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SALIENCE AND NOVEL L2 PATTERN LEARNING

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Introduction

According to frequency-based approaches to acquisition, exposure to exemplars and the engagement of cognitive mechanisms are believed to facilitate the acquisition of constructions (Bybee, 2008; Ellis, 2012; Goldberg, 2009; Tomasello, 2003). As defined by Goldberg (2006), constructions refer to learned pairings of form and function that include individual words and abstract linguistic patterns (e.g., the verb-object-locative construction [Subj + V + Obj + PP], as in *he put the box in the kitchen*) and that are governed by lexical and semantic rules. At various stages in the acquisition of a construction, different types of input may be particularly useful. In the initial stage when learners are first associating a form with its meaning, providing input which contains sentences constructed from a limited set of lexical items (i.e., low-variability input) may help them recognize the underlying similarity in structural relationships, rather than perceive each exemplar as a unique construction. Furthermore, low-variability input in which a key lexical item in the construction occurs with high token frequency (i.e., skewed distribution) may be particularly helpful as compared to input in which each key lexical item occurs with equal token frequency (i.e., balanced distribution). However, later in the acquisition process when learners are generalizing a construction to new lexical items or consolidating related constructions into a more abstract representation, input that provides greater lexical variety may promote pattern extension.

The Challenge of Novel L2 Pattern Learning

Empirical studies by Goldberg and colleagues with English first language (L1) speakers demonstrated that low-variability input with a skewed distribution promoted fast form-meaning mapping of a novel construction (Casenhiser & Goldberg,

2005; Goldberg & Casenhiser, 2008; Goldberg, Casenhiser, & Sethuraman, 2004; Goldberg, Casenhiser, & White, 2007; McDonough & Trofimovich, 2015). These studies involved the appearance construction, which was created using English nouns (Ns) and nonce verbs (Vs) following the N_1N_2V—*o* word order, with the corresponding meaning of N_1 appears in/on N_2 (e.g., *the spot the king moopoed*, *the sailor the pond naifoed*). However, although L2 researchers have found positive effects for low-variability input and construction learning, they have not reported advantages for a skewed distribution (Brooks, Kwoka, & Kempe, 2017; McDonough & Nekrasova-Becker, 2014; Nakamura, 2012; Year & Gordon, 2009). Within this line of research, our initial studies tested the effectiveness of low-variability input, with both skewed and balanced distributions, at helping L2 speakers learn the Esperanto transitive construction, while our later studies explored additional factors that might enhance construction learning. Nevertheless, across all studies that tested the Esperanto transitive, the participants' ($N = 417$) accuracy rate was only 40% for the most difficult sentence type, which is the OVS transitive (Fulga & McDonough, 2016; McDonough & Fulga, 2015; McDonough & Trofimovich, 2013, 2016; McDonough, Trofimovich, Dao, & Dion, 2016).

When faced with learners' relatively poor performance in our initial study, we searched for reasons why accuracy rates were so low and examined several factors that might positively affect pattern learning. A key learning challenge is the nature of the Esperanto transitive construction, which consists of both morphological and syntactic features. In terms of morphology, the suffix *-n* is added to mark all nouns as objects, regardless of their other features, such as animacy or definiteness. For example, the word apple (*pomo*) appears without an affix when it functions as the subject, but receives the *-n* suffix when it functions as the object (*pomon*). Nouns occur without indefinite articles, and subjects do not have agreement features with verbs, such as for person or number. In terms of syntax, word order in Esperanto transitive constructions is variable, as the accusative suffix differentiates subjects from objects. Although many word orders are possible, the most commonly used are SVO and OVS (Cox, 2011; Harlow, 1995), as in *knabo mordas pomon* and *pomon mordas knabo* (boy bites apple). As an example, both *filino mordas pomon* [SVO] and *pomon mordas filino* [OVS] express the meaning of 'girl bites apple.'

Unlike the appearance construction tested by Goldberg and colleagues, whose meaning could be understood by relying on word order, Esperanto transitives require reliance on morphology. For learners who are accustomed to using word order as a dominant cue for sentence interpretation, their initial tendency would be to interpret the first noun in an Esperanto transitive as the agent regardless of its case marking, which is consistent with predictions of the unified competition model of language acquisition (MacWhinney, 2012). This model holds that learners' L2 comprehension and production are shaped by the competition of all linguistic cues to utterance interpretation, including cues that come from their previously learned languages. Furthermore, even when there are similarities in how a speaker's previously learned languages encode argument roles, L2 learners may rely on word order as a general default strategy when processing morphology (Ferreira, 2003).

