An Analysis of the Relationship between Presence, Consciousness and Performance in Learner-centered Communicative Learning Using SCMC – Experimental Study

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This study aims to clarify the relationship between subjective perception and performance in the communicative learning using Synchronous Computer-Mediated Communication (SCMC). In this study, we developed four types of SCMC: videoconferencing (image and voice), audioconferencing (no image and voice), text-chat with image (image and no voice) and plain text-chat (no image and no voice). In this experiment, each system aids learners in being aware of and uttering a target formulaic expression as learning objectives. We investigated the effect of each system on psychological perception and productive performance, as well as the relationship between perception and performance. The results show that image and voice promote consciousness of natural communication and relief, while a text-mediated system enhances confidence in grammatical accuracy. In order to clarify the relationship between perception and performance, multiple regression analysis was conducted using perception as the independent variable and performance as the dependent variable. The results indicate that consciousness of natural communication and the use of the voice communication affect factors such as the number of utterances, while interlocutor's image and voice and consciousness of grammatical accuracy lead to self-correction.

Key words: Videoconferencing, Audio conferencing, Text-chat, Learning awareness, Learning performance

INTRODUCTION

CMC and Communicative Language Learning

There is a growing interest in the use of computer networks for second language acquisition (SLA) with the advancement in information technology. Recently, network technology such as Computer-Mediated Communication (CMC) allows teachers to offer Internet-based collaborative learning in SLA. It has been suggested that, in particular, synchronous CMC (SCMC) is effective in instruction of communication skills, because synchronous CMC such as text chatting in SLA can offer an environment similar to face-to-face communication (Blake, 2000). SCMC provides an environment similar to real time settings, which motivates learners to communicate with each other in the second language. CMC and other interactive media can be used for promoting learning (Furstenberg, 1997; Warschauer, 1997). Moreover, previous research findings have also reported the positive effect of the use of SCMC (e.g., Hanpel, 2003; Rosell-Aguilar, 2005; Wang, 2004). SCMC promotes more equal participation than face-to-face communication in discussions in a second language (Chun, 1994, 1998; Warschauer, 1996). Language learners who have studied in synchronous CMC outperform learners who have studied in asynchronous CMC and without CMC in the amount of speech in face-to-face discussion (Abrams, 2003). In addition, SCMC would enhance task-based communication such as discussion, due to a combination of the rapid nature of communication exchange, linguistic effects such as the amount of speech, and cognitive effects, which promote continuous communication with communication strategy (Tarone, 1981a, 1981b), and emotional effects such as increased participation in discussion by shy learners compared to a regular classroom (Beauvois, 1998a, 1998b). Language learners use communication devices in synchronous CMC, as well as in face-to-face communication (Lee, 2002, 2004; Smith,

2003). In particular, SCMC use in task-based communication is effective to promote the use of communication strategies such as negotiation of meaning (Smith, 2002) and feedback for repairing lexical and syntactic errors (Morris, 2005). CMC allows learners to speak with reduced anxiety (Kelm, 1992). In a similar study, learners who were trained with SCMC performed better on an oral test than those who were trained through regular classroom instruction (Beauvois, 1994). Beauvois (1994) suggested that a positive attitude to technology, a low-stress environment, and anonymity, allowing learners to hide personal information such as race, gender and timidity, leads to a positive effect in oral performance in second language communication. These features facilitate the acquisition of communication skills in second language. These positive effects promote interaction between learners, which many researchers regard as one of the most important skills in communication (e.g., Gass et al., 1989; Long, 1981, 1989).

Recent advances in technology have created a new type of SCMC which allows interlocutors to feel others' presence to a much greater degree than in text-based communication. Several studies have suggested the effects of such kinds of CMC in language learning. Videoconferencing allows learners to eliminate physical barriers and motivates them to speak in the second language (McAndrew et al., 1996). Videoconferencing also enables learners to use communication devices such as eye-gazing and gestures for understanding each other (Bruce, 1996). In task-based language learning, video-conferencing can improve performance in collaborative learning (Zähner et al., 2000). However, it was suggested that the practical use of IT-enhanced CMC in SLA has not yet been considered (Wang, 2004). In particular, instructional design must take into account the features of IT-enhanced CMC, including face-to-face instruction, for effective learning.

SLA Theoretical Background

From the view of SLA, as mentioned above, previous works suggest that CMC is effective in communicative language learning, because CMC can

promote social interaction such as negotiation of meaning between learners, comprehensive input and output. Interaction, comprehensive input and output seem to play an important role in language learning. The importance of these factors in classroom-based communicative instruction has been verified by many previous studies.

Comprehensive input means written or spoken information in the target language which the learner can comprehend (e.g., Gass et al., 1998; Krashen, 1985). Interaction is based on comprehensive input. In SLA, communication skills, in particular, seem to be learned through communication between participants such as learners and teachers (e.g., Long, 1981, 1989).

Interaction refers to meaningful communication to enable understanding, and drives comprehensive input. When people face a problem such as misunderstanding each other, they prefer to repair the problems before continuing communication (Clark, 1994). For example, when a learner cannot understand his/her interlocutor's utterance, his/her interlocutor may modify or paraphrase for the learner's understanding, or the learner may ask his/her interlocutor to repeat. Learners seem to learn communication skills through the production of comprehensive input in interaction.

Output refers to learning activity in language education. Learners need to perform learning activities such as uttering, repeating or writing, because learners produce comprehensive input through interaction (Swain, 1985, 1995). Swain (1995) claimed that output has three functions: noticing the gap between what the learner can and cannot express, hypothesis testing such as the trial-and-error method, and metalinguistic functions such as reflective learning.

