

The Relationship Between Cognitive Linguistic Approach and Right-Hemisphere of the Brain in Developing EFL Learners' Pragmatic Proficiency

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Abstract

The present study explored how the metaphor awareness-raising approach affects the involvement of the right hemisphere in developing EFL learners' knowledge regarding the different degrees of politeness embedded within different request expressions. The study results show that the metaphor awareness-raising group performed significantly better than the control group with regard to acceptability judgment and speaking tests at post-test. These data revealed that the metaphor awareness-raising approach could promote L2 learning because it aided input enhancement and concept projection; through these aspects, the participants were able to comprehend an abstract concept: the degree of politeness in terms of the spatial concept of distance. Accordingly, the proximal-distal metaphor enabled the study participants to connect the newly spatio-visualized concept of distance to the different politeness degrees attached to different request expressions; furthermore, they could recall them with the left side of the mouth being wider than the right. This supported certain findings from previous studies that indicated the possible involvement of the brain's right hemisphere in metaphor processing.

Keywords: Metaphor Awareness-Raising, Proximal-Distal Metaphor, Right Hemisphere, Left-Hemisphere, L2 Politeness, Mouth Asymmetry

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Introduction

Acquiring and using language, one of the most sophisticated human achievements, is a vital part of human life. Among the various theories concerning language acquisition, cognitive linguistic theories underscore the fact that the best acquisition and use of language recognizes that it reflects general cognitive processes and involves the unique ways through which humans experience and interact with the physical world. Lakoff and Johnson (2003) and Grady (1999) argued that many embodied concepts can be extended to encompass more abstract concepts and we can therefore comprehend certain abstract concepts with regard to the embodied concepts. This process—conceptual projection—forms the basis of conceptual metaphor theory (CMT) (Lakoff & Johnson, 2003). For instance, in the conceptual and theoretical metaphor LIFE IS A JOURNEY, we conceptualize *life* compared with *journey*. Grady (1997) proposed primary metaphors, whose conceptual projections connect objective and subjective experiences, and argued that humans tend to distinctly and simplistically perceive the physical world as a framework for understanding another distinct simple target concept. For example, oftentimes, we witness a scene where the quality of an entity may increase incrementally, and we may also perceive that the height of the entity has increased. Thus, this “quantity” is understood metaphorically based on verticality.

Lakoff and Johnson (2003) suggested that when we understand and experience one kind of a thing in terms of another based on spatial concepts, we metaphorically map the embodied concepts onto the non-embodied concepts and thus maintain long-term memory; this, in turn, could be considered as an involvement of the brain’s right hemisphere. The brain is divided into two cerebral hemispheres: left and right. The left side of the brain, which controls the right side of the body, is considered to be the superior verbal and analytical processor. The right side of the brain controls the left side of the body with a focus on non-verbal visual-spatial skills.

The present study was motivated by theoretical considerations regarding the conceptual projection and metaphorical idea of POLITENESS IS DISTANCE, as proposed by Panther and Thornburg (2003); this study applied these considerations to develop Japanese learners’ knowledge regarding the different politeness degrees and to explore the connection between the metaphorical concept projection and right-hemisphere dominance. Japanese EFL learners do not know certain language strategies (e.g., English requests can be mitigated with biclausal downgraders including the if-clause with past-tense modal verbs) and have difficulty adjusting the politeness degrees attached to request expressions according to situations.

Based on CMT and Japanese EFL learners’ tendencies, such learners’ conceptualizations about politeness degrees embedded in English request expressions may not be deeply entrenched in their knowledge of spatial relations. Accordingly, this study utilized spatial relations to make politeness degrees easier to learn and attempted to find the connection (if any) between the metaphor awareness-raising approach and right-hemisphere dominance activation.

Research on teaching L2 pragmatics and spatial concept application

Many past studies have treated speech acts—requests in particular—as target pragmatic features (Alcón-Soler, 2013; Harlenko & Jones, 2011; Nguyen, 2013; Q. Li, 2012; S. Li, 2013). Additionally, most of the empirical studies investigated whether second language (L2)

learners could identify and use appropriate pragmalinguistic realization patterns according to the given situation, while L2 learners' sociopragmatic knowledge was assessed primarily based on whether they could make a correct linguistic selection based on social variables under each given context. This emphasis on the pragmalinguistic aspects rather than the sociopragmatic domain influenced L2 learners' learning outcomes.

