

Lexical Access in Production of Idioms by Proficient L2 Learners

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ABSTRACT

Earlier studies have worked on the hybrid account of idiom representation in the mental lexicon and the need for the superlemma level in the staged process of idiom production. However, not much attempt has been undertaken to explore how idioms are represented in and accessed from the mental lexicon of second language (L2) during speech production. This paper presents the results of a cross-modal priming experiment conducted to explore whether or how idiom representation in L2 lexicon during language production resembles the one in L1 lexicon. Thirty-two Iranian English instructors were asked to memorize a list of English expressions (common idiomatic and literal phrases) and to produce them when presented with both the grammatical subject of the sentence and the prime words (related or unrelated). The results of this study showed a positive effect of priming for both idiomatic and literal phrases implying that every constituent of an idiom could be accessed individually. With related primes, the production of idiomatic expressions was significantly faster than the production of literal phrases, supporting the unitary representation of idiomatic expressions in L2 lexicon during speech production.

Key words: lexical access; idioms; speech production; second language learning; cross-modal priming

INTRODUCTION

Studies on the use of idioms in the speech of adult native speakers have revealed that about 70% of their speech consists of idiomatic expressions (Altenberg 1990; Becke, 1975; Coulmas 1979; Cowie 1992; Moon 1998). Pollio, Barlow, Fine and Pollio (1977) reported that in every minute of speech produced by a native speaker, about four idiomatic expressions are found. A considerable amount of these expressions has also appeared in the speech of second language (L2) learners (Wong 1976; Ellis 1994; Granger 1998; Howarth 1998). Due to the widespread use of idiomatic expressions in daily conversations, and in order to develop speech fluency, L2 learners need to learn how to use idiomatic expressions appropriately (De Caro 2009; Oppenheim 2000), but these expressions often pose particular problems to L2 learning (Cooper 1998; Fong 2006; Steinel, Hulstijn & Steinel 2007). Therefore, understanding how idiomatic expressions are represented in the mental lexicon of the L2 learners and whether or not their representations differs from the monolinguals is an area of research of much interest to researchers in psycholinguistics and applied linguistics.

Much insights have been gained from previous research on mental representation during the comprehension of idiomatic expressions among native speakers (Bobrow & Bell 1973; Swinney & Cutler 1979; Gibbs 1980; Cutting & Buck, 1997; Vega-Moreno 2001; Cacciari & Glucksburg 1991); however, only a few studies were conducted to unveil the automatic processes involved in representation of L1 idioms during language production, such as the hybrid model of idiom representation (Cutting & Bock 1997) and the superlemma theory (Sprenger 2003; Sprenger, Levelt & Kempen 2006). Much less is understood about how idioms are represented in L2 learners' lexicon during the course of language production. For instance, the unitary representation of idioms in L2 lexicon was proposed by some scholars (Nelson 1992; Jiang & Nekrasova 2007; Conklin & Schmitt 2008) while other supported the compositional nature of idioms in L2 mental lexicon during speech production (Siyanova-Chanturia, Conklin & Schmitt 2011; Cieslicka 2006, 2010). Apart from these two positions, there are also those who argue for parallel activation of both figurative and literal meanings of idiomatic expressions during their processing in L2 context (e.g. Cieslicka 2006, 2010; Giora 1997, 2002, 2003; Giora & Fein 1999; Abel 2003).

This paper will present a review of major assumptions in representation of idioms in L1 and L2 lexicon and idiom production in the following sections before describing a cross-modal priming experiment that was conducted with Iranian ESL instructors to address questions about the mental representation of idioms in the L2 speaker's mental lexicon and the link between the idiom and the words it comprises during speech production.

PROCESSING OF IDIOMATIC EXPRESSIONS IN L1

With the unique properties of idiomatic expressions in mind, researchers have come up with different models to describe their representation and access in language processing. One of the earliest models on idiom representation, the Idiom List Hypothesis (Bobrow & Bell 1973), claims that idioms are stored and retrieved as a whole unit in a separate place in the lexicon; thus during language processing idioms are initially processed literally, and if rejected, its figurative meaning is activated. Subsequent work has argued against this earlier model of idiom representation. For example, Swinney and Cutler (1979) proposed the Lexical Representation Hypothesis, which claims that idiomatic expressions are represented as a long string of words in the lexicon and all its meanings (literal and figurative) are accessed in parallel simultaneously. Cacciari and Tabossi (1988) in their theory called the Configuration Hypothesis argues that the figurative meaning of an idiom is realized only when the "idiom key" (a piece of information that identifies idioms as such) is spotted in the phrase. According to them, the interpretation of an idiom is literal until the idiom configuration is recognized in the phrase; therefore, the constituent lemmas of an idiom are not marked as idiomatic in the lexicon (Cacciari & Tabossi, 1988). In addition, other studies have shown that the literal meaning of the words in an idiom is also available to the speaker during comprehension and production (Sprenger et al. 2006; Sprenger 2003; Cieslicka 2006; Cutting & Buck 1997).

