

Dissociation and Association of Chunks

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Chunks, or patterns of sequences, have been attracting attention in studies of second language acquisition. For example, Ellis (2001) stated that “language acquisition is essentially a sequence learning problem: the acquisition of word form, collocations, and grammatical class information all results from predominantly unconscious (or implicit) processes of analysis of sequence information” (p. 41). Chunks have been investigated under different terms with slightly different interests. For example, there are numerous studies on *formulaic sequences*, which includes the notion of nativelikeness and pragmatics. Use of *multiword sequences* improves fluency of spoken performance in a second language, and studying such relationship can provide insights into language production (Tavakoli & Uchida, 2020). However, they can be considered chunks from the perspective of processing (Bybee, 2010).

Although the data-base of chunks is a precious source for fast and light-burden processing, learners of a second language tend to have little of this, as they start learning a second language by remembering and applying rules, without the data-base that is supposed to be at hand in the case of their first language. Filling in this missing data-base may lead to more easy processing of a second language. Considering that chunking is unconscious processing by nature (Ellis, 2002), incorporation of implicit learning of chunks may be one possible way to provide a data-base of chunks. This study defines chunks, followed by a description of chunking and segmentation to spotlight chunking as association. First language development is then briefly described to demonstrate there is a lack of data-base of chunks in learners of a second language. Finally, the study argues that encouraging implicit learning of chunks can be a solution to fill in the missing data-base.

Definition of Chunks

This study defines a *chunk* as a strongly associated group of elements that corresponds to meaning. Miller (1956) emphasized “the importance of grouping or organizing the input sequence into units or chunks” (p. 93) and argued that “since the memory span is a fixed number of chunks, we can increase the number of bits of information that it contains simply by building larger and larger chunks, each chunk containing more information than before” (p. 93). Gobet et al. (2001) defined a chunk as “a collection of elements having strong associations with one another, but weak associations with elements within other chunks” (p. 236). From the perspectives of language acquisition and processing, it is also important that such grouped or organized sequences are related to meaning. Ellis (2003) stated that “learning to understand a language involves parsing the speech stream into chunks which reliably mark meaning” (p. 77).

Various terms are used to refer to a group of elements (see Weiner, 1995, for a review). Table 1 presents some examples of such terms. They are similar but slightly different in focus of interest. For example, the term *lexical phrase* is strongly related to pragmatics as Nattinger and DeCarrico (1992) state “*lexical phrases* are collocations such as *how do you do?* and *for example*, that have been assigned pragmatic functions” (p. 36). Their focus of interest was on nativelike selection and fluency.

Wray (2000) used the term *formulaic sequence* in relation to nativelikeness and identity. Durran and Schmitt (2009) introduced four approaches to define *formulas*: namely, (1) native speaker intuition, (2) word combinations of a grammatical form, (3) collocations, and (4) frequency of occurrence in the corpus. Referring to Durran and Schmitt, Nation (2013) used *multiword unit* as an umbrella term and stated there are four kinds of multiword based on (1) common occurrence, (2) transparency of meaning, (3) frequency and association, and (4) intuition. Tavakoli and Uchida (2020) investigated the relationship between fluency and *multiword sequences*, or combinations of words that appear together with high frequency in a target language.

However, as Bybee (2010) mentioned, “all sorts of conventionalized multi-word expressions, from prefabricated expressions to idioms to constructions, can be considered chunks for the purpose of processing and analysis” (p. 35). Thus, this study uses *chunk* with focus on cognitive processing of language rather than native-likeness and pragmatics. This is in line with Raupach’s (1984) perspective in the sense that it does not restrict *formulaic units* to fixed expressions with pragmatic use in a

communicative situation nor exclude idiomatic expressions.