A communicative approach is effective in fostering communication skills by combining the three rationales above. However, in an interactive classroom setting, it is difficult to make learners aware of the learning objectives consciously. In general, learning objectives are not described clearly in communicative task-based instruction, because evaluation criteria are concerned with task accomplishment and outcome of communication, not fluency and accurate forms of learners' utterances (Ellis, 2003).

Instructional Background

Japan has traditionally focused on grammatical competence in language learning. However, with globalization, Japanese face the possibility of having to speak English anywhere, anytime, even in Japan. Thus, recently, the focus of instruction was shifted from English as sophistication to English as a communication tool, and the development of practical communication skills has been clarified as the goal of English education in the official curriculum guideline of Japan (Ministry of Education, Culture, Science and Technology, 2004). But teachers need much time to teach communication skills, which consist of many basics which learners, in particular beginners, have to master.

Ideally, teachers would teach both fundamental and high level skills in every face-to-face lecture. However, this ideal is difficult to achieve, because the lecture time is so short that they may not be able to accomplish the learning objectives which they have set. Therefore, one effective solution would be in the use of CMC; blended learning with CMC and face-to-face lectures would be practical and effective for second language learning.

In such blended learning, online learner-centered study is often offered, with the intent of motivating learners to study and review independently. It has been suggested that learner-centered instruction may promote negotiation of meaning and increase motivation in language learning (e.g., Fernandez-Garcia & Martinez-Arbelaiz, 2002; Pica & Doughty, 1985a, 1985b). Discourse in teacher-fronted instruction is more grammatical than that in learner-centered study (→ instruction, classes) (Pica & Doughty, 1985b).

However, there are concerns that learners do not study accurate speech in learner-centered communication, because learners are not conscious of learning objectives; that is, they do not understand what they have to learn and what they have to do in learner-centered instruction with no teacher present. Some studies report that it can be difficult for learners to learn objectives without consciousness of these objectives in second language learning (e.g., Schmidt, 1990, 1993, 2001). Many previous studies have compared the features of learner-centered communication performed with

various communication media; however, the effectiveness of particular media with respect to consciousness of learning objectives, and the requirements for effective communicative language learning, have not been discussed. Making communication as realistic and natural as possible is a major challenge of CALL (Bax, 2003), but there is also practical value in making learners conscious of learning objectives even in learner-centered communication. Learners should be provided with the opportunity to recognize their current skill level and to obtain assistance when necessary during learner-centered communication outside the classroom. It seems to be important to design instruction which raises consciousness of learning objectives and retains high motivation without having the teacher in front of the learner. Learner-centered SCMC for learner-centered communication seems to be potentially effective for learning when some support functions are integrated (Martin, 2005; Smyth, 2005).

CALL Design

In recent years, interactive media based on interactive instructional design has been applied in classrooms. This has led many researchers and instructors to pay attention to performance in learning. Attention to and consciousness of learning objectives in learning and acquisition is essential in designing effective instruction. However, the learning environment itself may place a high cognitive load on the learner, reducing the effectiveness of such instruction. Cognitive load theory assumes that environmental factors such as task, material, and ambient noise as well as learners' mental state affect the cognitive load of their learning, due to limitations of working memory and information processing (Kirschner, 2002; Sweller, 1988). This theory is concerned with the ease of understanding the learning material, interactivity with learning materials in learning, the presentation of information which promotes learning activities, and evaluation of the difficulty of learning materials. Thus, cognitive load theory can be a guideline for conducting effective learning environments. Many researchers (Chandler et al., 1991;

Kester et al., 2004; Sweller et al., 1998) suggested that the cognitive load theory facilitates the construction of effective learning material, and that management of cognitive load is important in learning.

One of the unique features of SCMC is that it encourages participants to respond to their interlocutors quickly (Blake, 2000; Warschauer, 1996). This motivates learners to participate and promotes interactivity, as mentioned above; however, it also increases the cognitive load of learning, since learners are forced to load the desired expressions and vocabulary immediately. One way to reduce this load is to present learners with an additional material to assist in second language acquisition. While the presence of such material may in itself cause additional cognitive load, it can also facilitate communicative learning, because it helps learners resolve communication problems such as unknown meaning (Canale, 1983) and promote learning performance and outcome (Bransford, 1990).

The Design and Objectives of This Study

In this study, we aim to investigate the issues surrounding the application of videoconferencing software to SLA. To do this, we analyze the following points:

1: the relationship between media and affective side
2: the relationship between affective side and productive performance
3: the relationship between affective side, media and use of assistance material

For this study, we first develop four types of Web-based software which allows learners to be conscious of their SLA objectives through learning task in learner-centered instruction: videoconferencing software, audioconferencing software, text-chat with image and plain text-chat. Using the software, we evaluate and discuss the media's influence on affective learning and the relationship between affective side and performance.

EXPERIMENT

System

In SLA research, one common topic is how to raise learners' consciousness of target language forms in communication tasks as we mentioned above. Previous studies have suggested the effectiveness of grammar consciousness-raising tasks in communication (Fotos & Ellis, 1991; Fotos, 1994). The significance of these studies was based on the importance of learners' awareness in communicative instruction. Some studies report that learners cannot learn learning objectives without consciousness of these objectives in second language learning (Schmidt, 1990, 2001). Existing SCMC software seemed to have difficulty in promoting learners' consciousness of learning objectives in learner-centered communication, because such software did not display the learning objectives and context for communication. Therefore, in learner-centered communication, we considered the necessity to (1) give context for communication and (2) display learning objective at all times in order to raise learners' consciousness of the learning objectives.

