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Constructional network at work in second language acquisition

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摘要: Second Language Acquisition (SLA) has benefited quite a lot from Construction Grammar. Most of the previous SLA researches adopting a constructionist approach have been primarily engaged in issues pertinent to the relevance of construction in SLA, the process of second language (L2) construction learning, and factors affecting L2 construction learning. This paper distinguishes itself from previous research by embarking on a new direction in the constructionist approach to SLA from the perspective of the constructional network. Specifically, it deals with how constructional network works in SLA and argues that L2 constructional network bears the imprint of and is reconstructed from L2 learners' L1 constructional network. The constructional network works in SLA in at least two ways which are manifested in the motivating function of vertical links in L2 learners' acquisition of schematic and complex constructions and the facilitative or inhibitive effect of horizontal links in L2 construction learning. Admittedly, our description of how the constructional network works in SLA is precursory and nonexclusive, and some general and specific issues are raised for future research. © 2022, The Author(s).

作者关键字: Construction grammar; Constructional network; Horizontal links; Second language acquisition; Vertical links

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RESEARCH

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Constructional network at work in second language acquisition

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Abstract

Second Language Acquisition (SLA) has benefited quite a lot from Construction Grammar. Most of the previous SLA researches adopting a constructionist approach have been primarily engaged in issues pertinent to the relevance of construction in SLA, the process of second language (L2) construction learning, and factors affecting L2 construction learning. This paper distinguishes itself from previous research by embarking on a new direction in the constructionist approach to SLA from the perspective of the constructional network. Specifically, it deals with how constructional network works in SLA and argues that L2 constructional network bears the imprint of and is reconstructed from L2 learners' L1 constructional network. The constructional network works in SLA in at least two ways which are manifested in the motivating function of vertical links in L2 learners' acquisition of schematic and complex constructions and the facilitative or inhibitive effect of horizontal links in L2 construction learning. Admittedly, our description of how the constructional network works in SLA is precursory and non-exclusive, and some general and specific issues are raised for future research.

Keywords: Second language acquisition, Construction grammar, Constructional network, Vertical links, Horizontal links

Introduction

How language is acquired, according to Chomsky (1986), provides access to the nature of linguistic knowledge. In turn, any theoretical assumption of the nature of linguistic knowledge makes predictions about how language is acquired. Construction Grammar, a new linguistic paradigm emerging during the 1980s as a reaction against the mainstream Generative Linguistics which maintains that linguistic knowledge is partitioned into a system of grammatical rules and a mental lexicon containing both words and idioms, assumes that linguistic knowledge is captured by a structured inventory of constructions which are defined as form-function pairings at varying levels of complexity and schematicity including simple words and fully filled idioms, partially filled morphological patterns and idioms, as well as partially filled or unfilled syntactic patterns that fall under the purview of grammatical rules in the light of the generative tradition (Goldberg, 2013). This revolutionary epistemological turn of linguistic knowledge makes quite different predictions about language acquisition in contrast to the mainstream generative approach whereby language acquisition is equated with a process of learning how

words and structures of the ambient language are related to elements of the genetically endowed Universal Grammar (Diessel, 2013). And these predictions mainly include (cf. Bybee, 2010; Dąbrowska, 2012, 2020; Ellis, 2003, 2012; Goldberg, 2006; Hilpert, 2014; Ibbotson, 2020; Kidd et al., 2018; Lieven, 2016; Schmid, 2020; Tomasello, 2003, etc.):

- (1) Linguistic knowledge is learned inductively from actual usage events during social interaction and communication;
- (2) What are learned are form-function pairings or constructions, and only constructions;
- (3) Constructions are learned in an item-based fashion, proceeding from concrete item-based chunks to low-level schemas and eventually to fully schematic patterns;
- (4) Language acquisition realized as construction learning is based on domain-general learning mechanisms such as attention, analogy, categorization, entrenchment, and automatization;
- (5) Linguistic knowledge acquired as a network of constructions manifests individual differences due to different experiences in construction learning.

The above predictions have radically changed our perception of language acquisition and provided illuminating insights into both First Language Acquisition (FLA) and Second Language Acquisition (SLA). As Gilquin and De Knop (2016) noted, SLA had theretofore not been brought into the focus of studies based on Construction Grammar. Hitherto the situation has unfortunately witnessed no noticeable change. In this case, this paper is contributed to a constructionist approach to SLA.