The coexistence of literal and idiomatic meanings of idiomatic expressions inspired the hybrid account of idiom production by Cutting and Bock (1997). They claimed that idioms are represented as both unitary and compositional entities in the lexicon. That is, an idiom is stimulated as a single idiomatic concept on a level of idiom processing which spreads activation to the lemmas comprising it, but these lemmas are not restricted to only the idiomatic structure. Cutting and Bock (1997) posited that although idioms are represented as a whole in the mental lexicon, they carry their own internal structure compared to structure-less large single words. This model is compatible with the Configuration Hypothesis (Cacciari & Tabossi 1988; Cacciari & Glucksberg 1991) in that all elements of an idiom

play a part in the activation of its idiomatic representation. However, a drawback on the hybrid account of idioms was that during the processing of idioms, a whole set of lemmas were provided to the speaker without their specified syntactic position in the phrase.

Accordingly, Sprenger (2003) modified Cutting and Bock’s (1997) hybrid model of idiom production by introducing a new node, the superlemma, in which the syntactic relationships between the individual lemmas in an idiom and their restrictions are indicated (Sprenger et al. 2006). At this level, an idiom is represented separately as a whole entity on the lexical-syntactic level of language processing, but it is also connected to its constituent lemmas which have their own set of independent syntactic and semantic features.

The superlemma model explains the process of idiom production by focusing on the pathway of the activation of nodes where the natural integration of literal and figurative use of a language takes place. In addition, the superlemma model fits in well with the models of language processing (Levelt, Roelofs & Mayer 1999; Kempen & Harbusch 2002; Roelofs 2003) that account for both speech comprehension and production in the language. As shown in Figure 1, when retrieving an idiom to be uttered, the pathway in the speaker’s mind starts with a preverbal message which activates the lexical concept. The stimulated lexical concept triggers the unitary representation of an idiom in her/his mental lexicon, the superlemma node. This results in the activation of all the simple lemmas encompassing the idiom along with the co-activation of their specified grammatical properties. This in return stimulates the morphological and phonological properties of the lemmas and the idiom is produced. Similarly during idiom comprehension, each lemma constituting an idiom contributes to the activation of the superlemma which triggers the idiom concept at the conceptual level resulting in comprehension of the idiom (Sprenger et al. 2006).

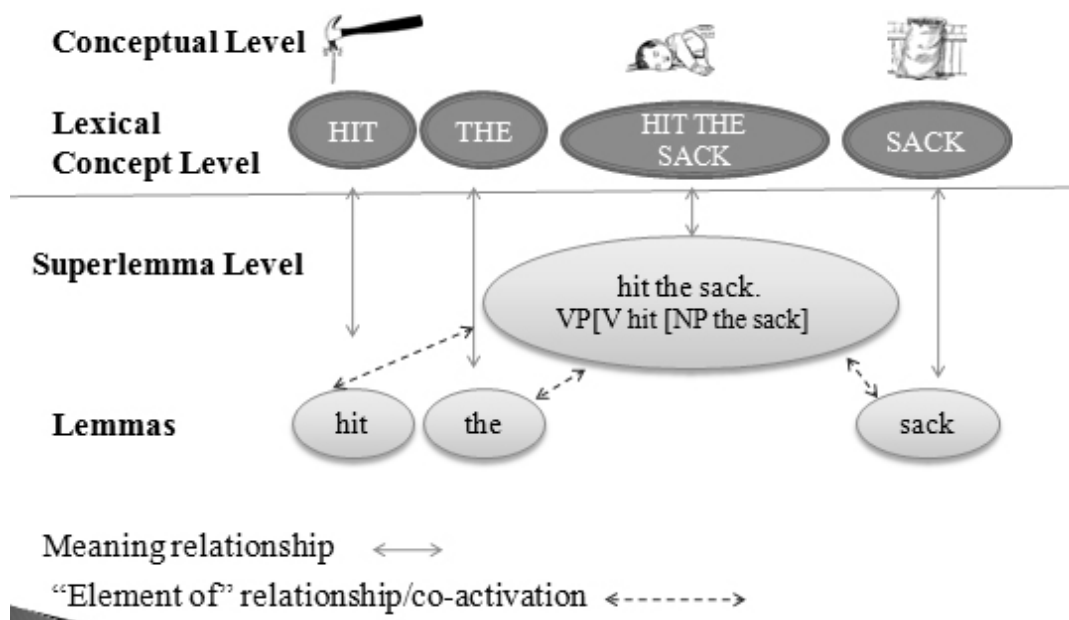


FIGURE 1 Representation of idiom “hit the sack” according to the Superlemma theory (adapted from Sprenger et al., 2006, pp.176)

PROCESSING OF IDIOMATIC EXPRESSIONS IN L2

Earlier studies on the representation of idioms naturally focused on their representation in the native speakers' mental lexicon. However, the attempt to uncover the representation of idioms and the steps involved in their access in L2 contexts has attracted the researchers in recent decades (e.g. Abel 2003; Giora, 1997, 2002, 2003; Cieslicka 2006). One of the most current areas in second language studies involves L2 idiom production (e.g. Conklin & Schmitt 2008; Siyanova-Chanturia Conklin & Schmitt 2011, Cieslicka 2010).

Abel (2003) in her model of Dual Idiom Representation model proposed two levels of idiom representation: lexical and conceptual representations. The lexical representation is represented at the mental lexicon, while the conceptual representation is represented at the general cognitive level and is nonlinguistic. She stated that non-decomposable idioms were assumed to have a separate lexical representation (idiom entry), while decomposable idioms were represented by means of both the lexical representation of their constituents (constituent entries) and the conceptual representation by which world knowledge is organized. For instance, the conceptual metaphor is activated in some idioms to trigger the idiomatic meaning, such as 'anger is like fire' that could be used to comprehend the idiom "he was spitting fire" (Abel 2003; Gibbs 1995).