For this experiment, we developed four types of software systems that allow learners to be aware of and utter the target formulaic speech as a learning objective: videoconferencing, audioconferencing, text-chat with image and text-chat without image. Formulaic speech is an expression that consists of fixed, repeated words and is employed in particular situations. We chose the acquisition of formulaic speech as the learning objective because its acquisition is employed commonly and accepted by learners of a wide range age in the early stages of SLA (Ellis, 1986), and is a possible effective tool for social interaction (Wray & Perkins, 2000). The system allows learners to select a target expression from several formulaic speech patterns which the teacher has set and display it during communication in SCMC. We assumed that learners use the target expression as a learning objective in communication.

System Architecture

This system is a client/server system. Clients consist of software allowing selection of expressions, display of target expressions and learning material in all types of system. In addition, the videoconferencing system has a camera, headset with microphone, and display of interlocutor's image and voice-based communication; the audioconferencing system has a headset with microphone and audio conference software; the text-chat system with images has a camera and text-based communication software; and the text-chat system without image has text-based communication software. All client software for all system types was developed in Macromedia® Flash™ and Action Script, and can be used on Web browsers with the Flash™ Player plug-in 7.0 or later installed. If the Flash™ Player plug-in is not installed, or if the installed version is too old, most Web browser software currently in common use (including Microsoft® Internet Explorer™, Netscape™, and Mozilla Firefox) will allow the user to download and install the plug-in automatically. The server side consists of software for management of learning material, management of target expressions, and storage of learners' selected expressions. The common functions in all types and the text-based communication software are implemented in PHP 5.0 and use the Apache 2.0 Web server with the PHP module; the use the Macromedia® Flash™ Communication Server MX 1.5 streaming server. All of the server software runs on the same computer.

System Functions

In these systems, SCMC software with learning material and functions for raising the consciousness of learning objective, learners use cameras and/or headsets with microphones, or just text-based communication software; to work together in real-time. First, the client software reads in the target expression file, which contains target expression categories and individual target expressions, from the server and displays them. The display on the

client then moves to the communication area. This area includes the selection and display of a target expression to help learners be conscious of the target expression as well as learning material for collaborative activity. In videoconferencing and text-chat with images, the server distributes learners' video to each learner using streaming; it also provides learning material documents and target expressions via the Web server, which the clients read in and display. For videoconferencing and audioconferencing, voice is distributed to each learner by the server. Messages typed in text-chat by learners are sent to the server, written into a log file on the server, then sent by the server to each client. The management functions on the server allow the teacher to easily register and edit expression categories and individual target expressions as well as links to learning material documents. This data is stored in XML files. The system reads this data in at the beginning of each section, as mentioned above.

Interface

Each system shows the target expression area, communication area and learning material. In the target expression area, target expression buttons are shown. When the learner clicks one of the buttons, target expression display appears in a pop up window. The learner can open multiple displays, and can move and close them. The format of the communication area changes depending on the system. Images are displayed for videoconferencing and text-chat with images; message display and typing area are shown for text-chat. For audioconferencing, only the learner's name area is shown. The interfaces for videoconferencing and text-chat with images are displayed in Figures 1, 2, 3 and 4. The interfaces of the audioconferencing and plain text-chat systems are similar, except for the lack of a display.

FIGURE 1

Interface of Videoconferencing
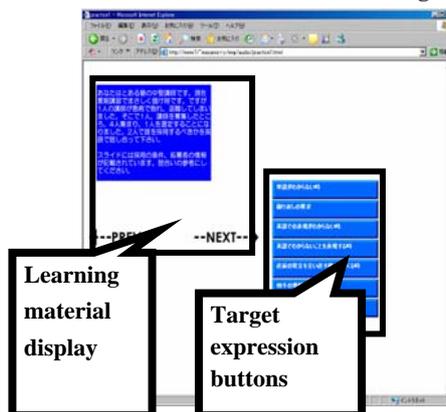

FIGURE 2

Interface of Audioconferencing

FIGURE 3

Interface of Text-chat with Image
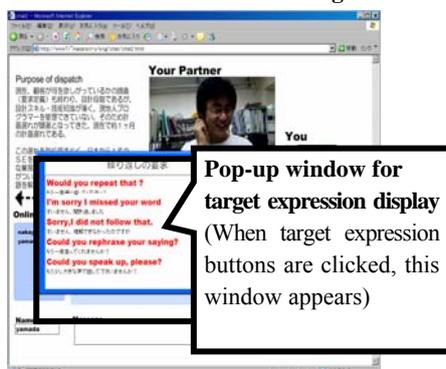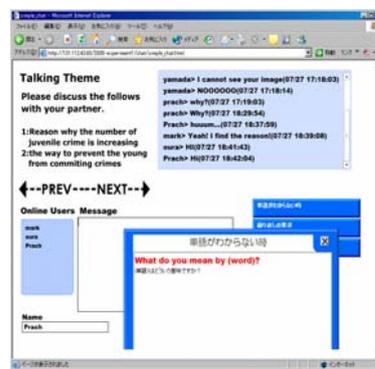

FIGURE 4

Interface of Plain Text-chat

METHOD

Subjects

The subjects in this study were 40 university students (female: 9, male: 31,

age range: 18-35, mean age: 22.1). Subjects did not know each other prior to the experiment. All subjects were non-native speakers. The subjects' proficiency in English varied from low-intermediate level students who had participated in some international conferences and had opportunities to talk with international students in their daily life to low level students who needed help to understand others' utterances, but all had reached at least high school standard level in grammar and vocabulary. Computer literacy among them was high; all used computers everyday for e-mail, text-chatting, the Internet, writing reports and so on.

