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Balanced vs. Skewed Input in L2 Argument Construction Learning: A Replication and Extension of Casenhiser and Goldberg (2005)

Abstract

The paper compares the effectiveness of balanced and skewed input at facilitating the acquisition of a novel construction by learners of English as a foreign language. The study replicates and extends Casenhiser and Godberg's (2005) seminal paper on L1 construction acquisition. The study argues that the previous research did not pay sufficient attention to the frequency-prototypicality connection, as observed in natural language usage, and makes an attempt to overcome this limitation by adopting a more principled approach to this issue, which takes into consideration the frequency effects.

Polish university students (N = 80) were randomly assigned either to skewed frequency groups, where the input was skewed towards the prototypical exemplars of the novel appearance construction, or a balanced frequency group, where the input was evenly distributed among the exemplars of this construction. Both groups were tested on comprehension of the target structure. The results suggest a facilitative effect of balanced input, as compared to the skewed input. This result was found to be correlated with the degree of cognitive/experiential entrenchment of the situations coded by the test exemplars, that is, the balanced frequency group significantly outperformed the control group only on tasks depicting highly familiar and frequently encountered scenes.

Keywords: balanced input, token frequency, type frequency, skewed input, usage-based grammar

A central task in language acquisition involves learning the associations between novel phrasal forms and novel meanings, variously referred to as linking rules, lexical patterns, or constructions. One way to address these associations has been to argue that they are an innate endowment of the human mind (Chomsky, 1980) and, therefore, do not require any conscious effort on the part of the language learner. However, this theory has been criticised for its lack of

psychological plausibility and appears to have lost much of its original appeal in favour of what is now known as *the usage-based approach* to language acquisition. The main argument of the usage-based theory is that form-meaning associations are learnable from the input and that the learning process is strongly influenced by the frequency with which these associations occur in linguistic input. The possibility of there being a causal link between frequencies of occurrence and learners' ability to generalize over the meanings of abstract syntactic patterns has been examined empirically from a number of standpoints. The present paper focuses on one particular strand of this research, namely the one dealing with the facilitatory effect of *skewed* versus *balanced input* in the acquisition of argument structure patterns. This line of research has been pursued by Casenhiser and Goldberg (2005) and Goldberg et al. (2004, 2007), who argue that the acquisition of L1 argument structure patterns (by children and adults alike) is greatly facilitated by the presence of a high-frequency verb in the input. The objective of the present paper is to replicate Casenhiser and Goldberg's (2005) and Goldberg et. al.'s (2004) seminal papers with a population of college students of English as a foreign language with a view to assessing whether the same principle applies to adult L2 construction learning. Significantly, I argue in this paper that previous studies have not paid sufficient attention to the fact that, in natural language use, the high-frequency items are prototypical members of the categories that they represent—a limitation that may have somewhat distorted earlier results. The present study attempts to overcome this limitation by modifying and extending the original study design to account for the prototypicality effect, thereby aligning with the assumptions of the usage-based approach. The details of the study are provided in the further sections of the paper. However, I will first present a brief outline of the usage-based approach, which provides the theoretical framework for this study, followed by an overview of previous research on the role of skewed and balanced input in L1 and L2 construction learning.

Theoretical Background

Constructional (usage-based) approaches define language as a vast, monostratal and multifaceted inventory of constructions—conventionalized pairings of linguistic forms with meaning (Croft, 2001; Fillmore & Kay 1993; Goldberg, 2006, 2019; Langacker, 1987, 2008). Constructions run the full gamut of linguistic units, ranging from single words, to various phrasal units (fixed or with open slots), to abstract syntactic patterns such as the ditransitive or the passive construction. Seen from this perspective, language learning is acquiring the associations between various morphosyntactic patterns and their meanings.