In addition, Paradis (1998) and Kecskes (2000) stated that due to poverty in idiom input in the L2 lexicon and low frequency of idiom use by second and foreign language learners, the idiom entry in L2 lexicon is limited; therefore, L2 learners rely more on the literal meaning of the idiom's constituents (i.e., constituent entries) whereas native speakers rely more on idiom entries. Accordingly, the representation of idioms could be different in L2 lexicon from L1 lexicon depending on the factors such as idiom decomposability (i.e., the degree to which the components of an idiom contribute to its figurative meaning), and frequency and familiarity of idiomatic expressions in language use (Abel 2003; Kecskes 2000; Cieslicka 2006). In other words, as the level of decomposability in an idiom increases, its representation as a unitary entity decreases and reliance on the lexical entry of its individual constituents increases. Likewise, the higher familiarity with an idiomatic expression possibly creates a stronger link between the constituent entries and the idiom entry in decomposable idioms (Abel 2003), and finally, more frequently heard or used idioms develop the idiom entries in the L2 learner's mental lexicon.

Additionally, because the meaning of L2 words are usually taught and used in its literal sense more frequently than in its figurative sense, Cieslicka (2006, 2010) posited that the literal meaning of the constituents of the idiomatic expression (constituent entries) in L2 idiom processing remains as a salient process (i.e. it is activated first in the lexicon) compared to its idiomatic one during both comprehension and production, even if the figurative meaning of the idiom is already part of the L2 learner's competence and has been automatized for production. By the same token, most studies on L2 idiomatic expressions are related to learning strategies which indirectly emphasize the importance of the literal meaning of the words in an idiomatic expression (e.g. Irujo 1993; Bortfeld 2003). Although, idiom representation in L2 lexicon is a dynamic process and differs from one person to another and from one stage of language learning to another, it seems reasonable to assume that idioms are represented simultaneously in a two-fold process, a unitary representation, carrying its figurative meaning, and a compositional one, carrying the literal meaning of its constituents.

Evidence from available studies however is far from being conclusive. As indicated earlier, some studies found support for the unitary representation of idioms during speech (Nelson 1992; Jiang & Nekrasova 2007; Conklin & Schmitt 2008), while others found support for the compositional nature of idioms in the L2 mental lexicon (e.g. Siyanova-Chanturia, Conklin & Schmitt 2011; Cieslicka 2006, 2010). In addition, there are also studies who found support for parallel existence of both idiom and

constituent entries in the processing of L2 idiomatic expressions (Bortfeld 2002, 2003; Kecskes 2000; Abel 2003).

THE PRESENT STUDY

RESEARCH QUESTION AND PREDICTIONS

Levelt and Mayer (2000), Sprenger et al. (2006) and Goldberg (2007) claimed that having the extra superlemma node as a unitary and compositional representation of an idiom at the lexical-syntactic processing level facilitates the retrieval of the idiom and this translates to shorter reaction time. The existence of the superlemma node was investigated using Dutch native speakers by Sprenger et al. (2006), but whether this node is also present in L2 learners' mental lexicon during the retrieval of L2 idioms has not been explored yet. The study reported in this paper sought to examine the assumptions of the superlemma theory in the L2 lexicon claiming that idioms have their own representation in the lexicon and that the constituents of an idiom are the same lemmas that are stimulated when they are used in a literal phrase.

In line with the assumptions of the superlemma theory, it was predicted that if idiomatic expressions are composed of simple lemmas that are involved in the structure of any lexical phrases during production, then it was assumed that these lemmas could be manipulated individually in a priming experiment. Particularly, if primed by means of an identity prime (a word identical to one of the words in the phrase), a shorter production time is expected (Glaser & Dünghoff 1984, Sprenger et al. 2006). For instance, priming the word *sack* (as an identity prime) in both the idiomatic expressions *hit the sack*, and *moved the sack* would result in a shorter production time for both phrases (main effect of prime type). However, a stronger facilitation of identity prime is predicted if the prime word is part of a phrase that altogether forms and activates a single lexical concept; i.e. the idiomatic concept. In our example, the word *hit* would more easily be activated than the word *moved* by the prime word *sack*, since the words in the idiom are connected to a common concept: 'to go to sleep'. But there is no connection between the words in the literal phrase *moved the sack*, except a temporary one which is constructed during production of the idiom in the experiment. Thus, a weaker priming effect of *sack* in *moved the sack* is predicted (main effect of sentence type) (see Figure 2). The primes unrelated to the selected phrases both phonologically and semantically were introduced as the control-primes. Therefore, a robust interaction in the mental lexicon between the identity primes and the retrieval of idiomatic expressions is expected. That is, a connection between simple lemmas in the L2 mental lexicon is predicted by means of a common idiom representation (the interaction effect).

