant group differences, $F(2, 36) = 2.406$, $p = .105$. Table 4 presents a summary of the findings and Figures 1 and 2 show the changes in the mean scores of learners in the picture description and error correction tasks at different stages of the study.

**Table 4** Summary of the findings

| Tests | Immediate posttest | Delayed posttest |
|---|---|---|
| PDT | HF > LF, task control, test control | HF > LF, task control, test control |
| ECT | HF > task control, test control | No significant differences between HF, |
|  | LF > test control (approached) | LF, and task control groups |

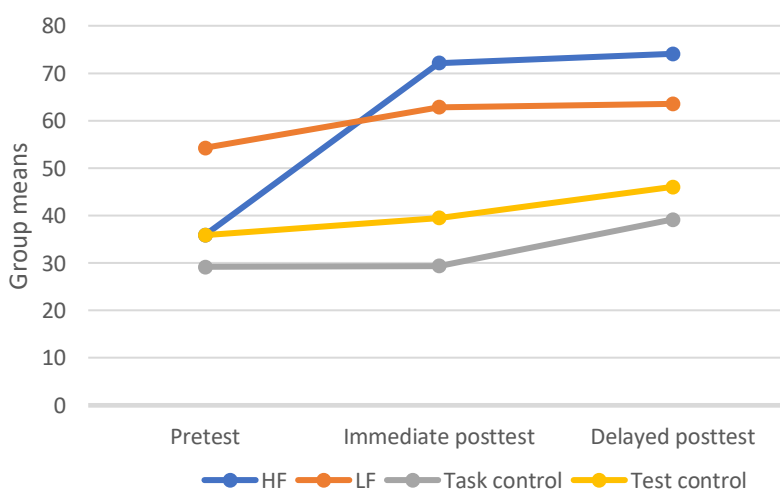*Note.* PDT = picture description task, ECT = error correction task



**Figure 1** Mean scores of the experimental and control groups in PDT
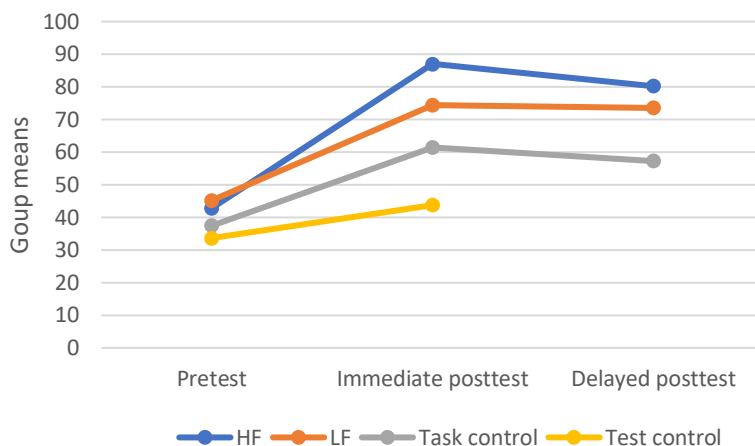
**Figure 2** Mean scores of the experimental and control groups in the ECT

To triangulate the data, the changes in learners' performance on the picture description and error correction tasks in the HF and LF subgroups were compared with the frequency of recasts that learners in these groups received. Table 5 shows the Pearson correlation coefficient results. As shown, in the picture description task, there were significant correlations between the frequency of recasts and the learners' score improvements from the pretest to the immediate posttest, $r$ = .588, and from the pretest to the delayed posttest, $r$ = .574. However, in the error correction task, there was no significant correlation between the recast frequency and the learners' score improvements.

