

L2 Learners' Acquisition of the Preposition *to*: Prototypical and Polysemous Features

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Abstract: This study examined the effects of instruction on the development of the English preposition *to* in a quasi-experimental setting with intermediate-level Japanese learners of English. Grammar tests were utilized to measure prepositional accuracies to understand the general effects of the treatment sessions that focused on developing knowledge of the preposition *to*. These tests were also used to verify if the prototypical feature of *to* (i.e., indicating an *endpoint*) and polysemous functions (i.e., spatial, temporal, and abstract) were correlated with changes in accuracies before and after the treatment sessions. Results of this investigation revealed that at the initial stage of this experiment there was little evidence that the notion of the prototypical meaning of *to* in the targeted items was understood, nor were these learners cognizant of the polysemy of the preposition *to* across spatial, temporal, or abstract contexts. Allowing for lexical substitution for the preposition *to* with *before* or *until* in the grammar tests, more temporal items could be correctly answered indicating a distinction between cognitive factors that may influence processing of the context, and the shared semantic properties of *to*, *before*, and *until*. After the treatment sessions, all targeted items reached very high accuracies in the post-tests for spatial and temporal scenes showing that learning effects could be maintained beyond the period of treatment. Abstract usages, on the other hand, had a lower level of achievement

with a higher rate of attrition after the treatment. The general pedagogical implications of these findings suggest that the prototypical features of prepositions should be taught taking into account polysemy and various other factors such as semantic choice, cognitive features, developmental stages and systematicity, as they may affect explicit learning, retention, and implicit usage of prepositions.

Keywords: prepositions, prototype theory, polysemy, SLA

1. Introduction

The learning and acquisition of English prepositions by second language (L2) learners has long been an area of interest. Prepositions are exceedingly difficult for L2 learners to understand and utilize, thus making pedagogical advances in the instruction of prepositions a priority for many researchers (e.g., DeKeyser, 2005; Snape, Leung, & Smith, 2009; Tyler & Evans, 2003). For example, there has been great interest in examining the lexical, functional, and conceptual properties of prepositions (see Bong, 2012; Hagège, 2010, Van der Gucht, Willems, & De Cuypere, 2007). Prepositions are seen to have a relationship between the prepositional complement and other parts of the sentence (Quirk, Greenbaum, Leech, & Svartvik, 1985, p. 657). They have spatial, temporal, and

abstract properties that may or may not include prototypical features (Bong, 2011; Geeraerts, 2010, pp. 184-192; Geeraerts, 2016; Rice, 1996), and are polysemous (e.g., Brenda, 2014). Prototype theory tries to explain the association that members of a category have in common, share characteristics, and are arranged by their similarity to the most frequent and prototypical attribute that its' members share (Brenda, 2014, p. 29; Geeraerts, 2010, 1988). The importance of prototypes from an instructional perspective is that their meaning may be quickly determined and applied to other meanings, even with little or no previous exposure (Ellis, 2013). Polysemy, on the other hand, embodies multiple related meanings or senses of a word or phrase. For example, the preposition *to* has a prototypical meaning indicating an endpoint in terms of a destination, transfer of something, the beginning or end of an action, but can also represent more abstract features such as effect on a person, reaction, behavior, attachment, comparison, relationship, etc. (see Yates, 2011).

The complex nature of prepositions (Lindstromberg, 2010; Littlefield, 2006), with many uses not fully examined, remains an area within second language acquisition (SLA) that requires further theoretical and pedagogical investigation. For example, pedagogical research on the application of explicit instruction in the form of written corrective feedback (WCF) on L2 writing has been found ineffective for intermediate-level L2 learners (e.g., Bitchener, Young, & Cameron, 2005; Taferner, 2015a). It is likely that WCF may have been ineffective due to the ambiguity in the meaning of the prepositions corrected. For example, when an instructor provides explicit corrective feedback (CF) on a prepositional error, there may be an incorrect assumption that the learner not only understands the feedback received, but can also apply the knowledge of prototypical and polysemous features to new compositions correctly. Furthermore, Bong's (2011) research

does not support the view that prototypicality and developmental patterns are related—forwarding the position that first language (L1) lemmatic transfer may be interfering with L2 lexical choice resulting in misdevelopment. Considering the lack of success of WCF, Taferner (2015b) investigated the impact of explicit instruction on some of the most frequent single-word prepositions *at*, *by*, *for*, *from*, *in*, *of*, *on*, *over*, *to*, and *with*. The selection of these items was based on previous studies (i.e., Bong, 2011, 2012; Chodorow, Gamon, & Tetreault, 2010). In Taferner (2015b), spatial, temporal, and abstract polysemous properties were examined through the utilization of a pretest, treatment, and two post-tests. The findings indicate that prepositions of time were the most difficult for Japanese learners of English (JLE). Subsequently, Taferner (in press) narrowed the investigation to only prepositions of time. This study found that general language proficiency, which was measured by participants, TOEIC scores, was not related to the ability to learn and retain the knowledge gained through the treatment sessions. Also, prototypical properties were examined and a difference in accuracies between the prepositional items was shown to indicate developmental stages as well as differences in systematicity within items (Towell & Hawkins, 1994). Another interesting finding of this investigation was that the preposition *to* had an extremely low accuracy level for some specific temporal usages (e.g., It is 5 minutes *to* 3:00 p.m.) at the beginning of the study. However, over the duration of the experiment, accuracy improved to over 90%, indicating that treatment was effective in promoting and maintaining the accuracy for this extremely difficult preposition. After considering the findings in Taferner (2015b) and Taferner (in press), as well as Tyler, Mueller, and Ho's (2011) study of the semantics of the preposition *to* from a cognitive linguistics perspective, *to* was determined to be a good candidate for this investigation of prototypical and polysemous features of spatial,

temporal, and abstract prepositions. The hypothesis for this study is that items with less complexity would be easier to learn and retain (Tyler, Mueller, & Ho, 2011, p. 123) i.e., spatial features would be easier to learn than temporal, and temporal features easier than abstract ones. The following research questions will be examined to further our understanding of the prototypical and polysemous nature of the preposition *to* in L2 learning:

1. What are the general effects of treatment on the development of explicit knowledge of the preposition *to*?
2. How does prototypicality influence learners' explicit knowledge of polysemous spatial, temporal, and abstract usages of the preposition *to*?