To assist L2 learners in interconnecting the pragmalinguistic and sociopragmatic aspects of a pragmatic target equally, Littlemore (2009) explained that embodied cognition that utilizes the spatial conceptualizations helps L2 learners internalize those two aspects of the pragmatic target and also acquire the concept of politeness. Similarly, Littlemore and Low (2006) emphasized the use of the primary metaphor to familiarize learners with the use of different politeness degrees according to contexts. To date, very few studies have adopted the primary metaphor for exploring the efficacy of the metaphor awareness-raising approach (Takimoto, 2020; Tyler, Mueller, & Ho, 2010).

Tyler et al. (2010) examined how the metaphor awareness-raising approach influenced the teaching of English modal verbs among EFL learners at a university in the US. Furthermore, Takimoto (2020) utilized spatial concepts to improve Japanese EFL learners' pragmatic proficiency regarding politeness degrees in making requests. The two studies' results show that the metaphor awareness-raising approach is more effective than the non-metaphor awareness-raising approach; however, associations between the efficacy of the spatial concept-oriented metaphor awareness-raising approach and right-hemisphere dominance was not investigated and remains under-researched. Therefore, the present study aims to identify the causes of the effectiveness of spatial concept-oriented metaphor awareness-raising approaches through a neuroscientific perspective.

Left and right-hemisphere involvement in metaphor processing

Many cognitive neuroscience studies utilize neuroimaging and electrophysiological techniques to investigate the relationship between first language (L1) metaphor processing and hemispheric lateralization. Some studies have shown greater right-hemisphere involvement in metaphor comprehension (Ahrens, Liu, Lee, Gong, Fang, & Hsu, 2007; Cardillo, Watson, Schmidt, Kranjec, & Chatterjee, 2012; Faust & Mashal, 2007; Mashal, Faust, & Hendler, 2005; Schmidt, DeBuse, & Seger, 2007); others failed to demonstrate preferential right-hemisphere metaphor processing (Benedek, Beaty, Jauk, Koschutnig, Fink, Silvia, Duns, & Neubauer, 2014; Rapp, Leube, Erb, Grodd, & Kircher, 2007; Stringaris, Medford, Giampietro, Brammer, & David, 2007).

The aforementioned studies differ methodologically in terms of data-gathering methods, task selection, and stimulus selection in cognitive neuroscience studies and these differences may have produced mixed results regarding the right-hemisphere hypothesis for metaphor processing. Additionally, most of the studies examined left and right-hemisphere roles in metaphor comprehension processing rather than metaphor production processing. Both hemispheres' contributions to metaphor production rather than comprehension should be explored further.

To examine each hemisphere's relative involvement in metaphoric production, real-time inspection should be conducted during actual speech production; to gain the end of real-time inspection, measurement of mouth asymmetry may be suitable. Accordingly, several studies (Argyriou & Kita, 2013; Argyriou, Byfield, & Kita, 2015) have measured mouth asymmetry

to analyze the relation between real-time speech production and left and right-hemisphere contributions.

Mouth asymmetry measurement has been utilized because speech articulation, normally controlled mainly by one side of the brain, causes muscles on the opposite side of the mouth to move more during speech production (Graves & Landis, 1990; Adams, Victor, & Ropper, 1997). Studies by Argyriou and Kita (2013) and Argyriou et al. (2015) proved that, compared with neuroimaging and electrophysiological techniques, which confine participants in small spaces that physically restrain any free movement, mouth asymmetry techniques can identify relative involvement from each hemisphere when participants' movements are less unrestrained. Additionally, mouth asymmetry techniques are non-invasive, inexpensive, and less time-consuming for locating different real-time hemispheric involvements during actual speech production.

Nevertheless, this technique has not been applied for identifying relative hemispheric involvements in L2 metaphorical speech production. Therefore, considering the still under-researched area of hemispheric involvement in L2 speech production, we must further explore whether visualizing instructional content based on spatial concept-based metaphor awareness-raising approaches could assist in enhancing right-hemisphere involvement, thus facilitating the acquisition of L2 politeness.

