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METHODOLOGICAL HURDLES IN CAPTURING CMC DATA: THE CASE OF THE MISSING SELF-REPAIR

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This paper reports on a study of the use of self-repair among learners of German in a task-based CMC environment. The purpose of the study was two-fold. The first goal sought to establish how potential interpretations of CMC data may be very different depending on the method of data collection and evaluation employed. The second goal was to explicitly examine the nature of CMC self-repair in the task-based foreign language CALL classroom. Paired participants (n=46) engaged in six jigsaw tasks over the course of one university semester via the chat function in Blackboard. Chat data were evaluated first by using only the chat log file and second by examining a video file of the screen capture of the entire interaction. Results show a fundamental difference in the interpretation of the chat interaction which varies as a function of the data collection and evaluation methods employed. The findings also suggest a possible difference in the nature of self-repair across face-to-face and SCMC environments. In view of the results, this paper calls for CALL researchers to abandon the reliance on printed chat log files when attempting to interpret SCMC interactional data.

INTRODUCTION

Though the field of computer-assisted language learning (CALL) is a rapidly emerging area within applied linguistics, the amount of CALL research on many current SLA topics is relatively modest. Though computer-mediated communication is fundamentally different than face-to-face communication, CALL/SLA studies often do not adequately ground their inquiry in existing "traditional" SLA research. Further, many CALL studies do not make use of existing technology in their data collection and analysis methods, which can severely limit the impact and relevance of their findings. This is unfortunate because CALL can be a powerful vehicle for exploring many of the core elements of current SLA theory. One of these core areas is the role of self-repair in L2 development. The present study explores self-repair in a task-based synchronous computer-mediated communicative (SCMC) environment and employs video screen capture software to evaluate the amount and nature of self-initiated self-repair (SISR) in an SCMC context. In this paper I will first establish the relevance of self-repair to SLA in both traditional and CMC environments. Then, through the discussion of a classroom-based empirical L2 study I will point out how using video screen capture technology yields a markedly different and more precise picture of the nature of SISR in an SCMC environment.

Self-repair in SLA

Learner self-repair or self-correction has been explored in a variety of educational contexts from various theoretical perspectives and with a focus on both native speakers and second/foreign language learners[1]. Self-repairs are seen as important from an SLA perspective because they provide us insights into a learner's interlanguage (IL) development. Indeed, self-repair is viewed by many as evidence of noticing an observable behavior from which we can infer that a learner has engaged in some monitoring strategy or has noticed a production error (Kormos, 1999).

Self-repair occurs when speakers detect that their output is faulty or inappropriate in some way. The speech flow is halted and a self-correction is executed. Foster & Ohta (2005) define self-correction as "self-initiated, self-repair, [which] occurs when a learner corrects his or her own utterance without being prompted to do so by another person" (p.420). Wouk (2005) makes the distinction between same turn self-repair in which a speaker, in the process of producing an utterance, stops that utterance before completion and continues it in some way that involves alteration of the syntactic structure that is being produced. The speaker may abort the utterance in progress and begin a completely new structure or change the syntactic framework of the utterance, utilizing lexical elements of the old syntax in a new syntactic frame. Buckwalter (2001) notes that the SLA literature normally equates repair with correction. This view precludes any investigation of difficulty that occurs in the absence of observable error such as a learner's preemptive action when anticipating difficulty. Kormos (2000) labels such occurrences as covert self-repair, whereby a learner notices an error prior to articulation and repairs it. Most of the SLA research on self-repair involves the overt variety since the phenomenon of covert self-repair can only be explored in highly controlled experimental settings or through the use of verbal reports or stimulated recall (Gass & Mackey, 2000).

Output

Self-repair is a type of modified output first argued by Swain (1985) to be key in SLA and is now considered to be a fundamental construct in current SLA theory (Izumi, 2003; Shehadeh, 1999, 2002; Swain & Lapkin, 1995). Modified or "pushed" output refers to corrections or rephrasings that are elicited by the L2 learner's interlocutor. Swain's (1985; 2005) comprehensible output hypothesis argues for the importance of learner output in terms of enhancing the noticing of one's own errors and states that the role of output is, at a minimum, "to provide opportunities for contextualized, meaningful use, to test out hypotheses about the target language, and to move the learner from a purely semantic analysis of the language to a syntactic analysis of it" (p. 252). Swain & Lapkin (1995) argue that when learners produce the target language, external or internal feedback leads them to notice a gap in their existing (IL) knowledge. This noticing pushes them to consciously reprocess their utterances to produce modified output. Research also suggests that learning depends partly on learners' ability to focus on form when they notice such a gap in their IL and also on the extent to which noticing is learner-initiated (Doughty & Williams, 1998; Long & Robinson, 1998).

The benefits of pushed output have also been discussed in terms of learner collaboration, which results in language related episodes "where students reflect consciously on the language they are producing" (Swain 2001:53). Though much of the interactionist research to date suggest that language related episodes are often triggered by lexis, there is also evidence that a great deal of learner collaboration is related to form (Ohta, 2001; Swain, 2001).

Though technically different from pushed output, self-initiated self-repairs are functionally similar to pushed output in that they serve to test hypotheses about the target language, trigger creative solutions to problems, and expand the learner's existing resources (Kormos, 1999). Self-repair, therefore, occupies an important position in SLA theory.