Put simply, the need to adopt morphology rather than word order as the most reliable cue for sentence interpretation may have contributed to the low accuracy rates for Esperanto transitives. In fact, previous research has shown how difficult it is for learners to adopt new morphosyntactic cues in L2 development (e.g., Gass, 1987; Jiang, 2007; Kempe & MacWhinney, 1998).

In order to enhance the likelihood that learners would learn that morphology—as opposed to word order—is the most effective strategy for understanding Esperanto transitives, we implemented a variety of experimental manipulations. In the first studies (Fulga & McDonough, 2016; McDonough & Trofimovich, 2013), we examined the effectiveness of low-variability input by manipulating several variables: the input distribution of training sentences (balanced or skewed), the instructions provided to the learners (deductive or inductive), and the nature of the visual images (color or black/white because color visuals have been found to positively influence recall, recognition memory, and semantic processing). Although we found no main effects for input distribution, type of instructions, or visual images, there was a significant interaction between input distribution and instructions. The combination of balanced input and instructions that told participants about the rules governing Esperanto transitives was most effective. The participants' language background was also examined (Fulga & McDonough, 2016; McDonough & Fulga, 2015), with both studies showing that learners whose first languages (L1s) had differential case marking based on definiteness were most successful. In later studies, we explored the potential contribution of learners' working memory and statistical learning abilities to novel pattern learning (McDonough & Trofimovich, 2016), and explored whether one-on-one learning tasks with an interlocutor would facilitate greater learning than listening activities administered to a group of learners (McDonough & Trofimovich, 2016). More details about these studies and their findings are discussed in subsequent sections that focus more narrowly on specific conceptualizations of salience.

Salience and Novel L2 Pattern Learning

In order to provide greater insight into these data, this chapter examines the effectiveness of the various experimental manipulations tested across the five studies. The goal is to consider the broader construct of salience in terms of how the specific characteristics of target materials, learner-internal factors, and learners' use of the learning environment may have affected the likelihood that they would learn the novel pattern. In discussing salience, as it applies to L2 learning and use, we draw on the multifaceted conceptualization of salience proposed by Ellis (2016). According to Ellis, salience can be determined through various aspects of the physical world and a person's experience with it, such that salience can be understood as a "property of the stimulus, and of the learner . . . , and of the context" (p. 344). These three aspects of salience correspond closely to several experimental manipulations employed in our research, which allows us to explore several facets of salience as being more or less relevant to the challenge faced by L2 learners in acquiring novel morphosyntactic patterns.

The first aspect of salience relevant to our research on the learning of Esperanto transitives pertains to salience as understood as the psychophysical characteristics of stimuli or objects in the world (see Ellis, Chapter 2). Applied to language, physical characteristics of salience would correspond to the properties of input that would make some of its aspects—compared to others—more distinct perceptually and hence more memorable to the learner. For example, in a meta-analysis of the research targeting the learning of English morphology, Goldschneider and DeKeyser (2001) showed that learners' accuracy with various morphological markers was associated with the perceptual salience of these markers (e.g., in terms of their status as free or bound morphemes; see also Behney, Gass, Spinner, and Valmori, Chapter 5), their frequency in the language, and the ease with which they can be readily associated with specific meanings (i.e., reliability of form-function mapping).

A focus on various distributions of low-variability input (skewed versus balanced), which represents a common theme in research on L2 morphosyntactic learning, aligns well with the view of salience as the property of the stimulus, in the sense that a particular distribution of input might make the key morphological aspect of Esperanto (accusative case marking) distinct, thus enabling learners to forge an initial link between the marker and its meaning and/or to extend this association beyond a few representative exemplars in the input. In our Esperanto studies, the skewed distribution included Esperanto transitive constructions created from a limited number of lexical nouns, but one noun occurred as an object with high token frequency. Having one noun in accusative case with high token frequency might help learners extract the underlying structure of the exemplars using that noun, such that the structure can then be generalized to other nouns. Although the balanced distribution similarly included Esperanto transitive constructions created from a limited number of nouns, each noun occurred as an object with equally low token frequency. Having the accusative suffix occur consistently across all nouns may help learners identify its relationship to other sentence elements.

The second aspect of salience relevant to the data on the learning of the Esperanto transitives relates to what Ellis (2016) termed the "top-down, memory-dependent, expectation-driven" account of salience (p. 343), which captures how prior knowledge, experience, or expectations can render certain aspects of input more or less salient for learners. Put differently, the cognitive and experiential toolkit that learners bring to the task of language learning might determine which aspects of input will be attended to and which might be processed less deeply or not processed at all. For instance, the specific instructions given to learners in a learning activity might create a set of top-down expectations that would guide them, in their processing of input, to attend to some of its aspects at the expense of others. As an example, learners who are given explicit information about grammatical rules might orient to language in the input differently than learners who are told to pay attention to the meaning of utterances. Similarly, learners whose L1s allow for overt case marking might be particularly sensitive to case marking in Esperanto due to their extensive experience with case marking in previously learned language(s), compared to learners whose

L1s do not mark case or whose L1s mark case based on various semantic-pragmatic properties of nouns, such as animacy or definiteness.