The methodology of this present study will now be described, followed by the results, discussion, and the conclusion.

2. Methodology

2.1 Participants

The participants of this study were Japanese university students ($N = 80$) in the Hiroshima area majoring in education, economics, business, engineering, or science. Four intact 1st-year English speaking-composition classes of 25-30 students participated in this experiment from October 2015 to February 2016. One class was randomly chosen as the Control group while the other classes were combined to form the Treatment group. The Treatment group ($n = 56$) completed a pretest for the targeted prepositions, two treatment tasks, and two post-tests, while the Control group ($n = 24$) only completed the pretest and two post-tests to compare their accuracies with the Treatment group over a period of nine weeks.

2.2 Instrument design

Grammar tests were developed to determine participants' knowledge of common usages

of the preposition *to* with the treatment tasks adapted from treatments developed in Taferner (2015b, in press). These tests and treatments were further expanded with Yate's (2011) examples and explanations of motion, time, and abstract usages (e.g., attitude, behaviour, comparison, and concern), and supported by Tyler, Mueller, and Ho's (2011, pp. 126-131) discussion of a cognitive linguistic approach that emphasized the notion of *endpoint* to learning *to* as a spatial, temporal, or abstract preposition (see Figure 1). Lindstromberg (2010, pp. 30-31) also supported this basic meaning of *to* that has a physical boundary as a landmark for motion, and can also be applied to temporal features.

It must be noted that open-ended nature of fill-in-the blank cloze test items in the grammar tests could not always isolate the preposition *to* as the only correct response, but could also allow the prepositions *before* and *until* in some cases as their semantic meanings are almost identical. Thus, analysis of these items will be made when lexical substitutions of *before* and *until* are also appropriate responses.

2.2.1 Grammar tests

Three grammar tests, a pretest, and two post-tests, were utilized in this study to elicit explicit knowledge of spatial, temporal, and abstract polysemy that shared the prototypical endpoint feature of the preposition *to*. The tests included 114 questions, 56 focused on 7 target items (8 tokens each) and 58 distractors. All of the tokens used in the three tests were altered, and the order of the tokens was randomized. This procedure emphasized learning of the meaning of the prepositions and eliminated the possibility of participants memorizing sentences. In previous studies (Taferner, 2015b, in press), their broad focus on many prepositional items had an effect on item statistical reliability as a low number of tokens per item were used. To improve reliability

I. Spatial preposition indicating motion to an endpoint:

- a. Jane is going to the post office.
- b. Mary is carrying the boxes to the kitchen.



II. Temporal preposition indicating the end of an activity or the start of something:

- a. Connie normally works to 5:00 p.m. (lexical substitution - until)
- b. This week, Mary worked everyday from 12:00 to 21:30.



- c. It is 3 minutes to 1:00 p.m. (lexical substitution - before/until)



- d. Barbara has 15 minutes to the presentation. (lexical substitution - until)



III. Abstract preposition indicating a connection to something:

- a. This ball belongs to Henry.

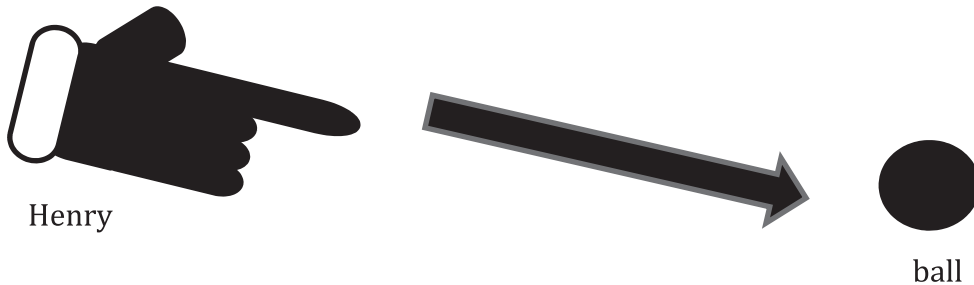


Figure 1. Visual representations of the preposition *to*

of the tests used in this current study, 8 tokens per item were included to increase confidence in the accuracies presented for each type of preposition examined. The questions in the tests first had a Japanese sentence followed by an equivalent English sentence with a blank space for a preposition to be written in to complete it. The English sentences were also developed to intentionally follow canonical word order so as to limit syntactic complexity (Love & Swinney, 1998) around the preposition. This strategy was an attempt at creating grammar tests in a more disciplined manner so as to limit variables such as sentence and lexical complexity that could influence the overall reliability of the test items. In addition, test items were initially created by bilingual applied linguists and were trialed by highly proficient JLE before being completed by the participants to further check for problems in the test items and oversights that could compromise test validity.

2.2.2 Grammar test items

The test items included three categories of prepositions: motion, time, and abstract usages.

i. Preposition of motion test items

T₁. (destination).

ジェインは郵便局に向かっていきます。

jein wa yubinkyoku ni mukatteimasu.

Jane is going _____ the post office.

(to)

T₂. (transfer).

メアリは箱を台所まで運ぶでしょう。

meari wa hako wo daidokoro made hakobudesho.

Mary is carrying the boxes _____ the kitchen. (to)

To, as a spatial preposition is used to indicate motion as seen in test items T₁ and T₂. Here, movement towards a destination and the transfer of

something to somewhere features of the preposition *to* were investigated.

ii. Preposition of time test items

T₃. (end of a period of time).

今週、メアリは毎日正午から午後9時半まで働きました。

konshu, meari wa mainichi shougo kara gogo kujihan made hatarakimashita.

This week, Mary worked everyday from noon ____ 9:30. (to / lexical substitution - until)

T₄. (amount of time before a clock time).

午後1時まで3分です。

gogo ichiji made sanpun desu.