**Table 5** Correlation between learners' improvement from pretest to posttests and feedback frequency

| Score change in high and low frequency subgroups | Recast frequency |
|---|---|
| PDT pretest to immediate posttest | .588** |
| PDT pretest to delayed posttest | .574** |
| ECT pretest to immediate posttest | .315 |
| ECT pretest to delayed posttest | .131 |

*Note.* ** $p$ < .001

## 5. Discussion

The research question asked whether recast frequency mediates the acquisition of English articles by L2 language learners in computer-mediated contexts. The findings revealed that recast frequency had a positive impact on learners' performance

on the picture description task, but not as much on the error correction task. The results of the picture description task showed that only recasts with high frequency were significantly effective in improving learners' online production of articles. A more complicated picture, however, emerged regarding the error correction task. Both the high and low frequency recast groups demonstrated improvement from the pretest to the immediate posttest, with the HF group outperforming both control groups and the LF group outperforming only the test control group. The findings of the delayed posttest, however, revealed no significant group differences between the HF, LF, and task control groups. In other words, recasts, regardless of frequency, were not significantly more effective than task completion in enhancing learners' performance on the error correction task. These findings were further corroborated by correlation results. Significant correlations were recorded between the frequency of recasts that learners received and their score improvement in the picture description task, but not in the error correction task.

The findings can be explained by examining the differences between the design features of the measurement instruments employed in the study and the type of knowledge that they are likely to gauge. Arguably, the meaning-focused and timed pressure nature of the picture description task rendered it better candidates for measuring learners' implicit knowledge. On the other hand, the untimed and form-focused nature of the error correction task increased the likelihood of tapping into the explicit knowledge of learners. If this argument is true, then our findings show that to build implicit knowledge of target structures learners need communicative practice coupled with form-focused intervention, in our case, a large quantity of recasts.

One way that feedback frequency may contribute to L2 acquisition is through enhancing the salience of target structures. Recasts are usually classified as implicit feedback. The unobtrusive nature of these CF strategies may make it difficult for language learners to recognize their corrective purpose, and learners may easily mistake recasts for teachers' comments on the content of the message, or a repetition of what learners have already mentioned (Lyster & Ranta, 1997). However, learners are more inclined to become cognizant of the corrective purposes of recasts when they target a single structure in a consistent manner. The frequency of recasts hence contributes to their noticeability and facilitates the acquisition of target structures. On the other hand, recasts provided in small quantities may fail to draw learners' attention to these features and turn of little help in improving learners' online use of language structures especially in time-pressured situations.

The role of feedback frequency can also be examined for its impact on the interaction between implicit and explicit knowledge. As N. C. Ellis (2005) contends, some degree of conscious awareness is required at the initial stages of language learning to create novel linguistic construction in explicit memory. The conscious involvement in form-function mappings is needed more for language features that

have a low salience and do not have much communicative value, such as articles. Once the associations between language elements are established, noticing is no longer necessary, and the subsequent usage of linguistic elements is enough for implicit tallying and strengthening of the connections. CF, as a form-focused strategy, serves to build these explicit representations at the initial phases of language learning. The more often learners' ill-produced language structures are mapped against target exemplars, the more likely it is that correct associations are established between language elements so that subsequent exposure and usage strengthen these connections in the implicit memory. Furthermore, the possible uptake that follows recasts (i.e., the immediate responses to recasts) can also feed into implicit memory and consolidate linguistic representations. In this sense, frequency can serve the acquisition process both at the initial explicit construction of grammar representations as well as the subsequent implicit associative learning through language usage.

Regarding the error correction task results, our findings showed that in the short run, recasts with higher frequency were more effective than recasts with lower frequency in raising learners' awareness and retrieval of their explicit knowledge of the target structure. The advantage of recast frequency, however, disappeared through time, apparently because learners' attention in the LF and task control groups was also drawn to the target structure, and they were relatively more successful at maintaining their raised attention between the first and second posttests than the learners in the HF group. Hence, our findings suggest that learners might need a relatively lower number of recasts to access or develop their explicit knowledge of English articles. The findings with regard to the task control group also show that learners' repeated exposure to the target structure during task performance and test completion may be of equal effectiveness in helping learners access and employ their explicit knowledge of the target structure.