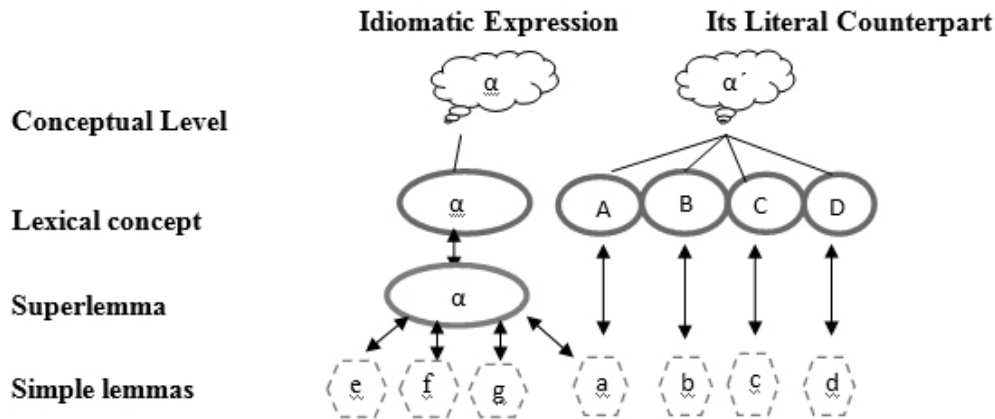


FIGURE 2 Retrieval of an idiom vs. its literal counterpart in this experiment

Overall, if our predictions were borne, we could claim that proficient L2 learners do process idioms more quickly than literal phrases, thus less time would be required to produce L2 idiomatic expressions than literal phrases. In addition, the positive effect of lemma priming for one of the constituents of the idiomatic expression would suggest that it is possible for the lemmas of the idiom to be individually retrieved.

PARTICIPANTS

The participants selected for this study were 32 (16 male and 16 female) proficient adult Iranian L2 learners, their ages ranged from 25 to 43 years (only three participants were above 40 years old). They were competent English instructors. They had studied and taught English professionally, for at least six years; they hold a diploma certificate, a Bachelor, or a Master degree in English language. They all also passed the Michigan ECCE proficiency test as a mandatory credential required of English Language instructors in the language institute that they worked for. For those participants who passed the ECCE test long time ago, their IELTS (International English Language Testing System) or TOEFL iBT (*Test of English as a Foreign Language, internet Base Test*) scores were considered. The participants were selected based on purposive sampling. Anchored in the premise that idiomatic expressions of a language are hard to acquire and take many years to be learned by L2 learners (Irujo 1986), only the proficient EFL learners were considered for the study. They were expected to comprehend and use idiomatic expressions more accurately and fluently. Since reaction time slows down by age 50 (Der & Deary 2006), there was an age limitation for the experiment. Table 1 summarizes the Iranian participants' English learning background, which was obtained via a questionnaire given out after the test.

TABLE 1: Background information pertaining to the proficiency level of the Iranian participants

(n=32)		Mean	Minimum	Maximum	SD
Age		31.84	25	43	4.88
English proficiency Test score	ECCE (N=17)	80.56	77	90	3.24
	IELTS (N=12)	7.58	6	9	0.97
	IBT (N=3)	95.66	78	106	15.37
Age starting English		11	6	12	1.58
Years of formal instruction		9.10	6	15	2.82
Years of residence in English speaking countries		0.71	0	6	1.54

MATERIALS

The selection of idiomatic expressions was based on several criteria. Firstly, the idioms selected should be the most frequent and familiar English idioms among the Iranian language learners of the same proficiency level; secondly, the idioms should have the same part of speech; thirdly, the same word length and syntactic form for their matching literal counterparts must be considered.

Accordingly, 50 English idiomatic expressions from Titone and Connine's (1994) study, all rated 5.5 and above in frequency test on a 1-7 likert scale were chosen. They were given to an independent panel of experts in English language (15 non-native English speakers, Iranian) to be rated based on Titone and Connine's (1994) scale of Frequency and Familiarity. Based on their results, 16 frequent and familiar conversational English idiomatic expressions were selected to be used in the study.

The panel of experts was also asked to identify a word in each of the expressions that would make them recall the idiom faster, since not all constituents of an idiom are evenly important for the recognition of the idiomatic configuration (Cacciari and Tabossi 1988). The most frequent words identified were used as the identity primes in the experiment. Sixteen unrelated (neither phonologically nor semantically related) prime words were also chosen. All prime words were recorded in one session by a fluent English speaker (See appendix A for a complete list of the phrases along with their primes and prompt words).

Moreover, the selected idioms had matching literal counterparts that shared the same syntactic structures and sentence lengths with the idioms, but there were a few exceptions, e.g. the idiomatic expression: the test *was a piece of cake* vs. its literal counterpart: the test *was to bake a cake*. The literal phrases also shared a word with the idiom (an identity prime). For example, in these phrases, the word *cake* was considered as the identity prime, shared between the idiomatic and literal phrase. Further, each pair began with a prompt word, which was either a grammatical subject or a noun phrase to induce the intended idiomatic expression or its literal counterpart. The selected idioms were mostly verb phrases, except for two (i.e. a piece of cake; at the back of one's mind).

It should be noted that each participant was given either the idiomatic phrase or its literal counterpart; thus, two diverse lists (list 1 and 2) consisting of 16 phrases (8 idiomatic expressions, 8 literal phrases) were created to be used by different participants (see Appendix A1).

To run the experiments, *E-Prime version 2 professional*, a psychology software tool and a microphone connected to a Serial Response Box (SR-Box) was used to measure the participants' reaction times when the phrases were produced.