Significantly, usage-based theories argue that input provides adequate and sufficient means for constructions to be learned, and that the learning process is governed by general cognitive abilities (e.g., the ability to generalize over similar instances or pattern recognition abilities), rather than by a special-purpose language module (Bybee, 2008, 2010; Bybee & Beckner, 2010; Goldberg, 2006; Ellis, 2013; Ellis & Cadierno, 2009; Ellis & Wulff, 2014; Lieven & Tomasello, 2008; Tomasello, 2000, 2003, 2012). In other words, language is a dynamic system that emerges from the speaker's accumulated experience of linguistic forms rather than being a biological or genetic endowment. As put by Ellis (2002), acquisition of grammar is "the piecemeal learning of many thousands of constructions and the frequency-biased abstraction of regularities within them" (p. 144). Frequencies of occurrence are arguably a crucial driving force behind language acquisition. Frequency leads to entrenchment and automatization—high-frequency constructions are processed with greater facility and are stored in memory for a longer span of time than low frequency constructions (Anderson, 1992; Bybee, 2006, 2007; Diessel, 2004, 2007; Ellis, 2002).

Two types of frequencies have been shown to be of significance in learning argument structure constructions: type and token frequency.[1] The former records how often a particular linguistic item appears in a constructional slot, while the latter refers to the number of distinct words in a construction. Usage-based theories distinguish between different roles of these two types of frequency. Token frequency is believed to promote entrenchment of particular constructions, whereas type frequency is argued to be responsible for the productivity of constructional schemas and making them accessible for use in new contexts (Bybee, 2001, 2008; Bybee & Thompson, 2000; Ellis, 2002, 2009, Ellis et al., 2016; Taylor, 2002). An important empirical finding of usage-based research is that these two types of frequencies are related through Zipf's law (Zipf, 1935). This means that the frequency distribution of the words occupying the verbal slots in constructions is such that one high-frequency token takes lion's share of all the occurrences (Ellis & O'Donnell, 2012; O'Donnel & Ellis, 2010). To illustrate, corpus-based studies have revealed that the most frequent type occurring in the English ditransitive construction (SVOO) is *give*, and that it significantly outnumbers all the other verbs used in this construction (Stefanowitsch & Gries, 2003). First language acquisition research also provides empirical evidence in support of Zipfian distribution, showing that the child's early use of verb argument constructions is strongly skewed towards one high-frequency item (Goldberg et al., 2004). Significantly, it has been argued that these high-frequency tokens

[1] Verb argument constructions are "semi-abstract patterns that comprise verbs and the arguments they occur with, such as V about N, V into N, V of N […]" (Ellis & Ogden, 2017, p. 606). Significantly, constructional approaches treat these patterns as meaningful in and of themselves, that is, as having meanings of their own, which are independent of the lexical meanings of words that happen to fill them.

represent the most prototypical exemplars of the categories they belong to and that the meanings they convey are more generic than the meanings of other verbs used in this construction (Goldberg, 2006; Ninio, 1999). For example, *give* is apparently more generic and more representative of the transfer meaning encoded by the ditransitive construction ('cause to receive') than any of the other verbs conventionally associated with this pattern (e.g., tell, offer, show, cost, throw). The same has been observed for naturalistic L2 acquisition. For instance, Ellis and Ferreira-Junior (2009) demonstrate that the input L2 learners are exposed to is Zipfian in the same way as L1 input and that the verbs they first use in various constructional frames tend to be prototypical and semantically generic.

This type of evidence strongly suggests that there might be a causal link between the high frequency of a prototypical verb and the acquisition of particular argument structure constructions. The next section presents an overview of studies that have investigated this possibility using experimental methods.

Skewed vs. Balanced Input: Previous Research

Goldberg and colleagues conducted a series of experiments, with both children and adults, to investigate whether there was a causal relationship between the high frequency of a prototypical verb filling a constructional slot and the acquisition of that construction (Casenhiser & Goldberg, 2005; Goldberg et al., 2004; Goldberg et al., 2007). Their aim was to determine whether the presence of a high-frequency, prototypical exemplar in the input had any effect on the participants' ability to comprehend and produce a morphologically novel construction (NP1NP2V) with the corresponding novel meaning of appearance (NP1 appears in the place designated by NP2). The participants were divided into three conditions: skewed frequency group, balanced frequency group and control group. In the skewed frequency condition half of the instances of the novel construction the subjects were presented contained the same verb, which was presented as prototypical. In the balanced condition group, on the other hand, the verbs were equally spread over the input sentences, with none of them being considered prototypical. The training session was immediately followed by testing, which showed that the skewed frequency condition produced significantly better learning results than the balanced group, which in turn showed a statistically significant improvement over the control group. The conclusion reached by the experimenters was that learning grammar constructions by L1 learners, children and adults alike, is greatly enhanced by the existence of a high-frequency prototypical exemplar in the input, and that this

positive effect manifests itself both in comprehension and production of the novel form-meaning pairings.