It is 3 minutes ____ 1:00 p.m. (to / lexical substitution - before & until)

T₅. (when something finishes).

コニーはふだん午後5時まで働きます。

koni wa fudan gogo goji made hatarakimasu.

Connie normally works _____ 5:00 p.m. (to / lexical substitution - until)

T₆. (amount of time before something starts).

バーバラは発表まであと15分あります。

babara wa happyou made ato jugofun arimasu.

Barbara has 15 minutes _____ the presentation. (to / lexical substitution - until)

Temporal usages of *to* in the tests are represented by: test item T₃ indicating the end of a period of time; item T₄, the amount of time before a clock time; item T₅, showing when something finishes; and item T₆, the amount of time before something starts. Note that control for lexical substitution of other prepositions of time for these test questions was not plausible as *to*, *before*, and *until* are seen as almost identical under these conditions. Therefore, results of both the targeted preposition *to* and these other correct responses

will be shown and discussed accordingly in the Results and Discussion sections.

iii. Abstract preposition test item

T₇. (connected in some manner).

このボールはヘンリーのです。

kono bo-ru wa henri no desu.

This ball belongs _____ Henry. (to)

To represent the many abstract uses of the preposition *to*, only one type, item T₇, something connected to something or someone in some manner was randomly chosen. The changes in accuracy results from this test item should show some general features that all abstract uses of *to* may share.

To explore the impact of instruction on the preposition *to*, treatment tasks were designed to provide learning opportunities for the spatial, temporal, and abstract usages aforementioned in this section.

2.2.3 Treatment tasks

Two treatment tasks that took approximately 30 minutes each to complete, were provided over a period of two weeks to the Treatment group. They allowed thorough explicit explanations and ample opportunities for personalized practice of seven prepositional items within the categories of motion, time, and abstract usage of *to* (see Appendix). The design of the treatment was adapted from Taferner (2015b, in press), and a number of Long's (2016) methodical principles. In Part 1, *Focus on Forms* grammar instruction with English and Japanese explanations was provided with repeated opportunities to practice the targeted items (Bygate, Skehan, & Swain, 2001). Then a *Focus on Form* meaning focused response to the participants' answers was provided as immediate CF on their Japanese interpretation of the English sentences. In Part 2 of the treatment, creative usage of the target items incorporating cognitive schema theory

where meaning through a visual representation of the sentence is produced in order to enhance personalized learning and memory (e.g., Mandler, 1984; Purpura, 2004, p. 46; VanPatten, 1996); and a final cloze exercise to check participants' explicit knowledge of the preposition *to* in spatial, temporal and abstract situations. After the treatment, changes in the accuracies of participants' knowledge of targeted prepositional meanings were determined through the comparison of pretest and post-test scores.

2.3 Data collection

This study followed the data collection schedule in Table 1. In Week 1, participants' TOEIC scores were tabulated and the pretest was given, followed by the treatments in Weeks 2 and 3. In Weeks 4 and 9, the post-tests were administered. The author tabulated all of the results and then had a graduate school student check that the data collected had been correctly entered before any data analysis was conducted.

Table 1. Data Collection

| | |
|--------|---|
| Week 1 | TOEIC scores and Pretest |
| Week 2 | Treatment 1 |
| Week 3 | Treatment 2 |
| Week 4 | Post-test 1 (one-week delayed post-test) |
| Week 9 | Post-test 2 (five-week delayed post-test) |

3. Results

Statistical analyses shown in this section were performed using IBM SPSS Statistics Version 23.0 to determine if and when the treatment had a significant effect on the Treatment groups' mean accuracy rates during this study. To conduct this study, changes in group as well as individual targeted test item accuracy rates were analyzed using a combination of independent samples *t*-tests, paired samples *t*-tests, repeated measures ANOVA, and Kendall's correlation to ensure the

veracity of the claims made by this study. The data collected in this study included TOEIC scores to measure general language proficiency of the participants, and scores from three grammar tests to record changes in learners' explicit prepositional knowledge were analyzed to respond to research question 1. This data will show if there is evidence of prototypical influences on the preposition *to* prior to the treatment sessions, staged development and systematicity across spatial, temporal, and abstract usages of the preposition *to* in order to answer research question 2. To determine if learners were able to utilize knowledge of the prototypical endpoint feature of the preposition *to* across its polysemous features prior to any instruction, a pretest incorporating spatial, temporal, and abstract usages was created. Additionally, post-tests were given to show the explicit knowledge participants were able to learn and retain from the treatments received. Furthermore, responses to the test items were tabulated according to the targeted preposition *to* and the test items that allowed for other correct responses, i.e., lexical substitution of *before* and *until* for the targeted item *to*. The identification of other *correct* responses indicates that the participants' conceptualization of the scenes used in the test items may be adequate, and should be acknowledged as so. This helps narrow down the problem of either a simple semantic issue to contend with, or a much greater cognitive influence when the learner could not strategically respond appropriately to the test item.

3.1 Treatment and Control group effects

To get a comprehensive perspective of the entire study, the data in Table 2 illustrates the effects of instruction on the Treatment and the Control groups from the initial stages of the investigation through to final post-test 2. A comparison of the Treatment and Control groups was made to ensure that the treatment of the preposition *to* was the main stimulus for gains in accuracy rather than a practice effect or other influence to identify if confounding variables may have influenced the results. The TOEIC scores, representing general language proficiency, show that the participants were at an intermediate level and that the Treatment group and the Control group were significantly different at the beginning of the study $F(2, 78) = 48.43, p < 0.001$.