RESEARCH DESIGN

The experiment uses a 2x2 factorial design in which four different conditions of sentence type (idiom vs. literal phrases) and prime type (identity vs. unrelated) were developed to find out how L2 learners' response time would vary when producing the phrases in four different conditions. Both idiomatic expressions and literal items were evenly distributed in the block. Every item was presented equally with both an identity prime and an unrelated prime, each repeated 4 times within a block. Thus, a block consisting of 128 trials was developed and presented pseudo randomly to ensure the consistency of priming and the repetition effects across the phrases.

The following hypotheses were tested:

H₁ : The reaction time in the production of both idiomatic and literal expressions is shorter with identity primes in L2 learners.

- H₀₁ : The prime type has no effect on the reaction time in production of idiomatic and literal expressions in L2 learners (Main Effect of Prime Type).
- H₂ : The reaction time in the production of idiomatic expressions is shorter compared to the reaction time for the production of literal expressions in L2 learners.
- H₀₂ : Sentence type has no effect on the reaction time in the production of idiomatic and literal expressions in L2 learners (Main Effect of Sentence Type).
- H₃ : There is interaction between Sentence Type and Prime Type on the reaction time in L2 production.
- H₀₃ : There is no interaction between Sentence Type and Prime Type on the reaction time in L2 production (Interaction Effect).
- H₄ : The reaction times between the two groups of participants using different sets of phrases (list 1 and 2) are significantly different.
- H₀₄ : There is no significant difference between the reaction times of the two groups of participants using different sets of phrases (List Effect).
- H₅ : The gender difference affects the reaction times in the production of idioms in L2 context.
- H₀₅ : The gender difference does not affect the reaction time in the production of idioms in L2 context (Gender Effect).

PROCEDURE

The procedures used in this study followed closely the methodology described in Sprenger et al.'s (2006) in Experiment 1. There were two phases involved for data collection: a preparatory learning phase and the experimental cued-recall test phase. All the participants were tested individually. The visual stimuli were shown on a computer screen and the auditory stimuli were heard through headphones. A microphone which was attached to the SR-Box captured the responses and signaled the initiation of responses which is registered by the E-prime software.

PREPARATORY LEARNING PHASE

The two lists of sixteen phrases: with 8 randomly chosen idiomatic expressions and 8 literal expressions were presented to the participants to memorize, so that they would be able to recall them fluently and flawlessly throughout the whole experiment whenever presented with the prompt words. Before the actual experiment, the researcher asked each participant to identify the idiomatic expressions among literal expressions and to define their meanings orally. This was done prior to the actual test to make sure all participants know the idiomatic expressions used in the experiment.

Once the participants were ready, they were evaluated by the researcher to make sure they remember the phrases in the list and can produce the phrases quickly and accurately. Any pauses, errors, or disfluencies when recalling phrases led to the repetition of the phrases in the list again. Since this experiment was not aimed at testing subjects' memorization ability, only when the participants were able to produce the phrases perfectly, did they proceed to the next stage.

CUED-RECALL TEST PHASE

The actual priming experiment took place in this phase. The presentation of an asterisk in the centre of the computer screen marks the beginning of a trial. Following the asterisk mark is the simultaneous presentation of the visual prompt and the audio prime. The prime was either identical or unrelated to the word in the intended idiomatic expression or its literal counterpart. The participants should react to the visual and auditory cues (the prompt and the prime words) by producing the sentences

they have memorized prior to the onset of the experiment as promptly as possible. The participant's responses trigger a voice key in the SR-box that records the response reaction time in millisecond. The participants were given 4000 milliseconds (a proper length of time identified during the pilot study) to produce the phrase after being introduced to the visual prompt and the aural prime. Responses later than 4000 msec. were rejected automatically by the computer and a new trial begins. Response times were measured from the time that visual stimulus presentation took place. Since the SR-Box was sensitive to any kinds of sounds and also in order to increase accuracy in the test, the participants were asked to avoid making unnecessary noises (see Figure 3 for the time course of the experiment). To measure the participants' knowledge of idioms used in the experiment, a post-experiment multiple choice item test was used. The participants were asked to match the idiom with its meaning (see Appendix B).

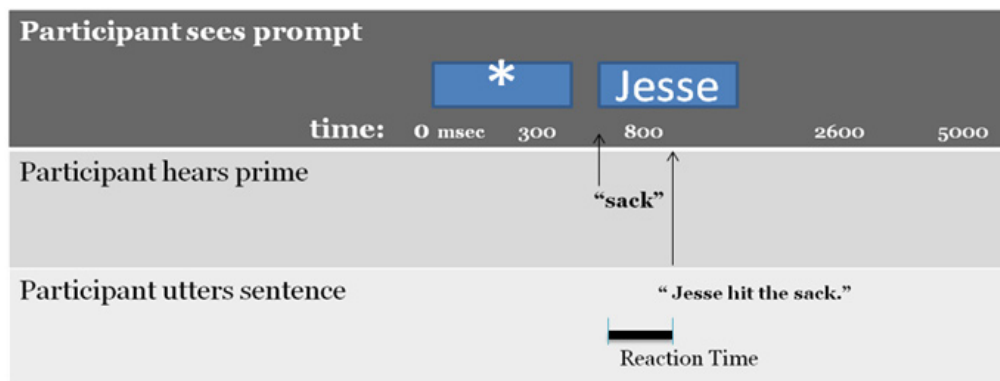


FIGURE 3 Time course of the priming experiment. Adapted from "Fixed expressions and the production of idioms" by S. A. Sprenger, 2003; pp. 52.