Goldberg et al.'s research has inspired L2 researchers to investigate the impact of skewed frequency input on the acquisition of new constructional meanings by L2 learners. However, this research failed to replicate Goldberg et al.'s optimistic findings regarding the facilitative effect of skewed input. For example, Year and Gordon's 2009 study, testing Korean children's learning of the English double object and prepositional dative constructions, did not find any significant impact of input skewedness. The results from both elicited production and acceptability judgment tasks showed that children in both the skewed and balanced frequency conditions demonstrated significant but comparable improvement in correctly recognizing and producing the ditransitive sentences. Also, both groups showed significant increase in their ability to generalize the constructional pattern to novel ditransitive constructions. However, overall, there were no significant differences between these two groups. Significantly, insofar as the groups differed in this experiment, it was the balanced frequency group that produced more grammatically correct ditransitive sentences, and they retained this ability over a longer period than the skewed frequency group.

McDonough and Nekrasova-Becker (2012) and McDonough and Trofimovich (2013) also investigated the effects of input skewedness on L2 construction acquisition. The former study tested the acquisition of the English dative construction by Thai learners of English as a foreign language under the skewed and balanced input conditions, whereas the latter compared the effectiveness of these two types of input at facilitating the comprehension of a transitive Esperanto construction by another group of Thai speakers. Both studies found that the balanced input was more effective than skewed input at promoting the comprehension of L2 constructions. Finally, Nakamura (2012), in a replication and extension of the study by Casenhiser and Goldberg (2005), found no significant positive effect of skewed input on the comprehension of a novel appearance construction and the Samoan ergative construction. Moreover, he showed that the production of the Samoan construction was negatively affected by exposure to skewed input.

Given these results, one might wonder whether L1 and L2 construction learning proceed along two different paths as far as the effects of type and token frequencies are concerned, with skewed input having a facilitative effect only on the acquisition of L1 constructions. In order to be able to address this question, we must first resolve the issue of semantic prototypicality of high-frequency tokens used in the experiments under consideration (cf. Introduction). As Ellis et al. (2016) point out, "we should investigate these processes while remembering that skewed input with high-frequency types aligned with more central meanings is the natural structure of language usage and acquisition" (p. 303). However, determining what should count as the central meaning (constructional

prototype) is not always a straightforward matter. While in natural languages degrees of prototypicality can be determined on the basis of frequencies of occurrence, invented (non-existent) constructions pose a greater challenge in this regard. In the experiments reported above, the issue of prototypicality has either not been mentioned at all or has only been addressed in passing, without sufficient clarification. Goldberg et al. (2004) provide only a single sentence explaining that "to be consistent with the finding that the most frequent verb had a very general meaning, the high-token-frequency exemplar was designed to encode the meaning of 'appearance' in a very general way, without designating a particular manner" (p. 300).

However, no further explication of the generality criterion has been provided in this or other studies, apart from listing the sentences used in the study and explaining their meanings. Hence, the prototypical scenes of appearance are the ones that depict: *the rabbit appearing on the hat*, *the frog dropping down onto the box*, *the bug appearing onto the table*, *the ball rolling into the room*. The non-prototypical scenes of appearance, on the other hand, depict *the monster wiggling out from under the cloth*, *the king dropping down into the chair*, *the sun rising into the sky*, *the queen rolling onto the stage* (cf. Casenhiser & Goldberg, 2005). Unfortunately, it remains unclear how the prototypical instances should be distinguished from the non-prototypical ones, especially since most of them involve some kind of motion, and thus seem to designate "a particular manner" rather than "appearance in a very general way." However, aside from the specific exemplars, a more important question is whether scenes of appearance that do not specify "the manner" are indeed instances of prototypical appearance. After all, our shared experiential knowledge tells us that things or people do not appear as if touched by a magic wand. On the contrary, their appearance is usually marked for manner, for example, people often appear by entering certain locations and things come into view or attract our attention as a result of being a part of different motion scenarios. Hence, if frequency of occurrence is the primary indicator of prototypicality, it can be assumed that prototypical appearance involves some kind of movement rather than arising from miraculous scenarios. Therefore, given these uncertainties, the present study codes and analyses different types of appearance, ranging from "appearance in general" to more specific scenes, most of which involve some kind of motion, and are hypothesized to be better candidates for the semantic prototype of the appearance construction. This hypothesis will be discussed in more detail in the next section, which deals specifically with the design of the study, its hypotheses and participants.