Previous studies in SLA adopting a constructionist perspective have been primarily concerned with the relevance of constructions in second language (L2) learning (e.g., Baicchi, 2016; Conklin & Schmitt, 2008; De Knop & Mollica, 2016; Gries & Wulff, 2005, 2009; Jiang & Nekrasova, 2007; Liang, 2002; Valenzuela Manzanares & Rojo López, 2008), the item- or exemplar-based developmental nature of L2 (e.g., Bardovi-Harlig, 2002; Ellis, 2012; Ellis & Ferreira-Junior, 2009a, 2009b; Ellis et al., 2016; Eskildsen, 2008, 2015, 2018; Eskildsen et al., 2015; Li et al., 2014; Mellow, 2006, 2008; Myles, 2004), and factors affecting how L2 constructions are learned including (Ellis & Cadierno, 2009: 118): input frequency (type-token frequency, Zipfian distribution, recency), form (salience and perception), function (prototypicality of meaning, importance of form for message comprehension, redundancy), and interactions between the form and function (contingency of form-function mapping) (e.g., Dahl, 2015; Ellis & Collins, 2009; Ellis & Ferreira-Junior, 2009a, 2009b; Gilquin, 2016; Luo, 2021). We attempt to distinguish ourselves from these previous studies by proposing a new perspective for the constructionist approach to SLA with particular attention paid to the constructional network. More specifically, we elaborate on how the constructional network works in L2 learning.

The remainder of this paper is organized as follows. "Constructional network model" section establishes a constructional network model by first re-assessing the status of constructions and then illustrating two dimensions of connections that organize constructions into a network, i.e., vertical and horizontal links. "L2 constructional network characterized" section renders a characterization of the L2 constructional network, arguing that the L2 constructional network is reconstructed on the basis of L2 learners'

L1 constructional network since the latter leaves traces on the former. "[Constructional network in SLA](#)" section expounds on how the constructional network works in SLA by concentrating on the two dimensions of connections, i.e., vertical and horizontal links, in L2 construction learning. This paper is concluded with some suggestions for future research on SLA from a constructional network perspective in "[Conclusion](#)" section.

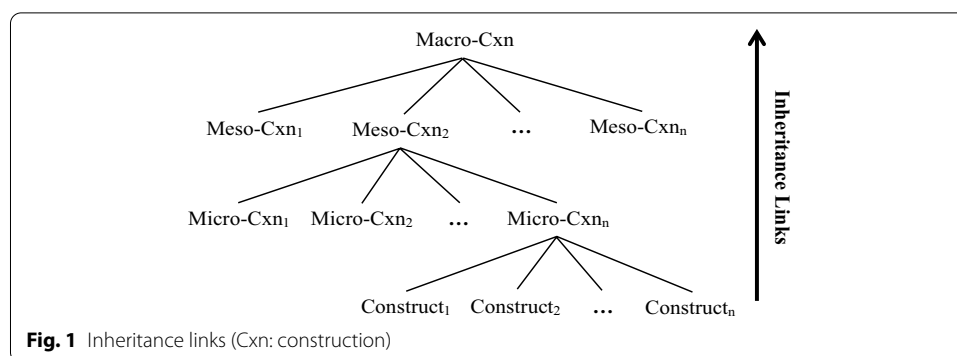
Constructional network model

One of the most basic tenets of Construction Grammar is that constructions are structured into a network called constructional network or construct-i-con. However, this thesis of constructional network remains underspecified even though Construction Grammar has enjoyed rapid development over the past few decades. Such critical issues as to what is the nature of the constructional network, how it is structured, what kinds of connections might exist within it, and how these connections are represented, are still mysteries yet to be unraveled. Only recently have construction grammarians begun to express their interest in the constructional network, especially in network connections. This part will outline a two-dimensional constructional network model based on previous research on construction connections. But before that, we will first reconsider the previous orientation of constructions in the constructional network.

Constructions reoriented

The constructional network is assumed to contain both constructions serving as nodes and connections between these nodes. Nodes, or constructions have long been attributed with a central role in the constructional network in that a tacit consensus has emerged that linguistic knowledge is stored primarily in constructions characterized by complex internal structures. However, Hilpert (2018) pointed out that this conception of nodes with internal complexity is incongruent with neural and psychological as well as many other approaches to networks whereby the internal complexity of nodes is limited to a threshold of activation, but the (activation) relations between nodes are given prominence. In other words, it does not meet the Cognitive Commitment maintained in Cognitive Linguistics which enjoins cognitive linguists to strive for an account of human language in accordance with what is known about the mind and the brain from other disciplines (Lakoff, 1990; Wen & Taylor, 2021).

But is it plausible to design a constructional network model similar to the neural network? Hilpert and Diessel (2017) cast an illuminating light on this question through their investigation on entrenchment. They claimed that the entrenchment of syntactic construction and morphological construction is realized by the entrenchment of connections between constructions such as instance links, subpart links, and symbolic links between form and meaning of constructions, which deviates from the previous tacitly acknowledged assumption that entrenchment is a characteristic of constructions in the constructional network. This finding indicates that linguistic knowledge is stored in both constructions and connections between constructions. Since constructions can be construed as form-meaning links, connections should have played a more critical role than constructions in the constructional network. Schmid (2017) even went much further and contended that there is no need to distinguish constructions serving as nodes in the



network from connections between nodes and the only format needed for the representation of linguistic knowledge is connections (or associations in Schmid's term).