In our studies, learners' L1 backgrounds were classified into categories identified by Sinnemäki (2014) in terms of whether and how the languages marked case on objects. Some languages never use case to indicate which noun functions as the object in a transitive construction, such as Cantonese, Dutch, English, French, Italian, Lao, Mandarin, Portuguese, Tagalog, Thai, and Vietnamese. This contrasts with Esperanto and other languages (e.g., Icelandic and Georgian) where overt case marking occurs regardless of a noun's semantic properties, which is referred to as nonrestrictive case marking. However, some languages have differential object case marking, in which nouns receive overt accusative affixes depending on their semantic-pragmatic properties, which include animacy, definiteness, information structure, and kinship terms. Commonly referenced semantic-pragmatic properties are animacy (Hindi, Telugu, Malayalam) and definiteness (Farsi, Turkish). Differential case marking has a narrower scope than restrictive case marking, where factors other than semantic-pragmatic properties (such as gender, number, word order, and plurality) determine whether accusative affixes are used. Languages with restrictive case marking include German, Japanese, Korean, Polish, and Russian.

Yet another aspect of salience which might be relevant to the learning of novel morphosyntactic structures by L2 learners is what Ellis (2016, p. 344) called a "context and surprisal" account of salience. Assuming that most learning situations are characterized by highly contextualized, embedded interactions between learners and their learning environments, this aspect of salience involves the extent to which the broader learning context might enhance certain aspects of input, creating the element of 'surprisal,' or heightened relevance of input within a contextualized learning situation. In this sense, some learning situations might be richer than others in terms of such situational affordances. For example, unlike non-interactive learning tasks administered in a group setting using timed presentation slides, one-on-one listening and speaking activities with an interlocutor might provide learners with opportunities to produce target utterances and receive feedback from an interlocutor, request repetition of difficult structures, and take the needed time to associate the form of utterances with their meanings depicted in images. Our most recent Esperanto study, which employed eye-tracking measures, explored whether such situational affordances (feedback and interlocutor eye-gaze) might enhance certain aspects of input for learners, making it easier for them to create form-meaning associations for difficult morphosyntactic patterns and extend this initial knowledge beyond a few trained exemplars.

To summarize, the goal of this chapter is to revisit our previous data targeting the learning of the Esperanto transitive construction by L2 learners, analyzing these data through the lens of salience conceptualized as a "stimulus-learner-context complex" (Ellis, 2016, p. 345). The current analysis is guided by the following research question: "across all studies, what factors associated with various aspects of salience facilitated L2 morphosyntactic pattern learning?" The following section provides an overview of the general research paradigm followed across all studies, but highlights methodological differences that reflect specific dimensions of salience.

Method

Participants

The participants were English L2 speakers (N = 417) who were studying degree programs at universities in Thailand and Canada. They were adults, ranging in age from their late teens to late twenties. They were relatively equally divided across gender (52% women), and came from a variety of L1 backgrounds (see "Salience as a Property of the Learner" subsection ahead for details). None of the participants had any prior knowledge of Esperanto.

Materials and Procedure

All experiments implemented learning and test materials. The learning materials were created to provide participants with low-variability input in the form of a small set of lexical items (4–7 nouns, 2–3 verbs) that were used to create equal numbers of SVO and OVS sentences (22–32 items total). The nouns were either used an equal number of times as objects (balanced distribution) or one noun occurred more frequently as the object (skewed distribution). The participants were first trained in the meaning of the lexical items, which involved the presentation of visual images paired with the corresponding orthographic forms, followed by presentation of visual images only. Following a vocabulary test to ensure that the word meanings had been acquired, most of the participants heard sentences and selected which of two visual images corresponded to their meaning, with the exception of the earliest study (McDonough & Trofimovich, 2013), where the participants selected one of two visual images to indicate which noun in each sentence was the object.

The learning phase was followed by a test phase, which included an immediate test using the same lexical items as the learning phase (6–12 items), a generalization test in which new lexical items were targeted (12–30 items), or both tests. When included, the purpose of the generalization test was to determine whether the knowledge participants had acquired was lexically-specific or could be applied to new nouns. The test items could not be correctly identified based on the meaning of lexical items only, because the visual images depicted fully reversible events. In order to understand the sentence correctly and select the corresponding image, participants had to rely on the accusative *-n* suffix rather than word order (either SVO or OVS). For example, participants had to select between an image of a horse chasing a bull or an image of a bull chasing a horse when they heard the test sentence *tauron pelas cevalo* [OVS] "horse chases bull."