Table 1

Some Terms for a Group of Elements

Term	Definition
Lexicalized sentence stem	“a unit of clause length or longer whose grammatical form and lexical content is wholly or largely fixed; its fixed elements form a standard label for a culturally recognized concept, a term in the language” (Pawley & Syder, 1983, pp. 191-192).
Lexical phrase (polywords, institutionalized expressions, phrasal constraints, sentence builders)	“‘chunks’ of language of varying length, phrases like <i>as it were, on the other hand, as X would have us believe</i> , and so on”(Nattinger & DeCarrico, 1992, p. 1).
Lexical item (words, multi-word items, polywords, collocations)	“the minimal units for certain syntactic purposes ... socially sanctioned independent units ” (Lewis, 1993, p. 90).
Lexicalized	“any combination of words which are stored in memory as a fully or partially formed sequence...” (Foster, 2001, p. 81).
Formulaic language	“multi-word (<i>How do you do?</i>) or multi-form strings (<i>rain-ed, can-'t</i>) which are produced or recalled as a whole chunk, much like an individual lexical item, rather than being generated from individual lexical items/forms with linguistic rules” (Weiner, 1995, p. 182).
Formulaic sequence	“a sequence, continuous or discontinuous, of words or other meaning elements, which is, or appears to be, prefabricated: that is, stored and retrieved whole from memory at the time of use, rather than being subject to generalization or analysis by the language grammar” (Wray, 2000, p. 465).
Multiword Sequence	“combinations of words that appear together highly frequently in a target language” (Tavakoli & Uchida, 2020, p. 507).

According to Gobet et al. (2001), there are two different approaches to form chunks. One is “a deliberate, conscious control of the chunking process (*goal-oriented chunking*)” (p. 236) and the other is “a more automatic and continuous process of chunking during perception (*perceptual chunking*)” (p. 236). The current study focuses on chunks in automatic cognitive processing because the interest of the study is in language acquisition instead of language learning strategies.

Chunking and Segmentation

This study reserves the term *chunking* for association of chunks into a larger one, whereas dissociation into smaller ones is referred to as *segmentation*. The term *chunking* is sometimes used for dissociation of chunks. For example, Tode (2003) defined chunking as segmentation by stating “chunking or temporal processing refers to the process of segmenting an incoming language sequence into smaller subsequences” (p. 24). On the other hand, *chunking* is also used for the association of smaller units into a larger one. For example, Newell (1990) defined chunks and chunking as follows:

A chunk is a unit of memory organization, formed by bringing together a set of already formed chunks in memory and welding them together into a larger unit.

Chunking implies the ability to build up such structures recursively, thus leading to a hierarchical organization of memory. Conceivably, it could form the basis for an equally ubiquitous law of practice (p. 7).

Forming a chunk by gathering closely associated elements is one thing and segmenting a sentence into smaller pieces is another; chunking is a process toward abstraction, whereas segmentation is a process of analyzation. To refer to these two different processes clearly without confusion, this study uses *chunking* to refer to association (or chunking up smaller pieces into a larger one) and *segmentation* for dissociation (or chunking down a larger one into smaller pieces).

In addition, the following statement by Ellis (2003) suggests the possibility that sentences are partially processed as chunks:

With increasing exposure, performance incremented on diverse measures: the proportion of lexis correctly recalled, correct expression of the adjective-noun agreement, correct subject-verb agreement, totally correct sentence, number of correct bigrams and trigrams, and, generally, conformity to the sequential probabilities of the language at letter, word and phrase level. (p. 75)

Dissociation and Association of Chunks

In other words, chunking could result in “islands of chunks” surrounded by the other elements that are yet to be chunked. This concept is similar to the notion of Boer’s (2006) “zone of safety” (p. 247), where prefabricated chunks are used correctly without errors. On the other hand, segmentation means drawing boundaries and, as such, all parts of the sentence are broken into segments. However, the assumption that every segment of a sentence is processed as a chunk is not plausible. Some parts may be processed holistically, while others can be processed analytically, as in the dual mode system (Skehan, 1998). Figure 1 contrasts chunking and segmentation. In Figure 1 (a), the sentence includes two islands of chunks: namely, “arrive at the airport” and “a heavy traffic jam.” In Figure (b), the sentence is segmented into six parts, although each segment may or may not be processed as chunks.

Figure 1

Islands of Chunks

(a) Chunking

They wanted to (arrive at the airport) early,
but they were caught in (a heavy traffic jam).

(b) Segmentation

They wanted / to arrive at the airport / early /,
but / they were caught / in a heavy traffic jam / .