Some earlier studies also showed that the effects of recasts might be better reflected in language measures that tap into learners' oral production (e.g., Ahn & Kim, 2016; Hassanzadeh et al., 2019; Lyster & Saito, 2010; Nassaji, 2017; Révész, 2012; Révész & Han, 2006; Zhao, 2015). The positive effect of recasts in improving learners' productive use of the target structure can also be explained through the similarity between treatment sessions and testing conditions. According to transfer appropriate processing (TAP), we can remember items better when the cognitive processes involved in learning them are similar to the processes involved in retrieving them from memory (Blaxton, 1989; Morris et al., 1977). It could hence be argued that the online and productive nature of the treatment sessions made it more likely for recasts to exert their impact during the oral production task, which enjoyed similar conditions of language use.

The current study has its limitations. First, as noted earlier, in order to prevent a ceiling effect, the data of learners who scored higher than 80 in either task at the

pretest stage were removed from the analysis. This resulted in participant attrition, especially in the error correction task, and made it more likely that the results on this task would be affected by individual factors. Second, the number of learners in the HF and LF recast subgroups was not identical. The original plan was to assign four learners to each subgroup. However, this turned out to be impossible because of abrupt changes in learners' schedules. Therefore, the findings may have been affected by more individual attention that the subgroups with fewer members received. Yilmaz (2016), for example, showed that, at least for some language structures, learners may benefit more from the CF that is directed at their own errors rather than their peers'. Third, the present study examined the effect of recast frequency on two functions of articles, whether an entity was mentioned earlier or not, so the findings cannot be generalized to other functions of this structure. Fourth, the absence of data for the test control group on the delayed posttest of the error correction task made it difficult to compare the long-term effect of recast frequency with testing effect. Fifth, no final exit questionnaire was applied to investigate learners' awareness of the corrective nature of recasts and the structure targeted in the study. Sixth, because there were no recordings of learners' interaction with their peers in the virtual chatrooms during the practice time, it is not possible to find out the number of recasts that learners had received from their peers before they started to retell the story to the researcher and other participants. Finally, since the learners in the subgroups did not receive the same number of recasts, regardless of which main group they belonged to (the HF or LF, see Table 1), it is difficult to claim that all learners in the HF subgroups had the same advantage over the learners in the LF subgroups.

## 6. Conclusion

This study compared the effectiveness of recasts provided in different quantities in the acquisition of English articles. The findings present empirical evidence to support the earlier suggestion made by R. Ellis and Sheen (2006) that recasts can help learners with their acquisition process when they are given as "a rich diet" (p. 588). In our case, learners' improvement in their ability to use articles accurately was mostly reflected in the oral production task, and not so much in the written error correction task. All the same, the findings draw SLA researchers' attention to the importance of the frequency of CF as a major intervening variable. They also offer possible explanations for the findings of some earlier studies in which recasts were provided for only a short duration and turned out to be ineffective, especially in terms of learners' oral production of language structures.

The next important step is to develop a criterion based on CF frequency. Studies need to be designed where CF frequency is manipulated, and its impact

on the acquisition of different language structures is examined. Ideally, this will help SLA researchers decide on the minimum amount of CF that is needed to assist language learners at different proficiency levels to move forward in their language acquisition process. Researchers who do not employ the specified quantity of CF in their studies should hence refrain from making bold claims regarding CF ineffectiveness. The present study was conducted in a computer-mediated context. Research can also explore the interaction between CF frequency and the acquisition of different language structures in classroom-based contexts, where recasts compared to other explicit CF, have appeared to be less effective. Further studies are required to examine how frequency interacts with the effectiveness of written recasts in SCMC environment. Several studies, for example, have reported that written recasts provided during text-based chat may not be very effective in learning non-salient language features (see Kourtali, 2022; Kourtali & Borges, 2023; Sauro, 2009; Yilmaz, 2012).

An important implication of our study is that recast quantity is a significant factor that teachers and researchers need to consider when addressing learners' errors. This, however, does not mean that teachers should necessarily stick to one type of CF for a considerable amount of time before its effectiveness becomes evident. The dynamic environment of language classes may require language teachers to make occasional shifts between implicit and explicit CF strategies (Lyster et el., 2013; Sarandi, 2016), and there is some evidence that such mixed application of CF is beneficial for L2 development (e.g., Sarandi, 2020; Yilmaz, 2013). However, when the nature of language classes demands more implicit handling of errors, for example, when emotionally sensitive language learners are involved, a continuous provision of CF, distributed over time, is expected before the effects of CF emerge.