For the majority of the studies, timed presentation slides with embedded visual images and audio files were created to control delivery and response times. Participants received answer sheets with sets of images in rows, and their task was to select the correct image for each sentence. The participants completed the experimental materials in groups (6–30), after a researcher explained the tasks, gave instructions, and clarified any questions. For the majority of the studies, there were no

opportunities to produce Esperanto transitives during the learning activities. However, for the most recent study that included eye-tracking data, participants had an individual session with a researcher who carried out the materials in a one-on-one setting without the use of prerecorded, timed presentation slides. Non-verbal cues, such as eye-gaze and pointing gestures, were used by the researchers in an attempt to draw participants' attention to the correct visual image, which were displayed on posterboards. Furthermore, participants were asked to produce Esperanto transitive sentences as part of the learning phase, and the researcher provided feedback in the form of recasts in response to their grammatical errors.

Analysis

Learning of the Esperanto transitive construction was operationalized in three studies through d' values, which are a measure of sensitivity (corrected for response bias) at discriminating between two response alternatives. In the remaining two studies (McDonough & Trofimovich, 2016; McDonough et al., 2016), simple accuracy rates (number correct) was summed for all test items or only the OVS items. In order to compare across all studies, the current analysis operationalized learning in terms of OVS accuracy rates only, which reflect the participants' ability to understand the more difficult Esperanto transitive that requires understanding of case marking. Participants can interpret SVO transitives correctly by relying on SVO word order by using knowledge from previously known languages, including their knowledge of English as an L2, or by applying a general processing strategy to interpret the first noun as agent. Due to variation in the number of tests and test items, the raw scores for OVS items were converted to proportions (OVS items correct over total OVS items). Either independent-samples *t*-tests or one-way ANOVAs were used to compare participants' performance based on the aspect of salience being investigated.

Results

The research question asked what factors associated with salience facilitated L2 morphosyntactic pattern learning. To address this question, data across all our Esperanto studies were compared to test the effectiveness of three possible conceptualizations of salience at facilitating L2 speakers' ability to learn a novel morphosyntactic pattern: external manipulations to the learning materials, learner-internal variables (L1 background and expectations created through task instructions), and learners' use of the learning environment.

Salience as a Property of the Stimulus

To explore whether the researchers' efforts to enhance the salience of the key morphological and syntactic features of the Esperanto transitive construction affected pattern learning, we examined the impact of manipulating the input distribution of the target construction. The majority of the studies provided balanced input, which was low-variability input where the transitive construction appeared with a small

TABLE 8.1 OVS Learning by Input Distribution

Distribution	***n***	***M***	***SD***	*95% CI*
Skewed	93	.38	.30	[.32, .44]
Balanced	324	.41	.38	[.37, .45]

Note: CI = confidence interval.

set of lexical items, with each target noun used an equal number of times. However, in light of claims about the benefits of low-variability input in which one exemplar occurs with high token frequency (i.e., skewed input), two of the initial studies compared learning materials with either a balanced or skewed input distribution (Fulga & McDonough, 2016; McDonough & Trofimovich, 2013).

As shown in Table 8.1, there was little difference in the OVS scores based on input distribution, and an independent-samples *t*-test confirmed that there was no statistically significant difference in the proportion scores: $t(415) = 0.76$, $p = .450$, $d = 0.09$. Thus, the findings for OVS proportion scores from the entire dataset confirm the results of both prior Esperanto studies that measured performance based on *d'* prime sensitivity values (Fulga & McDonough, 2016; McDonough & Trofimovich, 2013). In addition, the absence of any advantage for skewed input with Esperanto transitives confirms the findings of previous studies that targeted a wider range of structures, including Samoan ergatives (Nakamura, 2012), English datives (Year & Gordon, 2009), and Russian case inflections (Brooks et al., 2017).

Salience as a Property of the Learner

The second conceptualization of salience we investigated involved: 1) learners' individual differences, particularly in terms of their prior experience with case marking in previously learned languages; and 2) the amount and type of explicit information about Esperanto provided to the participants. These two manipulated variables dealt with learner-internal aspects of salience—namely, effects of prior knowledge and of expectations created through task instructions on the learning of the Esperanto transitive construction.

With respect to learners' individual differences, it is possible that linguistic information may be more or less salient to learners based on their own cognitive, psychological, or social characteristics. For example, studies of working memory or statistical learning ability have investigated whether high-scoring learners are more likely to detect linguistic regularities than learners with lower scores. We explored an individual difference (i.e., L1 background) that has been shown to play a role in L2 speakers' orientation to linguistic information. Although this variable was included in the experimental design in only two studies (Fulga & McDonough, 2016; McDonough & Fulga, 2015), we collected information about learners' L1 background in all studies.

