L2 interpretation of negative polar questions: Evidence from online experiments

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Abstract. This paper studies Korean L2 English learners' responses to negative polar questions (NPQs – i.e., negative *yes-no* questions), focusing on the differences between EFL learners (those learning English as a foreign language in Korea) and ESL learners (those learning English as US residents). The paper first considers differences in the syntax and semantics of Korean and English NPQs, differences that may lead to misinterpretations when questions are translated from one language to the other. The paper then describes a series of experiments comparing Korean EFL and ESL learners' responses to English polar questions, focusing on measuring participants' response times (RTs) and unexpected responses (UERs) to distinct classes of these.

Keywords. Korean; English; negative polar question; L2 interpretation; high-negation; low-negation

1. Introduction. The current study looks at the L2 interpretations of negative polar questions (NPQs) – *yes-no* questions that incorporate a negation – and answers to them. We first review more traditional approaches to the interpretation of these and what we believe to be a false typological dichotomy. The dichotomy involves categorizing languages based on whether they exhibit what are called either polarity-based or truth-based answering patterns to NPQs (with English falling into the polarity-based category and Korean being truth-based). However, on closer examination of both English and Korean polar questions (PQs), we show that each language has two distinct NPQ constructions that might be characterized as polarity-based and truth-based, and that these correlate with the semantic negation being inside or outside of the questioned proposition.

Despite English and Korean both having two types of NPQ constructions, it is nevertheless true that each language shows a strong tendency toward one of two answering patterns, with English tending towards polarity-based answers and Korean tending to be truth-based. These cross-linguistic differences might be seen to adversely affect the acquisition of NPQs on the part of second language learners. Implementing a series of online experiments with two groups of Korean learners of English, an EFL cohort and an ESL cohort, the current study is designed to ascertain how beginner and advanced L2 learners interpret two distinct forms of NPQ constructions.

2. Traditional dichotomy. The interpretation of NPQs is typically understood as divided into two patterns, polarity-based and truth-based, and these two patterns have been assumed to characterize languages that have them. For example, English (among other languages) is characterized as having polarity-based NPQs, while Korean and other languages are characterized as having truth-based NPQs (Holmberg 2016; Jones 1999; Pope 1976).

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Example (1) shows, for English, that a simple *yes* answer to a polarity-based NPQ affirms the positive proposition, denoting "I am hungry", and a simple *no* answer denies it, denoting "I am not hungry." In contrast, example (2) shows, for Korean, that a simple *yes* answer to a truth-based NPQ denies the positive proposition, denoting "I am not hungry", and a simple *no* answer affirms it, denoting "I am hungry."

(1) Q: Are**n't** you hungry?
     A: Yes (I am hungry).   /   No (I am not hungry).

(2) Q: pay   **an**   kop-ni?
         stomach   NEG   be.hungry-Q
         'Aren't you hungry?'
     A: ung, (pay   an   kopha).   /   ani, (pay   kopha).
         yes   stomach   NEG   be.hungry   /   no   stomach   be.hungry
         'Yes (I am not hungry).'   /   'No (I am hungry).'

Despite polarity-based interpretations of NPQs being typical of English and truth-based interpretations being typical of Korean, we claim that a typological distinction between languages on this basis is merely apparent, and that each language actually has both types of NPQ constructions. The interpretations of NPQs and answers to them, for each language, depends on the structure of the NPQs themselves and on their conversational contexts.

We further argue that, rather than being attributable to any "typological" difference, the contrary interpretive tendencies of certain languages with respect to NPQs is attributable to (i) the relative frequency of certain NPQ constructions and (ii) the tendency of some NPQs to be ambiguous.

3. Two types of NPQs in English and Korean. We now turn to examine more closely the variety of NPQ constructions that previous arguments for typological distinctions have mostly ignored. We will show here that English and Korean each have both polarity-based and truth-based NPQs.