Procedure

Subjects were randomly divided into four groups: the videoconferencing group, the audioconferencing group, the text-chat with image group, and the plain text-chat group. After instruction on using the system and tasks prior to the experiment, each subject moved to his/her room. A laptop computer with a webcam and headset was set in each room, and all computers were connected to a LAN. Subjects were divided into pairs, and each pair performed a learner-centered discussion for fifteen minutes; all pairs were given the same topic, that of choosing new school teacher from four candidates, taking into consideration the given conditions. Information and background about the school and candidates were given in the learning material displayed in each system (see the explanation of the system interface above). As mentioned above, each pair consisted of subjects who had not met before, because familiarity between subjects may have an influence on communication (e.g., falling back to their native language) and evaluation (e.g., a subject may be affected by his/her friend's thinking when they evaluate the system). From the educational view, familiarity is an important factor in educational performance, but we controlled this condition by erasing this factor, because this study aims to investigate the effect of systems which enhance social presence on second language learning issues. Finally, subjects were asked to answer a questionnaire.

Data Collection

The aim of this study is to investigate the contribution of subjective evaluation to learning performance. Data was collected in two ways. The first is a questionnaire. All subjects were required to answer a questionnaire after the experiment. The questionnaire asked all subjects to rate the perceived presence of interlocutor, the perceived ease of communication, and the perceived consciousness of second language communication while communicating in each SCMC from a 6-point rating scale. The questions asked to subjects are displayed in Table 1.

TABLE 1
Questions in Questionnaire

#	Questions	Scale
1-1	Rate the frequency of your utterance while using SCMC	1:less than face-to-face – 6: more than face-to-face
1-2	Rate the perceived ease of starting communication from you	1: not at all – 6: very much
1-3	Rate the perceived ease of understanding your partner's utterances	1: not at all – 6: very much
1-4	Rate the perceived ease of saying what you want to say	1: not at all – 6: very much
1-5	Rate the perceived consciousness of your partner's presence	1: not at all – 6: very much
1-6	Rate the perceived relief in communication in SCMC	1: not at all – 6: very much
1-7	Rate the perceived ease of communication in English	1: not at all – 6: very much
1-8	Rate the perceived feeling of the similarity between face-to-face and using SCMC	1: far from face-to-face – 6: very close
1-9	Rate the perceived consciousness of accuracy in English communication	1: not at all – 6: very much
1-10	Rate the perceived consciousness of responding as soon as possible	1: not at all – 6: very much
1-11	Rate the perceived consciousness of communicating the desired meaning in English, even if you make a mistake in grammar	1: not at all – 6: very much
1-12	Rate the perceived easiness of reflecting on your utterances	1: not at all – 6: very much

1-13	Rate the perceived consciousness of the grammatical accuracy of your partner's utterances	1: not at all – 6: very much
1-14	Rate the perceived consciousness of the response speed of your partner	1: not at all – 6: very much
1-15	Rate the perceived consciousness of the comprehension of your partner's utterances	1: not at all – 6: very much

The second data collection method is video-recording. In order to conduct an objective research, all communication was video-recorded, and the items listed in Table 2 were counted for each subject.

TABLE 2
Data Collected Through Analysis of Video Records

#	Items
2-1	Total number of turns
2-2	Utterances of the target expression
2-5	Self-corrections
2-7	Interruptions
2-8	Mean interval between utterances

Factor Analysis and Multiple Regression Analysis

In order to determine the validity of and detect perceived psychological factors for each item, exploratory factor analysis and confirmatory factor analysis were employed. Items with a communality less than 0.20 were excluded. Confirmatory factor analysis was performed to find the influence of each factor; items were assigned to the factor by which they were most influenced, judged by factor loading. Next, Cronbach's alpha scores between items which belong to each factor were calculated for confirmation of internal consistency. A score near 1.0 means a high reliability between items belonging to each factor (Yanai et al., 2002). After that, multiple regression analysis was conducted using each factor as an independent variable and language learning performance items as dependent variables in order to speculate on the relation between perceived psychological factors and language learning performance.

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RESULTS

Factor Analysis

14 of the 15 items were retained after exploratory factor analysis; items 1-12, "rate the perceived easiness of reflecting on your utterance", was less than 0.20 on communality, and was therefore excluded. Subsequently, four factors were extracted by confirmatory factor analysis. The first factor is "perceived easiness of communication in English by interlocutor's presence" ($\alpha = 0.885$), concerned with some items which contain perceived strength of presence, perceived ease of communication in English, and so on. The second factor is "the consciousness of natural communication" ($\alpha = 0.771$), affecting items dealing with speed of response, comprehension of the partner's utterances, and so on. The third factor was named as "the confidence of grammatical accuracy" ($\alpha = 0.715$), containing of the speed of the partner's response and consciousness of grammatical accuracy, along with a negative effect of perceived consciousness of communicating the desired meaning in English. The last factor is "the perceived consciousness of the comprehension of your partner's utterances". The result of factor analysis and Cronbach's alpha is shown in table 3.

TABLE 3
Factor Analysis and Cronbach's Alpha in Each Factor

	Fac1	Fac2	Fac3	Fac4	Communality
Rate the perceived consciousness of your partner's presence	0.901	-0.057	-0.048	0.118	0.810
Rate the perceived feeling of the similarity between face-to-face and using SCMC	0.789	0.215	-0.144	-0.067	0.803
Rate the perceived ease of understanding your partner's utterances	0.660	-0.031	0.119	-0.137	0.443
Rate the perceived ease of communication in English	0.616	0.441	-0.174	0.003	0.834
Rate the perceived relief in communication in SCMC	0.449	0.439	0.013	-.0.033	0.560
Rate the perceived ease of saying what you want to say	0.099	0.852	0.087	-0.048	0.741