Research on Self–repair

Self-correction data have been collected through a variety of means in L2 research, including picture description, spatial description, interviews, storytelling, open narration, and information gap activities (Camps, 2003; Fathman, 1980; Kormos, 2000; Lennon, 1990; van Hest, 1996; Verhoeven, 1989). Generally speaking, the research to date on self-repair suggests that language learners tend to prefer self- over other-repair (Buckwalter, 2001; Foster & Ohta, 2005; van Lier, 1988); that L2 speakers self-repair more often than native speakers (Kormos, 2000; van Hest, 1996); and that self-repair more often leads to modified output than does other-initiated repair. Researchers have also explored various types of self-repairs such as repairs of the message conveyed, repairs in the manner of expression (or appropriateness repairs), and error repairs, which have included lexical, phonetic, and grammatical repairs. Out of this work emerge trends in the type of SISR that occurs during learner interaction as well as several key variables that affect the nature and amount of self-repair, including learner preferences, developmental factors, and task type.

Types of self-repair

In most of the SLA research on self-repair, researchers have generally concentrated on the focus and structure of self-repair. Kormos (2000) found that lexical errors were repaired considerably more frequently than grammatical errors in the L2. This is in line with a general assumption by researchers of L2 production that L2 learners pay considerably more attention to lexical appropriateness than to grammatical accuracy. Kormos also found that the distribution of self-repairs shows no considerable difference between L1 and L2 data in the frequency of the various types of self-repairs. In contrast, Lennon (1990) found relatively little self-correction among his university level L1 German L2 English speakers, though when they did self-correct they most often focused on lexical items. Fathman (1980) found that 50% of all repairs were lexical in nature.

Van Hest (1996) discusses self-repair structure in terms of three components: 1) a reparandum, which is either an error or an inappropriate expression; 2) an editing phase, which occurs immediately following the interruption of the flow of speech; and 3) a reparatum, which is the actual correction or change of the problematic item. Much of this work is based on research from L1 psycholinguistics and Levelt's (1983) repair classification system (Kormos, 2000; van Hest, 1996). This work makes a distinction between overt and covert repair. From this perspective, covert repairs (those made before articulation) proceed the same way as overt repairs. One must infer covert repair through indirect evidence such as word or phrase repetitions, syllabic repetition, silent pauses, etc. (Postma & Kolk, 1992). Van Hest proposes the model below for classifying overt self-repair. The present study adapts this model for classifying instances of SISR. The reasons for choosing the model proposed in van Hest (1996) for the current study were that this model is based largely on Levelt (1983), which has been applied widely in the in the literature on self-repair (Kormos, 2000). Further, this model is quite systematic and reliable, emerging out of a corpus of almost 5,000 self-repairs produced by Dutch speakers in their L1 and L2 across various task types. Finally, adapting such a strong existing taxonomy allows for more powerful comparisons of results across related studies.

Overt Self-Repairs

- Error repair (E-repair): Those repairs made because the speaker has made an error.
- Appropriateness repair (A-repair): Those repairs made because the speaker thinks the original message is inappropriate in some way. For example, a message may be perceived as not having been specific enough.
- Different repair (D-repair): Those repairs in which the speaker interrupts his current message to introduce a new, totally different topic.
- Rest repair (R-repair): All other types of overt self-repair.

Covert Self-Repairs

- Those cases whereby the speaker discovers imminent trouble in his/her message and “interrupts” him/herself before the troublesome item is uttered.

In this work van Hest (1996) found that appropriateness repairs accounted for 39.7% of self-repairs, with error repairs making up 22.4%, different repairs 10.1%, with 12.3% of self-repairs remaining unclassified. Covert repairs made up 15.5% of all L2 self-corrections. Interestingly, Levelt's model does not explain where errors of morphology should go, though some researchers have collapsed syntactic and morphological errors together in a broader category of "grammatical" errors (Lai & Zhao, 2006).

Developmental factors in self-repair

Both age and L2 proficiency level seem to affect the amount and nature of self-repair (Camps, 2003; Fathman 1980; Kormos, 1999; van Hest, 1996; Verhoeven, 1989). Of these factors, proficiency-related variables in self-repair are particularly relevant to the current study. Camps (2003) suggests that learners who make a large number of errors possess a more limited knowledge of the target language, and therefore are not as well prepared to notice errors and correct them. They may be unaware of errors because either they do not know what a correct form would look like or they are too busy attending to other elements in their production (like finding suitable lexical items to express their ideas).

In contrast, van Hest (1996) found that advanced learners correct themselves less frequently than lower level learners. Additionally, beginning and intermediate L2 speakers produced significantly more self-repairs of lexical errors and significantly fewer repairs of lexical appropriateness than the advanced L2 speakers. Likewise, Kormos (1999) found that participants at a higher level of proficiency self-corrected linguistic errors significantly less frequently than learners at the pre-intermediate level, whereas they repaired the appropriateness of informational content more frequently than pre-intermediate students did.

Task type as a variable in self-repair

L2 self-repair research also reveals that the frequency of repairs concerning the information content of the message varies across tasks (Poulisse, 1997; van Hest, 1996). Van Hest, for example, suggests an effect for task type, concluding that tasks requiring more precise expression will result in more appropriateness repairs than in tasks with less-rigid structure. Kormos (2000) also suggests that the frequency of appropriateness repairs both in L1 and L2 is affected by task characteristics and the situational variables of the interaction.

Self-Repair in a CALL Context

Self-repair has been accepted by many as evidence of noticing (Lai & Zhao, 2006), which has been argued to be fundamental to the SLA process (Schmidt, 1993). Text-based chat has been argued to be a good venue for exploring self-repair, since it seems to provide an increase in processing time and opportunity for learners to focus on form (Pellettieri, 1999; Shehadeh, 2001; Smith, 2004), which may lead to a heightened potential for noticing one's own errors. Indeed, Yuan (2003) suggests that the nature of SCMC requires learners to attend to both linguistic forms as well as the meaning of their communication.