DATA ANALYSIS

The sound files were checked for errors and wrong or missed answers. Since the participants were L2 learners, wrong verb tenses were tolerated. But different word orders or word replacements were considered as erroneous production. The data was gathered based on the participants' reaction times recorded by E-prime and the percentage of erroneous sentences calculated for the four conditions. Then, the difference in response latencies between the idiomatic expressions and the literal phrases were subjected to descriptive analysis and repeated measure ANOVA (within-subject & between-subject) statistical procedures. The results would show whether the identity prime which is a part of the building block of an idiomatic expression and a literal sentence as well could facilitate their retrievals (the main effect of prime type). But in case of idiomatic expressions, it was predicted that they would be retrieved faster, since they possess a single lexical concept in the L2 mental lexicon (main effect of sentence type). The interaction between the prime type and the sentence type factors could explain whether the simple lemmas constituting an idiom are connected by means of a common idiom entry.

RESULTS

The data from one participant was eliminated, because they were heavily confounded with errors. However, error analysis on the rest of data showed a total error of 9.20% (4.26% Female; 4.94% Male). Error percentage per condition is: Idiom-identity (1.51%), literal-Identity (1.64%), Idiom-unrelated (2.75%) and Literal-unrelated (3.30%). The erroneous responses were excluded from further

analysis. The error analysis reveals the high percentage of errors occurred in unrelated conditions and for literal phrases.

Tables 2 and 3 present the mean production latencies in four different conditions of the experiment. Idiomatic expressions were produced faster when triggered with identity primes, and literal phrases, when primed with unrelated words to the phrase, took the longest time. A repeated measure ANOVA (between and within-subject) on the data was conducted to compare first the main effect of Prime Type (identity vs. unrelated prime) on the reaction time during the production of idiomatic expressions vs. literal phrases (see Table 3). Separate analyses were performed with either subjects (participants) or items, yielding F1 and F2 statistics respectively. The results show a highly significant main effect of Prime Type [$F_1(1, 30) = 113.23, p < 0.01, F_2(1, 15) = 47.42, p < 0.01$] meaning that the reaction time in the production of both idiomatic and literal expressions is shorter with identity primes which rejects the null hypothesis H_{01} and supports the alternative hypothesis, H_1 of the study. In other words, the difference in the average response latencies of 1328.6 msec for unrelated prime vs. 1184.3 msec for identity prime was significant, suggesting the positive effect of priming in the production of both idiomatic and literal phrases, when primed with one of their constituents. This finding also suggests that the lemmas in the idiomatic expressions can be accessed individually. The positive effect of priming is in line with Sprenger et al.'s (2006) study on Dutch L1speakers in the production of Dutch idioms.

TABLE 2 : Mean production latencies and standard deviation of the experiment in participant analysis

Sentence Type	Prime Type Mean RT in msec. (Std. Deviation)	
	Identity	Unrelated
Idioms	1155.94 (149.84 SD)	1327.16 (200.98 SD)
Literal phrases	1212.73 (197.91 SD)	1330.0 (208.78 SD)

TABLE 3: Mean production latencies and standard deviation of the experiment in item analysis

N: # of phrases					
Conditions	Mean RT	Std. Deviation	N	Minimum RT	Maximum RT
Identity Idiom	1153.85	87.93	16	1010.69	1344.91
Identity Literal	1209.18	114.65	16	1013.44	1439.07
Unrelated Idiom	1326.36	120.69	16	1125.72	1473.84
Unrelated Literal	1322.26	109.29	16	1100.38	1511.05

TABLE 4 : Subject analysis of variance results

Source	Sum of Square	df	Mean Square Error	F	Sig. of F
Main Effect of: Prime Type	662499.53	1	5851.03	113.23	0.000
Sentence Type	24875.85	1	12247.12	2.031	0.164
Interaction Prime type*Sentence Type	24074.78	1	4888.72	4.925	0.034

The results also show that Sentence Type did not yield a significant main effect on the reaction time, [$F_1(1, 30) = 2.03, p = 0.164, F_2(1, 15) = 1.437, p = 0.249$] suggesting failure to reject the null hypothesis, H_{02} . However, further analysis particularly with identity prime showed a large variation in the mean reaction time during the production of idioms vs. literal phrases (i.e. 56.8 msec.) compared with a much smaller value with unrelated primes (i.e. 2.84 msec) (see Table 2). A paired sample t-test analysis by subject confirmed that the difference in speech production latencies between idiomatic expressions and literal phrases in identity prime condition is highly significant [$t_1(31) = -2.594, p < 0.05$] which suggests that the idiomatic expressions are produced much faster compared to the literal phrases. The non-significant results obtained in the repeated measure ANOVA can also be explained by the interaction effect between sentence type and prime type which is found to be significant [$F_1(1, 30) = 4.925, p < 0.05, F_2(1, 15) = 6.133, p < 0.05$]. The facilitative effect of the identity prime on the production of idiomatic expressions (174.22 msec.) is significantly greater compared to its literal counterpart (117.27 msec.). However when primed with an unrelated word, there is no difference in the response latencies of the participants for both idiomatic and literal phrases (see Figure 4). These results can be interpreted to mean that unrelated words presented as primes inhibited recall and production of idioms in the same degree as it did to its literal counterparts.