Across the dataset, the majority of the participants (56%) spoke L1s that did not use case marking, which included mostly Thai L1 speakers along with L1 speakers of

TABLE 8.2 OVS Scores by L1 Background

L1 group	***N***	***M***	***SD***	*95% CI*
No case marking	232	0.34	0.32	[0.30, 0.38]
Definiteness	129	0.56	0.40	[0.48, 0.63]
Animacy	58	0.33	0.34	[0.24, 0.42]

Mandarin, Portuguese, and Vietnamese. The remaining participants spoke languages with differential object marking based on either definiteness (30%), mostly Farsi, but also Arabic and Tamil; or animacy (14%), distributed across French, Gujarati, Hindi, Punjabi, Spanish, and Telugu. Four participants who spoke L1s with restrictive case marking (i.e., limited to a subset of objects regardless of influencing factors, as in Japanese and Russian) were excluded from this analysis. In terms of any additional previously known languages, most participants reported only knowing their L1 and English. Less than one-third of the participants reported knowledge of heritage languages, primarily Mandarin, as well as some proficiency in French or Spanish as an additional L2. As shown in Table 8.2, the participants from definiteness L1s scored higher (0.56) than those with animacy L1s (0.33) or L1s without case marking (0.34).

Because the homogeneity of variance assumption was violated, a one-way ANOVA with the Welch *F* ratio is reported. The ANOVA indicated that there was a statistically significant difference among the scores, Welch's $F(2, 143.06) = 14.36$, $p = .001$. Games-Howell post-hoc tests indicated that the definiteness L1 group scored significantly higher than animacy L1 group ($p < .001$, $d = 0.62$) and the no case marking group ($p < .001$, $d = 0.61$), but there was no difference between the animacy and no case marking groups ($p = .982$, $d = 0.03$). Thus, the findings confirm the main effect for L1 background (definiteness > animacy) reported previously (Fulga & McDonough, 2016) as well as the superior performance of definiteness groups as compared to no case marking groups (McDonough & Fulga, 2015), both of which reported *d'* prime sensitivity values.

The second learner-specific manipulation concerned the instructions given to learners about the Esperanto transitive construction prior to carrying out the learning task, although this variable was only directly tested in one study (McDonough & Trofimovich, 2013). Nevertheless, in reviewing the experimental materials used across all five studies, we identified four types of information that participants received. Some participants (11%) were told explicitly the two key rules governing the Esperanto transitive construction, which are flexible word order (specifically SVO or OVS) and the accusative *-n* affix. Approximately one-third of the participants (32%) were informed that Esperanto had flexible word order, so they needed to pay attention to the noun endings in order to understand the sentences. Almost half of the participants (45%) were told only that they should pay attention to the noun endings while listening to the sentences. Finally, participants in the last condition (12%) were not given any information about Esperanto or suggestions about what to attend to while listening.

TABLE 8.3 OVS Learning by Instructions Provided

Information about Esperanto	***n***	***M***	***SD***	*95% CI*
Flexible word order + *-n* suffix	47	0.58	0.19	[0.53, 0.64]
Flexible word order, pay attention to noun endings	135	0.36	0.33	[0.30, 0.41]
Pay attention to noun endings	187	0.40	0.41	[0.34, 0.46]
None	48	0.37	0.34	[0.27, 0.47]

The mean OVS scores are provided in Table 8.3, and there was a statistically significant difference among the scores: Welch's $F(3, 147.91) = 12.67$, $p = .001$. Games-Howell post-hoc tests indicated that participants who received information about both Esperanto rules scored significantly higher than those who were told only about its flexible word order and encouraged to pay attention to the noun endings ($p < .001$, $d = 0.82$). They also scored significantly higher than participants who were told to pay attention to noun endings only ($p < .001$, $d = 0.56$) and those who were given no information at all ($p = .002$, $d = 0.76$). None of the other comparisons reached statistical significance. Thus, it appears that the most effective experimental manipulation across the studies was to inform the participants explicitly about the two key morphosyntactic rules governing the Esperanto transitive construction. Simply providing information about word order alone or in combination with the suggestion that participants pay attention to noun endings was no more effective than withholding all information.