Rate the perceived ease of starting communication from you	0.046	0.829	0.150	0.048	0.741
Rate the frequency of your utterance while using SCMC	-0.002	0.599	0.177	0.085	0.393
Rate the perceived consciousness of the grammatical accuracy of your partner's utterances	0.452	-0.474	0.249	0.257	0.397
Rate the perceived consciousness of responding as soon as possible	0.003	0.432	0.422	-0.006	0.339
Rate the perceived consciousness of the response speed of your partner	-0.068	0.153	0.875	0.095	0.752
Rate the perceived consciousness of accuracy in English communication	-0.088	0.267	0.728	-0.015	0.549
Rate the perceived consciousness of communicating the desired meaning in English, even if you make a mistake in grammar	-0.190	0.323	-0.458	0.388	0.531
Rate the perceived consciousness of the comprehension of your partner's utterances	-0.022	0.023	0.047	0.972	0.940
Eigen Value		4.929	2.212	1.714	1.333
Cumulative Contribution ratio (%)		33.049	46.098	55.429	63.489
Cronbach α		0.885	0.771	0.715	-

*Principal Factor Method, Varimax rotation

Difference Between four Factors in Subjective Data

A two-way analysis of variance (ANOVA) revealed that the main effect for image was statistically significant in factor 1 and factor 2 (factor 1: $F(3,36)=5.248$, $p < 0.05$; factor 2: $F(3,36)=8.680$, $p < 0.01$;). And, interaction effect between image and use of voice versus text was confirmed on factor 1. As for factor 3, only main effect for the communication medium was confirmed. However, for factor 4, there was no significant effect. Table 4 shows the average score, main effects and interaction effect for each item.

TABLE 4
Mean Scores and Effects for Each Factor

#	Item	Image	Voice/Text	Mean	Main effect of image	Main effect of Voice/Text	Interaction effect
Fac1	Perceived easiness of communication in English by interlocutor's presence	Yes	Voice	4.18	*		+
		No	Voice	2.65			
		Yes	Text	3.52			
		No	Text	3.38			
Fac2	The consciousness of natural communication	Yes	Voice	3.87	**		
		No	Voice	2.40			
		Yes	Text	3.63			
		No	Text	2.90			
Fac3	The confidence of grammatical accuracy	Yes	Voice	2.75		***	
		No	Voice	2.90			
		Yes	Text	4.65			
		No	Text	4.15			
Fac4	The perceived consciousness of the comprehension of your partner's utterances	Yes	Voice	5.10			
		No	Voice	5.30			
		Yes	Text	5.10			
		No	Text	5.10			

***: $p < 0.001$; **: $p < 0.01$; *: $p < 0.05$; +: $p < 0.1$

Difference Between four Factors in Language Performance

In the result of ANOVA, significant effect on all items was revealed statistically in the use of voice versus text. And the main effect for image was shown in 2-1, "mean number of turns", and 2-5, "mean number of self-correction". However, interaction effect between the use of voice versus text and image was shown in 2-1. Table 5 shows the result in detail.

TABLE 5
Mean Values and Effects for Language Performance

#	Item	Image	Voice/Text	Mean	Main effect of image	Main effect of Voice/Text	Interaction effect
2-1	Mean number of turns	Yes	Voice	65.30	***	***	**
		No	Voice	34.40			
		Yes	Text	10.80			
		No	Text	9.10			
2-2	Mean number of utterances of the target expressions	Yes	Voice	1.30		**	
		No	Voice	1.70			
		Yes	Text	0.60			
		No	Text	0.40			
2-3	Mean number of self-correction	Yes	Voice	1.50	+	*	
		No	Voice	0.50			
		Yes	Text	0.40			
		No	Text	0.20			
2-4	Mean number of interruption	Yes	Voice	3.30		***	
		No	Voice	1.80			
		Yes	Text	0.00			
		No	Text	0.00			
2-5	Mean interval between utterances (second)	Yes	Voice	1.31		***	
		No	Voice	11.85			
		Yes	Text	57.27			
		No	Text	49.57			

***: $p < 0.001$; **: $p < 0.01$; *: $p < 0.05$; +: $p < 0.1$

Multiple Regression Analysis

This study aims to reveal the relation between affective evaluation, media (voice versus text, system with and without image) and language learning performance for the effective design of CALL using SCMC. In order to find the relation, multiple regression analysis was conducted between the four factors above as independent variables and five language learning performance items as dependent variables. Additionally, dummy variables were used to differentiate the medium used. A variable, "voice communication" was set to 1 when voice was used, for communication and to 0 when text was used; another, "partner's image", was set to 1 when the partner's image was present,

0 when it was not. The significant relationships are displayed in the following figures.

Figure 5 shows the significant positive relation between factor 1, image, voice communication and number of turns. In this relation, the number of turns seems to be positively affected by factor 1 ("perceived ease of English communication due to presence"), "voice communication", and "partner's image".

Figure 6 shows the significant relation between communication medium and the utterance of the target expressions. The systems allowing learners to speak English, rather than type it, were statistically effective on the use of target expressions.