Recasts have been and will continue to be among the most preferred CF strategies for the majority of language teachers. They have also been the focus of attention of SLA researchers. Any studies that supply information on the factors that contribute to their effectiveness are hence of paramount importance to both groups. We hope that the present study has served this objective by casting light on how frequency may affect recast effectiveness.

## Acknowledgements

References

Ahn, J., & Kim, Y. (2016). The effects of recasts and working memory on the development of implicit and explicit knowledge. *Chinese Journal of Applied Linguistics, 39*(1), 3-25. https://doi.org/10.1515/cjal-2016-0001

Akiyama, Y. (2017). Learner beliefs and corrective feedback in telecollaboration: A longitudinal investigation. *System, 64*, 58-73. https://doi.org/10.1016/j.system.2016.12.007

Aljaafreh, A. & Lantolf, J. P. (1994). Negative feedback as regulation and second language learning in the zone of proximal development. *Modern Language Journal*, *78*(4), 465-483. https://doi.org/10.2307/328585

Ammar, A. (2008). Prompts and recasts: Differential effects on second language morphosyntax. *Language Teaching Research, 12(*2), 183-210. https://doi.org/10.1177/1362168807086287

Ammar, A., & Spada, N. (2006). One size fits all: Recasts, prompts and L2 learning. *Studies in Second Language Acquisition, 28*(4), 544-548. https://doi.org/10.1017/S0272263106060268

Asari, Y. (2017). Salience-enhanced recasts and their effects on learners' production of uptake and modified output. *Journal of Pan-Pacific Association of Applied Linguistics*, *21*(1), 65-84.

Bao, R. (2019). Oral corrective feedback in L2 Chinese classes: Teachers' beliefs versus their practices. *System, 82*, 140-150. https://doi.org/10.1016/j.system.2019.04.004

Blaxton, T. A. (1989). Investigating dissociations among memory measures: Support for a transfer appropriate processing framework. *Journal of Experimental Psychology: Learning. Memory & Cognition, 15*(4), 657-668. https://doi.org/10.1037/0278-7393.15.4.657

Brown, D. (2016). The type and linguistic foci of oral corrective feedback in the L2 classroom: A meta-analysis. *Language Teaching Research, 20*(4), 436-458. https://doi.org/10.1177/1362168814563200

Butler, Y. (2002). Second language learners' theories on the use of English articles. *Studies in Second Language Acquisition, 24*(3), 451-480. https://doi.org/10.1017/S0272263102003042

Carroll, S., & Swain, M. (1993). Explicit and implicit negative feedback: An empirical study of the learning of linguistic generalizations. *Studies in Second Language Acquisition, 15*(3)*,* 357-386. https://doi.org/10.1017/S0272263100012158

Dede, M. (1986). *Studies in Turkish linguistics.* John Benjamins.

Doughty, C., & Varela, E. (1998). Communicative focus on form. In C. Doughty & J. Williams (Eds.), *Focus on form in classroom second language acquisition* (pp. 114-138). Cambridge University Press.

Egi, T. (2007). Interpreting recasts as linguistic evidence: The roles of linguistic target, length, and degree of change. *Studies in Second Language Acquisition, 29*(4), 511-537. https://doi.org/10.1017/S0272263107070416

Egi, T. (2010). Uptake, modified output, and learner perceptions of recasts: Learner responses as language awareness. *Modern Language Journal, 94*(1), 1-21. https://doi.org/10.1111/j.1540-4781.2009.00980.x

Ellis, N. C. (2002). Frequency effects in language acquisition: A review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition, 24*(2), 143-188. https://doi.org/10.1017/S0272263102002024

Ellis, N. C. (2005). At the interface: Dynamic interactions of explicit and implicit language knowledge. *Studies in Second Language Acquisition, 27*(2), 305-352. https://doi.org/10.1017/S027226310505014X

Ellis, N. C. (2014). Implicit and explicit learning of language. In P. Rebuschat (Ed.), *Implicit and explicit learning of language* (pp. 3-23). John Benjamins.