The printed text may also add to the salience of input and output in general and the noticing of non-target-like input and output in particular (Izumi, 2002; Salaberry, 2000; Smith, 2004). Smith has also argued that a heightened saliency of linguistic input and output is a favorable byproduct of the CMC interface, with increased saliency due largely to the permanence of the message. This notion of permanence has also been used to explain the lack of learner uptake in a synchronous computer-mediated communication (SCMC) environment (Smith, 2005). Kitade (2000) suggests that internet chat provides opportunities for learners to self correct both grammatical and pragmatic errors in their own linguistic output for essentially two reasons: first, there is no turn-taking competition and, second, there is more time for things like self-monitoring. Also, there are few paralinguistic cues available in text-based chat, which might reduce the sense of urgency to respond, and this, in turn, might facilitate learners' ability to monitor their language output more closely. SCMC texts are not ephemeral like oral/aural input and learners can scroll up/down to access an earlier message quite easily. Whether they in fact do this is an empirical question. Taken together, these features may positively influence a learner's ability to notice and subsequently correct non-target like language (Lai & Zhao, 2006; Smith & Gorsuch, 2004).

Recent studies on CMC self repair

Studies of self-repair in a CMC context are few. Those that do exist tend not to build on the existing work on self-repair (from the non-CMC applied linguistics literature) and take a limited view of the types of self-repair investigated. These studies are often stifled by a failure to employ existing technology in the data collection and evaluation phases of the research.

Jepson (2005) found that though both voice and text chats contained various types of repair moves, self-correction was not among them. He suggests that self-correction in an SCMC context may be rare because speakers do not notice their errors or because the non-native speaker – non-native speaker SCMC context is not conducive to self-correction. Lee (2002) considered self-corrections in the framework of a broader study on the nature of modification devices in a CMC environment and categorized them as belonging to one of two categories, lexical or grammatical. Though no statistical data were provided, Lee reports that most of the self-corrections made by her intermediate-level L2 learners of Spanish were made on the "concordance of gender and number" (p. 284), and only occasionally was incorrect usage of lexical items recognized and self-corrected. She suggests that learner keyboarding skills, language proficiency, and attention to linguistic aspects might contribute to a high number of errors in (written) production.

Yuan (2003) found that of 512 errors in his CMC data, only 44 or 8.59% of them were self-repaired. Over 43% of the self-repairs were grammatical in nature (sentence structure, agreement, noun/article, and preposition), though errors of nouns/articles and prepositions were only very rarely self-corrected. Errors of verb tense, modals, and adjective-noun sequences were never self-corrected. Lexical self-repairs accounted for almost 30% of the self-repairs. Yuan also counted self-repairs of spelling errors (25%). Most notable is the fact that although learners made 57 verb tense errors (exactly as many as sentence structure errors), none of these errors were self-corrected. Yuan argues that evaluating such CMC chat logs allows one the advantage of seeing certain processes that the learner undergoes while trying to construct meaning in their L2, arguing that they provide "real, recorded examples of errors (repaired or unrepaired) learners made while trying to achieve certain communicative goals" (p. 204).

One of the very few studies to employ screen capture technology in an SLA/CALL study is Lai & Zhao's (2006) study which examines the capacity of text-based chat to promote learners' noticing of their own problematic production. In this study instances of learner self-correction are viewed as evidence of noticing. Lai & Zhao found that online chat was superior to face-to-face interaction for promoting noticing of mistakes even after controlling for differences in the amount of language output produced in each condition.

As we can see from these few studies, using printed chat logs in the evaluation of SCMC data is the methodological "industry standard" (with the notable exception of Lai & Zhao). Though chat logs certainly do have value for interpreting SCMC interaction, they fail to capture a significant portion of the data. It is precisely these "missing data" that may provide the most insight into the potential roles of monitoring, attention and noticing, and pushed output in interlanguage development within a CMC context. In order to gain a more complete view of learner CMC interaction, especially that which involves learner self-repair, use of a dynamic screen capture record is required. Relying on a static artifact to make claims about a dynamic process requires an uncomfortably wide and unnecessary leap of faith.

For example, Jepson (2005) reports that there were absolutely no self-correction moves in his data, claiming that the SCMC environment is perhaps not conducive to self-correction. This seems unlikely since there is ample research that strongly suggests a heightened degree of attention to form in a CMC context. More likely is the possibility that significant self-repair did occur, but the data collection methodology employed was not sensitive enough to detect it. Jepson (2005) suggests employing technology that records each keystroke in an effort to uncover what he calls "hidden" self-correction. He comments that in his study it was not possible to observe if participants edited their own messages before they sent them and acknowledges that some self-correction repair moves may not have been measurable. This is an important point of which some CALL researchers have taken note (see, for example, Pellettieri's, 1999, use of YTalk). However, this approach is not only cumbersome when it comes to data analysis; it also obscures other potentially interesting elements of online interaction such as scrolling as a strategy to "recapture" previous content. Due to this limitation, Smith & Gorsuch (2004) suggest that claims about the occurrence of certain interactional moves and strategies largely require one to infer too much in those studies that use only a hard copy transcript of the interaction.

It seems, then, that if there are instances of self-repair that appear on the chat logs, there must be many more that are attempted, but edited out before the message is sent to the interlocutor. It is important to note that from an interactionist perspective on SLA, the potential value of this output in the form of self-repairs is not diminished by the fact that they may be subsequently edited out by the learner.

CMCovert repair

In an SCMC context a unique type of self-repair is possible that may be considered a CMC-specific form of self-repair. In this case a message is typed, but a self-initiated correction or rephrasing is executed before the message is sent to the interlocutor. The self-repair is certainly overt from a psychological perspective, but essentially "covert" from the interlocutor's perspective in that there is never any evidence of there having been a self-repair or rephrasing. Further, such repair is often not immediate and regularly contains several "embedded" self-repairs in the same evolving message. The proposed methodology allows an examination of this type of self-repair, heretofore lost to methodological limitations of the research design.