For English, in example (3), negation is contracted and moves out of the VP through Subject-Aux Inversion (SAI). The syntactic position of this negation is high, and the high-negation NPQ asks whether the positive proposition "you saw him" is true or false. Consequently, a *yes* answer to this NPQ means I saw him, and a *no* answer means that I didn't. This answering pattern is exactly identical to the answering pattern in (1) which has been considered as the typical polarity-based pattern. Example (4), in contrast, is an NPQ in which the negator remains in situ inside the VP following the adverb *really*. This low-negation NPQ asks whether the negative proposition "you didn't see him" including the low-negation is true or false. In this case, a *yes* answer confirms the negative proposition and means that I didn't see him, and a *no* answer is a denial of the negative proposition and means that I did.

(3) Q: Did**n't** you [VP see him]?   (High-neg)
     A: Yes, (I saw him).   /   No, (I didn't see him).

(4) Q: Did you (really) [VP **not** see him]?   (Low-neg)
     A: Yes, (I didn't see him).   /   No, (I saw him).

Similarly, Korean also has two distinct NPQ constructions involving high-negation or low-negation, respectively. With Korean high-negation, long-form negation (LFN), as in example (5), the negator *an* 'not' is affixed to the *ha* 'do' auxiliary verb, while the lexical verb *po* 'see' is nominalized by the *-ci* affix. This LFN-NPQ asks whether the positive proposition "you saw him" is true or false. Consequently, a *yes* answer to this NPQ means that I saw him, and a *no* answer means that I didn't. These interpretations are similar to those of English high-negation NPQ in (3). Example (6), in contrast, contains a low-negation, short-form negation (SFN). In the SFN construction, the negator *an* is inside the VP affixed to the lexical verb *po* 'see'. This SFN-NPQ asks whether the negative proposition "you didn't see him" is true or false. Like English low-negation NPQ in (4), a *yes* answer confirms the negative proposition and means that I didn't see him, while a *no* answer denies the negative proposition and means that I did.

(5) Q: ne-nun   [vp   ku-lul   po-ci]   **an**h-ass-ni?   (LFN)
         you-NOM   him-ACC   see-NMLZ   neg.do-PST-Q
         'Didn't you see him?'
     A: ung,   (po-ass-e).   /   ani,   (an   po-ass-e).
         yes   see-PST-DECL   no   NEG see-PST-DECL

(6) Q: ne-nun   [vp   ku-lul   **an**   po-ass-ni]?   (SFN)
         you-NOM   him-ACC   NEG   see-PST-Q
         'Didn't you see him?'
     A: ung,   (an   po-ass-e).   /   ani,   (po-ass-e).
         yes   NEG see-PST-DECL   no   see-PST-DECL

As we can see through examples (3)-(6), English and Korean each have two distinct types of NPQs. Refuting the traditional dichotomy, each of the languages have both types of answering patterns, and the interpretation of *yes-no* answers to these is decided in part by the structure of NPQ constructions themselves. Of course, in some specific conversational contexts, both English and Korean native speakers might interpret a given NPQ in a manner contrary to what is expected. Nevertheless, it is clear that each language has both types of NPQs. As such, we can say that languages are themselves not strictly divided into two typological classes based on their NPQ interpretations, as proposed in previous literature.

4. The acquisition of L2 NPQs. Unfortunately, previous L2 studies on the acquisition of NPQs have simply accepted without question this illusory typological distinction, whereby languages are classified as having either polarity-based NPQs (the "English pattern") or truth-based NPQs (the "Korean pattern") (Kim 1985; Choi 1991; Akiyama 1979, 1992; Hiramatsu 2003; Parrish & Tomaoka 2010; Xu & Snyder 2011; Choi 2014; Ko 2017; Liou & Liu 2020; Zhang & Vanek 2021; Woods & Roeper 2021; Tian et al. 2021). In other words, these studies have not considered the possibility that each language can have both polarity-based (high-negation) and truth-based (low-negation) NPQs. Guided by this misunderstanding, some L2 studies have gone on to claim that the "English (polarity) pattern" is easier to acquire than the "Korea (truth) pattern," arguing further that L2 learners of a language whose NPQs are typologically opposite will have more difficulties acquiring NPQs in the target language.