The present study pursued the findings of Takimoto (2020); thus far, no studies have probed how metaphor awareness-raising approaches affect teaching different degrees of L2 politeness as well as right-hemisphere involvement. To address this gap, this study investigated the following research question:

How do metaphor awareness-raising approaches influence right-hemisphere involvement in developing EFL learners' knowledge of different politeness degrees attached to request expressions?

Research methodology

Participants

The study participants were monolingual Japanese speaking students from a Japanese university (57 right-handed participants) belonging to two intact classes. They had majored in science and engineering and had been learning English as a foreign language for eight years in Japan. Their average age was 20 years old and their English proficiency level was the intermediate level.

Target expressions

Following Takimoto's study (2020), the present study utilized the POLITENESS IS DISTANCE metaphor to examine the teaching of biclausal downgraders in English requests invoking hypotheticality. The list of biclausal downgraders in Table 1 is based on those adopted by Takimoto (2020). Two native speakers of English (from New Zealand and Great Britain) confirmed a list of request strategies and ensured directness among these strategies.

Table 1. List of request strategies

	Strategy	Example
CASUAL	1. Mood derivable	<i>(Please) clean my room.</i>
REQUESTS	2. Preparatory question	<i>Can you clean my room?</i>
ORIGINATING IN REAL SPACE	Permission question	<i>Can I borrow your pen?</i>
	3. Mitigated-preparatory question	<i>Could (Would) you clean my room?</i>
	Mitigated-permission question	<i>Could I borrow your book?</i>
POLITE	4. Biclausal mitigated-want statement	<i>I would appreciate it if you could clean my room.</i>
REQUESTS	Biclausal mitigated-preparatory	<i>I wonder if you could clean my</i>
ORIGINATING	5. statement	<i>room.</i>
IN	Biclausal mitigated-permission	<i>I wonder if I could borrow your</i>
HYPOTHETICAL	statement	<i>book.</i>
SPACES	Biclausal mitigated-preparatory	<i>Would it be possible for you to</i>
	6. question	<i>clean my room?</i>
	Biclausal mitigated-permission	<i>Would it be possible for me to</i>
	question	<i>borrow your book?</i>

Note: 1 = most direct ~ 6 = least direct

Brown and Levinson (1987) suggested that the amount and type of politeness was determined by three social context variables: (a) *power*, the speaker's relative social status compared with that of the hearer; (b) *closeness*, between the speaker and the hearer; and (c) *speaker difficulty*, experienced by the speaker when asking the hearer to perform a speech act. Accordingly, different politeness degrees based on the different degrees of these social variables were used and evenly reflected in the instructional and testing materials.

Learning treatments

A single instructor (who was a researcher) conducted complete learning sessions on Zoom in Japanese once a week for two weeks. The treatment and control groups attended a 30-minute learning session consisting of teacher-directed computer-based learning. During these sessions, they received no feedback.

The metaphor awareness-raising approach group's computer-based learning included these components: (a) using computers to observe an illustration about English requests, which was based on the POLITENESS IS DISTANCE metaphor, for 10 minutes with the instructor's metapragmatic information and (b) engaging in problem-solving tasks for 20 minutes. However, the control group's computer-based learning included these components: (a) using computers to observe a list of English requests for 10 minutes with the instructor's metapragmatic information and (b) engaging in problem-solving tasks for 20 minutes.

Testing instruments and procedures

The present study used a pre/post-test design to reaffirm the efficacy of the cognitive technique and its connection to right-hemisphere involvement. The pre-test was administered a week before the first learning session, and the post-test was administered a week after the second learning session. The present research did not administer the delayed post-test because it emphasized determining whether metaphor awareness-raising approaches for developing EFL learners' pragmatic proficiency entailed right-hemisphere activation.

Each test contained an acceptability judgment test (AJT) along with a speaking test in the post-test. Two different AJT versions were developed to minimize the test learning effects. The post-test commenced with the speaking test followed by the AJT because of concerns that the AJT might provide the participants with some hints about the speaking test. The participants were given five minutes each to complete the AJT and the speaking test. The AJT was administered online through a learning management system; the speaking test was conducted online individually through Zoom.