Ellis, N. C. (2017). Salience in usage-based SLA. In S. Gass, P. Spinner, & J. Behney (Eds.), *Saliency in second language acquisition* (pp. 22-40). Routledge.

Ellis, R. (2001). Introduction: Investigating form-focused instruction. *Language Learning, 51*(1), 1-46. https://doi.org/10.1111/j.1467-1770.2001.tb00013.x

Ellis, R. (2003). *Task-based language learning and teaching*. Oxford University Press.

Ellis, R. (2007). The differential effects of corrective feedback on two grammatical structures. In A. Mackey (Ed.), *Conversational interaction in second language acquisition: A collection of empirical studies* (pp. 339-360). Oxford University Press. https://doi.org/10.1017/S027226310606027X

Ellis, R., Loewen, S., & Erlam, R. (2006). Implicit and explicit corrective feedback and the acquisition of L2 grammar. *Studies in Second Language Acquisition, 28*(3), 339-368. https://doi.org/10.1017/S0272263106060141

Ellis, R., & Sheen, Y. (2006). Reexamining the role of recasts in second language acquisition. *Studies in Second Language Acquisition, 28*(4), 575-600.

Ellis, R., Sheen, Y., Murakami, M., & Takashima, H. (2008). The effects of focused and unfocused written corrective feedback in an English as a foreign language context. *System, 36*(3), 353-371. https://doi.org/10.1016/j.system.2008.02.001

Erlam, R., & Loewen, S. (2010). Implicit and explicit recasts in L2 oral French interaction. *The Canadian Modern Language Review, 66*(6), 877-905. https://doi.org/10.3138/cmlr.66.6.877

Fu, T., & Nassaji, H. (2016). Corrective feedback, learner uptake, and feedback perception in a Chinese as a foreign language classroom. *Studies in Second Language Learning and Teaching, 6*(1), 159-181. https://doi.org/10.14746/ssllt.2016.6.1.8

Gass, S. (1997). *Input, interaction, and the second language learner*. Lawrence Erlbaum.

Goo, J. (2012). Corrective feedback and working memory capacity in interaction-driven L2 learning. *Studies in Second Language Acquisition, 34*(3), 445-474. https://doi.org/10.1017/S0272263112000149

Goo, J. (2020). Research on the role of recasts in L2 learning. *Language Teaching, 53*(3), 1-27. https://doi.org/10.1017/S026144482000004X

Goo, J., & Mackey, A. (2013). The case against the case against recasts. *Studies in Second Language Acquisition, 35*(1), 127-165. https://doi.org/10.1017/S0272263112000708

Han, Z. (2002). A Study of the impact of recasts on tense consistency in L2 output. *TESOL Quarterly, 36*(4), 543-572. https://doi.org/10.2307/3588240

Hassanzadeh M., Marefat, F., & Ramezani A. (2019). The impact of single versus multiple recasts on L2 learners' implicit and explicit knowledge. *Heliyon, 5*(5), 1-9. https://doi.org/10.1016/j.heliyon.2019.e01748

Huebner, T. (1983). *A longitudinal analysis of the acquisition of English*. Karoma.

Huebner, T. (1985). System and variability in interlanguage syntax. *Language Learning, 35*(2), 141-163. https://doi.org/10.1111/j.1467-1770.1985.tb01022.x

Ishida, M. (2004). Effects of recasts on the acquisition of the aspectual form -te i-(ru) by learners of Japanese as a foreign language. *Language Learning, 54*(2), 311-394. https://doi.org/10.1111/j.1467-9922.2004.00257.x

Iwashita, N. (2003). Negative feedback and positive evidence in task-based interaction: Differential effects of L2 development. *Studies in Second Language Acquisition, 25*(1), 1-36. https://doi.org/10.1017/S0272263103000019

Kamiya, N. (2015). The effectiveness of intensive and extensive recasts on L2 acquisition for implicit and explicit knowledge. *Linguistics and Education, 29*, 59-72. https://doi.org/10.1016/j.linged.2014.11.002