Another point is that chunking as association may result in *chains of chunks*. Figure 2 illustrates such an example. In the sentence “He wanted to adopt a dog,” “want to + [VERB]” can be processed as a chunk, while “adopt + [NOUN]” can be also processed as a chunk. This example demonstrates the possibility that chunks are not only combined side-by-side but they can also latch with each other, forming chains of chunks that would eventually processed together as one longer chunk.

Figure 2
Chains of Chunks



Length and Abstraction of Chunks

Chunks are put together to form a larger unit by chunking and, as a result, they have a hierarchical structure (Christiansen & Chater, 2016; Ellis, 2001, 2002; Miller, 1956; Newell, 1990). Thus, chunks can come in various lengths. In recent years, chunks have been measured by n-gram indices. Tavakoli and Uchida (2020) used proportion, frequency, and association based on bigrams and trigrams to measure chunks.

Chunks also vary in the degree of abstraction. They can be constituted with concrete words, words plus slots to be filled, or more abstract part-of-speech n-grams. For example, “adopt a dog” is a concrete chunk, whereas “adopt + a + [NOUN]” is a chunk with a slot. This chunk can be further generalized to “[VERB] + [ARTICLE] + [NOUN]” as a more abstract chunk.

It is most likely that different parts of a sentence are processed with different degrees of abstraction. Thus, effects of chunks are expected to be the sum of those from chunks with different degree of abstraction. In addition, treatment to promote chunk use may affect different levels of chunks: First, learners may memorize the exact word-to-word chunk, followed by generalization to the ones with slots, and eventually more abstract level of chunks.

Abstraction is also involved in processing of chunks. Christiansen and Chater (2016) argued that incoming information is hierarchically chunked into higher level of chunks so that the information can be passed on through the processing bottleneck.

Chunks in Language Acquisition

Chunks play a role in language acquisition. In the literature, it is argued that chunks remembered as a whole contribute to faster and easier processing of language, while rule-based processing involves creative and flexible use of language (Skehan, 1998). According to Skehan (1998), exemplar-based holistic processing and rule-based analytic processing work in tandem as a dual mode system. Foster (2001) also states language is processed both analytically with the syntactic rules and holistically with “instant access to a memory store of fixed or partially formed phrases” (p. 79).

Dissociation and Association of Chunks

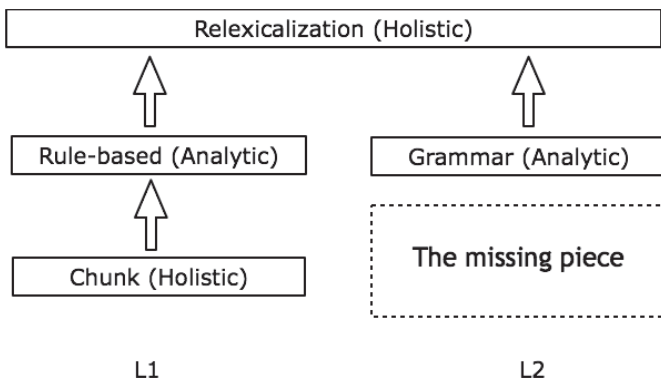
The balance between the analytic and holistic processing varies as language develops. Wray (2002) proposed a model with four phases to describe first language development. In the first phase until 20 months after birth, the child stores linguistic units without analyzing the internal structure. In the second phase, between 20 and 30 months, the child starts to analyze the structure, and analytic processing becomes dominant. In the third phase, between 8 and 18 years, the proportion of unanalyzed formulaic sequences increases again, because making sentences with analytic grammar all the time is not efficient. In the last phase in the late teens, the proportion between analytic and holistic processing reaches a settling point.

In second language acquisition, the stored chunks can also be a precious data-base of useful items at hand. Lewis (1993) argued “these chunks become the raw data by which the learner begins to perceive patterns, morphology, and those other features of language traditionally thought of as ‘grammar’” (p. 95). Chunks are also reported to be the source of fluency, processed with light cognitive burden (Tavakoli et al., 2000). Thus, this data-base can be considered “the missing piece” in second language acquisition. If learners start with explicit knowledge of grammatical rules, they have little of this precious data-base to rely on for fast and light-burdened processing.