This type of self-repair is different from true covert repair since, in the latter, we may not expect the same output-related benefit that may only be present upon actually producing the target language. Of course, some of the argued benefits of pushed output for the speaker are obtained only once the interlocutor reacts to a speaker's productive output. In an SCMC environment, these conditions will be the same, as will possible benefits achieved when one engages in truly covert self-repair[2].

However, what I term here as "CMCovert" self-repair is an interesting and largely unexplored phenomenon that may provide us valuable insights into the nature of such self-repair as well as the effect of CMCovert self-repair on SLA. Given the pervasiveness of such repairs I argue that any examination of the occurrence and possible effects of SCMC self-repair from the repairer's point of view simply must include this CMCovert self-repair. To do this one must abandon the practice of simply using printed chat logs to analyze CMC interactional data and employ more dynamic means such as screen capture technology. This does not only apply to investigations of self-repair, but to CMC learner interaction in general as suggested by Smith & Gorsuch (2004).

THE CURRENT STUDY

The purpose of the current study is two-fold. First, I wish to establish empirically just how misguided it would be for CALL researchers to continue to rely on printed chat logs alone when making SLA-related claims about SCMC interaction. This inadequacy is revealed by comparing two types of data from the same task-based interaction sessions: the printed chat log and the Camtasia screen capture video record of the same session for the same participants (hereafter chatscript). The amount of SISR, then, is the dependent variable in this study with the learners in this study serving as their own control group. Data collection/evaluation methodology is the independent variable. Second, the nature of learner self-repair in this SCMC context will be explored. Though there is considerable research on face-to-face self-repair, there is very little CALL work on this topic.

Research Questions

This study explores what Buckwalter (2001) has described as self-initiated self-repair, albeit in a SCMC environment. Following Lai & Zhao (2006), self-repairs were defined as episodes where the participants immediately corrected their own production without prompts from their interlocutors. Some of these episodes are visible on the final chat logs of each session and, as we will see, some are not. All SISR episodes, however, are visible on the video file of the relevant chat session.

The research questions are as follows:

- Does the hard copy transcript of chat interactions differ from that which is available using a screen capture program in terms of the amount of SISR that is evident?
- What is the nature of CMCovert self-repair?

In order to answer these questions, hard copies of all the chat logs for all participants across all tasks were analyzed and coded for instances of SISR. Hypothesis 1 predicts that evidence of a significantly higher amount of SISR will be found in the screen capture condition. This prediction is based largely on Smith & Gorsuch (2004), who found that a similar method of data collection captured a much richer picture of the CMC interaction of the participants in their study. Drawing from previous research on self-correction as well as CALL, a substantial amount of CMCovert self-repair is expected (Hypothesis 2a). More pronounced attention to form manifested in a higher number of grammatical self-repairs than lexical self-repairs are expected due to the increased planning/monitoring, and processing time afforded by the CMC medium (compared to a face-to-face setting). Also, because of the relatively low proficiency level of the participants (Novice-High), more self-correction of grammar-related problems is expected (Hypothesis 2b). It is also expected that few appropriateness (A) self-repairs relative to the number of error (E) self-repairs will be found also due mostly to the relatively low proficiency level of the participants (Hypothesis 2c). A summary of the four directional hypotheses follows below:

- *Hypothesis 1*: A significantly higher amount of SISR will be found in the screen capture condition than in the hard copy transcript condition.
- *Hypothesis 2a*: A substantial amount of CMCovert self-repair is expected.
- *Hypothesis 2b*: More SISR of grammar-related problems than lexical ones are expected.
- *Hypothesis 2c*: Few appropriateness (A) SISRs relative to the number of error (E) SISRs will be found.

Methodology

Participants

Forty-six beginner-high proficiency level students participated in this study as part of their regularly scheduled German language course at a major southwestern university in the United States. Students were required to meet once every other week in the foreign language micro-computing lab. Six CMC sessions were scheduled over the course of the semester. All students were either sophomore or junior undergraduates and all were native speakers of English. None were German majors. Their proficiency level and placement in the German sequence was determined by an in-house online placement test. All participants in the present study were characterized by the instructor of record as roughly at the ACTFL Novice-High proficiency level and were familiar with the chat function in Blackboard. All participants did complete one training session prior to data collection to ensure they were familiar with the general task and procedures since they were not necessarily accustomed to performing similar task-based CMC activities in their German class. Though there was some evidence of target cultural materials and short samples of authentic literature, the core textbook and instruction were largely organized along a grammatical syllabus.

Materials

Paired participants completed one jigsaw task per session over the course of the semester, which resulted in a potential total of six tasks per student (assuming perfect attendance). This task type was chosen because of its structural requirement of two-way information exchange by participants who are striving to reach a convergent goal. Pairs were not necessarily matched from week to week. Though each task was slightly different, they all follow Pica, Kanagy, and Falondon's (1993) task features for jigsaw tasks. Four of the six tasks were video-based, whereby one learner (learner A) would view a two-minute dramatic video clip that corresponded to the week's assigned course content. The other learner (learner B) would not view this clip but would study a series of eight stills from the same video clip, randomly arranged.

The stills were such that a logical order was not discernable simply by examining the photos alone but quickly and easily sequenced upon viewing the clip from which they were taken. The remaining two tasks were standard sequential ordering tasks, where learners each held three out-of-sequence pictures which when put together made up a logical story sequence. The video-based tasks were directly tied to the core content and textbook of the course and came from the ancillary DVD and workbook accompanying the main course textbook. Participants interacted with one another via the chat function in Blackboard and were assigned to one of various paired "groups" under Blackboard's Communication tool, Virtual Classroom. Following Smith & Gorsuch (2004) and Lai & Zhao (2006), the dynamic screen capture software Camtasia was employed to record exactly what appeared on each participant's computer screen in real time. Camtasia has the capability of recording and creating a movie file of each participant's computer screen, allowing one to play back the chat session in its entirety.