Figure 5
The Relation between Factors, Medium, and the Number of Turns

***: $p < 0.001$; **: $p < 0.01$; *: $p < 0.05$;
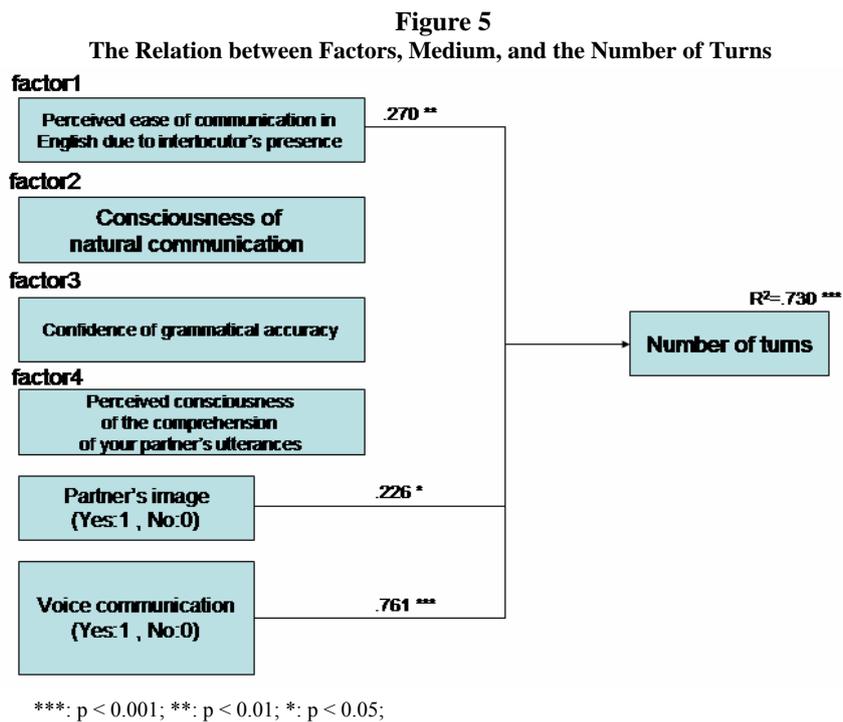
The significant relation between the four factors, medium and self-modification was shown in Figure 7. The relation between factor 3, "confidence of grammatical accuracy", "partner's image", "voice communication" and self-modification were statistically significant. It can be said that a system which enables learners to communicate using voice with the interlocutor's image promotes utterances for the error correction.

Interruption seems to be affected by the perceived ease of English communication due to presence and by the use of voice for the communication medium. Figure 8 reveals the positive relation between factor 1, medium and number of interruptions.

The relation depicted in Figure 9 shows that factor 2 ("consciousness of natural communication") and the use of voice communication encourage rapid response in English communication. Conversely, less consciousness of natural communication and text communication seems to cause learners to take longer respond in English communication.

FIGURE 6
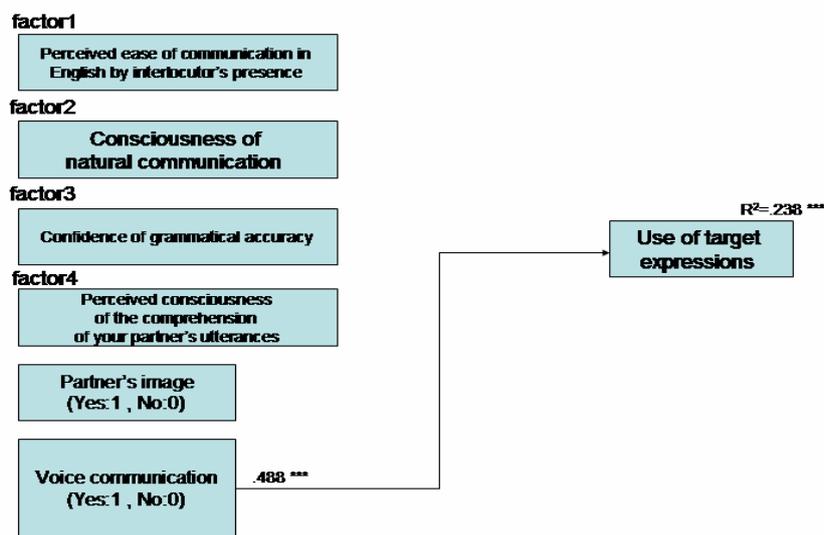**The Relation between Medium and the Use of Target Expressions**

FIGURE 7
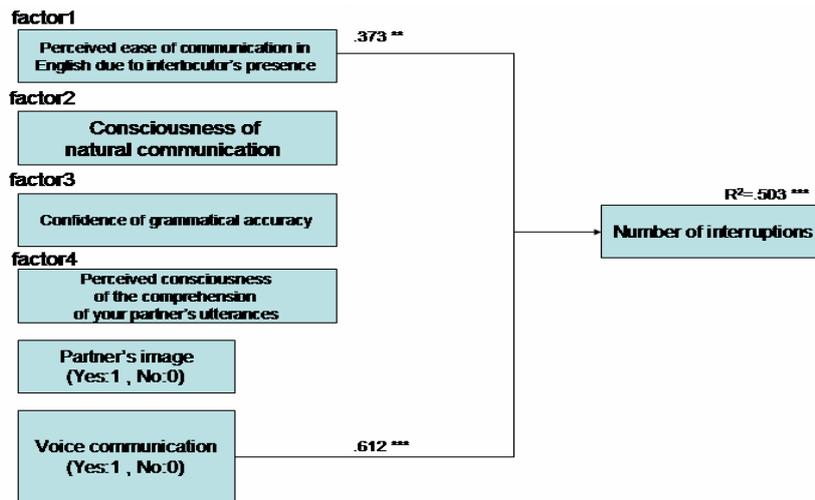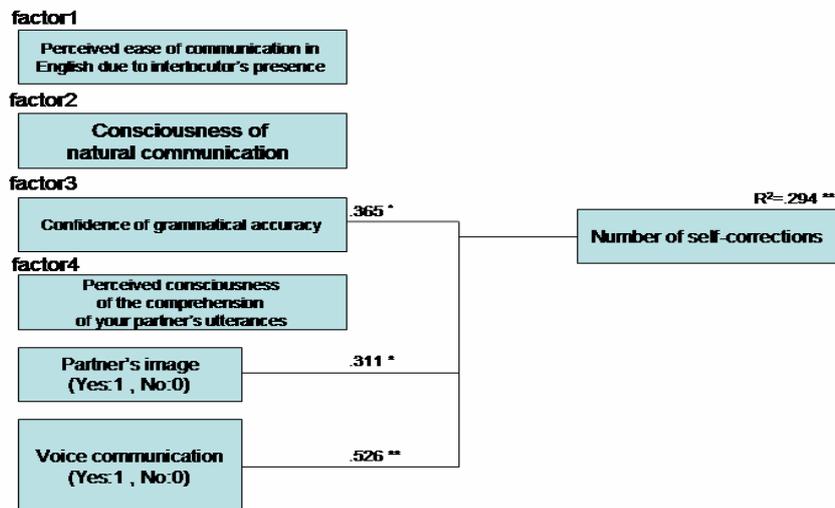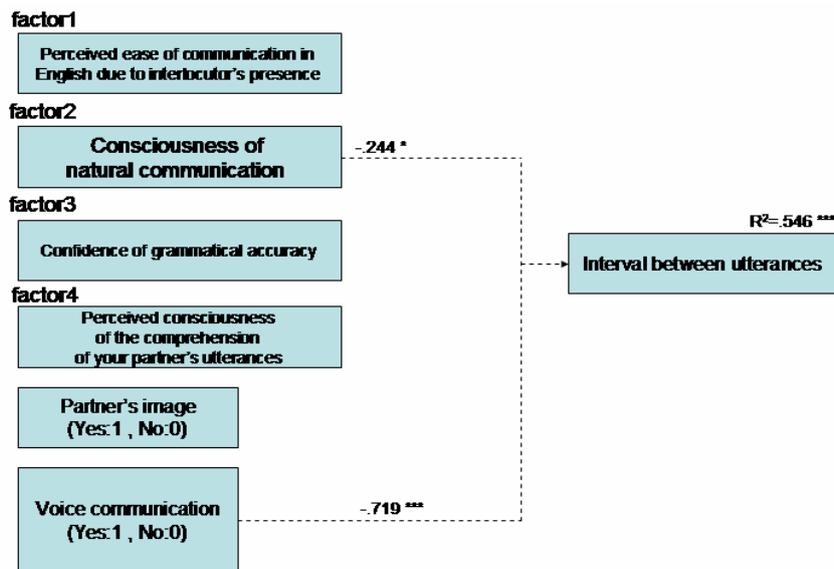**The Relation between Factors, Medium and the Number of Self-corrections**