Salience as a Property of the Learning Environment

Our last analysis examined salience as conceptualized in terms of how learners make use of the learning opportunities available in a given environment. Whereas salience as external manipulation focused on what researchers can do to make an aspect of language more "learnable," here the focus is on whether learners exploit opportunities that are present in the learning context. Specifically, we focus on learning through one-on-one interactions, in which participants had opportunities to produce OVS transitives and receive feedback from an interlocutor, request repetition of OVS sentences, and take as much time as they needed to identify which picture corresponded with a sentence they heard. As described previously, our latest eye-tracking study (McDonough et al., 2016) implemented the learning phase through individual, interactive listening and speaking activities, rather than through a group-administered, timed slideshow presentation. The regression analysis indicated that both production of OVS sentences and eye-gaze length to images while listening to OVS sentences predicted accuracy. Eye-gaze was measured as the total duration of eye-gaze (in seconds) calculated from the time participants looked at the correct picture while or after hearing the sentence until the moment they gave an answer.

In order to shed further light on how these learner behaviors impacted test accuracy, we classified each participant in terms of how they made use of the interactive learning environment. As shown in Table 8.4, approximately one-third of the

TABLE 8.4 Salience as Exploitation of the Learning Environment

Learning behaviors	***n***	***M***	***SD***	*95% CI*
Produced accurate OVS transitives	14	0.59	0.30	[0.42, 0.77]
Long eye-gaze to OVS visual images	13	0.47	0.32	[0.28, 0.66]
Neither	21	0.16	0.25	[0.05, 0.28]
Non-interactive learning context	369	0.41	0.36	[0.37, 0.44]

participants either produced at least three accurate OVS transitives during the learning tasks (*Mdn* = 1) or spent an average of at least 3.75 seconds looking at the correct images for the interlocutor's OVS transitive sentences (*Mdn* = 3.40) before providing an answer. The other participants (44%) failed to engage in these behaviors with similar frequency, such as never producing any OVS transitives or having only short glances to the OVS images. Learners who produced OVS transitives had the highest test accuracy (0.59), followed by those with long eye-gaze (0.47). In contrast, learners who did not as fully exploit these learning opportunities scored much lower (0.16). For comparison purposes, we also included the data for 369 participants who learned the Esperanto transitives in a group-administered, non-interactive context using timed presentation slides.

A one-way ANOVA indicated that the difference was statistically significant, Welch's $F(3, 26.61) = 8.02$, $p = .001$. Games-Howell post-hoc tests indicated that the production group ($p = .001$, $d = 1.56$) and the eye-gaze group ($p = .034$, $d = 1.08$) outscored participants who engaged in neither behavior, and that there was no significant difference between the production and eye-gaze groups ($p = .731$, $d = 0.39$). Furthermore, learning in a non-interactive context resulted in higher accuracy, compared to learning one-on-one without engaging in production or (extensive) eye-gaze behaviors ($p = .001$, $d = 0.81$). None of the other comparisons reached statistical significance. In sum, learners' interaction with the learning materials and interlocutor, specifically their production of more OVS sentences and greater time spent looking at OVS images, positively affected their learning. However, one-on-one learning was inferior to timed, non-interactive input presentation if learners failed to exploit at least some aspects of the interaction context, such as opportunities to carefully observe depicted relationships or produce target utterances.

Discussion

The goal of this chapter was to revisit our data on the learning of the Esperanto transitive construction by L2 learners, focusing on the impact of several experimental manipulations in relation to salience as involving stimulus, learner, and context characteristics. Only three manipulations resulted in overall accuracy rates that surpassed both the 0.50 chance performance and the 0.40 overall mean learning rate across the entire dataset ($N = 417$). The learning of the Esperanto transitive structure was most optimal when learners: 1) came from L1 backgrounds with case marking languages based on noun definiteness (0.56); 2) were provided with instructions emphasizing

both rules governing Esperanto transitives (0.58)—namely, that all objects are marked by the accusative marker *-n* and that Esperanto has a variable word order; and 3) had the opportunity to produce the difficult OVS structure during a one-on-one learning phase (.59). The duration of learners' eye-gaze to images depicting difficult OVS structures during the (interactive) learning phase was also associated with performance (0.47) that surpassed the overall mean of 0.40, yet this rate was nevertheless below the chance threshold. Given that even the most favorable of conditions (at least among those targeted in this analysis) did not yield learning rates in excess of 60% accuracy, these findings confirm our previous conclusions that the learning of Esperanto transitives—a structure requiring learners to adopt a novel way (through the use of morphology) to express a familiar concept (transitivity)—remains a challenging task for L2 learners.