Procedures

Participants were required to attend and participate in each session since these were built into the syllabus of the course. Participation in the study was voluntary and followed the university's prescribed IRB protocol. The six CALL tasks described above were completed every other week during the middle part of the semester (over 12 weeks). Each class lasted approximately one hour. The average amount of time it took pairs to complete each task was just over 25.5 minutes as measured by the time stamp on the chat logs of the interactions. No specific time limit was placed on students once they began the task; however, given the length of the class, participants realistically had about 40 minutes to complete each task.

All students worked collaboratively online with a partner. Each participant was given task sheet A or B. All of those holding task sheet A were grouped together and separate from those students in group B. This was done in order to reduce the chance that any participant would gain visual access to their interlocutor’s (partner’s) task sheet/video clip. For the video-based tasks, the clip for that session was made available to group A in each dyad. These students viewed the clip with headphones on while their partner studied the still images of various scenes from the same video clip (group B). Once the video clip had played through one time, participants were directed to interact with their assigned chat partner and decide the proper order of the pictures held by student B. In order to successfully complete this task, learner A had to describe in detail the events in the short video clip (in the target language) while learner B attempted to place the pictures in order based on these descriptions. Likewise, learner B was told to describe each picture to learner A in order to facilitate this ordering. Learners were instructed to interact using the target language with the goal of agreeing on a likely order to the still images held by learner B. Once this order was agreed on learners were to declare the task completed by typing the proposed order of the pictures and writing "finished". Upon task completion, Camtasia was stopped and the video record of the interaction saved to a removable storage drive. The chat logs of these interactions were saved automatically in Blackboard.

Data analysis

Following Kormos (2000), truly covert repairs were not considered in the data since one can only infer these occurrences. Rather, CMCovert self-repairs (those that are recorded, but which do not appear on the chat logs), as well as those which are truly overt (appearing on the chat logs), were considered. Following Lai & Zhao (2006) and Lee (2002), spelling mistakes/corrections were not counted in the data. Errors in the obligatory capitalization of German nouns and subsequent self-corrections were counted and coded as lexical errors (EL). Since the first research question sought to compare the amount of self-repair evident when employing two data collection methodologies in a paired groups fashion, only those participants whose chat records showed evidence of self-repair across both of these methodologies were candidates for inclusion in these data. To this end, all printed chat logs (n=94) of pair interaction were evaluated and coded for instances of self correction (method A) using the coding scheme below (see Table 1), which is adapted from van Hest (1996). Table 2 shows examples of each of these categories from the data.

Table 1. Description of Types of Self-Repair.

Type of self-repair		**Description**
Error	Lexical (EL)	The learner has selected the wrong word and substitutes the correct one for it.
	Morphological (EM)	The learner corrects a morphological error.
	Syntactic (ES)	The learner produces a grammatical construction which cannot be finished without violating the grammar of the target language.
Appropriateness	Lexical (AL)	The learner replaces one term with another, usually more precise, term which better fits the concept s/he wishes to express.
	Syntactic (AS)	The learner replaces the original syntactic construction with a construction which, in his/her opinion, is more appropriate.
	Insertion (AI)	The speaker repeats part of the original utterance and inserts one or more words to specify his/her message.
Different	(D)	The speaker interrupts his/her current message to introduce a new, totally different topic. Abandonments.
Rest	(R)	All other self-repairs that do not fit cleanly into any of the other categories.

Note: Other categories discussed in van Hest (1996) were either not appropriate for the CMC context, for example, phonological errors, or were not present in the data and, therefore, are not included in these tables.

This resulted in a total of eight chatlogs. That is, out of the transcripts of the twenty-eight students completing the tasks described above, there was evidence of self-repair on only eight of the 94 chatlog transcripts, or 8.5%. This resulted in a total of 9 instances of self-repair (see Table 3). Next, the corresponding Camtasia file was viewed in its entirety (method B) for each corresponding transcript (n=8). Each video file was coded for instances of SISR according to the same coding scheme (Table 1).

Table 2. Examples of Self-repair Types

Type of self-repair		**Camtasia**	**Chatlog**
Error	Lexical (EL)	…~~ist~~ hat auch…	…hat auch…
	Morphological (EM)	…welche Buchstabe~~n~~ ist…	…welche Buchstab ist …
	Syntactic (ES)	…weil er d~~ie~~as ma~~a~~ädchen…	…weil er das mädchen…
Appropriateness	Lexical (AL)	…bitte ~~Wurst und S~~ Schnitzel.	…bitte Schnitzel.
	Syntactic (AS)	…wann er ~~mit~~ sein freundin…	…wann er sein freundin…
	Insertion (AI)	Drei Leute sind [im Morgen] im Restaurant. [+]	Drei Leaute sind im Morgen im Restaurant.
Different	(D)	die männer sind look wie sagt man ~~looking~~ to look at?	wie sagt man to look at?

Note: A coding scheme adapted from Smith & Gorsuch (2004) is shown in the Appendix.

Results

The chat data for the target learners yielded a total of 1,464 words. The number of words produced by these learners on the tasks considered ranged from 101 to 398 (M=183, SD=93). As can be seen from

Table 3 below, there were many more instances of self-repair evident when using method B. A Wilcoxon Signed Ranks Test shows that significantly more instances of learner self-repair were captured using method B than method A (z = 2.53, p =. 01, r = .79; see Table 4). To allow for a clearer comparison to previous studies, "standardized scores" for instances of self-correction relative to the quantity of discourse produced by each participant were calculated. As can be seen from Table 5, the Wilcoxon Signed Ranks Test yielded very similar results (z = 2.52, p = .01, r = .88). Viewed another way, learners who engaged in task-based CMC interaction with a partner actually self-repaired about six times per one hundred words (of printed transcript), whereas they *appear* to have self-repaired less than once per one hundred words based on the hard copies of the chat logs alone[3].