Kim, J. H. (2021). The relative effect of recasts on L2 Korean learners' accuracy development of two different forms and its relationship with language analytic ability. *Language Teaching Research, 25*(3), 451-475. https://doi.org/10.1177/1362168819859910

Kim, Y., Payant, C., & Pearson, P. (2015). The intersection of task-based interaction, task complexity, and working memory: L2 question development through recasts in a laboratory setting. *Studies in Second Language Acquisition, 37*(2), 549-581. https://doi.org/10.1017/S0272263114000618

Kourtali, N. E. (2022). The effects of face-to-face and computer-mediated recasts on L2 development. *Language Learning and Technology, 26*(1), 1-20. http://hdl.handle.net/10125/73457

Kourtali, N. E., & Borges, L. (2023). The effects of feedback timing on L2 development in written SCMC. *Computer Assisted Language Learning*. https://doi.org/10.1080/09588221.2023.2171066

Lee, E. J. (2013). Corrective feedback preferences and learner repair among advanced ESL students. *System, 41*(2), 217-230. https://doi.org/10.1016/j.system.2013.01.022

Li, H. (2018). Recasts and output-only prompts, individual learner factors and short-term EFL learning. *System*, *76*, 103-115. https://doi.org/10.1016/j.system.2018.05.004

Li, S. (2014). The interface between feedback type, L2 proficiency, and the nature of the linguistic target. *Language Teaching Research, 18*(3), 373-396. https://doi.org/10.1177/1362168813510384

Loewen, S., & Erlam, R. (2006). Corrective feedback in the chatroom: An experimental study. *Computer Assisted Language Learning, 19*(1), 1-14. https://doi.org/10.1080/09588220600803311

Loewen, S., & Nabei, T. (2007). Measuring the effects of oral corrective feedback on L2 knowledge. In A. Mackey (Ed.), *Conversational interaction in second language acquisition* (pp. 361-377). Oxford University Press.

Loewen, S., & Philp, J. (2006). Recasts in the adult English L2 classroom: Characteristics, explicitness, and effectiveness. *Modern Language Journal, 90*(4), 536-556. https://doi.org/10.1111/j.1540-4781.2006.00465.x

Long, M. (1996). The role of the linguistic environment in second language acquisition. In W. Ritchie, & T. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 413-468). Academic Press.

Long, M. (2007). *Problems in SLA*. Lawrence Erlbaum.

Long, M., Inagaki, S., & Ortega, L. (1998). The role of implicit negative feedback in SLA: Models and recasts in Japanese and Spanish. *Modern Language Journal, 82*(3), 357-371. https://doi.org/10.1111/j.1540-4781.1998.tb01213.x

Lyster, R. (2004). Differential effects of prompts and recasts in form-focused instruction. *Studies in Second Language Acquisition*, *26*(3), 399-432. https://doi.org/10.1017/S0272263104263021

Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake: Negotiation of form in communicative classrooms. *Studies in Second Language Acquisition, 19*(1), 37-66. https://doi.org/10.1017/S0272263197001034

Lyster, R., & Saito, K. (2010). Oral feedback in classroom SLA: A meta-analysis. *Studies in Second Language Acquisition, 32*(2), 265-302. https://doi.org/10.1017/S0272263109990520

Lyster, R., Saito, K., & Sato, M. (2013). State-of-the-art article: Oral corrective feedback in second language classrooms. *Language Teaching, 46*(1), 1-40. https://doi.org/10.1017/S0261444812000365

Mackey, A. (2006). Feedback, noticing and instructed second language learning. *Applied Linguistics, 27*(3), 405-430. https://doi.org/10.1093/applin/ami051

Mackey, A., & Philp, J. (1998). Conversational interaction and second language development: Recasts, responses, and red herrings? *Modern Language Journal, 82*(3), 338-356. https://doi.org/10.1111/j.1540-4781.1998.tb01211.x

Mackey, A., & Sachs, R. (2012). Older learners in SLA research: A first look at working memory, feedback, and L2 development. *Language Learning, 62*(3), 704-740. https://doi.org/10.1111/j.1467-9922.2011.00649.x