The motivation for our current research stems from a desire to correct the negative impact that this misunderstanding of NPQs has likely had on studies of L2 NPQ acquisition.

5. The current experiment. This study tested two groups of Korean-speaking English learners, an EFL cohort and an ESL cohort. The EFL group consisted of 33 high school and undergraduate students in Daegu, South Korea, who had never studied abroad in English speaking countries and had only learned English as a school subject in classroom settings. The ESL group consisted of 60 graduate and undergraduate Korean-speaking students at the university of South Carolina and Iowa State University who had been in the US at least one year. The current experimental results are compared with L1 English speakers' responses to PPQ and NPQ stimuli collected in Park & Dubinsky (2019).

Participants took part in only one of three distinct experiments. Experiments 1 and 2 presented each participant with 24 positive polar questions (PPQs) and 24 NPQs, together with 24 filler questions, for a total of 72 items. Experiment 1 tested high-negation NPQs and Experiment 2 tested low-negation NPQs. Experiment 3 presented participants with 24 PPQs, 24 high-negation NPQs, 24 low-negation NPQs, and 24 filler questions, for a total of 96 items.

Example (7) illustrates the experimental items used in the current experiments. (7a) is an example of PPQ, (7b) is an NPQ with high negation, and (7c) is an NPQ with low negation. In order to disambiguate the syntactic position of low-negation, we inserted an adverb *really* before the negation. Participants were to choose either a *yes* or a *no* response to these experimental items based on a prompt that they were shown prior to the question. Example (8) illustrates the types of filler questions used in these experiments. These consisted of *wh*-questions regarding the color or shape of the prompt symbols shown to participants as in (8a) and (8b), along with *yes-no* tag questions as in (8c).

(7) a.   Did you see a red circle?   (PPQ)
     b.   Did**n't** you see a red circle?   (High-NPQ)
     c.   Did you really **not** see a red circle?   (Low-NPQ)

(8) a.   What color was the symbol you saw?
     b.   What shape was the symbol you saw?
     c.   You saw a red circle, didn't you?

For each question, participants saw two slides in serial order. The first slide presented a symbol with a particular shape and color, displayed for 1000ms in one of five different symbols (triangle, star, square, X, or circle) and in one of five different colors (red, blue, black, yellow, or green),. The second slide displayed for 5000ms a written question with two answer choices. Participants read the question and then chose between two possible answers.

For each experimental item, we recorded subjects' response times (RTs) and their unexpected responses (UERs), where unexpected responses are answers that do not follow naturally from the stimulus symbol and following question. Suppose, for example, a red circle is presented, as in Figure 1, and followed by either "Did you see a red circle?" (as shown) or "Didn't you see a red circle?" Here, "yes" is the expected response, and "no" is a UER. We expect high-negation NPQs and PPQs to show the same answering patterns, whereas low-negation NPQs should show the opposite answering patterns to the other PQ types. By analyzing participants' RT and UER for three distinct question types, it was possible to find if L2 learners process PPQs and NPQs similarly or differently and if they can differentiate the two different NPQ constructions, the high- and low-negation NPQs.