Acceptability judgment test

The present study adopted the AJTs from Takimoto's study (2020); these required participants to read about 18 situations in English. After this reading, participants were required to assess each request based on the degree of perceived acceptability on an 11-point scale and then instructed to select the most appropriate request form. Their ratings were compared with English native speakers' baseline data. When a given participant's scores matched appropriately with English native speakers' baseline data, five points were assigned to a participant. The test contained 18 items with a maximum score of 90.

Speaking Test

The speaking test was conducted online on a one-on-one basis through Zoom. During the test, participants had to sit right in front of the computer screen and keep both hands still on their computer tables. The researcher and participants faced each other through the computer screen, and the researcher video-recorded participants' responses in "Active Speaker View" mode through Zoom. The participants had to make an oral request in English under a given situation. They were assigned three situations before the speaking test; following this, they received consecutive situation numbers (e.g., Situation 1, Situation 2, and Situation 3) on an individual white paper sheet (72 font size) from the researcher, who continued holding this paper until the participant started making requests in English. After the video recording, the researcher transcribed the participants' responses, and two native English speakers (from Britain and New Zealand, respectively) scored the transcribed participants' requests on a 5-point scale based on their appropriateness for each situation. The test contained three situations including two highly imposed situations and one low imposed situation (maximum score: 15). One highly imposed speaking-test sample situation was as follows:

Situation 1: You are writing a difficult paper for Professor Hill. You need some help with the paper, but Professor Hill is away for a month. A friend of yours has suggested you go and see Professor Watson. Although you do not know Professor Watson, and Professor Watson is extremely busy, you have decided to ask Professor Watson to look through your long

paper before you hand it in the next day. What would you ask Professor Watson? Please start speaking now.

You: _____

Results

The AJT scores (scored by the researcher) and the speaking-test scores (evaluated by two English native speakers) were analyzed using SPSS Version 27.0 (IBM Corp, 2020). The participants' transcribed speaking-test request expressions were further analyzed using AntConc 3.5.7 (Anthony, 2018).

Descriptive statistics and statistical analysis assumptions

The participants' performances in the treatment and control groups regarding the pre-test and the post-test of each testing instrument are indicated using the number of participants (n), mean (M), and standard deviation (SD) for each case (Table 2).

Table 2. Descriptive statistics for two testing instruments

Time	Acceptability Judgment Test				Speaking Test				
	Treatment	n	M	SD	Time	Treatment	n	M	SD
Pre	MR	30	39.17	14.92	N/A				
	Control	27	31.67	18.03					
	Total	57	35.63	16.75					
Post	MR	30	67.33	22.04	Post	MR	28	15.00	0.00
	Control	27	39.63	12.85	Control	29	11.24	3.97	
	Total	57	54.21	22.087	Total	57	13.09	3.39	

Note: MR = metaphor awareness-raising approach; Pre = pre-test; Post = post-test

Acceptability judgment and speaking tests

The two-way repeated-measures ANOVA results for the acceptability judgment test indicated a significant main effect on Instruction ($F [1, 55] = 25.13, p = .000 < .001, \eta p^2 = .314$) and Time ($F [1, 55] = 36.39, p = .000 < .001, \eta p^2 = .398$). No significant interaction effects were observed between Instruction and Time: $F (1, 55) = 11.38, p = .001, \eta p^2 = 11.38$. Furthermore, the results of the independent-measures t -test for the speaking test disclosed a significant main effect on Instruction: $t (55) = 15.21, p < .001, d = 1.10$.

Mouth asymmetry analysis

Recordings of participants' mouth opening were analyzed using a two-dimensional motion analysis software (Move-tr/2D, Library Inc., Tokyo, Japan). It processed participants' mouth movements on a scene-by-scene (1/25 second) basis during the participants' responses; only scenes of participants' using target words were analyzed. The mouth asymmetry analysis encompassed 2,901 scenes (935 scenes for *requesting help with a paper*, 667 scenes for *borrowing a smartphone*, and 1299 scenes for *requesting a makeup exam*) for the metaphor awareness-raising approach group and 2,743 scenes (962 scenes for *requesting help with a*

paper, 795 scenes for *borrowing a smartphone*, and 986 scenes for *requesting a makeup exam*) for the control group.