Table 3. Self-repairs by Type, Across Method of Data Collection

Type of Self-Repair		**Method**		
		Chat log	**Camtasia**	**Totals**
Error	Lexical (EL)	3	23	26
	Morphological (EM)	2	29	31
	Syntactic (ES)	4	16	20
	Total (E)	9	68	77
Appropriateness	Lexical (AL)	0	5	5
	Syntactic (AS)	0	9	9
	Insertion (AI)	0	3	3
	Total (A)	0	17	17
Different	D	0	1	1
Rest	R	0	0	0

Table 4. Comparison of Self-repairs in chat logs vs. Camtasia

Method	**N**	**M**	***SD***	***z***	***p***	**effect-size *r***
A (Chat log)	8	1.13	.35			
B (Camtasia)	8	10.75	5.31	2.53	.01	.79

Figure 1 below shows two transcript versions of the same chat interaction. The left column is the "Camtasia-enhanced" chatscript, which was transcribed while viewing the video screen capture file. The column on the right shows a traditional chat log of the same segment without the benefit of the Camtasia file. In column B only one instance of SISR is evident (lines 6b-7b) whereas column A shows at least three non-spelling self-repairs (lines 5a, 6a-7a, and 8a). The SISR in lines 5a and 8a go undetected when relying on printed chat logs alone. The appendix shows the coding scheme employed in evaluating the Camtasia data.

Table 6 shows the data realigned to collapse the categories of morphological and syntactic self-corrections together into the broader category of "grammatical" self-repair. This will allow for an easier comparison with data reported in previous studies discussed earlier. Although there were almost twice as many grammatical self-repairs as lexical self-repairs, this difference was not statistically significant. Finally, when we compare the differences in self-corrections of errors with self-corrections of appropriateness issues, we find that learners self-repaired significantly more errors (z = 2.53, p =. 01, r = .68; see Table 7). In order to see if there were any differences in which types of self-repairs learners engaged in within the error (EL, EM, ES) and appropriateness (AL, AS, AI) categories (see Table 3) a Friedman test was performed. Differences within each category were not statistically significant.

SCMC Chatscript Column A	**Hard copy of transcript Column B**
1a. Pierre: er hat seine geschaft aufgeraumt 12:59:43	1b. Pierre: er hat seine geschaft aufgeraumt 12:59:43
2a. Pierre: bildung C er geht nach hause und seine garge ist nicht sauber 1:00:08	2b. Pierre: bildung C er geht nach hause und seine garge ist nicht sauber 1:00:08
3a. Daniel: D-Der man ging ins [2a] garage und es ist sehr schmusti~~v~~g 1:00:29	3b. Daniel: D-Der man ging ins garage und es ist sehr schmustig 1:00:29
4a. Daniel: E-er g~~i~~ ~~h~~eht raus deines zimme~~m~~ ~~er~~ r 1:00:54	4b. Daniel: E-er geht raus deines zimmer 1:00:54
5a. Daniel: F-~~Er~~Das Garage ist sauber und er hat eine hacke im hand 1:01:15	5b. Daniel: F-Das Garage ist sauber und er hat eine hacke im hand 1:01:15
6a. Daniel: **in deiner hand 1:01:26	6b. Daniel: **in deiner hand 1:01:26
7a. Daniel: seiner* 1:01:31	7b. Daniel: seiner* 1:01:31
8a. Daniel: meine ist def□ seine gescha~~ftr~~ft? 1:02:19	8b. Daniel: seine geschaft? 1:02:19
9a. Daniel: ich habe k~~a~~ein geschaft nur ein garage und ein Bettzimmer. 1:02:36	9b. Daniel: ich habe kein geschaft nur ein garage und ein Bettzimmer. 1:02:36

Figure 1. Camtasia enabled chatscript and printed chat log comparison. Click the following link to view this actual segment from the data (link to Camtasia Example Flash file)

Table 5. Self-Repairs Per Word Across the Two Data Collection Methods

Method	**N**	**M**	***SD***	***z***	***P***	**effect-size *r***
A (Chat log)	8	.007	.003			
B (Camtasia)	8	.061	.020	2.52	.01	.88

Table 6. Percentage of the Total Number of Self-Repairs (Grammatical vs. Lexical)

Method	**Grammatical self-repairs**	**Lexical self-repairs**	**Other self-repairs (AI & D)**
A (Chat log)	6 (67%)	3 (33%)	0 (0%)
B (Camtasia)	54 (63%)	28 (33%)	4 (5%)

Note: Morphological and syntactic categories were collapsed together into a larger grammatical category

Table 7. Method B Error and Appropriateness Self-Repairs

Self-repair type	**N**	**M**	***SD***	***z***	***P***	**effect-size *r***
Errors	8	8.50	4.63			
Appropriateness	8	2.13	1.36	2.53	.01	.68

In sum, the data suggest that the Camtasia screen capture method (method B) of data collection and analysis yields significantly more evidence of SISR than does the chat log method (method A). There are also significantly more SISRs of errors than appropriateness points. In all cases the effects were of a strong magnitude as indicated by the high effect-size *r* measure. No differences across sub-types of error and appropriateness SISRs were found.