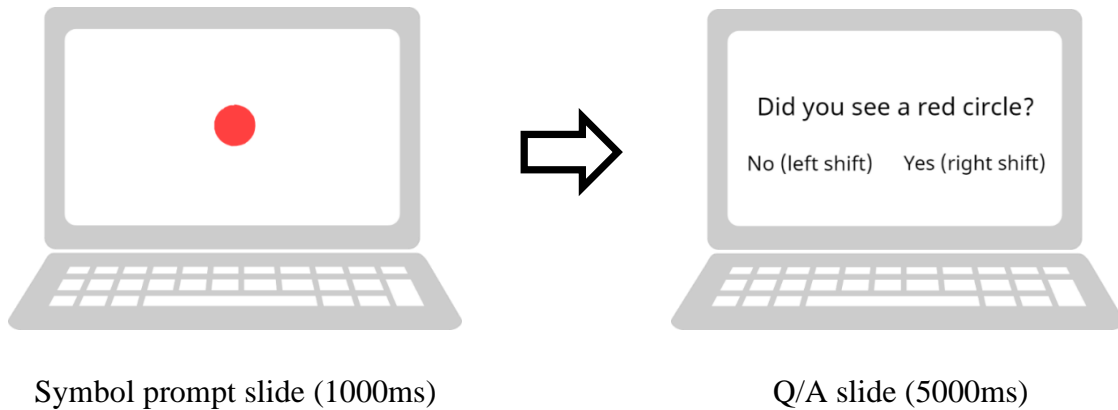Symbol prompt slide (1000ms)   Q/A slide (5000ms)

Figure 1. A series of slides for each question

Participants' RTs and UERs were aggregated for each question type tested: PPQs, high-negation NPQs, and low-negation NPQs.

Our predictions were that both EFL and ESL learners would have slower RTs and higher UERs than L1 English speakers. Further, we predicted the less proficient EFL learners to have slower RTs and higher UERs than the more advanced ESL learners.

6. Results. Regarding RTs, both L2 groups' responses were significantly different from L1 group's responses. Figure 2 shows PPQ and high-negation NPQ response times in Experiment 1. Here, L1 English speakers show similar RTs for both question types, with no statistical differences (PPQ: 1046ms vs. NPQ: 1114ms, $p=.063$), suggesting that they process PPQs and high-negation NPQs almost identically.

In contrast, both basic EFL (PPQ: 1528ms vs. NPQ: 1750ms, $p<.001$) and advanced ESL groups (PPQ: 1292ms vs. NPQ: 1414ms, $p<.001$) show significantly slower RTs for high-negation NPQs than for PPQs. Also, as expected, ESL learners had faster RTs for both PPQs and high-negation NPQs than did EFL learners.
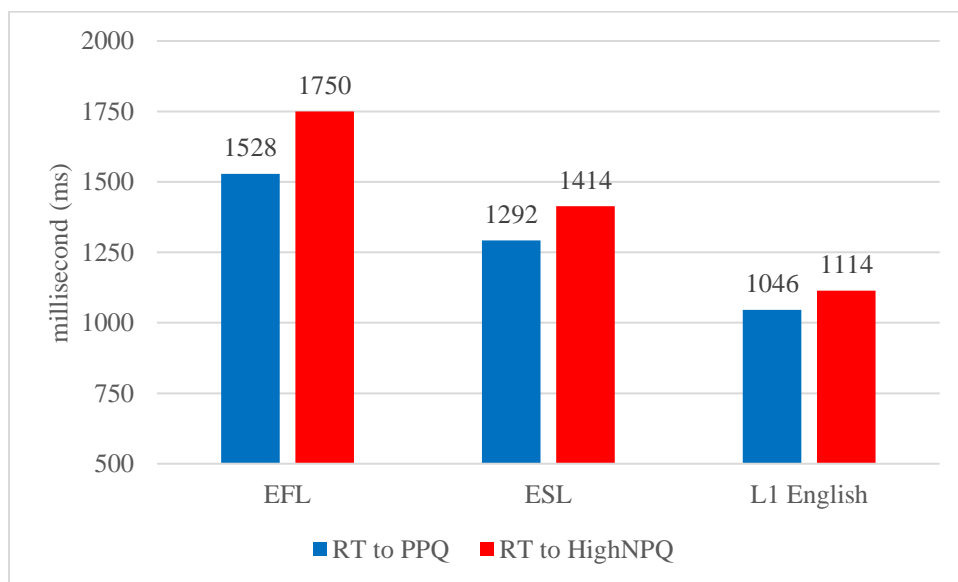