Master, P. (2002). Information structure and English article pedagogy. *System, 30*(3), 331-348. https://doi.org/10.1016/S0346-251X(02)00018-0

McDonough, K. (2007). Interactional feedback and the emergence of simple past activity verbs in L2 English. In A. Mackey (Ed.), *Conversational interaction in second language acquisition* (pp. 323-338). Oxford University Press

McDonough, K., & Mackey, A. (2006). Responses to recasts: Repetitions, primed production, and linguistic development. *Language Learning, 56*(4), 693-720. https://doi.org/10.1111/j.1467-9922.2006.00393.x

Monteiro, K. (2014). An experimental study of corrective feedback during video conferencing. *Language Learning & Technology, 18*(3), 56-79. https://doi.org/10125/44384

Morris, D., Bransford, J. D., & Franks, J. J. (1977). Levels of processing versus transfer appropriate processing. *Journal of Verbal Learning & Verbal Behavior, 16*(5), 519-533. https://doi.org/10.1016/S0022-5371(77)80016-9

Muranoi, H. (2000). Focus on form through interaction enhancement: Integrating formal instruction into a communicative task in EFL classrooms. *Language Learning, 50*(4), 617-673. https://doi.org/10.1111/0023-8333.00142

Nakatsukasa, K. (2016). Efficacy of recasts and gestures on the acquisition of locative prepositions. *Studies in Second Language Acquisition, 38*(4), 771-799. https://doi.org/10.1017/S0272263115000467

Nassaji, H. (2016). Anniversary article interactional feedback in second language teaching and learning: A synthesis and analysis of current research. *Language Teaching Research, 20*(4), 535-562. https://doi.org/10.1177/1362168816644940

Nassaji, H. (2017). The effectiveness of extensive versus intensive recasts for learning L2 grammar. *Modern Language Journal*, *101*(2), 353-368. https://doi.org/10.1111/modl.12387

Nassaji, H., & Kartchava, E. (2020). Corrective feedback and good language teachers. In C. Griffiths & Z. Tajeddin (Eds.), *Lessons from good language teachers* (pp. 151-163). Cambridge University Press.

Öztürk, B., (2005). *Case, referentiality and phrase structure*. John Benjamins.

Panova, I., & Lyster, R. (2002). Patterns of corrective feedback and uptake in an adult ESL classroom. *TESOL Quarterly, 36*(4), 573-595. https://doi.org/10.2307/3588241

Rassaei, E. (2017). Video chat vs. face-to-face recasts, learners' interpretations and L2 development: A case of Persian EFL learners. *Computer Assisted Language Learning, 30*(1-2), 133-148. https://doi.org/10.1080/09588221.2016.1275702

Rassaei, E. (2020). The separate and combined effects of recasts and textual enhancement as two focus on form techniques on L2 development. *System 89*, 102-193. https://doi.org/10.1016/j.system.2019.102193

Rassaei, E. (2022). The effects of recasts on L2 grammar: A meta-analysis. *The Language Learning Journal.* https://doi.org/10.1080/09571736.2022.2097298

Révész, A. (2012). Working memory and the observed effectiveness of recasts on different L2 outcome measures. *Language Learning, 62*(1), 93-132. https://doi.org/10.1111/j.1467-9922.2011.00690.x

Révész, A., & Han, Z. (2006). Task content familiarity, task type, and efficacy of recasts. *Language Awareness, 15*(3), 160-179. https://doi.org/10.2167/la401.0

Roothooft, H. (2014). The relationship between adult EFL teachers' oral feedback practices and their beliefs. *System, 46*, 65-79. https://doi.org/10.1016/j.system.2014.07.012

Sagarra, N., & Abbuhl, R. (2013). Optimizing the noticing of recasts via computer-delivered feedback: Evidence that oral input enhancement and working memory help second language learning. *Modern Language Journal, 97*(1), 196-216. https://doi.org/10.1111/j.1540-4781.2013.01427.x

Sarandi, H. (2016). Oral corrective feedback: A question of classification and application. *TESOL Quarterly*, *50*(1), 235-46. https://doi.org/10.1002/tesq.285