We have some reservations about Schmid's more radical view since links between form and meaning and connections between constructions are apparently of different nature and if they are differentiated, we end up with a similar distinction between connections and constructions. Instead, lining up with Hilpert and Diessel (2017), we advocate simplifying and reducing constructions to form-meaning links without recourse to their internal complexity, and attaching a prioritized role to connections in the constructional network. With form-meaning links having already been extensively discussed in previous research, we will only concern ourselves with connections between constructions and introduce two dimensions of connections in the constructional network, i.e., vertical and horizontal links.

Vertical links

Vertical links give rise to a taxonomic hierarchy and link constructions at differing levels of schematicity. They have always been described as subsidiary products of the schematization of constructions. Two major types of vertical links can be identified: single inheritance links and multiple inheritance links.

Characterized by varied schematicity, constructions generally fall into macro-constructions (schemas), e.g., English ditransitive construction [Subj V Obj₁ Obj₂] ↔ [X CAUSES Y TO RECEIVE Z], meso-constructions (sub-schemas), e.g., [V_{TRI}-able]_{Aj} ↔ [[CAN BE SEM_i-ed]_{PROPERTY}]_j and [X TAKE Y for granted] ↔ [X DOES NOT VALUE Y], and micro-constructions, e.g., the word *acceptable*, or the idiom *Love me, love my dog*, with the most schematic macro-constructions being instantiated by less schematic meso-constructions and meso-constructions by concrete micro-constructions which are in turn instantiated by constructs in actual usage events. They form a hierarchy and are connected by inheritance links in the way that constructions at the lower level of schematicity inherit formal and semantic features from those at the higher level, as illustrated in Fig. 1.

Goldberg (1995) proposed four types of inheritance links including instance links, polysemy links, metaphorical links, and subpart links. In instance links, constructions at the lower level are special cases of corresponding constructions at the higher level, as exemplified by the relation between the REFUSE.verb-class-specific ditransitive construction

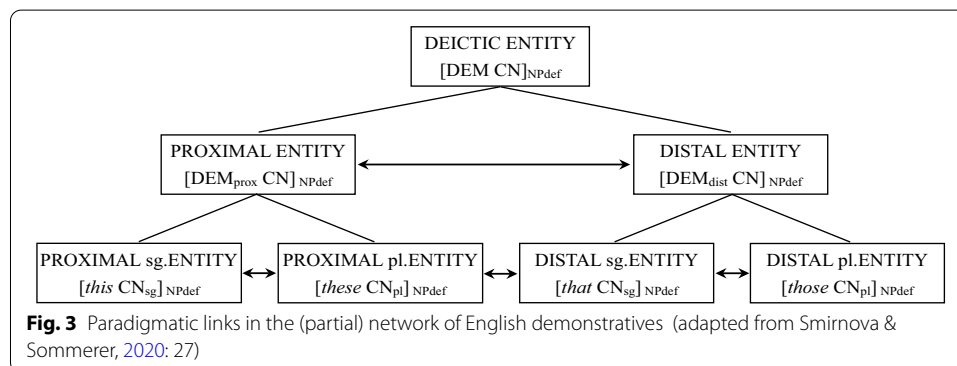
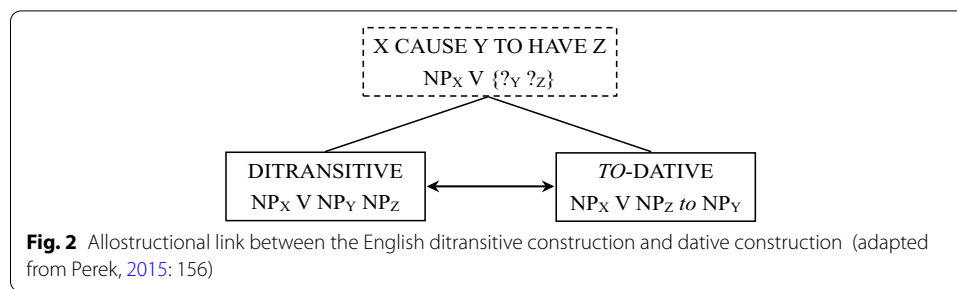
and the REFUSE.verb-specific ditransitive construction. Polysemy links describe connections between different conceptually related meanings of the same construction, for example, the relation between [X CAUSES Y to RECEIVE Z], [X ENABLES Y to RECEIVE Z], and [X INTENDS to CAUSE Y to RECEIVE Z] meanings of the English ditransitive construction. Similar to polysemy links, metaphorical links are semantic in nature, but they connect different constructions with conceptually related meanings, for example, the relation between the English Caused-Motion construction and Resultative Construction. As for subpart links, they deal with connections between constructions exhibiting partial similarities in forms or meanings, for example, the relation between the English Caused-Motion Construction and Intransitive Motion Construction.