FIGURE 8
The Relation between Factors, Medium and Interruption

FIGURE 9
The Relation between Factors, Medium and Response Time
(Note: the Dotted line Indicates a Negative Relation)

Opinions and Suggestions from Subjects

Some subjects who used each type of SCMC commented on the SCMC implementation and other functions. Almost all who used SCMC with partner's image commented that they felt a positive effect on communication. Subjects who used SCMC without partner's image, on the other hand, tended to have negative opinions.

Positive comments

Comment 1: It was similar to face-to-face setting. I was motivated to speak during the communication.

Comment 2: I was able to feel my partner's presence, so I could enjoy communicating in English, but a larger image size would make it easier to feel the partner's presence.

Comment 3: I could think and consider what to say after seeing my partner's non-verbal response. It was very helpful for language learning.

Comment 4: When I made an error in grammar, I could see whether my partner understood what I meant through the image. I felt relaxed, even when I made a mistake.

Comment 5: I could communicate with my partner. I watch her image to see her behavior, so I could wait for her response.

Negative comments

Comment 1: It was difficult to speak using only voice. When I could not hit upon the suitable words, I wanted to use gestures for explanation.

Comment 2: I could not find a chance to start to speak, because I could not see my partner's non-verbal response.

Comment 3: I made my partner wait for my responses a lot, because it took me a long time to find the right words to say. I was afraid that he thought I wasn't serious.

Comment 4: I could not voice my thoughts and feelings without seeing my partner's image.

With regard to the use of voice versus text in English communication, most opinions were negative for both media formats. Comments about voice communication generally reflected self-evaluation of ability, while comments about text communication tended to focus on the sense of discomfort in text-based communication.

Comment 1: I did not have enough time to consider what to say, because I felt compelled to response rapidly, so I could not speak accurate English.

Comment 2: I could not hit upon the suitable vocabulary in communication, and I felt bad for making my partner wait for my response.

Comment 3: We could not use gestures with voice explanation in text-chat with image, and gestures alone will not let my partner

understand what I mean.

Comment 4: I felt the sense of discomfort when text is mixed with image. I prefer to speak. It allows me to respond rapidly.

Comment 5: I had to change my message depending on my partner's response while I was typing.

DISCUSSION

In this experiment, the relation between four types of SCMC, consciousness of learning in communication and language learning performance was considered through comparison. We found two types of consciousness during English communication in this experiment; the consciousness of natural communication, reflected in factors 1 and 2, and consciousness of learning during English communication, with which factors 3 and 4 are concerned. The results of this experiment suggest that the presence or absence of the interlocutor's image affects consciousness of natural communication, and the use of voice versus text for communication influences consciousness of learning during communication. However, the results of ANOVA revealed an additional interaction effect for factor 1 ("perceived ease of communication in English due to interlocutor's image"); while this factor is categorized into consciousness of natural communication, this result suggests that a combination of voice and image can enhance the perception of presence, i.e., closeness to a face-to-face setting.

In text-chat, learners tend to be more conscious of grammatical accuracy than those in video and audioconferencing. This is because typing allows learners to pay attention to grammatical form and accurate spelling of vocabulary. Learners can check the accuracy of their messages as they type; when they find an error, they can revise it before sending the message to their partner. This is the reflective feature of text-chat (Lee, 2002). Moreover, learners could take significantly more time to type and send their message to their partner than when speaking in video and audioconferencing; that is, they

can be conscious of grammatical accuracy and type their message without the pressure to produce speech. Learners seemed more relaxed and satisfied with English communication in text-chat, taking into consideration foreign language anxiety and learning belief among Japanese English learners (Kubo, 1997). However, learners tended to concentrate on continuous and natural communication rather than learning consciousness in SCMC-based communication.