Input Distribution as Salience

In studies focusing on the learning of L2 morphosyntactic patterns from aural input, the frequency composition of learning materials is often used as a means of drawing learners' attention to important relationships between the target morphosyntactic features and their meaning. As discussed previously, two types of low-variability distributions are typically compared—those exemplifying a construction with a key lexical item that is more frequent than other items in the distribution (skewed input) and those exemplifying a construction with several lexical items sharing the same (low) token frequency (balanced input). Contrary to L1 research targeting the appearance construction in English (e.g., Goldberg et al., 2004, 2007), the current analysis showed that, in the case of learning Esperanto transitives, skewed distributions are not superior to balanced distributions, which is in line with previous work demonstrating no advantage for skewed input as a way of focusing of learners' attention on key features of L2 structures (Brooks et al., 2017; McDonough & Nekrasova-Becker, 2014; Nakamura, 2012).

At least one reason for the difference between research targeting the appearance construction and L2 studies focusing on various other structures relates to the morphosyntactic pattern targeted. In Goldberg's studies, the appearance construction (e.g., as in *the sailor the pond naifoed*) involves two (familiar) English nouns and an English-sounding nonce verb, with argument roles interpretable through reliance on word order only (N_1N_2V), a dominant cue for sentence interpretation (e.g., Ferreira, 2003). And in terms of novelty, both the structure (N_1N_2V) and the meaning (N_1 appears in/on N_2) of the construction are novel. In contrast, the learning challenge for Esperanto transitives concerns the form, or how an already familiar concept (transitivity) relates to a novel morphological affix (*-n*) in the presence of a conflicting word order cue. Thus, skewed input might facilitate novel form-meaning mapping in cases where the only relevant cue (word order) is already familiar to learners. However, skewed input might be of less use in situations when learners need to acquire novel forms to describe somewhat familiar meanings (which encapsulates a typical learning scenario for adult L2 learners), especially when one cue, such as word order, competes with a more relevant key cue, such as a case inflection.

However, it may be that the difference between skewed and balanced input distributions in determining the outcomes of novel L2 morphosyntactic learning is not as extensive as once thought, based on the null finding of the current large-scale comparison. In a study focusing on the learning of Russian case marking from balanced and skewed input, Brooks et al. (2017) showed that balanced input was more beneficial than skewed input at facilitating learners' generalization of case markers to new vocabulary, but that this positive effect was weak, dissipating by the last of the three learning sessions. Brooks et al. argued that the benefit of balanced input resided in its ability to promote category-based learning, unlike skewed input which favored item-based processing (Matthews & Bannard, 2010). Nevertheless, because this benefit was short-lived, even learners exposed to skewed input distribution could accrue enough evidence—given sufficient exposure—to detect and extend underlying patterns. The training procedure used by Brooks et al. (three sessions of about 2 hours each) was among the longest exposure manipulations used thus far. It appears, then, that what is important for morphosyntactic learning might be the availability of sufficient exposure to low-variability input, rather than its precise distributional properties. Put simply, as far as salience is concerned, it is likely the overall learning experience with low-variability input—not its distribution—that helps learners detect novel patterns and expand this knowledge beyond a few trained exemplars.

Learner-Internal Factors as Salience

In terms of salience, understood as the knowledge and expectations that language users bring to the learning task, the current analyses targeted learners' knowledge of case marking in previously learned languages and the amount and type of explicit information that learners received at the onset of the learning task. With respect to L1 influences on morphosyntactic learning, the overall finding was that learners' prior experience with case marking in their L1s was facilitative of pattern learning, compared to cases where learners' previously learned languages featured no case morphology. However, the mere presence of accusative morphology in learners' L1 was insufficient to ensure that learners succeed in the learning of Esperanto transitives. Only learners with L1s that mark case morphology based on noun definiteness (e.g., Arabic, Farsi, and Tamil), but not noun animacy (e.g., French, Hindi, and Spanish), performed above chance. In essence, mere presence of the target feature in learners' L1s is insufficient to promote the learning of an L2 morphosyntactic pattern, but a processing bias—for example, one prioritizing definite nouns inflected for case—might provide learners with just the needed attentional focus to more easily decipher the underlying pattern for a structure, compared to learners who lack such a processing bias. While the precise reasons for definiteness as an experience-driven salience cue should be targeted in future research, an interim conclusion is clear: What learners bring to bear to the learning task—in terms of their previous linguistic knowledge and experience—has consequences for their L2 processing and learning (e.g., Ellis et al., 2014; MacWhinney, 2012; VanPatten, 1996).