Using the first recording scene as the basis, the center of the participant's forehead (Point 1 in Figure 1) was fixed as the reference point. Based on the reference point and the tip of the nose (Point 2 in Figure 1), the vertical axis on the coordinates was determined. Then, using the vertical axis as the reference axis, the left end (Point 4 in Figure 1) and the right end of the mouth (Point 3 in Figure 1) were set as measurement points, and the horizontal axis was determined using these coordinates. Comparative coordinate conversion was performed on the recordings after the basic scenes were completed. Namely, using the reference point, the coordinates were converted as $(x, y) = (0, 0)$, and it was assumed that the reference axis connecting the reference point and the nose tip was immobile. The coordinate displacements of measurement points 3 and 4 were calculated based on the reference axis. The present study defined mouth asymmetry as right-sided mouth asymmetry (the left side of the mouth opens wider than its right side) or left-sided mouth asymmetry (the right side of the mouth opens wider than its left side).

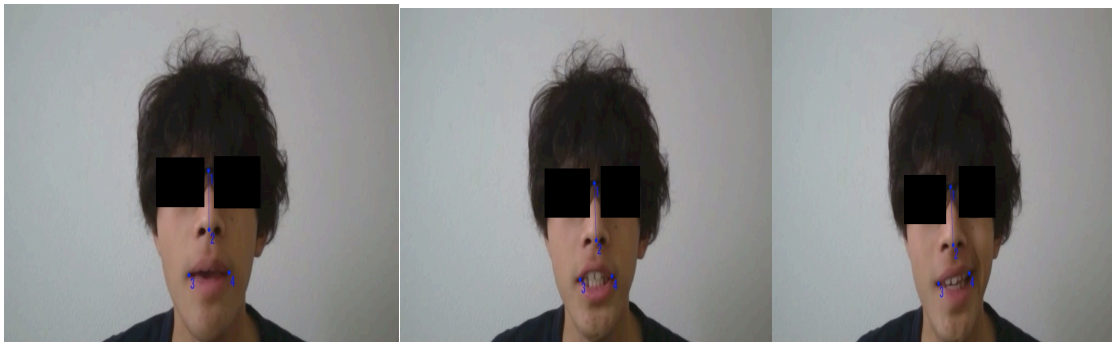


Figure 1: (From left to right). Examples of right-sided mouth asymmetry maximum mouth opening, equal mouth opening, and left-sided mouth asymmetry maximum mouth opening

First, this study analyzed whether the right-sided and left-sided mouth-opening widths differed in the metaphor awareness-raising approach and control groups. Significant differences in the left-sided mouth-opening width (L) and the right-sided mouth-opening widths minus the left-sided mouth-open widths (R-L) for *requesting help with a paper*, *borrowing a smartphone*, and *requesting a makeup exam* were observed through two independent-measures *t*-tests (no significant differences were observed in the right-sided mouth-opening width [R]) (Table 3). Second, the study ran two paired-samples *t*-tests to locate where the differences in L and R could be found. Statistical analysis indicated significant differences between the L and R, with L being wider than R in the metaphor awareness-raising approach group: $t(29) = -3.57, p < .01, d = 1.78$ for *requesting help with a paper*, $t(29) = -5.67, p < .01, d = 1.50$ for *borrowing a smartphone*, and $t(29) = -6.45, p < .01, d = 1.19$ for *requesting a makeup exam*. However, while significant differences were also observed between L and R in the control group, unlike the metaphor awareness-raising approach group, these results indicated that the participants' R was wider than their L: $t(26) = 3.25, p = .003, d = .96$ for *requesting help with a paper*, $t(26) = 2.77, p = .010, d = .68$ for *borrowing a smartphone*, and $t(26) = 2.90, p = .007, d = 1.05$ for *requesting a makeup exam*.

In summary, significant differences were observed in L and R between the metaphor awareness-raising approach and control groups, and the metaphor awareness-raising approach group's L was significantly wider than the R. This provided some evidence that the metaphor awareness-raising approach group's right-hemisphere involvement may have increased the

left-side bias for mouth openings during the participants' metaphorical processing of the target request expressions that they used. However, it could be hypothesized that, within the control group, the participants' left-hemisphere dominance may have increased the right-side bias for mouth openings when they were producing target request expressions.