The Experiment: Design, Hypotheses, and Participants

Since the experiment was designed as a replication of Goldberg et al. (2004) and Casenhiser and Goldberg (2005), the same target construction was used, that is, a novel phrasal form (N1N2V), with the verbal slot filled with nonce verbs, and paired with the appearance meaning (NP1 comes to exist in NP2). The construction was both syntactically novel—it had SOV word order as opposed to the standard SVO word order—and semantically novel in that there is no verb argument construction in English devoted to the appearance meaning. As pointed out in the preceding section, in addition to the effects of input frequencies of lexical fillers of this construction (high vs. balanced), the present study has been designed to control for the types of situations coded by particular input exemplars. Therefore, eight scenes of appearance have been created, including scenes of general appearance, as defined by Goldberg et al. (2004) (without specifying its manner), and scenes of appearance that specify a particular manner. The former category comprises scenes which show an entity that occurs spontaneously, without any internal or external cause, as if by magic: *presents appear under Christmas tree*, *a picture appears on an empty wall*, *a pimple appears on a boy's nose*, *a rainbow appears in the sky*. Three other scenes depict appearance combined with a particular manner of motion: *a referee runs into the stadium* (forward, pedestrian motion), *a spider drops onto the table from out of sight* (downward motion), *a flower grows out of a thicket of grass* (upward motion). The last scene depicts a *smile appearing on a girl's face*, which represents a more abstract, metonymically motivated appearance (effect for cause). The input sentences have been constructed in such a way as to reflect varying degrees of protypicality. As noted above, prototypicality tends to be operationalized as frequency of occurrence, hence the scenes of appearance designed for this study can be arranged on a cline, with the opposite poles occupied by scenes that depict purely imaginative acts (in this study this category overlaps with Casenhiser and Goldberg's "general appearance"), and situations that constitute common everyday experience (e.g., entering rooms). There is also an intermediate category, which can be positioned between these two poles—these are real-life situations that, however, are not part of recurring everyday experience (e.g., rainbow appearing in the sky). All the sentences constructed for this experiment are provided in Appendix 1 (see Tables 1–3). The general hypothesis posed in this study is that the type of input—skewed vs. balanced—affects learning new constructional meanings. Given our uncertainties concerning the semantic prototype of the appearance construction, two types of skewedness have been tested: the one in which the high-frequency item is paired with "general appearance" (without specifying the manner), and the one

in which the high-frequency verb occurs in constructions denoting specific appearance (specified for manner). The specific hypotheses are outlined below:

I. Hypothesis 1: Skewed input in which high-frequency items are paired with sentences depicting general appearance will facilitate the acquisition of the appearance construction by L2 learners. The general appearance corresponds to scenes depicting various miraculous acts, that is, the ones that are not marked for manner.
II. Hypothesis 2: Skewed input in which high-frequency items are paired with sentences depicting appearance marked for manner will facilitate the acquisition of the appearance construction by L2 learners. As specified above, the prototypicality of these instances is judged based on the frequencies of occurrence of particular scenes in real life.
III. Hypothesis 3: Balanced input (in which lexical fillers of the appearance construction are spread evenly over the input sentences) will facilitate the acquisition of the appearance construction by L2 learners.

Altogether, a total of 80 undergraduates participated in the study as part of an extra-credit course requirement. All participants were native speakers of Polish majoring in English as a foreign language at one of Polish colleges of higher education. They ranged from 18 to 21 years of age. The participants were randomly and equally assigned to four treatment conditions: skewed frequency 1 (N = 20), in which the high-frequency item was paired with scenes of general appearance (see Table 1, Appendix 1), skewed frequency 2 (N = 20), in which the high-frequency verb was paired with scenes depicting appearance marked for manner (see Table 2, Appendix 1), balanced frequency (N = 20), in which verbal fillers were spread equally across the training sentences (see Table 3, Appendix 1), control condition (N = 20), which received no treatment. The research activities were conducted during regularly scheduled classroom sessions by the same instructor. Participants were informed that they would watch some video clips and read and listen to sentences with new words describing the scenes depicted in the scenes. They were instructed to listen carefully to the sentences and try to understand their meanings. The instructions were provided in Polish.