Inheritance links presented above are single inheritance links because they represent a single-source process whereby one lower-level construction inherits features from only one higher-level construction. In addition to single inheritance links, Goldberg (1995, 2013) mentioned a special kind of inheritance link, multiple inheritance link. Via multiple inheritance links, one construction is allowed to inherit features from multiple source constructions of different levels. For instance, the partially schematic construction [What's X Doing Y] at least inherits forms and semantics from fully schematic constructions including VP construction, Subject-Predicate construction, Progressive construction, Left-dislocation construction, Subject-Auxiliary Inversion construction, and concrete lexical constructions such as *what*, *do*, etc. But it should be noted that how inherited features from different constructions, which are potentially conflicting to one another, are resolved remains to be unveiled.

Horizontal links

Vertical links typically connect constructions at different hierarchical levels, but constructions at the same level are also connected and these kinds of connections are horizontal links. Not until recently did horizontal links arouse the interest of construction grammarians. At present, two sub-types of horizontal links have been recognized, allostructional links and paradigmatic links, both of which are based on similarity of constructions.

Allostructional links depict the connections between what were previously called syntactic alternations. Construction Grammar formulated the surface generalization hypothesis that syntactic and semantic generalizations associated with a surface argument structure form are typically broader than those between the same surface form and a distinct form from which it is hypothesized to be syntactically or semantically derived (Goldberg, 2006: 25). According to this hypothesis, there is no strict derivative relation between syntactic alternations and they are better regarded as independent constructions. But this does not mean that they are not related. As Cappelle (2006) had warned, the emphasis on syntactic alternations as independent constructions should not overshadow their potential relatedness. He argued that syntactic alternations are variant structural realizations of the same underlying abstract underspecified construction. He coined the terms “allostruction” and “constucteme” to refer to the variant and the underlying underspecified construction. Allostructional links are recruited to capture the connections between all allostructions, as is illustrated in Fig. 2 by the relation (symbolized



by the bidirectional arrow) between the English ditransitive construction and dative construction which are presumably the variants of the constructeme $[NP_X V \{?_Y ?_Z\}]$.

Allostructional links are essentially based on similarity in constructional meaning but variation in constructional form. All allostructions encode a common event frame, and consequently convey a highly similar propositional meaning (Perek, 2015). But they manifest distinct ways of conceptualization for the event and profile or obscure different elements in the event frame in different syntactic positions, which results in their formal variation and pragmatic division (De Vaere et al., 2020; Perek, 2015).

Compared with allostructional links, paradigmatic links build on the similarity in constructional form but the contrast in constructional meaning. They reflect the relation between different choices or cells under the same syntactic paradigm (Van de Velde, 2014). Take the English demonstratives as an illustration. In this construction, a distributional paradigm can be identified and within the paradigm, there are choices between proximal and distal in terms of deixis and between plural and singular in terms of number, which produce a set of constructions including proximal demonstratives vis-à-vis distal demonstratives, singular proximal demonstratives vis-à-vis plural proximal demonstratives, and singular distal demonstratives vis-à-vis plural distal demonstratives, as formalized in Fig. 3. These choices share the same surface syntax but with related meaning differences. They are connected through paradigmatic links (signified by bidirectional arrows).

By arguing for a reduced representation of constructions as merely form-meaning pairings without any internal complexity as is proposed in Croft's (2001) Radical Construction Grammar, and attaching due importance to connections between constructions in the constructional network, this section has given a glimpse of a two-dimensional

constructional network model. Admittedly, this two-dimensional model simplifies the complexity of constructional connections and multiple dimensions of links might exist between constructions (Smirnova & Sommerer, 2020), it is a theoretically viable model and does shed valuable light upon constructionist perspective on how linguistic knowledge can be organized and represented.

Through vertical and horizontal links, constructions are structured into a two-dimensional constructional network. This modeling of linguistic knowledge, however, has been primarily rooted in the acquisition and processing of native language. Does it work in L2 too? Converging evidence accumulated from various L2 processing experiments such as L2 syntactic sorting tasks (e.g., De Knop & Mollica, 2016; Gries & Wulff, 2005; Liang, 2002; Valenzuela Manzanares & Rojo López, 2008), priming experiments (e.g., Baicchi, 2016; Gries & Wulff, 2009), and processing time tests (e.g., Conklin & Schmitt, 2008; Jiang & Nekrasova, 2007), which cover constructions of different sizes and degrees of schematicity and involve learners of distinct L2s with diverse L1 backgrounds, has confirmed that constructions do underpin L2 learners' linguistic competence. Since constructions are present in L2 learners, a constructional network is predictably to be so. Then what L2 constructional network would be like?