Figure 2. RTs to PPQs and High-negation NPQs in Experiment 1

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In Experiment 2, all three groups had significantly longer RTs for low-negation NPQs than PPQs, meaning that L1 speakers and L2 learners all needed more time to process the low-negation in English NPQs. As expected, both L2 groups had slower RTs than L1 English speakers for both question types. However, counterintuitively, more advanced ESL learners (PPQ: 1657ms vs. NPQ: 2458ms, $p<.001$) had longer RTs than EFL learners (PPQ: 1543ms vs. NPQ: 2338ms, $p<.001$) for both PPQs and low-negation NPQs. This might indicate that advanced ESL learners were more confused generally by an experiment having English low-negation NPQs. This result is a reverse of RTs that were collected in Experiment 1 with high-negation NPQs. We will return to this matter later.
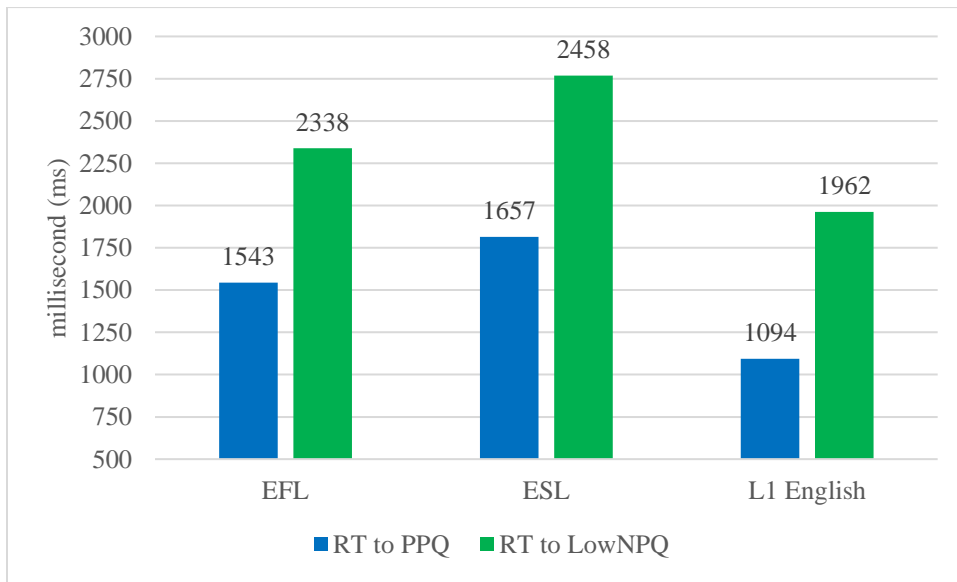

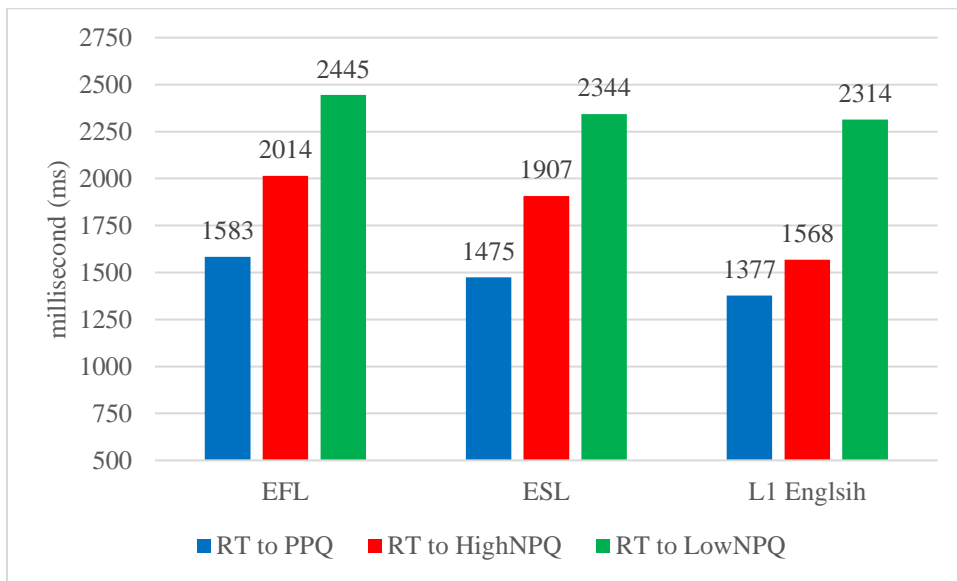Figure 3. RTs to PPQs and Low-negation NPQs in Experiment 2