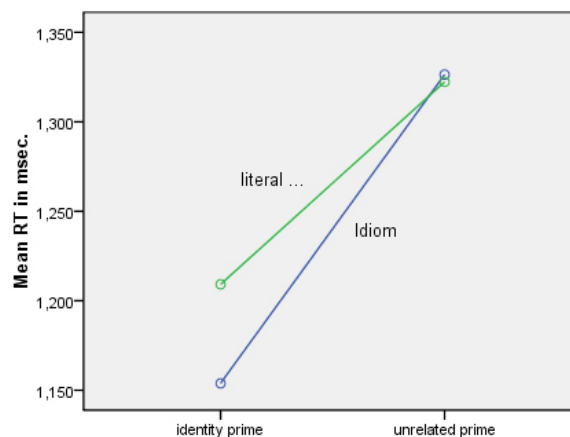


FIGURE 4 : Main effect of sentence type and interaction effect

In addition, the results from the between-subject repeated measure analysis showed a non-significant result for list effect [$F_1(1, 30) = 0.325, p > 0.05$], and gender effect [$F(1, 30) = 1.297, p > 0.05$], failure to reject the null hypotheses, H_{04} & H_{05} of the study. These results suggest that the list and gender are not significant factors that affect the results of the study.

DISCUSSION

The results of this study on one hand supports the positive effect of priming in the production of both idiomatic and literal phrases by the Iranian L2 learners when stimulated by a related prime (identity prime) compared to when activated by unrelated primes. Shorter production latencies were observed for both types of phrases with identity primes as expected suggesting that both idiomatic and literal phrases are composed of ordinary simple lemmas, since one of their constituents can activate both types of phrases. In other words, the audio prime that is identical to a word of the intended phrase could stimulate the representation of the related word comprising the phrases, which in return could activate the production of the whole phrase for both the idiom and its literal counterpart (a part of a whole). This effect could argue in favor of the compositional nature of idioms.

On the other hand, the findings reveal that idiomatic expressions are produced much faster than their literal counterparts when facilitated by the idiom key. This result could be interpreted that the idiomatic expressions are possibly stored and represented as memorized lexical chunks in the L2 mental lexicon. The idiom key as a constituent in the building block of the idiom, can initiate the retrieval of the idiom holistically. In other words, faster production of idiomatic expressions could indicate a special relationship between the idioms' components and its associated idiom concept in the mental lexicon. The presence of an interaction between the identity prime and the idiomatic expressions reinforces the proposition that idioms have unique unitary entry in the mental lexicon. This result supports the assumption of having an idiom entry in Abel's (2003) Dual Idiom Representation model and the existence of an idiom node in Cutting and Bock's (1997) Hybrid model which links the individual representation of words composing an idiom together in a single representational unit. Likewise, this study is in agreement with the assumptions of the Sprenger et al.'s (2006) study speculating that idioms have both unitary and compositional representations. That is, idioms have their own lexical concept in the mental lexicon, which is connected to the single representation of the idiom, the superlemma in which the simple lemmas of the idiom's constituents are linked together in a syntactic frame.

The study however did not find sentence type as a significant main effect. To account for the data, the following explanation is offered. Given the significant interaction effect between prime type and sentence type, and the fact that the response latencies were not significantly different for idioms and literal phrases when presented with unrelated primes, it could be that the unrelated primes were either stronger inhibitors for idioms compared to literal phrases or that the unrelated primes simply did not trigger the idiom configuration during the idiom production. If the unrelated prime somehow inhibited access to the idiom configuration, resulting in the idiomatic expression being produced as if they were literal expressions, the data would be completely expected. If the above explanation holds, the data would seem to support the hybrid view of idiom representation proposed by Cutting and Bock (1997), the configuration hypothesis by Cacciari and Tabossi (1988) and the view on parallel activation of figurative and literal meaning by researchers such as Bortfeld (2002, 2003), Keeskes (2000), and Abel (2003).

Finally, it is worthy of notice that the differences observed between conditions were more likely due to the treatment differences rather than other factors such as gender and list effects.

CONCLUSION

In this study the assumption that idiomatic expressions enjoy faster production compared to the generated literal phrases was examined by means of a cross-modal priming experiment in which the response times for the production of idioms and their literal counterparts were compared when identity and unrelated primes were introduced.

The empirical data from this study found support for the unitary representation of idiomatic expressions, which is directly connected to its constituent lemmas. This unitary node triggers the individual lemmas constituting the idiom leading to an enhanced level of processing which utilizes less time and energy. However, it should be noted that the evidence on the representation of idiomatic expressions during production in L2 context is still small and more research needs to be done. If idiomatic expressions play an important role in L2 fluency, more research on their representation and process, especially in second language production could help us better understand the cognitive processes involved in their learning.

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APPENDIX A
EXPERIMENT MATERIALS

This is the list of idiomatic expressions and their literal counterparts. The idiomatic expressions are written in *Italic*.