Participants in the balance and high token frequency condition saw eight film clips, each of which depicted a different scene of appearance. Both the skewed and the balanced condition participants listened to the same five nonsense verbs—the difference between the two groups being in the frequency with which the verbs occurred in the sentences. In the balanced condition three verbs occurred twice and two verbs occurred once (2–2–2–1–1). In the skewed condition, on the other hand, one verb occurred four times and four verbs occurred once (4–1–1–1–1). The scenes were played twice, hence the participants saw 16 clips altogether. In the skewed frequency condition, the sentences with high-frequency items were introduced first, since the earlier research showed

that the forward order had a positive effect on the acquisition of the target construction. In the balanced group, on the other hand, the order of presentation was random. Each clip contained a sentence describing the scene displayed at the bottom so that participants could read it while watching the clips as they unfolded. Also, while watching the clips, respondents listened to the trainer who read the sentences out. All video clips were converted into digital computer files and presented as power-point slides.

The training was immediately followed by testing phase, which consisted of forced-choice tasks. As in the training session, participants viewed short video clips depicting the appearance construction with a description sentence at the bottom of the screen. They also heard the sentence spoken aloud by the instructor. Fourteen new clips were created with new nonce verbs to avoid the possibility that the participants just memorized the strings presented in the training rather than learning the meaning ascribed to the new pattern. The clips were arranged into seven pairs, that is, two clips were presented side by side on the computer screen. They were designed in such a way that one of them depicted a scene in which an entity comes into sight, whereas the second one portrayed a very similar scene with the objects or characters remaining in constant view or disappearing from the view. For example, in one of the scenes a pair of glasses appears on a man's face, while in the second clip the glasses fall off his face. The sentences were constructed by analogy to the training sentences, that is, they reflected a similar range of situations—apart from scenes of general appearance, where an entity comes into view spontaneously or as if by magic, the clips presented a particular manner of appearance, that is, forward, upward and downward motion, as well as metonymic meaning (see Table 4, Appendix 1 for the list of the test sentences). Each of the three conditions in both experimental groups saw exactly the same sets of clips. While watching the scenes, participants were asked to pick the clip that corresponded to the descriptions that they heard. They did it by filling a questionnaire form provided by the instructor. In the no-training condition, respondents went directly to the test phase without watching either video. The order of presentation was randomized, so that the scenes of appearances or non-appearance did not follow a predictable sequence. In addition to seven pairs of test clips, participants saw four pairs of filler clips to conceal the true purpose of the experiment. The clips were paired with sentences with novel verbs in a familiar pattern SVO or SVA. Filler sentences were not analysed in this study. All the answers were coded for accuracy. The results of the experiment are presented in the next section.

Results

The independent variable that was manipulated in the experiment was the input type—balanced versus skewed. As pointed out in the section above, two types of skewedness were analysed—the one involving the pairing of skewed frequencies with general appearance, on the one hand, and the one where the high-frequency item was inserted into constructions denoting specific appearance (i.e., various motion events). The depended variable was the accuracy with which the participants paired the novel pattern with the appearance meaning. Table 1 presents the means scored on the forced choice tasks in the four groups (the two experimental groups, the balanced group and the control group) and the standard deviations:

Table 1

Experimental Results

Condition	Number of correct choices (mean out of 7)	SD	Median
Skewed-input (1)	3.7	2.12	4
Skewed-input (2)	3.9	1.97	4
Balanced	5.0	3.49	5
Control	2.9	1.17	3

As can be seen, the balanced frequency group performed much better than the skewed frequency groups (1) and (2), whose performance was approximately at the same level. This shows that the type of skewedness did not have any major effect on the participants' ability to learn the new constructional meaning. However, the skewed frequency groups showed a clear improvement over the control group, indicating that they have acquired knew knowledge about constructional meaning from the input provided. The control group, on the other hand, did not perform any better than chance.