L2 constructional network characterized

SLA differs from FLA in various aspects with special regard to the state of conceptual development, pre-existing linguistic knowledge, and language input, since L2 learning typically proceeds with a matured conceptual system, already acquired L1 knowledge, and distorted inputs (Ellis, 2003: 72). In this case, questions naturally arise as to whether the L2 constructional network is similar to that of native speakers, and whether L2 learners build an entirely new constructional network or reconstruct the L1 constructional network for L2.

In terms of the first question, not inconsiderable evidence has proven that there are discrepancies between L2 and corresponding L1 constructional networks. In an investigation on Czech-, German-, and Spanish-speaking advanced English learners' representation of English verb-argument constructions (VACs) (e.g., *V prep. N*) in contrast to that of native English speakers, Römer et al. (2014) reported that all the three groups of learners' form-meaning mappings for 19 English VACs manifest different degrees of divergence from that of native speakers, with L1 German vs. English correlations ranging from 0.62 to 0.9, L1 Spanish vs. English correlations from 0.35 to 0.81 and L1 Czech versus English correlations from 0.3 to 0.89. This finding is further confirmed by Römer et al.'s (2020) follow-up research on German- and Spanish-speaking advanced English learners' knowledge of 34 English VACs including both *V prep. N* and *V reflexive pronoun* constructions. Garibyan et al. (2019) examined the argument structure constructions (ASCs) elicited by groups of 33 advanced non-native speakers of English and 13 native speakers of English based on different kinds of partially filled constructions, and found that native speakers and advanced learners differ in their choices of ASCs and the lexical constructions filling the slots of minimally different verb-specified ASCs as the stimuli. This finding also indicates that L2 learners' representation of ASCs is different from that of native speakers. In addition to VACs and ASCs, placement caused motion construction produced by L2 learners of Spanish and Danish is also detected to be

different from that of native Spanish and Danish speakers in Hijazo-Gascón et al. (2016). Since constructions are part of the constructional network, the difference between L2 learners' constructions and native speakers' corresponding constructions necessarily presupposes the discrepancy between the L2 constructional network and the corresponding L1 constructional network.

As for the second question, it has been found that there are L1 construction traces in the use of L2 constructions. For example, Martínez Vázquez's (2008) corpus-based survey showed that in the production of English caused motion constructions which are typical of satellite-framed language, L2 learners with L1 backgrounds of satellite-framed languages (German, Dutch and Swedish) use more caused motion constructions with more diversity in their essays than those with L1 backgrounds of verb-framed languages (Spanish, French and Italian). Römer et al. (2014) presented a similar finding that Czech and German learners of English, whose L1 are satellite-framed just like English, produce more target-like verbs in responses to generative free association tasks on VACs than Spanish learners whose L1 is verb-framed. Lemmens and Perrez (2018) made a straightforward comparison of how locative events are encoded by native French speakers, native Dutch speakers, and French-speaking learners of Dutch with three proficiency levels. The result suggests that Dutch learners' use of locative constructions and choice of verbs within these constructions are influenced by their L1s and the more proficient the learners are, the more target-like their production of constructions is. In a word, the presence of L2 learners' L1 construction traces in their L2 constructions reveals that L2 learners reconstruct the L1 constructional network instead of constructing an entirely new one for L2.

Since constructions represent conceptualizations of events and entities, and are connected to each other through form or meaning or both, L2 learners' reconstruction of their constructional network in L2 learning can be described at three levels: conceptual level, construction level, and connection level.

At the conceptual level, a matured conceptual system has already been developed in L2 learners. Given that human beings are born with similar physiological structures and cognitive apparatus and confronted with a similar physical world, the majority of the conceptual system is universal due to its embodied nature (Jiang & Yang, 2021). Therefore, the preexisting conceptual system provides full access to L2 learning. Reconstruction at this level is only invoked if a conceptual gap or mismatch occurs. There is a conceptual gap when new concepts emerge from L2, or the pre-established conceptual system contains more concepts than needed in L2. In this case, L2 learners will have to add new conceptual space to the conceptual system or carve up a specialized space for L2. For example, the French have a concept of GENDER and distinguish masculine from feminine in their conception of entities, whereas the Chinese do not. As a consequence, Chinese-speaking learners of French must construct a conceptual space for the missing concept of GENDER in their native language if they want to acquire the French noun system successfully, whereas for the French-speaking Chinese learners, a specialized space without GENDER must be set up in their noun system for Chinese. Mismatch arises when concepts evoked by L2 are not identical to those available. In this case, L2 learners will have to reorganize their conceptual system. For example, the Chinese make a distinction between paternal and maternal relatives while the English do not,

which leads to the mismatch of kinship concepts. When learning these concepts, English-speaking learners of Chinese will split their concept of UNCLE, for example, into paternal and maternal uncles and link them to Chinese concepts of *SHUSHU* and *JIUJIU* respectively, whereas Chinese-speaking English learners will merge their concepts of *SHUSHU* and *JIUJIU* and link them to the English concept of UNCLE.