The pretest scores for the preposition *to* also indicated that the groups were significantly different $F(2, 78) = 4.90, p = 0.019$. However, when including lexical substitution, the pretest scores showed that they were statistically similar $F(2, 78) = .14, p = 0.713$. The results of the Treatment group indicate the treatment was effective in increasing the accuracy rates of the preposition *to* items treated at the time of the two post-tests: post-test 1 $F(2, 78) = 25.44$ and $p < 0.001$, and post-test 2 $F(2, 78) = 5.16, p < 0.001$; post-test 1 with lexical substitution $F(2, 78) = 76.49, p < 0.001$, and post-test 2 with lexical substitution $F(2, 78) = .73, p < 0.001$. The Treatment group had an overall 34% gain in using the preposition *to*, when other

**Table 2. Treatment ($n = 56$) and Control ($n = 24$) Groups Mean Scores
(Independent Samples *t*-test) ($N = 80$)**

| Items | Treatment <i>M</i> (<i>SD</i>) | Control <i>M</i> (<i>SD</i>) | <i>F</i> | <i>p</i> | Treatment *LS <i>M</i> (<i>SD</i>) | Control *LS <i>M</i> (<i>SD</i>) | <i>F</i> | <i>p</i> |
|----------------|-------------------------------------|-----------------------------------|----------|----------|---|---------------------------------------|----------|----------|
| TOEIC Score | 542.5 (39.9) | 431.9 (6.9) | 46.43 | .000** | | | | |
| Pretest | .54 (.13) | .47 (.10) | 4.90 | .019 | .79 (.13) | .71 (.12) | .14 | .713 |
| PT 1 | .96 (.04) | .50 (.10) | 25.44 | .000** | .98 (.02) | .73 (.13) | 76.49 | .000** |
| PT 2 | .88 (.09) | .49 (.13) | 5.16 | .000** | .95 (.06) | .73 (.13) | 30.46 | .000** |
| PT 2 – Pretest | .34 | .02 | | | .16 | .02 | | |

*LS = includes both preposition *to* and lexical substitution (i.e., *before* and *until*) results; ** $p < 0.001$

prepositions were included in the mean scores as lexical substitution the improvement was at 16%, while the Control showed only an insignificant 2% gain.

Figure 2 graphically illustrates the Treatment and Control group mean scores for the duration of the study. A paired-samples *t*-test shows the Treatment group scores as: Post-test 1–Pretest $t(55) = .25, p < .001$; Post-test 2–Post-test 1 $t(55) = -.04, p < .001$; and Post-test 2–Pretest $t(55) = .21, p < .001$.

Figure 3 illustrates the Treatment and Control group mean scores that take lexical substitution

into account. Paired-samples *t*-tests scores (Post-test 1–Pretest $t(55) = .20, p < .001$; Post-test 2–Post-test 1 $t(55) = -.03, p < .001$; and Post-test 2–Pretest $t(55) = .16, p < .001$) show the Treatment group improved significantly at each test interval when compared to the pretest.

3.2 Treatment test item effects

To determine the effects of the treatment on each of the seven targeted usages of the preposition *to*, a repeated measures ANOVA was conducted to establish the variance of mean accuracy scores at the pretest, post-test 1, and post-test 2 intervals (see

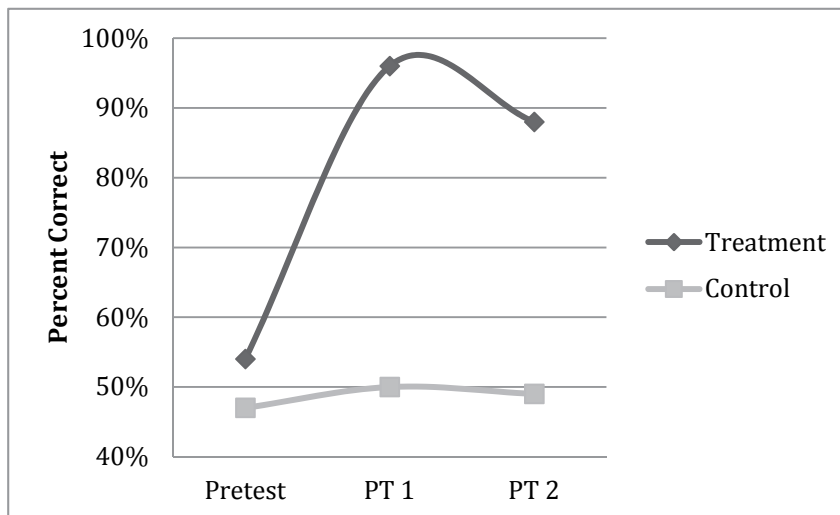


Figure 2. Group Preposition *to* Mean Scores

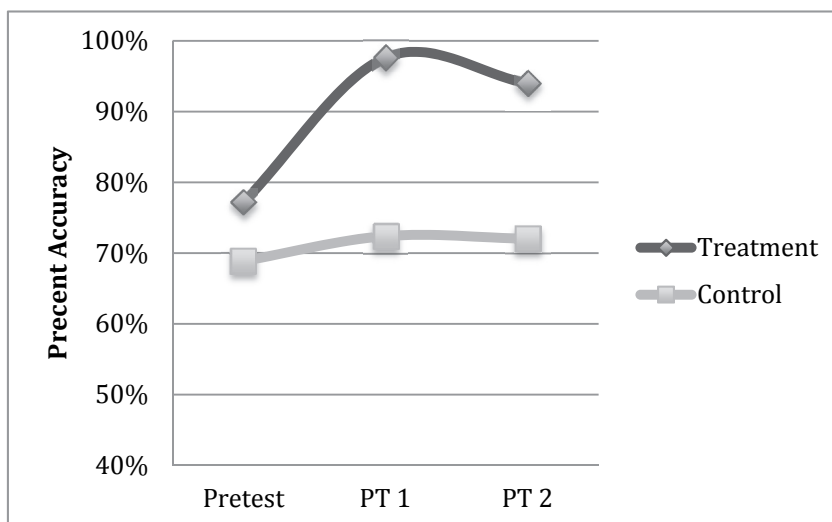


Figure 3. Group Preposition *to* plus Lexical Substitution Mean Scores

Table 3. Treatment Item Accuracy Orders & Repeated Measures ANOVA Results ($N = 80$)