The degree of support for the specific hypotheses presented in the previous section is listed below:

- *Hypothesis 1*: A significantly higher amount of SISR will be found in the screen capture condition than in the hard copy transcript condition.
  Result: Strongly supported
- *Hypothesis 2a*: A substantial amount of CMCovert self-repair is expected.
  Result: Strongly supported
- *Hypothesis 2b*: More SISR of grammar-related problems than lexical ones are expected.
  Result: Partially supported
- *Hypothesis 2c*: Few appropriateness (A) SISRs relative to the number of error (E) SISRs will be found.
  Result: Strongly supported

DISCUSSION

The data suggest that relying on printed transcripts alone may create the impression that learners do not self-correct very often in an SCMC environment – clearly a faulty conclusion. Indeed, these numbers show that evaluating instances of self-correction on the basis of printed chat logs alone leads to an underestimation by over eight-fold of the amount of self correction that actually occurred. In fact, the present data may be a conservative estimate of this difference since Lai & Zhao's (2006) data show an even higher rate of self-correction in an SCMC setting (29 self-corrections per one hundred words). Such a pronounced and fundamental mis-characterization of the nature of SCMC interaction can help explain conclusions such as those in Jepson (2005) who, finding little self-repair in his CMC data, stated that though both voice and text chats contained various types of repair moves, self-correction was not among them. Jepson also suggests that self-correction in an SCMC context may be rare because speakers do not notice their errors, and thus would not need to correct them. Alternatively, he suggests that since self-correction is very dependent on the social context of the interaction (Kormos, 1999), it may be that the non-native speaker – non-native speaker SCMC context is somehow not conducive to self-correction. For example, learners may not see the need for accuracy or may perceive self-correction as face threatening. This rationale, however, contradicts much of the recent CMC interactionist research which suggests that the CMC environment most likely enhances noticing (Lai & Zhao, 2006; Smith, 2004).

The results from the current study are similar in some ways to previous findings and quite different in other ways. Yuan (2003) found that learners corrected under 9% of their errors in a CMC environment. His data, which includes self-repair of spelling errors, suggests that the CMC environment does not always make errors more salient to learners, at least not verb tense and modal errors, which were never self-repaired. In order to make Yuan's data more comparable to this study, the spelling self-corrections in his data need to be removed. This results in a new number of 33 self-repaired errors (down from 44) of which 20 were grammatical (61%) and 13 were lexical (39%). These numbers are quite similar to those found in the present study (63% and 33% respectively). It is also interesting to note that the method of data collection does not seem to influence the relative amount of each type of self-correction recorded (Table 6). This point is reinforced when we consider that Yuan's data were based on printed transcripts of the chat interaction.

In terms of which types of SISR learners engage in, it seems the results are largely in conflict with the existing self-repair literature, which is largely limited to face-to-face studies. Van Hest (1996), for example, found that almost 40% of SISR were appropriateness repairs compared with 22% of error SISRs. Kormos (2000) reports that almost 39% of all SISRs were error repairs compared with almost 23% appropriateness SISRs. This study found a relatively high percentage of "different" repairs (almost 22%)

as well. Kormos also found little difference in grammatical and lexical error self-repairs (16.9% and 14.2% respectively), which is similar in some ways to the findings in the present study.

The little data available that specifically focuses on learner self-correction in a CMC environment suggests that learners do self-correct in an SCMC task-based setting, perhaps due to a heightened degree of noticing, which is fostered by the SCMC environment itself. Second, learners tend to focus on errors rather than appropriateness issues when engaged in SISR and virtually no "different" and "rest" points. Third, learners seem to correct grammatical points more often than lexical points, though this difference was not statistically significant.

Though it is normally of little value to compare CALL with face-to-face studies, it is interesting to note the pronounced differences in what learners seem to self-correct across the two environments. Taken together, the face-to-face self-repair literature seems to show a clear preference for lexical self-repairs over grammatical self-repairs, precisely the opposite of that found in most of the SCMC studies. The question, then, is why this may be so.

Written communication normally affords more opportunity for attention to form, whereas spoken language often occurs under more time pressure to achieve fluency (Chapelle, 2003). The SCMC interaction allows for more processing time, which is conducive to focusing on form. The visual saliency of the text as well as the permanency of the written word, which enables one to review the previous "utterances," allows learners to focus their attention on the formal aspects of their output without disrupting the flow of communication.

Context Influencing the Nature of Self-Correction

Linguistic context

It is not surprising that self-repair of grammar-related problems is so common in the data given the relatively high percentage of morphological errors made by the learners. Aside from the noted potential for the CMC environment to enhance a focus on form, it may also be that errors that do not require a major restructuring of the utterance, but rather merely need to apply simple rules of grammar (as do morphological errors) are more likely to be self-corrected by L2 speakers (Kormos, 2000). In the SCMC environment this condition may be enhanced as these relatively "minor" morphological errors are rendered more salient due largely to their "permanence" on the screen. This may help explain why Table 3 shows nearly a 2:1 ratio of the number of morphological errors self-repaired to the number of syntactic errors repaired in the Camtasia condition.

Classroom Context

The nature of the language instruction that the learners are used to may influence what they choose to self-correct. For example, if learners receive instruction that stresses the importance of grammatical accuracy in successful communication and students regard grammatical errors as serious flaws in their performance, they may make an effort to correct their grammatical errors. This notion is supported by Bardovi-Harlig and Dörnyei (1998), who found that grammatical errors were more salient for L2 speakers in a foreign language setting than for L2 learners in a naturalistic environment. The students in the present study fall clearly into the former category.

There may also be a complex combination of L1 and L2 linguistic, classroom, and cultural influences that come together to influence the nature of SISR. Shonerd (1994) notes the seeming selectivity of learner self-repair and suggests the nature of self-repair may be culturally bound. His Japanese L1 speakers made more morphological and syntactic self-repairs of their English usage and fewer lexical and pronunciation repairs than did other L1 groups. In terms of the present data, there were numerous SISRs that involved the capitalization of German nouns. As mentioned, these SISRs were coded as lexical errors. The interaction of German and English linguistic factors and the classroom cultural context may have come together to influence the nature of SISRs in this study.