Figure 4. RTs to PPQs, High-negation NPQs, and Low-negation NPQs in Experiment 3

Experiment 3 presented participants with all three polar question types. In this experiment, basic EFL and advanced ESL learners showed similar RTs overall. As shown in Figure 4, low-negation NPQs had longer RTs than high-negation NPQs, which had longer RTs than PPQs. RTs for each of the three types were significantly different for all groups (EFL group: $F(2, 717) = 69.318$, $p<.001$; ESL group: $F(2, 1365) = 109.15$, $p<.001$; L1 English group: $F(2, 1653) = 249.27$, $p<.001$).

The results of UERs also reveal that advanced ESL group and basic EFL group showed significantly different answering patterns to two distinct NPQ constructions. In Experiment 1, as shown in Figure 5, UERs to PPQs were very low across the board (EFL 3.8% vs. ESL 2.3% vs. L1 speaker 2.8%), meaning that two groups of L2 learners interpreted these as correctly as L1 speakers. However, UERs for high-negation NPQs were significantly higher than for PPQs with both the EFL (PPQ: 3.8% vs. NPQ: 27.1%, $p<.001$) and ESL groups (PPQ: 2.3% vs. NPQ: 5.6%, $p<.05$).
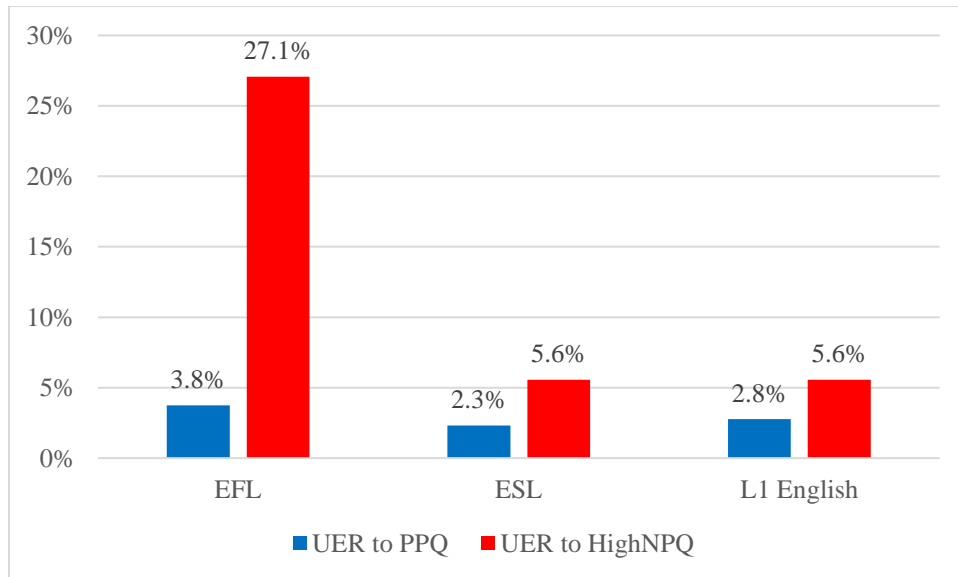

Figure 5. UERs to PPQs and High-negation NPQs in Experiment 1

In Experiment 1, L1 speakers and advanced ESL learners had very similar responses for high-negation NPQs. Both groups had low UER numbers for PPQs and high-negation NPQs. In contrast, the less proficient EFL learners had dramatically and significantly higher UERs for high-negation NPQs.