| Treatment Accuracy Orders and Mean Rates | | | | Treatment (Between-subjects factor—Control) | | | |
|--|-----------------------|-----------------------|-----------------------|---|---------|---------|--------------------------|
| | Pretest | PT 1 | PT 2 | | F | p | Partial Eta ² |
| Easy to Difficult | T ₃ (0.93) | T ₁ (1.00) | T ₄ (0.99) | T ₁ | 7.92 | < .001* | .09 |
| | T ₁ (0.78) | T ₃ (1.00) | T ₃ (0.99) | T ₂ | 7.71 | < .001* | .09 |
| | T ₂ (0.76) | T ₂ (0.99) | T ₁ (0.97) | **T ₃ | 1.05 | = .352 | .01 |
| | T ₇ (0.55) | T ₄ (0.99) | T ₂ (0.92) | T ₄ | 25.88 | < .000* | .25 |
| | T ₄ (0.43) | T ₆ (0.94) | T ₇ (0.81) | T ₅ | 67.95 | < .000* | .47 |
| | T ₆ (0.23) | T ₅ (0.92) | T ₆ (0.80) | T ₆ | 98.80 | < .000* | .55 |
| | T ₅ (0.12) | T ₇ (0.91) | T ₅ (0.73) | T ₇ | 27.89 | < .000* | .26 |
| | | | All items | 107.07 | < .000* | .58 | |

* $p < 0.001$ **ceiling effect PT = post-test

Table 3).

The Treatment group results of all of the targeted prepositions show $F(2, 55) = 107.07$, $p < 0.001$ (partial eta-squared = .58) for preposition *to*. A repeated measures ANOVA was also conducted with the preposition *to* plus lexical substitution data for all targeted items which resulted in $F(2, 55) = 38.31$, $p < 0.001$ (partial eta-squared = .33). Both preposition *to* and preposition *to* plus lexical substitution calculations show significant differences and large effect sizes for all of the items except for T₃, which was limited due to an initial ceiling effect. The results for T₄, T₅, and T₆ generally indicate the strongest treatment effects are for the use of *to* as a preposition of time, with mixed effect sizes for spatial and abstract usages.

3.3 Accuracy orders

The next area of inquiry was the changes in accuracy orders of the treatment items of this

study (see Table 4). The mean accuracy scores for preposition *to* shows that most prepositions of time on average were the most difficult. T₃ (e.g., John works from 9:00 to 5:00.), on the other hand, had an accuracy rate of over 90% in the pretest. This shows that some items were familiar to learners and therefore required little instructional attention. In the case of T₁ (destination) and T₂ (transfer), the rates were extremely high due to lexical substitution. Finally, the abstract item was the lowest for the lexical substitution calculation across all the tests. After the treatment, the rates went up to over 90% for all of the items, with post-test 1 results showing the same accuracy order for both preposition *to* and preposition *to* plus lexical substitution calculations.

The accuracy order results for preposition *to* will be shown in the next section. These results focus on the semantic component of the test items in this study.

Table 4. Treatment Item Accuracy Orders and Mean Scores ($n = 56$)

| | Pretest | PT 1 | PT 2 | Pretest LS | PT 1 LS | PT 2 LS |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Easy to Difficult | T ₃ (0.93) | T ₁ (1.00) | T ₄ (0.99) | T ₃ (0.97) | T ₁ (1.00) | T ₄ (1.00) |
| | T ₁ (0.78) | T ₃ (1.00) | T ₃ (0.99) | T ₁ (0.89) | T ₃ (1.00) | T ₃ (0.99) |
| | T ₂ (0.76) | T ₂ (0.99) | T ₁ (0.97) | T ₂ (0.89) | T ₂ (0.99) | T ₁ (0.98) |
| | T ₇ (0.55) | T ₄ (0.99) | T ₂ (0.92) | T ₆ (0.73) | T ₄ (0.99) | T ₂ (0.96) |
| | T ₄ (0.43) | T ₆ (0.94) | T ₇ (0.81) | T ₄ (0.71) | T ₆ (0.99) | T ₆ (0.96) |
| | T ₆ (0.23) | T ₅ (0.92) | T ₆ (0.80) | T ₅ (0.67) | T ₅ (0.96) | T ₅ (0.89) |
| | T ₅ (0.12) | T ₇ (0.91) | T ₅ (0.73) | T ₇ (0.55) | T ₇ (0.90) | T ₇ (0.80) |

PT = post-test; LS = includes both preposition *to* and lexical substitution (i.e., *before & until*) results

3.3.1 Proposition *to* accuracy orders

Table 4 shows the test item results of the Treatment group. This table illustrates that prepositions of time T₄, T₅, and T₆ benefited the most from the treatment, abstract prepositions T₇ were successfully promoted, and the accuracies of motion T₁ and T₂ improved as well. To statistically demonstrate which of the test items were equivalent in terms of accuracy orders, paired samples *t*-test calculations were performed. In the pretest and post-test 2, five accuracy levels resulted. Post-test 1 had four levels showing differing degrees of prototype or semantic sensitivity to the preposition *to*, polysemy, and possible cognitive demands.

Finally, to demonstrate the Treatment group’s correlation between the three tests and accuracy orders, a Kendall’s tau-b correlation of participants’ accuracy orders before and after treatments was calculated (see Table 6). It was found that post-test 1 and post-test 2 results were the most similar. A strong positive correlation between post-test 1 and post-test 2 resulted ($\tau_b = .50, p = .000$).

In the next section, the accuracy order results for lexical substitution will be shown. These results demonstrate a closer view of the cognitive influences on the test items in this study.