Figure 3 represents a schematic view of first and second language acquisition. In the case of the first language, chunks are memorized and processed holistically first. The chunks are then analyzed to find rules. Rule-based processing is then relexicalized, and starts to be processed holistically again (Skehan, 1998). Since the chunks remain in the data-base after they are analyzed, holistic processing is always available in case of necessity even in the presence of rule-based processing. On the other hand, learners of a second language start with learning the grammar without the data-base of chunks, which is at hand in the case of their first language. This is like starting language learning from the middle point. They lack the data-base of chunks to rely on, and consequently they have no choice but to use rule-based processing. As Tavakoli and Uchida (2020) argued, having knowledge of multiword sequences (or chunks) is a way to decrease the cognitive burden in language processing. Thus, learning chunks should be part of second language learning at some point, if not at the beginning.

Figure 3

Schematic Diagram of L1 and L2 acquisition



In an attempt to promote learning of chunks, explicit instructions of chunks have been studied. For example, Boers et al. (2006) investigated the effects of explicit instruction to emphasize noticing of phrases. Participants were 32 college students majoring in English (16 in each of the treatment and control groups, respectively). The results revealed that the treatment raised awareness of formulaic sequences, and the treatment group was judged to be more proficient in interviews. Their fluency improved, but improvement in accuracy was not statistically convincing. Boers et al. (2006) concluded that “noticing may be a prerequisite for learning, but it does not necessarily guarantee the acquisition of every single element that gets noticed” (p. 257).

In the same line of study, Strenger et al. (2010) also investigated effects of awareness raising of chunks. However, no evidence was obtained for uptake of chunks. They concluded that uptake requires, not only noticing but also several subsequent encounters with the noticed formulaic sequences. In light of the limited time in classroom to provide such encounters, Strenger et al. (2010) argued that “if teacher-led chunk-noticing activities alone are insufficient to stimulate uptake, then it follows that more chunks need to be explicitly targeted *in* class and that this requires steps that go beyond mere noticing” (p. 113).

Considering that chunking is unconscious and automatic processing of association, incorporation of implicit learning of chunks may be another possible way to promote their use. For example, Yamaoka (2015) tried to encourage use of implicit knowledge

Dissociation and Association of Chunks

of chunk combinations by reading patterns of chunk combinations aloud. It was hypothesized that, if encountering the same patterns of construction results in implicit knowledge, reading-aloud practice with patterned chunk combinations would be effective in obtaining implicit knowledge of such chunk combinations. A total of 15 first-year college students successfully finished picture description tasks and reading-aloud practices. The treatment group exhibited higher fluency and accuracy in the picture description task in the post test, possibly a result of implicit learning of chunk combinations. Indeed, chunking may be closely related to implicit learning. For example, Christiansen (2018) described the relationship between chunking and implicit statistical learning (ISL) as “ISL may be construed as statistically based chunking” (p. 472).

Discussion and Conclusion

Chunks are a precious data-base for fast and light-burden processing. However, this data-base may be the missing piece in second language acquisition, because second language learners often experience a lack of such data-base when they start learning with significant reliance on grammatical rules. It is fair to say that, compared to first language users, second language learners use too much analytic processing. Thus, providing the missing data-base of chunks can be a solution to make second language processing in proportion in terms of analytic and holistic processing, leading to fluent and accurate use of a second language.

One possible way to realize this is utilization of implicit learning. Chunking is automatic and natural processing to associate smaller parts into larger ones. If this natural processing is harnessed by the practice of repeated encounters with the same patterns, implicit learning of chunks may be possible, resulting in higher fluency and accuracy in spoken performance.

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Dissociation and Association of Chunks

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Dissociation and Association of Chunks

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Abstract

This study is mostly a literature review and provides some thoughts on chunks. First, the chunk is defined as a strongly associated group of elements that corresponds to meaning, followed by an explanation that various terms for multiword expressions can be seen as chunks from the perspective of cognitive processing. After that, chunking and segmentation are contrasted in order to spotlight the associative nature of chunking process. A brief review of first language development is provided from the viewpoint of analytic and holistic processing. Based on this view, it is argued that the data-base of chunks as a source of light-burden processing can be considered the missing piece in second language acquisition. Considering that chunking is automatic and natural processing, implicit learning can be a solution to fill in this missing data-base of chunks. One possible way to realize this is repeated practice where learners encounter the same pattern combinations of chunks intensively.