Language learning performance was affected by the amount of information used in conversation and perception of presence, the latter of which is influenced by the communication medium. The experimental results suggest that the use of videoconferencing leads to more frequent utterances, speculating from the interaction effect in tables 1 and 2, while the use of voice versus text has influence on the other aspects of performance. The use of voice communication seems to have also had two influences on English communication in this experiment. One is the load of English communication; from the comments, subjects felt difficulty in speaking English because of their inadequate ability to speak English accurately. The use of target expressions and self-correction, which are concerned with English learning, were affected by this aspect of the use of voice versus text. The other is the nature of communication. Subjects' comments suggest that the effect of this aspect is enhanced with the added presence of the interlocutor's image; however, the number of interruptions and response speed are unique features of voice communication as seen in the ANOVA results.

Additionally, the presence or absence of the partner's image affected subject's self-corrective actions. Subjects commented that they could take advantage of gestures to determine their partner's level of comprehension, and correct their utterances upon recognizing an inability to transfer comprehensive meaning to their partner. In traditional text-chat, which lacks social cues (Garrison et al., 2002; Levy et al., 2006), learners need to explicitly tell all that they think, including affective points. Moreover, the immediacy of SCMC gives learners the pressure to produce language quickly (Levy et al., 2006). From these viewpoints, learners may feel load during

communication in English in SCMC, but the presence of the partner's image seems to help learners determine the timing to speak as well as gauge their partner's comprehension.

In multiple regression analysis, significant relationships between some factors and interactive performance were confirmed. The aspect of presence cause more active communication, enhancing the perceived ease of communication in English; learners tend to speak English actively, even in learner-centered communication. Factor 3, concerned with learning consciousness, has an effect on self-correction. Judging from subjects' comments, learners seemed to reflect on their utterances, based on their partner's level of understanding, then modified the grammatical errors in the utterances. The negative relationship between factor 2 ("the consciousness of natural communication"), voice communication and mean interval between utterances is significant; that is, there is a tendency to delay responses in communication environments far from face-to-face settings. The results above coincide with the results of ANOVA in this study. The only relationship found for target expression usage was with voice communication; psychological perception had no significant effect expression usage. The use of voice makes learners feel loaded in communication in English. In that situation, it seems that learners faced the opportunities to use target expression concerned with communication strategies.

CONCLUSION

This study aims to investigate two points with respect to the use of SCMC in second language learning: the effect of communication medium on learners' affective side to learning and the relationship between medium, learners' affective side and productive performance. The interlocutor's image and voice communication allow learners to understand each other; learners can use non-verbal cues such as smiling and nodding. Non-verbal cues facilitate comprehensive communication in second language. Learners can transfer their meaning and determine whether their partner understands what

they want to say. Image and voice makes learners conscious of natural communication due to its similarity to face-to-face situations. Communication in text chat, on the other hand, enhances learning consciousness. The reflective feature of text chat allows learners to be conscious of grammatical accuracy and to modify an error, without feeling rushed. Checking for errors and revising before sending the message enables learners to communicate with each other using accurate grammar.

The results of multiple regression analysis suggest that affective perception such as relief in and ease of communication, along with the use of audio and image, promotes interaction such as number of turns and interruptions between learners. Confidence in grammatical accuracy during communication, combined with the presence of image and voice, influences self-correction, while consciousness of natural communication and the use of voice communication have a negative influence on response speed. Learners use target expressions as learning objectives frequently in voice communication, because target expressions concerning communication strategies assisted learners in continuing communication during voice SCMC, in which learners felt load.

Considering each medium from an educational standpoint, it can be said that text-chat helps learners be conscious of grammatical and lexical accuracy. In particular, novice learners tend to be conscious of continuous communication rather than form (van Patten, 1990); on the other hand, Japanese English learners tend to prefer studying forms (Kubo, 1997). From these viewpoints, text-chat seems to be effective for learners to study both forms and communication skills. However, we cannot deny the effect of multimedia-based SCMC such as videoconferencing. Voice communication provides many chances to study through negotiation of meaning (Japson, 2002). Voice communication with image offers the opportunity to foster practical skills in communication such as laughing and nodding (Kock, 2001), and can enhance distance learning, increasing learners' motivation and leading to continued participation in learning (Koenders, 2002; Smyth, 2005). In this study, videoconferencing had a significant effect on all aspects of performance and affective evaluation. However, it is essential to understand the features of

each medium with respect to second language communication and make effective use of them, such as blending text-chat and videoconferencing, taking into consideration the learner's language proficiency, learning objectives, target language, computer literacy, and computer environment. For example, Toyoda et al. (2002) suggest the effectiveness of the use of CMC in interactive language learning using Japanese as the second language, similarly to our research. However, unique language features such as filler, which is one of the important measurements of communicative competence for successful communication in Japanese, should be considered in order to set learning objectives. From the viewpoint of intercultural communication as a learning objective, a highly interactive communication and personal experience-telling are essential factors (Kelm, 1992; O'Dowd, 2005). The interlocutor's presence, which seems to be the key factor for highly interactive communication, plays an important role in self-disclosure, which is the desire to tell personal experience and ideas. The anonymity of CMC such as text-chat promotes self-disclosure (Joinson, 2001). Thus, low presence SCMC such as plain text-chat and audio conferencing seems to be effective on highly interactive intercultural communication.

This study suggests the effects of SCMC in communicative second language learning, considering the relationship between consciousness in English communication and productive performance. However, this study has limitations; this study was designed within an experimental setting, and the results may not be directly applicable to practical environments. Long term investigation in classroom settings and with greater numbers of subjects will be needed to extend the examination of the effectiveness of SCMC and the applicability of this model.

ACKNOWLEDGEMENT

Technology (MEXT) and the Japan Society for the Promotion of Science (JSPS).

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