Sarandi H. (2020). Mixed corrective feedback and the acquisition of third person "-s." The *Language Learning Journal, 48*(4), 402-413. https://doi.org/10.1080/09571736.2017.1400579

Sarandi, H., & Çelik, M. (2019). The effects of explicit recasts and output-only prompts on learning L2 grammar. *Hacettepe University Journal of Education, 34*(4), 981-998. https://doi.org/10.16986/HUJE.2018043537

Sauro, S. (2009). Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning & Technology, 13*(1), 96-120. https://doi.org/10125/44170

Schachter, J. (1991). Corrective feedback in historical perspective. *Second Language Research, 7*(2), 89-102. https://doi.org/10.1177/026765839100700202

Schmidt, R. (1990). The role of consciousness in second language learning. *Applied Linguistics, 11*(2), 129-158. https://doi.org/10.1093/applin/11.2.129

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3-32). Cambridge University Press.

Sheen, Y. (2004). Corrective feedback and learner uptake in communicative classrooms across instructional settings. *Language Teaching Research, 8*(3), 263-300. https://doi.org/10.1191/1362168804lr146oa

Sheen, Y. (2007). The effects of corrective feedback, language aptitude, and learner attitudes on the acquisition of English articles. In A. Mackey (Ed.), *Conversational interaction in second language acquisition* (pp. 301-322). Oxford University Press.

Sheen, Y. (2008). Recasts, language anxiety, modified output, and L2 learning. *Language Learning, 58*(4), 835-874. https://doi.org/10.1111/j.1467-9922 .2008.00480.x

Sheen, Y., Wright, D., & Moldawa, A. (2009). Differential effects of focused and unfocused written correction on the accurate use of grammatical forms by adult ESL learners. *System, 37*(4), 556-569. https://doi.org/10.1016/j.sy stem.2009.09.002

Swain, M. (1993). The output hypothesis: Just speaking and writing aren't enough. *Canadian Modern Language Review, 50*(1), 158-164. https://doi.org/10.31 38/cmlr.50.1.158

Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Seidlhofer (Eds.), *Principle and practice in applied linguistics: Studies in honour of H. G. Widdowson* (pp. 125-144). Oxford University Press.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

van de Guchte, M., Braaksma, M., Rijlaarsdam, G., & Bimmel, P. (2015). Learning new grammatical structures in task-based language learning: The effects of recasts and prompts. *Modern Language Journal, 99*(2), 246-262. https:// doi.org/10.1111/modl.12211

Wacha, R. C., & Liu, Y. T. (2017). Testing the efficacy of two new variants of recasts with standard recasts in communicative conversational settings: An exploratory longitudinal study. *Language Teaching Research, 21*(2), 189-216. https://doi.org/10.1177/1362168815624268

Yilmaz, Y. (2012). The relative effects of explicit correction and recasts on two target structures via two communication modes. *Language Learning, 62*(4), 1134-1169. https://doi.org/10.1111/j.1467-9922.2012.00726.x

Yilmaz, Y. (2013). The relative effectiveness of mixed, explicit and implicit feedback in the acquisition of English articles. *System*, *41*(3), 691-705. https:// doi.org/10.1016/j.system.2013.07.020

Yilmaz, Y. (2016). The role of exposure condition in the effectiveness of explicit correction. *Studies in Second Language Acquisition, 38*(1), 65-96. https:// doi.org/10.1017/S0272263115000212

Yoshida, R. (2010). How do teachers and learners perceive corrective feedback in the Japanese language classroom? *Modern Language Journal, 94*(2), 293-314. https://doi.org/10.1111/j.1540-4781.2010.01022.x

Zhao, Y. (2015). *The effects of explicit and implicit recasts on the acquisition of two grammatical structures and the mediating role of working memory* (Unpublished doctoral dissertation, University of Auckland).

Zhao, Y., & Ellis, R. (2022). The relative effects of implicit and explicit corrective feedback on the acquisition of 3rd person -s by Chinese university students: A classroom-based study. *Language Teaching Research, 26*(3), 361-381. https://doi.org/10.1177/1362168820903343