Reconstruction at the conceptual level is ultimately realized at the construction level and connection level. At the construction level, reconstruction operates in several situations. The first one is to expand the L1 constructional network by introducing totally new constructions from L2 when these constructions are L2 specific and have no conceptual basis in the preexisting conceptual system. For instance, Chinese-speaking learners of French will recruit an inflectional construction for GENDER in their constructional network. Similarly, the L1 constructional network can be expanded by constructionalization¹ when L2 constructions can be conceptually linked to concepts available but nonetheless not constructionalized in L1. Take the English inflectional constructions for the plurality of nouns as an illustration. There are no such constructions in Chinese, but the concept of plurality is readily on hand. So, what Chinese-speaking English learners do for learning these constructions is only to constructionalize this concept and link the L2 construction form to the meaning of plurality. In addition to its expansion, the constructional network may be reorganized. When both L1 and L2 share the same construction, which, however, is simultaneously characterized by language-specific features, the re-pairing of form and meaning happens in the process of L2 learning thus resulting in the reorganization of the constructional network. This is perhaps the most common situation for reconstruction at the construction level. A case in point is the resultative construction. In Chinese, resultative construction belongs to a type of complex predicate constructions, i.e., [V-Vcomp] such as *da-po* 'hit-break'. But it is realized by an argument structure construction, i.e., [Subj V Obj Xcomp] in English. Consequently, for Chinese-speaking learners of English, the resultative meaning will be re-paired with the form [Subj V Obj Xcomp], while for English-speaking learners of Chinese, it will be re-paired with the form [V-Vcomp].

At the connection level, any reconstruction at the construction level entails not only the re-pairing of form-meaning links but also re-connections between constructions. The above-mentioned resultative construction will suffice. In native Chinese speakers' constructional network, the resultative construction is vertically linked to and inherits features from complex predicate constructions and horizontally to the serial verb constructions, but in Chinese-speaking English learners' L2 constructional network it is vertically linked to and inherits features from transitive constructions and horizontally to caused motion construction. In other words, when Chinese-speaking English learners acquire the English resultative construction, the pre-established connections for Chinese are adjusted to those of English.

The argument for L2 learning as reconstructing the L1 constructional network is cognitively feasible and tenable because human beings are cognitive misers (Taylor, 1981; Wen, 2019). Fundamental to cognitive psychology and social cognition, this cognitive

¹ "Constructionalization" employed here refers the synchronic process of pairing a linguistic form with particular meaning(s), which is different from Traugott and Trousdale's (2013) use of the same term in diachronic sense.

miser model holds that human beings “are limited in their capacity to process information. Because of this, either shortcuts to information processing may be taken or people may be unwilling to expend a lot of mental effort to think about something” (Pennington, 2000: 6). In the case of L2 learning, the L1 constructional network is a shortcut for L2 learners and it will save them additional cognitive efforts in acquiring the L2 constructional network.

In summary, the L2 constructional network is different from that of native speakers. This difference is most likely ascribable to its being reconstructed from, and thus “contaminated” by, L2 learners’ L1 constructional network.

Constructional network in SLA

This section probes into the constructional network and scrutinizes how it relates to L2 learning. Since previous research on SLA from the constructionist perspective has prioritized constructions in the constructional network, we will take another direction by focusing on connections between constructions and see how they work in L2 learning.

Vertical links in L2 construction learning

The constructional network is constituted by constructions of different degrees of schematicity and complexity, with less schematic constructions vertically linked to more schematic ones through simple inheritance links and more complex constructions vertically linked to less complex ones through multiple inheritance links. But how are schematic and complex constructions, which fall under the purview of grammar according to traditional grammarians and generative linguists, learned provided that simple concrete constructions, i.e., lexical constructions can be learned by rote? This question has long baffled linguists. The mainstream generative linguists even claim that they cannot be learned in the face of the poverty of stimulus, but are genetically endowed instead. This view has dominated the studies of language acquisition for decades.