Table 3. Right- and left-sided mouth-opening widths and the difference between them during target request production

	Treatment	Mean	SD	<i>t</i>	<i>p</i>	<i>d</i>
RH R	MR	1.63	1.71	.23	.818	1.46
	Control	1.54	1.11			
RH L	MR	2.79	1.33	6.71	.000	1.07
	Control	.60	.96			
RH R-L	MR	-1.16	1.78	-4.57	.000	1.45
	Control	.12	1.73			
BS R	MR	1.26	1.10	-1.66	.103	1.05
	Control	1.72	.98			
BS L	MR	2.81	1.64	3.81	.000	1.44
	Control	1.36	1.17			
BS R-L	MR	-1.56	1.50	-6.31	.000	1.19
	Control	-.36	.68			
RM R	MR	1.00	1.10	-1.96	0.55	.94
	Control	1.49	.73			
RM L	MR	2.40	1.36	5.23	.000	1.11
	Control	.90	.74			
RM R-L	MR	-1.40	1.19	-6.65	.000	1.12
	Control	.59	1.05			

Note: R=right-sided mouth-opening width; L= left-sided mouth-opening width; R-L= R minus L; RH = *requesting help with a paper*; BS = *borrowing a smartphone*; RM = *requesting a makeup exam*; MA = *metaphor awareness-raising approach*

Discussion and conclusion

This study analyzed how metaphor awareness-raising approaches affected right-hemisphere involvement in developing EFL learners' knowledge of different politeness degrees embedded in different request expressions. The results showed that the metaphor awareness-raising group performed significantly better than the control group on acceptability judgment and speaking tests at post-test. These data showed that the proximal-distal metaphor enabled participants to connect spatial visualized conceptualizations of distance to different politeness degrees attached to different request expressions and recall them with wider left-sided mouth openings than the right, thereby supporting previous studies' findings (Argyriou & Kita, 2013; Argyriou, Byfield, & Kita; 2015) about possible right-hemisphere involvement in metaphor processing.

Two possible factors may have improved the effectiveness of the metaphor awareness-raising approach regarding possible right-hemisphere involvement. The first concerns the conceptual projection between distance (a spatial concept) and politeness (the target concept). The metaphor awareness-raising approach group engaged in concept projection, through which participants managed to understand an abstract concept—the degrees of *closeness*, *power*, and *speaker difficulty*—in terms of spatially visualized concepts such as NEAR–FAR and HIGH–LOW; this was accompanied by right-hemisphere involvement. However, rather than concept projection, the control group was required to learn a list of request expressions by rote, and this may have reduced right hemisphere dominance (Graves & Landis, 1990; Lindell, 2006).

Another reason for the effectiveness of the metaphor awareness-raising approach may be the participants' lack of familiarity with the concept of embedding politeness in request expressions. During the speaking test, the metaphor awareness-raising approach group engaged in metaphorical concept mapping with regard to spatially visualized concepts such as NEAR–FAR and HIGH–LOW, connecting them to the concept of politeness degrees: *closeness*, *power*, and *speaker difficulty*. This specific metaphorical cross-domain mapping was part of the participants' efforts to bring two distant concepts closer together to identify differences in the politeness degrees between the request expressions.

According to Beeman's Fine Coarse Coding theory (Beeman, 1998), right hemisphere processing activates distantly associated concepts and peripheral aspects of meanings and simultaneously maintains multiple meaning activations, whereas left-hemisphere processing selects and maintains activations of closely associated concepts and central aspects of meanings. In short, metaphorical expressions with a low degree of familiarity (for example, politeness levels) will be handled by the right hemisphere, while literal expressions with a high degree of familiarity will be handled by the left hemisphere.

Regarding follow-ups on the current findings, profound results could be obtained through future studies that delve into the effects of the metaphor awareness-raising approach on relative right and left-hemisphere involvement in EFL learners' metaphoric production processing. It may be beneficial to conduct further analyses on spatial-oriented metaphor awareness-raising approaches by using a neuroscientific angle; this could provide fellow researchers and teachers with more insights that will help them develop optimum instructional methods for teaching L2 abstract concepts in an EFL context.

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