In terms of the processing orientation imposed on learners through instruction, providing learners with the full rules governing Esperanto transitives (inflectional morphology, coupled with flexible word order) resulted in above-chance performance, compared to cases where no rules were supplied or when learners were instructed to pay attention to noun endings, with or without information about the flexible word order rule. This result points to the conclusion that learners' success in learning novel morphosyntactic patterns might require explicit instructions which may cue learners in on the relevant properties of the input. These instructions might need to be fairly detailed, as simply telling learners to pay attention to noun endings—with no information as to what to expect—produced no appreciable benefit to their learning rates, as compared to situations when such information was withheld or when it was provided along with the flexible word order rule. A strong explicit component to input-driven tasks in L2 morphosyntactic learning has been noted before, for example, in relation to learning activities conducted in language classrooms (e.g., McDonough & Nekrasova-Becker, 2014; McDonough & Trofimovich, 2013; Year & Gordon, 2009), where the "explicitness" of the learning environment might overshadow a data-driven, implicit orientation of learning tasks. Explicit influences on input-driven L2 morphosyntactic learning have also been noted in lab-based research (Nakamura, 2012), where learners' explicit knowledge of target constructions was linked to their performance accuracy, raising the possibility that explicit knowledge facilitated test performance. Thus, as far as salience is concerned, processing expectations orienting learners explicitly to the target pattern might be particularly useful for the learning of difficult L2 morphosyntactic structures (DeKeyser, 2016).

Learning Context as Salience

If one aspect of salience involves being able to use the affordances offered by the learning environment, then various types of learning environments might differ in the extent to which they promote L2 morphosyntactic learning. In the current dataset, which compared several features of the learning environment (e.g., opportunities to produce target structures and observe images depicting target relationships in one-on-one interaction), only production of target structures during learning activities resulted in above-chance performance with the difficult OVS transitive structure. However, the comparison of an interactive learning context (administered by an interlocutor) with a non-interactive learning activity (conducted in a group session through timed, prerecorded presentation slides) revealed that non-interactive learning (0.41) was overall more beneficial than interactive learning (0.16) when learners never engaged in production of the target structure or looked extensively at the target images, although performance in both situations remained below chance. It appears that, unless learners fully exploit the affordances of interactive learning environments, such environments might be distracting if the learning goal is to extract a novel morphosyntactic pattern.

The finding that production opportunities during learning activities were facilitative of L2 morphosyntactic learning aligns well with prior interaction research

showing the importance of production practice (Loewen, 2005; Loewen & Philp, 2006; McDonough, 2005; Sato & Lyster, 2007, 2012) and highlights production practice as an important route to test performance accuracy in morphosyntactic pattern learning. This finding is also in line with structural priming research showing that the production component of priming tasks, rather than the comprehension component, may be associated with learners' subsequent production accuracy rates (McDonough & Kim, 2009; McDonough & Chaikitmongkol, 2010). Thus, the production component of learning activities might drive at least some detection of the targeted morphosyntactic features, likely because generation of utterances requires learners to attend more extensively to the relationship between form and meaning. Put differently, a focus on production as part of learning activities might make morphosyntactic patterns salient to learners, enhancing their subsequent performance.

A preliminary finding of this large-scale analysis concerns the role of eye-gaze duration in morphosyntactic learning. As in our original study (McDonough et al., 2016), the current analysis revealed a positive role for learners' self-initiated looking behaviors to images depicting the meanings of difficult OVS structures during interactive learning tasks. Although the learning rate associated with looks to critical images (0.47) was below chance, it surpassed the 0.40 value for the entire dataset and was among the higher learning rates recorded across our studies. This finding invites further research into potential reasons explaining participants' eye-gaze behavior. Following from prior research (e.g., Goodwin, 1981), one potentially relevant factor is the extent of interlocutor-learner shared eye-gaze, on the assumption that mutual eye-gaze acts as an attention cue leading to common understanding (Richardson & Dale, 2005). Mutual eye-gaze was not directly manipulated in our original study, since the interlocutor explicitly engaged the learner's eye-gaze only in cases when errors were made, prior to delivering feedback (McDonough et al., 2016). What this preliminary finding implies, however, is that learners' eye-gaze behavior is an important aspect of an interactive learning environment, with learners' eye-gaze durations reflective of some aspects of L2 morphosyntactic learning. It would be important, in future research, to examine potential mechanisms underlying such learning (e.g., Godfroid, 2016; Yurovsky, Smith, & Yu, 2013).

Conclusion

Using a large-scale analysis of previously collected datasets, the current chapter synthesized our prior research on the learning of the Esperanto transitive construction, using the broader construct of salience to understand the effect of various experimental manipulations. Taken together, the patterns uncovered through the analysis revealed a complex picture of input-specific, learner-internal, and context-driven influences on the learning of novel L2 morphosyntactic structures. While the emerging pattern of findings is a complex one, it only reflects individual influences of several factors. Therefore, it still remains to be seen how various influences on L2 morphosyntactic learning interact as learning unfolds in real time, with learning—and the role of salience in it—conceptualized as a complex, dynamic, and adaptive phenomenon (Ellis, 2016).

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