In Experiment 2, all three groups showed significantly higher UERs for low-negation NPQs than for PPQs. This mirrored the RT results for this experiment. High UERs for all groups in response to English low-negation NPQs is expected, as they tend to be semantically ambiguous and pragmatically more complex. Unexpectedly, though, advanced ESL learners (60.1%) had a higher UER rate for the low-negation NPQs than did less proficient EFL learners (42.9%) as shown in Figure 6. We suspect that EFL learners, not being proficient enough to answer these correctly, may have responded randomly to these stimuli. We also suspect that ESL learners' high UER rate might be attributable to their systematically interpreting low-negation NPQs as if they were high-negation NPQs.
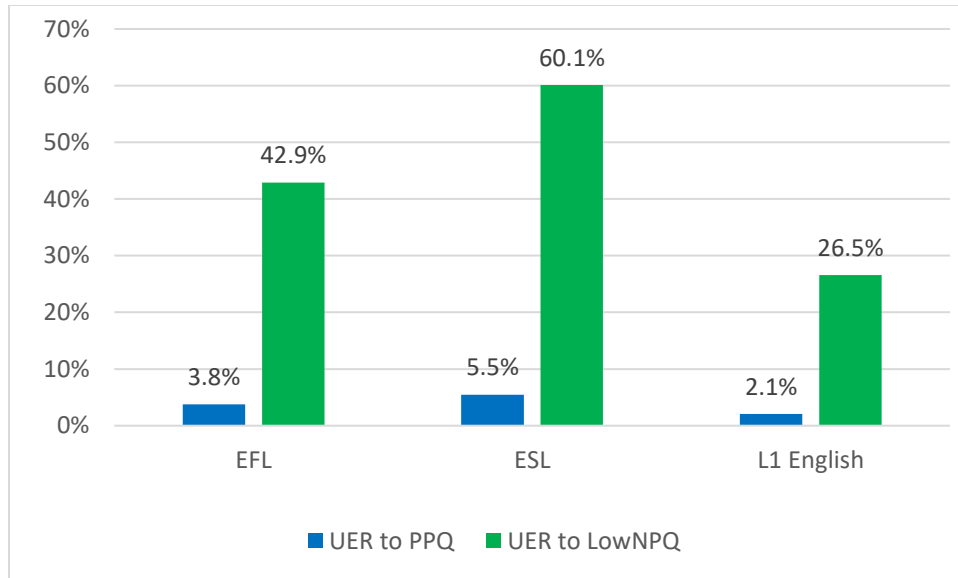
Figure 6. UERs to PPQs and Low-negation NPQs in Experiment 2

A high UER rate for low-negation NPQs also emerged for ESL learners in Experiment 3. Figure 7 shows that ESL learners (74.3%) had a higher UER rate than did EFL learners (58.3%). Compared to their near native-like performance with PPQs and high-negation NPQs in Experiment 1 and 3, ESL learners' UER rates for low-negation NPQs are unexpected and beg an explanation.
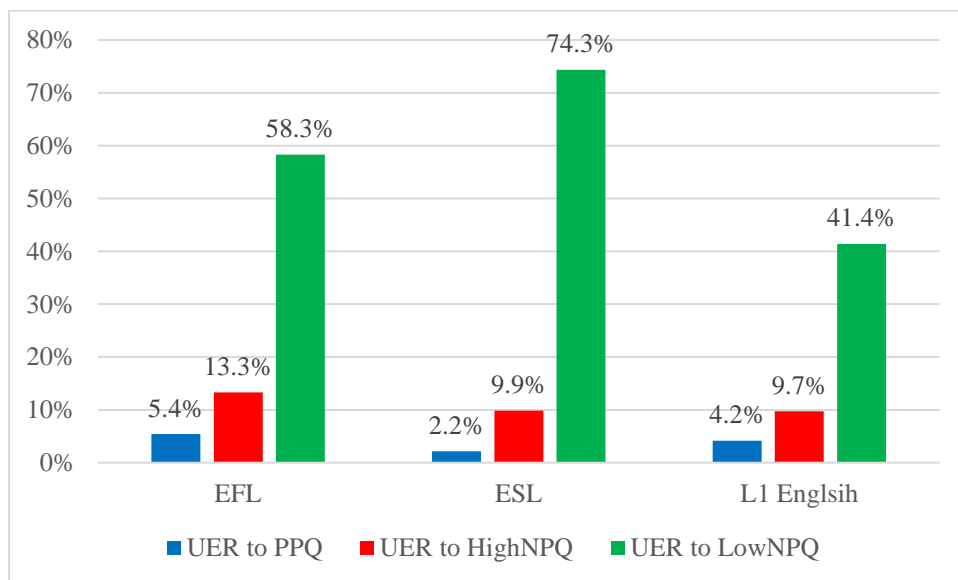