Recently, however, mounting converging evidence has posed severe challenges to such a prevalent view. One of the heuristic discoveries coming from the constructionist approach to SLA is that L2 learners are capable of learning schematic and complex constructions through usage events. For example, focusing on the schematic dimension of syntactic constructions with DEPENDENT VERB-HEADED CONSTITUENTS (DVCs), Mellow (2008) analyzed the longitudinal data which documents stories written by a 12-year-old Spanish learner of English for the depiction of 15 different wordless picture books over a time span of 201 days, and found that schematic constructions with DVCs emerge from few DVCs selected by specific verbs such as auxiliary *be*, *begin*, *decide*, *go*, *help*, *need*, *try*, and *want*, and gradually becomes grammaticalized and generalized through extension to a very large range of constructions. Similarly, Ellis and Ferreira-Junior (2009a, 2009b) were concerned with schematic VACs, including verb locative construction (VL), verb object locative construction (VOL), and ditransitive construction (VOO). According to them, the learning of VACs begins with some most frequent verb-specific instantiations, for example, *go* for VL, *put* for VOL, and *give* for VOO. Not only fully schematic constructions but partially schematic constructions are also learned through usage. Bardovi-Harlig (2002), for example, examined the acquisition of the future constructions *will* and *going to* by 16 adult L2 English learners from

four L1 backgrounds (Arabic, Japanese, Korean, and Spanish) and concluded that L2 English learners develop creative uses from early formulaic uses, especially in terms of *going to* whereby its latter uses with different verbs and varied person and number emerge from the formulaic use of *I am going to write*. A similar process is also observed in L2 learners' learning of other partially schematic constructions such as DO-negation construction (Eskildsen & Cadierno, 2007), modal construction *can* (Eskildsen, 2008), and yes/no interrogatives and WH interrogatives (Eskildsen, 2015), and so forth. With particular regard to the complexity dimension of constructions, Mellow (2006) traced a Spanish-speaking English learner's longitudinal development of relative clause construction, and declared that relative clause construction is learned by the L2 learner only after its constituting constructions such as subordinate conjunctions, NP constituent constructions, modification constructions, and so on, have been acquired, and that complex relative clause constructions are learned only when simple ones are acquired.

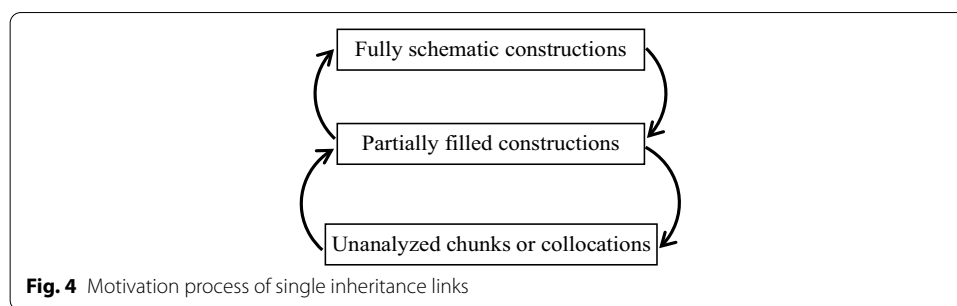
In general, L2 learners' acquisition of schematic and complex constructions follows a common sequence that starts from a few unanalyzed chunks or collocations, to low-level generalizations with limited scope and lexically specified slots, and ultimately to fully schematic constructions, and from simple patterns to complex constructions. But why this developmental sequence is observed by L2 learners is still waiting to be uncovered.

We propose that the usage-based learning sequence of schematic and complex constructions is motivated by vertical links in the constructional network, though various other motivations may have collaborated. More precisely, single inheritance links motivate the increasing schematicity, whereas multiple inheritance links motivate the increasing complexity of L2 constructions.

L2 learners first identify and store a few unanalyzed chunks or collocations based on inputs and the situated contexts of usage. With more repeating inputs available and by recourse to general cognitive ability such as categorization and analogy, they generalize over these previously learned chunks or collocations, which gives rise to partially filled constructions. At the same time, single inheritance links between early chunks or collocations and the partially filled constructions are established and stored, which encourage more similar chunks or collocations and are in turn further strengthened. Once these partially filled constructions are entrenched and diversified, further generalizations are made and fully schematic constructions arise. Simultaneously, single inheritance links between them are built and stored. In the same vein, they provoke more diverse use of the partially filled constructions and are strengthened in turn. This motivating function of single inheritance links is endorsed by De Knop and Mollica (2016) and Sung and Yang (2016), in which the learning of ditransitive phraseologisms and transitive resultative construction are respectively found to be motivated by literal ditransitive constructions and caused motion construction.

It should be emphasized that both lower-level chunks or collocation, partially filled constructions, and fully schematic constructions are stored in the constructional network due to single inheritance links which are also stored just like constructions. The motivation process of single inheritance links is cyclic and can be diagrammatized in Fig. 4.