Two one way Anovas were performed (separately for the two types of skewedness) to confirm the effect of balanced input on the acquisition of the appearance construction. Both tests confirmed the significant effect for type of training: The *f*-ratio value for the first data subset (skewed input 1) is 9.1618; The *p*-value is .001802 and the result is significant at $p < .05$. For the second data set (skewed input 2), the *f*-ratio is 9.2372, the *p*-value is .001736 and this result is also significant at $p < .05$.

In the next step, the results obtained in the balanced group have been broken down by individual scenes (exemplars) and analysed for accuracy. As pointed out above, the test sentences were constructed by analogy to the training

sentences, which means that they coded a similar range of situations (general appearance, appearance through forward/upward/downward motion and metonymic appearance). Table 2 presents the percentages of the correct choices for each of the seven comprehension tasks in the three conditions.

Table 2

Proportions of Correct (Expected) Responses for Particular Tasks in the Three Experimental Conditions

	The scene of appearance	Balanced (*N* = 20)	Skewed 1 (*N* = 20)	Skewed 2 (*N* = 20)
1	The glasses appear on the man's nose.	55%	35%	45%
2	Santa Clause appears on the sleigh.	55%	40%	50%
3	The sun appears in the sky.	65%	45%	55%
4	The teacher enters the classroom from out of sight.	95%	75%	70%
5	The bird comes from out of sight and lands down on the tree branch.	55%	55%	45%
6	The cactus appears on the human hand.	95%	65%	70%
7	Anger appears on the girl's face.	85%	55%	60%

The results of the experiment show that participants' performance varied depending on the type of scene they were exposed to. In the balanced group, which outperformed both skewed conditions (cf. Table 1), the best scores were achieved on tasks (4), (6), (7), with the rate of correct choices ranging from 85% to 95%. The other tasks scored significantly worse, and therefore they did not contribute significantly to the overall positive score of the balanced condition. As can be seen, the highest scores (95%) come from the task portraying a teacher entering a classroom (as opposed to the teacher walking back and forth inside of a classroom) and the cactus appearing on the hand (as opposed to the cactus only growing higher on one's hand). Also, participants' performance on the task portraying anger appearing on a girl's face was significantly high, with 85% of correct choices. The worst scores, on the other hand, have been achieved on tasks depicting glasses appearing on a man's face, a Santa Claus appearing on a sleigh, as if by magic, and a bird landing down on a tree branch, each of which scored around the same number of correct choices (55%). Participants performed only slightly better on the task involving the sun appearing in the sky—65% selected the scene of appearance, rather than the scene with the sun being in constant view and then setting down.

Discussion

The results presented in the previous section indicate that L2 learners' acquisition of new form-meaning pairings is influenced not only by the type of input (lexically diverse input proving more beneficial than skewed input) but also by the semantic properties of individual items constituting the balanced input. The second part of the experiment revealed that participants performed considerably better on tasks portraying specific appearance than on those involving general appearance, as defined earlier. As shown in the results, the highest scores were achieved on tasks portraying common, everyday types of activities or situations whereas the lowest scores occurred in tasks involving magical acts of appearance. It goes without saying that entering rooms, buildings, or other types of enclosures is an inevitable part of our day-to-day routine. By the same token, humans, as a highly social species, are regularly exposed to the faces of other people, who communicate various messages and emotions through their facial expressions, such as smiling or anger (which are arguably the most commonly encountered facial signals). Participants' high performance on the task portraying a cactus appearing on one's hand (task 6), which is apparently an unusual or miraculous occurrence, might be seen as an exception to this tendency. However, it is not necessarily so if we recognize that this task provides a reference to a common idiomatic expression in contemporary Polish, meaning that one thinks that something is very unlikely or will never happen (corresponding roughly to the English "when the hell freezes over"). Needless to say, idiomatic expressions have special linguistic and cultural status—they are established by common usage, representing generally accepted and widely used expressions (often easily visualized in speakers' minds by evoking vivid images).