Limitations of the Current Study

Perhaps the clearest limitation of the current findings is the small sample size (n=8) from which the data are drawn. Thus, it is hard to generalize from these data. However, the choice was made from the outset to include only those chat records which contained hard copy evidence of SISR. This resulted in a low pool of participants (much lower than actually took part in the study) from which the self-repair data was drawn. Indeed, this is the only way to really make the comparisons needed to answer research question 1, which asked whether the hard copy transcript of chat interactions would differ significantly from a Camtasia-enabled transcript.

Perhaps another limitation was that the interaction was not anonymous. The role of anonymity in CMC interaction is well established (Zhao, 1998). It could be that knowing who one's interlocutor is has some effect on the amount and nature of one's SISR. For example, it could be that knowing the identity of one's interlocutor may affect whether or not one self corrects depending on the learner's relationship to that interlocutor. This is an empirical question that could be taken up in future research.

Another limitation is that the tasks learners completed each week, while conforming broadly to Pica, Kanagy, and Falondon's (1993) jigsaw task type, were slightly different, which may have influenced the nature of the SISRs. In addition to the large body of literature on the effect of task type on learner interaction, the self-repair literature also suggests that the frequency and type of self-repair is affected by the task structure (see, for example, van Lier, 1988). It would be interesting to test van Hest's (1996) assertion that those tasks requiring more precise expression will result in more A-repair. A first step in this work would be to establish what exactly draws out "more precise" expression in an SCMC context that goes beyond the "precision" elicited by the CMC medium itself.

CONCLUSION AND FUTURE DIRECTIONS

The results of this study suggest that relying on printed chat logs alone when analyzing SCMC data is a very tenuous undertaking. The recommendation here is to abandon this practice in CMC research in favor of one similar to that presented in this study, at least when data salient to the specific area of inquiry may be lost.

Future inquiry using this methodology may include exploring the influence of classroom context on the type of self-correction. It would be interesting to see if, for example, learners accustomed to a communicative classroom context engage in a different type of SISR than those learners who are used to more structure-oriented contexts. Second, because there seems to be a trend toward learners self-repairing grammatical points rather than lexical ones in a SCMC environment, it would be interesting to explore this notion further with larger numbers of students perhaps across various target languages. As it stands, there is a theoretical rationale to explain this occurrence as well as some empirical evidence to support it, but the data are far from conclusive. Third, the SCMC medium may itself influence the nature of SISR. One artifact of this medium is the ability learners have of scrolling back in the chat text to review previous messages. Indeed, Lai & Zhao (2006) base some of their predictions on this assumption. Though such occurrences in an SCMC setting are well established, the influence of this feature of SCMC interaction has not specifically been shown to directly impact the nature or amount of SISR. Future research may wish to explore this idea more explicitly. Finally, it seems that existing models of SISR are insufficient to account for what occurs in an SCMC context. A model of SISR specific to the SCMC context would be helpful for future inquiry into this important area of applied linguistics.

NOTES

1. Self-repair in this paper is considered synonymous with self-initiated self-completed correction. Self repair and self-correction are used interchangeably.

2. As one reviewer points out, in true covert repair learners may engage in hypothesis testing in their minds as evidenced in some think aloud protocols. However, I argue that CMCovert self-repair is indeed unique in that in an SCMC environment we often see many lengthy and embedded self-repairs, whereas in a face-to-face environment these are often shorter, more direct, and immediate.

3. The number of words produced by each individual was used when calculating this figure and not the total words produced by the dyad.

APPENDIX

SCMC Coding Scheme

Coding symbol	Meaning	Explanation
~~strikethrough~~	Indicates text that has been typed and subsequently deleted before message is sent.	Strikethrough shows messages or parts of messages that a learner has typed but deleted before sending the final message. None of the strikethrough text appears on the screen of the interlocutor nor on the hard copy of the chat log.
Black bar + underline ▌	Indicates text with embedded deletion has been deleted. Black vertical bar indicates where deletion begins. Deleted text is underlined to the left of the bar.	Black bar + underline is used when a message or part of a message which already has some deleted sections is subsequently deleted in its entirety. This coding allows the acknowledgment of deletions of text with embedded deletions.
[post-hoc inserted text]	Indicates that the text within the brackets has been inserted at a later point in the message.	Note: A second, third, etc. occurrence of post-hoc inserted text is signified with double/triple brackets respectively [[text]], [[[text]]].
[~~post-hoc deleted text~~]	Indicates that the deleted text within the brackets was deleted at a later point in the message.	Note: A second, third, etc. occurrence of post-hoc deleted text is signified with double/triple brackets respectively [[~~text~~]], [[[~~text~~]]].
[+]	Indicates the point in the message at which the [post-hoc inserted text] was inserted.	Note: The point in the message at which a second, third, etc. post-hoc insertion is made is signified with double/triple brackets respectively [[+]], [[[+]]].
[-]	Indicates the point in the message at which the [post-hoc deleted text] was deleted.	Note: The point in the message at which a second, third, etc. post-hoc deletion is made is signified with double/triple brackets respectively [[-]], [[[-]]].
[+/-]	Indicates the point in the message at which a correction was made.	This code is used for short one or two character corrections such as for capitalization, spelling, typos, etc. This code eliminates the need for using the more lengthy [-][+] in sequence.
[line number] Example: [3]	Indicates the point in text currently being typed but not yet sent where a new line from the interlocutor appears on the screen of the target participant.	Often a line from the interlocutor will appear on the screen mid-way through a message which is in the process of being typed. This code indicates both the point at which this new message appears and its line number on the chat log/chatscript. For example in the chat text below Jordan's line 3 appears while Katarina is typing line 6. Specifically, it occurs immediately after Katarina types the word "nimmt".

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