3.3.2 Proposition *to* plus lexical substitution accuracy orders

The mean test item results for the Treatment group that includes lexical substitution are displayed in Table 4. The prepositions of time T₄, T₅, and T₆ improved substantially from the treatment, followed by abstract prepositions represented by T₇, and the prepositions of motion T₁ and T₂. T₃ had almost no change in accuracy as the initial mean score was close to 100%. To show which items were cognitively similar, paired samples *t*-test calculations were made (see Table 7). Initially, the items in the pretest resulted in three accuracy levels. T₃ in accuracy order Level 1 had the highest score. Representing Level 2, the prepositions of motion, T₁ and T₂, had accuracy rates close to 90%. Finally, Level 3 included

Table 5. Treatment Accuracy Orders (Paired Samples *t*-test) ($p < .05$)

| | | | | | | | |
|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Pretest | 1 T ₃ | 2 T ₁ | 2 T ₂ | 3 T ₇ | 3 T ₄ | 4 T ₆ | 5 T ₅ |
| Post-test 1 | 1 T ₁ | 1 T ₃ | 1 T ₂ | 1 T ₄ | 2 T ₆ | 3 T ₅ | 4 T ₇ |
| Post-test 2 | 1 T ₄ | 2 T ₃ | 3 T ₁ | 4 T ₂ | 5 T ₇ | 5 T ₆ | 5 T ₅ |

Table 6. Treatment Group Accuracy Orders (Kendall’s Correlation)

| | Pretest | Post-test 1 | Post-test 2 |
|-------------|---------|-------------|-------------|
| Pretest | - | | |
| Post-test 1 | .09 | - | |
| Post-test 2 | .02 | .50* | - |

* $p < .01$

the most difficult items: T₆, T₄, T₅, and T₇. After instruction, all of the items had accuracy rates over 90%, as seen in post-test 1.

The paired samples t-test results could distinguish between the accuracy orders to show clear differences in cognitive complexity by demonstrating significant differences statistically. The items had the following accuracy order after the treatment sessions: T₁, T₃, T₂, T₄, T₆, T₅, and T₇. At the time of post-test 2, similar to post-test 1, six levels were also present, but with some changes in the order: T₄, T₃, T₁, T₂, T₆, T₅, and T₇. These orders demonstrate abstract prepositions were the most difficult to learn, a wide range of differences in

the complexity of prepositions of time was found, and prepositions of motion were ordered closely together.

Similar to the results of the preposition *to* calculation, the Kendall's tau-b correlation of participants' accuracy orders show that post-test 1 and post-test 2 scores are the most comparable ($\tau_b = .34, p = .000$) (see Table 8). The results of the grammar tests show group and individual test item accuracy changes for preposition *to* and the effect of lexical substitution before and after the treatment.

A thorough discussion of the results in this section will now follow.

Table 7. Treatment Preposition *to* plus Lexical Substitution Accuracy Orders (Paired Samples *t*-test) ($p < .05$)

| | | | | | | | |
|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Pretest | 1 T ₃ | 2 T ₁ | 2 T ₂ | 3 T ₆ | 3 T ₄ | 3 T ₅ | 3 T ₇ |
| Post-test 1 | 1 T ₁ | 2 T ₃ | 2 T ₂ | 3 T ₄ | 4 T ₆ | 5 T ₅ | 6 T ₇ |
| Post-test 2 | 1 T ₄ | 2 T ₃ | 3 T ₁ | 4 T ₂ | 5 T ₆ | 6 T ₅ | 6 T ₇ |

Table 8. Treatment Preposition *to* plus Lexical Substitution Accuracy Orders (Kendall's Correlation)

| | Pretest | Post-test 1 | Post-test 2 |
|-------------|---------|-------------|-------------|
| Pretest | - | | |
| Post-test 1 | .15 | - | |
| Post-test 2 | .18 | .34* | - |

* $p < .01$

4. Discussion

The results of this study have raised many issues that require further explanation regarding the complexities involved in learning the single-word preposition *to*. At the beginning of the study, TOEIC scores representing general language proficiency were recorded for the participants with the Treatment group with higher scores than the Control (see Table 2). Unlike the correlation between the TOEIC and pretest grammar test scores in Taferner (in press), higher TOEIC scores of the Treatment group in this present study were consistent with higher pretest scores. This trend continued after the treatments as seen in the post-tests, with the Treatment group making significant gains after the treatments and the Control not making any significant improvement.

The primary topics that will be addressed in this section include the two research questions objectives of reporting the general treatment effects on the Treatment group and the individual targeted test items for evidence of development, and describing the influence of prototypicality on learners' explicit knowledge of polysemous spatial, temporal, and abstract usages of the preposition *to*.

4.1 Treatment effects

The effects of the treatment sessions on changes in accuracy of the preposition *to* can be understood from two perspectives; as a group of items and as individual prepositional usages. The group results represent general treatment effects, whereas analysis at the item level can help separate and understand the characteristics of each prepositional usage. In turn, these results can be used to inform pedagogical sequencing and task development accordingly to work out when specific linguistic features are learnable by particular learners and then to offer learners productive learning opportunities (Roos, 2016, p. 131).

4.1.1 Group effects

Analysis of the changes in accuracy rates indicates a significant difference in the preposition *to* was present at each test interval (see Table 2 and Figure 2). The Treatment group significantly improved after the treatment, but could not retain all that was learned. Post-test 2 results still showed that the treatment had a positive and lasting influence. Similarly the preposition *to* plus lexical substitution scores also improved significantly and reached a higher level than preposition *to* only, after the treatments, but not all of these gains were maintained at post-test 2. These differences between the two calculations demonstrate that cognitive development precedes lexical precision at pretest conditions. These group results show that the general effects of treatment were effective for both the development of semantic and cognitive properties of the preposition *to*. The determination that post-test group accuracy orders are statistically similar illustrates that treatments help focus learners and orient them towards a clearer understanding of the targeted linguistic feature (see Table 6 and Table 8). To understand more precisely which items had the greatest gain and retention in accuracy, individual prepositional usages will now be discussed.