As for the increasing complexity in their L2 constructions, L2 learners avail themselves of multiple inheritance links. Though we are not in favor of assigning complex



internal structures to construction, constructions, complex constructions in particular, are at least analyzable in terms of part-whole relations except for links between form and meaning. Complex constructions contain parts or slots that need to be filled by other smaller constructions. In this case, in learning a complex construction, L2 learners must first acquire the smaller constructions that instantiate it. When these smaller constituting constructions are acquired, they have access to the complex construction. This complex construction is entrenched if multiple inheritance links are fostered between it and the smaller constructions through conceptual blending. The establishment of multiple inheritance links will instigate L2 learners' extended use of types of those constituting constructions, which further strengthens the links. The multiple inheritance links are stored together with the complex constructions and their constituting constructions in the constructional network.

Horizontal links in L2 construction learning

Vertical links motivate L2 learners' increasing schematicity and complexity in their L2 constructions, or rather, the productivity and creativity of the L2 constructions. In comparison, horizontal links affect how constructions are learned by L2 learners. They may exert either facilitative or inhibitive effects on L2 construction learning.

It has been expounded in the last section that L2 constructions are learned in a usage-based fashion. This usage-based process is item- or exemplar-based. Specifically, L2 learners' productive language abilities emerge from most frequently recurring concrete, item-based chunks or collocations which act as exemplars. In other words, partially filled constructions (and eventually fully schematic constructions) are learned and consequently single inheritance links are established based on exemplars. We further argue that the establishment of single inheritance links is facilitated by horizontal links, or more accurately, paradigmatic links. Due to paradigmatic links, L2 learners are able to expand their use of more semantically similar items in the chunks or collocations with reference to earlier acquired exemplars. For example, in the longitudinal data collected by Li et al. (2014) on L2 learner's learning of *go*- and *come*-specific motion constructions, the L2 learner's expression of Path relies only on a limited number of prepositions (e.g., *to*, *in*) and satellites (e.g., *down*, *home*) which function as the exemplars in their first recording periods, but increasingly varied linguistic resources are witnessed in later recording periods. It is also because of paradigmatic links that more inputs are chunked the way earlier acquired exemplars are chunked. As is pointed out by Ellis and Ferreira-Junior (2009b), exemplars serve as cues for categorizing different inputs as examples of

the target construction. With more varied items alternating with the exemplar chunks or collocations and more exemplar-like chunks, single inheritance links are fostered more easily. In this way, paradigmatic links facilitate the establishment of single inheritance links and hence the learning of more schematic constructions.

Vertical links may also inhibit the learning of some L2 constructions. This is especially true of allostructional links which generally connect constructions with similar meanings. Constructions with similar meanings are often challenging to differentiate. They usually compete with each other in the process of L2 learning, and pose serious problems for L2 learners. According to Xu and Zhang (2020), who studied Chinese-speaking English learners' acquisition of four English constructions, i.e., the active construction, the verbal passive construction, the adjectival passive construction, and the middle construction, the adjectival passive construction is more difficult to learn than its allostruction, the verbal passive construction, because the latter impedes an accurate construe of the meaning of the former, whereas the middle construction is more difficult to learn than its allostruction, the intransitive construction, for the same reason.

In this section, a precursory elucidation of how the constructional network works in SLA is offered with particular attention paid to the two dimensions of connections in the constructional network. It is argued that vertical links underlie L2 learners' acquisition of schematic and complex constructions while horizontal links may either facilitate or inhibit L2 construction learning.

Conclusion

The ultimate goal of SLA is to acquire a native-like L2, which is apparently realized by the complete mastery of the L2 knowledge. In line with the tenet of Construction Grammar, linguistic knowledge is structured into a constructional network. In this sense, SLA is in essence the learning of the L2 constructional network. However, owing to differences in the state of conceptual development, the pre-existence of L1 knowledge, and the distortion of language inputs, the L2 constructional network is different from that of native speakers. Or rather, it bears the imprint of L2 learners' L1 constructional network, to the extent that the former is the reconstruction of the latter.

Zooming in on the constructional network, how it works in SLA can at least be illustrated by the motivating function of vertical links in L2 learners' acquisition of schematic and complex constructions and the facilitative or inhibitive effect of horizontal links in L2 construction learning. It is nevertheless noteworthy that such a description is precursory and nonexclusive. Future in-depth examinations are urgently expected as to such general issues as how the L2 constructional network emerges, what roles social cognition plays in the emergence of the L2 constructional network, and to such specific issues as how vertical and horizontal links interact in L2 construction learning, how the inhibitive effect of horizontal links can be resolved, and how, most probably, multiple dimensions of links function in L2 construction learning.

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Authors contributions

CJ drafted this article under the guidance of XW, and XW substantively revised it especially in terms of its third part. Both authors read and approved the final manuscript.

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