Figure 7. UERs to PPQs, High-negation NPQs, and Low-negation NPQs in Experiment 3

7. L2 interpretation of English NPQs. Summarizing, neither EFL nor ESL learners had problems with PPQs. Regardless of proficiency, all L2 learners answered PPQs quickly and correctly. However, in regard to NPQs, the EFL and ESL groups' performance differed for the two English NPQ types. The negator in high-negation NPQs only functions pragmatically, rather than semantically/propositionally, and this results in both EFL and ESL learners having slower

RTs for these than for PPQs. In contrast, L1 English speakers responded high-negation NPQs as quickly as they responded to PPQs. In regard to NPQ constructions, we found L1 speakers' and L2 speakers' interpretation of these were significantly different. Advanced ESL learners did appear to understand that high-negation NPQs are logically equivalent to PPQs, and responded to them much as L1 speakers did, showing similarly low UER rates. In contrast, less proficient EFL learners appeared to have difficulty interpreting high-negation NPQs and may have responded to them randomly.

All three groups had the longest RTs and highest UER rates in response to low-negation NPQs, which may be attributable to the tendency of these constructions to be semantically ambiguous and pragmatically complex. However, one interesting and unexpected effect did emerge. For low-negation NPQs, the more advanced ESL group had significantly longer RTs and higher UER rates than the less proficient EFL group who almost randomly answered the negative questions. This result was puzzling and begs an explanation.

These results were unanticipated but not accidental. It appears that some ESL learners (having greater grammatical proficiency than EFL learners, but not nearly as much pragmatic knowledge as L1 English speakers) systematically answered low-negation NPQs as if they were high-negation NPQs. This means that they perhaps interpreted all English NPQs identically without distinguishing the semantic-pragmatic differences between high-negation and low-negation NPQs. Being that low-negation NPQs occur infrequently in natural language, it is plausible that ESL learners who have stayed in the US for a long time might not had enough opportunity to become familiar with and learn the use of this NPQ type.

It turns out that both EFL and ESL learners learned their English primarily in classroom settings. Thus, even though the ESL learners were residing in the US at the time of testing, their acquisition of semantically ambiguous and pragmatically complex constructions like low-negation NPQs were not likely to be learned in an L2 classroom. Additionally, post-experiment interviews revealed that some participants had been taught that English NPQs should be answered as though they are all logically contradictory to Korean NPQs, which is exactly what the mistaken typology of these would call for. Thus, unfortunately, some advanced L2 learners may have gotten the answers to experimental items wrong from having applied the incorrect instruction they had received in the classroom. These L2 learners consciously interpreted all English NPQs in the same way as they answer PPQs.

8. Limitation. While the current study compared EFL and ESL groups with limited exposure to native English-speaker interactions, it is still not certain whether the current results can be precisely attributed to different "types of exposure" or different "levels of proficiency". This is because our experiments only controlled for the location where English language was taught to the subjects, and not for other L2 factors. The influence of diverse conditions of L2 acquisition will need to be considered/tested more carefully in the future study.

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