4.1.2 Test items effects

The changes in accuracy orders of individual items due to instructional treatments shows the possibility of developmental stages and systematicity, which can inform the sequencing and expectations of classroom pedagogy (see Tables 3, 4, 5, and 7). Of the items treated, the results show that prepositions of time are the most difficult to learn. However, these items have a large range of accuracies with one item requiring very little instructional support to improve. The other prepositions of time had quite low accuracies at the onset of this study. The high lexical substitution rates for the prepositions of motion indicate the

conceptualization of the context is not difficult for the learners. This is most likely due to previous instruction and high frequency of exposure and usage in the classroom. The lowest position in the order of accuracies, abstract usages, represents the most challenging item. Examining seven uses of *to* with spatial, temporal, and abstract polysemy provides evidence that both developmental stages and systematicity are present. In addition, the comparison of the preposition *to* and preposition *to* plus lexical substitution demonstrates that treatment of spatial and temporal items is highly effective, whereas abstract items require individual focused instruction with less chance of long-term retention. The items T₅ (i.e., showing when something finishes) and T₆ (i.e., indicating amount of time before something starts) had extremely high rates of improvement after treatment with large effect sizes for both with and without lexical substitution. The accuracy order levels, however, are different for preposition *to* and preposition *to* plus lexical substitution. For the preposition *to* calculation, T₅ and T₆ are statistically the same, but for preposition *to* plus lexical substitution there is a difference between the items demonstrating systematicity, possibility due to cognitive factors, or even telic properties of the predicate (Wagner, 2006). Another possibility is the L1 semantic influence (see Jiang, 2004, p. 419) where T₅ uses *made* and T₆ uses *made ato* to represent slight different notions of a period of time in which something starts or something finishes. Further investigation of these two items is likely to contribute to a deeper understanding of prepositions of time and cross-linguistic influences. The prototypical properties of the preposition *to* will now be examined.

4.2 Prototypical influence

Where the preposition *to* is considered to be an indicator or signal of an endpoint, one could expect prototypical influences for spatial and temporal usages as the prototypical attribute

is said to originate from spatial functions (see Kranjec, Cardillo, Schmidt, & Chatterjee, 2010), with less of a possibility for abstract contexts as the prototypical feature may or may not be present. At the beginning of this study an extremely wide range of accuracy levels were recorded across the polysemous features of the preposition *to*. T₃ (signals the end of a period of time), T₁ (destination), and T₂ (transfer) all had high accuracy rates with clear prototypical properties that they share. These items with the highest accuracies could be considered as acquired with rates reaching over 90%. At this point, prototype theory across polysemous features could be argued, as these items seem to form a cluster around a prototypical feature with high accuracies. Nonetheless, the three other prepositions of time in this study T₄ (shows amount of time before a clock time), T₅ (indicates when something finishes), and T₆ (shows amount of time before something starts) have characteristics similar to other L2 lexical features, yet the prototypical endpoint feature is not represented very well with regards to accuracy rates. It is apparent that T₃ is commonly used and explicitly taught in English classes in Japan, which may account for the higher accuracy rate. The problem is with T₄, T₅, and T₆. These represent lower accuracy levels, even though the prototypical endpoint notion is present in all three of these items. After the treatment sessions, however, all of these items reached high levels of accuracy as demonstrated in post-test 1. T₄ retained a high level of accuracy, but T₅ and T₆ dropped significantly for the preposition *to* only calculation. The preposition *to* plus lexical substitution calculation remained noticeably high for all of the items leading to the conclusion that both cognitive and semilexical prototypical properties must be explicitly taught; however, retention of the targeted item *to* may not be maintained. As for the lowest position in the order of accuracies, the abstract item T₇; its' characteristics are harder to conceptualize;

therefore it is better treated as an independent lexical item requiring explicit instruction and memorization.

5. Conclusion

This study investigated prototypical and polysemous features of the preposition *to* before and after the application of explicit instruction in a quasi-experimental investigation with intermediate-level JLE. In particular, this study investigated the general effects of treatment on the development of explicit knowledge of the preposition *to*, and how the prototypical feature of the preposition *to* influences learners' explicit knowledge of polysemous spatial, temporal, and abstract usages.

Results of this study revealed that at the onset of this experiment there was little evidence that these learners were aware of the prototypical *endpoint* feature of the preposition *to* across polysemous situations. Incorporating lexical substitution into the calculation when *before* or *until* could be correctly substituted for the preposition *to*, more items could be correctly answered indicating the presence of semilexical features where a distinction between cognitive factors and semantic options were available. After treatment, however, all items reached high accuracies in the post-tests for spatial and temporal scenes showing that learning effects could be maintained beyond the period of treatment. Abstract uses on the other hand, had a lower level of achievement with a higher rate of attrition after the treatment. This study shows that explicit instruction emphasizing prototypical features may have a positive effect across polysemous contexts. Nevertheless, the general pedagogical implications of the findings suggest that the prototypical features of a preposition should be explicitly taught taking into account various factors such as semantic choice, cognitive features, developmental stages, and systematicity may affect retention.

Less attention should be paid to abstract usages, as each item seems to need independent explicit instruction.

For future research in this area, narrowing the investigation to a smaller number of temporal prepositions with a selective treatment may provide further insight into the properties of prototypical influence on a range of prepositional usages. Additionally, the development of treatments for explicit knowledge along with tasks that encourage implicit usage of prepositions should also be the ongoing focus of SLA research for the promotion of L2 learning.

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References

- Bitchener, J., Young, S., & Cameron, D. (2005). The effect of different types of feedback on ESL student writing. *Journal of Second Language Writing*, *14*, 191-205.
- Bong, H.-K. M. (2011). Lemmatic transfer in the second language acquisition of English prepositions. *Proceedings of The 16th Conference of Pan-Pacific Association of Applied Linguistics*. Hong Kong: Pan-Pacific Association of Applied Linguistics, 109-116.
- Bong, H.-K. M. (2012). Acquisition of the English preposition *at*. *Shinshu University Institutional Repository (SOAR-IR)*, *6*, 148-164.
- Brenda, M. (2014). *The cognitive perspective on the polysemy of the English spatial preposition over*. Newcastle upon Tyne, U.K.: Cambridge Scholars Publishing.
- Bygate, M., Skehan, P., & Swain, M. (Eds.). (2001). *Researching pedagogic tasks: Second language learning, teaching and testing*. Essex, U.K.: Pearson Education.