Finally, let us consider tasks (3) and (5), with the former scoring only slightly better (65%) than the latter (55%). Both tasks portray real-life situations rather than magical acts, however, the events they depict can barely be described as being part of our daily routine. Specifically, one does not regularly watch birds flying over trees (unless one is an expert specializing in birds' behaviour), and, even more so, we seldom get the chance to admire sunrises, although, of course, this might happen occasionally. Therefore, although these situations do not represent "general appearance" in the same way as tasks (1) or (2), they are not the types of situations we encounter very often in our daily routine, either. In other words, they occupy the "middle ground" on our prototypicality continuum, as defined earlier.

The tendency observed in the balanced group appears to extend to the two skewed frequency conditions (see Table 2), except that the differences between the best- and worst-performing tasks are less pronounced. As skewed

frequencies did not have any significant positive impact on learning gains, they will not be discussed further.

The current experiment does not provide evidence supporting the facilitative effect of input skewedness on the learning of new verb argument constructions in an L2 instructional setting. While the use of a single, high-frequency token did not prove to be particularly helpful in the acquisition of the semantics associated with the novel appearance construction (regardless of the type of skewedness), the results of the experiment show that a balanced selection of verbs evoking frequently encountered situation types did have a significantly positive impact on learning gains. This appears to be consonant with some earlier L2 construction acquisition studies, most notably with Year and Gordon (2009), McDonough and Nekrasova-Becker (2014) and McDonough and Trofimovich (2013). However, it must be emphasized at this point that these studies are not directly comparable to the current research due to several significant differences in study design. Specifically, the former two studies investigate the effects of skewed vs. balanced input on the acquisition of an authentic English construction (the English ditransitive/dative construction) by L2 learners of English. While these studies produced interesting results, the learners' prior knowledge of English, as well as cross-linguistic transfer, might have influenced the learning outcomes. It appears that the use of an artificial language offers a more suitable methodological option for exploring language learning processes under controlled conditions. This is apparently the approach adopted in McDonough and Trofimovich (2013), who studied the acquisition of an Esperanto accusative construction and argued for the greater effectiveness of balanced input, following deductive instruction. However, as the authors explicitly admit, their study does not control for the prototypicality of the high-frequency items in any way, which somewhat weakens the results, although it does not entirely invalidate them.

The results obtained in the current study are not entirely unexpected when viewed from the perspective of L2 classroom practice. One common approach to teaching new syntactic structures is the inductive method, which involves providing learners with examples of various uses of a new construction (filled with different words) and requiring them to draw generalizations about its meaning. Given that participants of the experiment were all adult L2 learners with extensive experience in classroom-based L2 learning, it is possible that their prior learning experience and explicit learning environment associated with the formal classroom setting influenced the way they approached the target construction. In addition, as mentioned earlier, construction grammar research on language acquisition suggests that type frequencies are more conducive to category extension and generalization, whereas token frequencies promote entrenchment and category strengthening. The results of the present study appear to suggest that L2 learners might rely on category extension mechanisms to

a greater extent than L1 learners. However, this is a hypothesis that requires further empirical verification.

Importantly, the current experiment indicates that the balanced group's scores were considerably higher on tasks presenting common, everyday types of scenes rather than on tasks dealing with more general situations, which, in our experiment entailed some unusual or even fictitious types of occurrences. This result seems to confirm the general, usage-based theory, namely that "[h]umans are sensitive to the frequencies of events in their experience" (Ellis, 2002, p. 145). Thus, it can be tentatively concluded at this point that the process of construction learning is significantly fostered or at least facilitated to certain extent by input material that is embedded in familiar or experientially grounded conceptions (which is probably true of all kinds of learning). In other words, L2 learners tend to benefit most from exposure to a diversified input that comprises familiar and highly entrenched types of situations when learning the meanings of new morphosyntactic patterns. If familiarity and frequency of occurrence are assumed to indicate semantic prototypicality, as in the present study, the results suggest that prototypicality positively affects L2 learners' acquisition of constructional meanings.

Conclusion

Overall, the findings of the present study lead us to reject Hypotheses 1 and 2, which assume that skewed input is more beneficial for L2 grammar learning than balanced input, and to accept Hypothesis 3, which attributes greater effectiveness to balanced input. More specifically, it appears that L2 learners benefit more from input consisting of grammar structures filled with a variety of lexical items than from input dominated by a single, high-frequency token. As noted earlier, this result may be due to the explicit learning environment associated with the formal classroom setting. Significantly, the results of this study show that learning gains are greater for constructions that align with typical human experiences and can therefore be regarded as encoding prototypical meanings. This finding becomes more meaningful when we recognize that prototypicality is a gradient phenomenon, with some types of meaning being closer to the prototype than others. Hence, it appears that exposure to lexically diversified input, which nonetheless remains close to the prototype, is more effective for L2 grammar learning than input that places excessive emphasis on the prototype itself.