- Chodorow, M., Gamon, M., & Tetreault, J. (2010). The utility of article and preposition error correction systems for English language learners: Feedback and assessment. *Language Testing*, *27*(3), 419-436.
- DeKeyser, R. M. (2005). What makes learning second-language grammar difficult? A review of the issues. *Language Learning*, *55*, 1-25.
- Ellis, N. C. (2013). Second language acquisition. In G. Trousdale & T. Hoffmann (Eds.), *Oxford handbook of construction grammar* (pp. 365-378). Oxford, U.K.: Oxford University Press.
- Geeraerts, D. (1988). Where does prototypicality come from? In B. Rudzka (Ed.), *Topics in cognitive linguistics*, (pp. 207-229). Amsterdam, Netherlands: Benjamins.
- Geeraerts, D. (2010). *Theories of lexical semantics*. Oxford, U.K.: Oxford University Press.
- Geeraerts, D. (2016). Prospects and problems of prototype theory. *Diacronia*, *4*, A53 (1-16).
- Hagège, C. (2010). *Adpositions*. Oxford, U.K.: Oxford University Press.
- Jiang, N. (2004). Semantic transfer and its implications for vocabulary teaching in a second language. *The Modern Language Journal*, *88*, 416-432.
- Kranjec, A., Cardillo, E. R., Schmidt, G. L., & Chatterjee, A. (2010). Prescribed spatial prepositions influence how we think about time. *Cognition*, *114*, 111-116.
- Lindstromberg, S. (2010). *English prepositions explained*. Amsterdam, Netherlands: John Benjamins.
- Littlefield, H. (2006). A fine-grained approach to lexical and functional syntactic categories: Evidence from English prepositions and their acquisition. Saarbrücken, Germany: VDM Verlag Dr. Müller.
- Long, M. H. (2016). In defense of tasks and TBLT: Nonissues and real issues. *Annual Review of Applied Linguistics*, *36*, 5-33.
- Love, T. E., & Swinney, D. A. (1998). The influence of canonical word order on structural processing. *Syntax and Semantics*, *31*, 153-166.
- Mandler, J. M. (1984). *Stories, scripts, and scenes: Aspects of schema theory*. Hillsdale, NJ: Lawrence Erlbaum.
- Purpura, J. E. (2004). *Assessing grammar*. Cambridge, U.K.: Cambridge University Press.
- Quirk, R., Greenbaum, S., Leech, G., & Svartvik, J. (1985). *A comprehensive grammar of the English language*. New York: Longman.
- Rice, S. (1996). Prepositional prototypes. In Martin Pütz and René Dirven (eds.), *The construal of space in language and thought*, (pp. 135-165). Berlin, Germany: Mouton de Gruyter.
- Roos, J. (2016). Acquisition as a gradual process: Second language development in the EFL classroom. In J.-U. Kessler, A. Lenzing, and M. Liebner (Eds.), *Developing, modelling and assessing second languages*. Amsterdam, Netherlands: John Benjamins.
- Snape, N., Leung, Y. I., & Smith, M. S. (Eds.) (2009). *Representational deficits in SLA*. Amsterdam, Netherlands: John Benjamins.
- Taferner, R. H. (2015a). Pedagogical implications of effective corrective feedback on L2 writing. In P. Clements, A. Krause, & H. Brown (Eds.), *JALT2014 Conference Proceedings*. Tokyo: JALT.
- Taferner, R. H. (2015b). The effects of instruction on intermediate JLEs' prepositional accuracy: An exploratory study. *Studies in European and American Cultures*, *22*, 19-36. The Association for the Research of European and American Cultures, Graduate School of Integrated Arts and Sciences, Hiroshima University.
- Taferner, R. H. (in press). Effects of explicit instruction on prepositions of time. In G. Brooks (Ed.), *2016 PanSIG Journal*. Tokyo: JALT.
- Towell, R., & Hawkins, R. (1994). *Approaches to second language acquisition*. Clevedon: Multilingual Matters.
- Tyler, A., & Evans, V. (2003). *Lexical meaning and experience: The semantics of English prepositions*. Cambridge, U.K.: Cambridge University Press.
- Tyler, A., Mueller, C., & Ho, V. (2011). Applying cognitive linguistics to learning the semantics of English prepositions *to, for, and at*: An experimental investigation. *VIGO International Journal of Applied Linguistics*, *8*, 180-205.
- Van der Gucht, F., Willems, K., & De Cuyper, L. (2007). The iconicity of embodied meaning. Polysemy of spatial prepositions in the cognitive framework. *Language Sciences*, *29*, 733-754.

VanPatten, B. (1996). *Input processing and grammar instruction in second language acquisition*. Boston: McGraw-Hill.

Wagner, L. (2006). Aspectual bootstrapping in language acquisition: Telicity and intransitivity. *Language Learning and Development*, 2(1), 51-76.

Yates, J. (2011). *The ins and outs of prepositions*. Hauppauge, New York: Barron's.

Appendix. Treatment of T_5 -to

Part 1. Definitions パート1：定義

T_5 -to To is used to indicate when something finishes.

T_5 -to 前置詞toは、特定の時刻など時を表す表現の前に現れて、その時間まで出来事が継続して終了することを表します。形式: 名詞/動詞 + to + 時刻など時を表す表現

例: ナツコはいつも朝7時まで寝ます。 Natsuko always sleeps to 7:00 a.m.

- a. Our class will continue to 12:00 p.m. _____.
- b. This restaurant is open to 10:30 p.m. _____.
- c. Karen danced to 11:00 p.m. _____.

Part 2. Definitions with pictures. パート2：写真で見る定義

| Preposition (前置詞) 定義 | Sentence 新しい文を書きなさい。 | Picture 絵 |
|--|----------------------|-----------|
| T_5 -to 前置詞toは、特定の時刻など時を表す表現の前に現れて、その時間まで出来事が継続して終了することを表します。形式: 名詞/動詞 + to + 時刻など時を表す表現 | | |

Part 3. Preposition exercises. パート3：前置詞の練習。正しい答えを書いてください。

例: Tonight, John is playing basketball _____ 9:00 p.m. (T_5 -to)