A few caveats are in order here. Given the design of this study, the results apply only to the comprehension of new constructional meanings. Consequently,

further research might explore how the factors under analysis influence the production of new argument constructions by L2 learners. Another reservation concerns the age of the participants, who were all young adults familiar with various methods and techniques of foreign language learning/ teaching. Thus, the question for future research is whether children's learning of new L2 constructional meanings follows the pattern observed for adults in the present study. On a more general note, further research is needed into other factors optimizing language input. While the present study has shed some light on the role of skewed versus balanced frequencies in L2 constructions learning, it has also generated several questions that merit further empirical investigation. These pertain, among others, to the role of experiential grounding in structuring linguistic input and to the role of input frequencies as category extension and category strengthening mechanisms in L2 acquisition of new morphosyntactic patterns.

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Appendix 1

Training and Test Sentences

Table 1

Training Sentences in the Skewed Frequency Group 1

	Scene depicted in the clip	Skewed frequency group 1 (vacun 4, nimbo 1, gerum 1, peksi 1, fegar 1)
a	A rainbow appears on the sky	The rainbow the sky vacuns
b	A pimple appears on a boy's nose	The pimple the nose vacuns
c	A picture appears on the wall	The picture the wall vacuns
d	Presents appear under the Christmas tree	Presents the Christmas tree vacuns
e	A referee runs into the stadium	The referee the stadium nimbos
f	A spider drops onto the table from out of sight	The spider the table gerums
g	A flower grows out of a thicket of grass	The flower the grass peksis
h	Smile appears on a girl's face	The smile the face fegars

Table 2

Training Sentences in the Skewed Frequency Group 2

	Scene depicted in the Clip	Skewed frequency group 2 (vacun 4, nimbo 1, gerum 1, peksi 1, fegar 1)
a	A rainbow appears on the sky	The rainbow the sky nimbos
b	A pimple appears on a boy's nose	The pimple the nose gerums
c	A picture appears on the wall	The picture the wall peksis
d	Presents appear under the Christmas tree	Presents the Christmas tree fegars
e	A referee runs into the stadium	The referee the stadium vacuns
f	A spider drops onto the table from out of sight	The spider the table vacuns
g	A flower grows out of a thicket of grass	The flower the grass vacuns
h	Smile appears on a girl's face	The smile the face vacuns

Table 3

Training Sentences in the Balanced Group

	Scene depicted in the clip	Balanced frequency group (vacun 2, nimbo 2, gerum 2, pekis 1, fegar 1)
a	A rainbow appears on the sky	The rainbow the sky vacuns
b	A pimple appears on a boy's nose	The pimple the nose vacuns
c	A picture appears on the wall	The picture the wall nimbos
d	Presents appear under the Christmas tree	Presents the Christmas tree nimbos
e	A referee runs into the stadium	The referee the stadium gerums
f	A spider drops onto the table from out of sight	The spider the table gerums
g	A flower grows out of a thicket of grass	The flower the grass peksis
h	Smile appears on a girl's face	The smile the face fegars

Table 4

Test Sentence

	Scene of appearance (slide A)	Another scene (slide B)	Test sentence
a	The glasses appear on the man's nose	The glasses fall off the man's nose	Glasses the nose birkuns
b	Santa Claus appears on the sleigh	Santa Claus is riding the sleigh	Santa Claus the sleigh ventis
c	The cactus appears on one's palm and grows taller	The cactus merely grows taller on one's hand	The cactus the hand perums
d	The sun rises in the sky	The sun sets in the sky	The sun the sky mupos
e	The teacher enters the classroom	The teacher is in the classroom walking and explaining things	The teacher class-room virums
f	The bird comes from above (from out of sight) and lands on the tree	The bird already sits on the tree and jumps from one branch to another	The bird the tree nintus
g	Anger appears on the girl's face	Anger disappears from the girl's face	Anger the face likums