No	Prompt	Identity Prime	Idiomatic Expression	Its Literal Counterparts
1	John	Cold adj.*	John <i>gave me the cold shoulder</i> .	John touched me with his cold hand.
2	Ben	Swallowed V	Ben <i>swallowed his pride</i> for the job.	Ben swallowed his gum by mistake.
3	The test	Cake N	The test was <i>a piece of cake</i> .	The test was to bake a cake.
4	Jesse	Sack N	Jesse <i>hit the sack</i> .	Jesse moved the sack.
5	Kate	Picture N	Kate <i>got the picture</i>	Kate bought the picture.
6	Peter	Ice N	Peter <i>broke the ice</i> at the party.	Peter crushed the ice in the bucket.
7	Andy	Ate V	Andy <i>ate his words</i> .	Andy ate the meal.
8	Rob	Pulled V	Rob pulled my leg.	Rob pulled the cart.
9	Tom	Back N	Tom was <i>at the back of my mind</i> .	Tom was at the back of the house.
10	Sue	Air N	Sue <i>cleared the air</i> in the conversation.	Sue pumped some air into the ball.
11	Julia	Face V	Julia had to <i>face the music</i> .	Julia had to face the danger.
12	Linda	Twisted V	Linda <i>twisted my arm</i> for the deal.	Linda twisted her hair into a knot.
13	David	Grip N	David <i>loosened his grip</i> on the problem.	David tightened his grip on the bat.
14	Our friends	Knot N	Our friends <i>tied the knot</i> in the church.	Our friends removed the knot in the rope.
15	The robot	Arm N	The robot <i>cost me an arm and a leg</i> .	The robot drew him an arm and a nose.
16	Bill	Horses N	Bill, <i>hold your horses</i> please.	Bill, feed the horses please.

*Parts of speech: N (noun), V (verb), Adj. (adjective)

APPENDIX A1

List 1	<ol style="list-style-type: none">1. Linda twisted my arm for the deal.2. David tightened his grip on the bat.3. John gave me the cold shoulder.4. Ben swallowed his pride for the job.5. The test was to bake a cake.6. Jesse hit the sack.7. Kate bought the picture.8. Peter broke the ice at the party.9. Andy ate his words.10. Rob pulled the cart.11. Tom was at the back of the house.12. Sue cleared the air in the conversation.13. Julia had to face the danger.14. Our friends tied the knot in the church.15. The robot drew me an arm and a nose.16. Bill, feed the horses please!
List 2	<ol style="list-style-type: none">1 John touched me with his cold hand.2 Ben swallowed his gum by mistake.3 The test was a piece of cake.4 Jesse moved the sack.5 Kate got the picture.6 Peter crushed the ice in the bucket.7 Andy ate his meal.8 Rob pulled my leg.9 Tom was at the back of my mind.10 Sue pumped some air into the ball.11 Julia had to face the music.12 Linda twisted her hair into a knot.13 David loosened his grip on the problem.14 Our friends removed the knot in the rope.15 The robot cost me an arm and a leg.16 Bill, hold your horses please!

APPENDIX B
POST EXPERIMENT IDIOM TEST

Please select the correct meaning of each idiom in the sentence.

1. John gave me *the cold shoulder*.
 a) John's shoulder is cold. c) I ignored John.
 b) John ignored me. d) I am afraid of John.

2. Ben *swallowed his pride* for the job.
 a) The job took away Ben's confidence. c) Ben had to lower his expectations for the job.
 b) Ben was proud of his job. d) The job was not satisfactory for John.

3. The test was *a piece of cake*.
 a) The test was easy. c) The piece of cake was for the test.
 b) The cake was part of the test. d) The test was sweet.

4. Jesse *hit the sack*.
 a) Jesse was hit by a sack. c) Jesse slept in the sack.
 b) Jesse fell asleep. d) Jesse went to bed.

5. Kate *got the picture*.
 a) Kate understood. c) Kate took the picture.
 b) Kate understood the picture. d) Kate received the picture.

6. Peter *broke the ice* at the party.
 a) Peter crushed the ice at the party. c) Peter made people feel relaxed.
 b) Peter made people feel cold. d) Peter provided cool air at the party.

7. Andy *ate his words*.
 a) Andy was hungry. c) Andy's words were wrong.
 b) Andy admitted being wrong. d) Andy's words were interesting.

8. Rob pulled my leg.
 a) Rob dragged me by the leg. c) Rob hurt my leg.
 b) Rob annoyed me. d) Rob teased me.

9. Tom was *at the back of my mind*.
 a) I was thinking about Tom. c) I liked Tom.
 b) Tom was facing my back. d) Tom had forgotten me.

10. Sue *cleared the air* in the conversation.
 a) The air was not fresh in the conversation. c) Sue cleared her throat in the conversation.
 b) Sue cleared the misunderstanding. d) Sue cleaned up the mess.

11. Julia had to *face the music*.
 a) Julia had to accept the consequences. c) Julia had to attend to the music.
 b) Julia was afraid of the music. d) Julia had to accept her mistake.

12. Linda *twisted my arm* for the deal.
 a) Linda turned my arm in the deal. c) Linda persuaded me to make the deal.
 b) The deal was to twist my arm. d) Linda messed up the deal.

13. David *loosened his grip* on the problem.
- a) David did not have a problem.
 - b) David took it easy on the problem.
 - c) David's problem was easy.
 - d) David solved an easy problem.
14. Our friends *tied the knot* in the church.
- a) Our friends had a knot in the church.
 - b) Our friend started going to church.
 - c) Our friends got married in the church.
 - d) A knot was tied in the church.
15. The robot *cost me an arm and a leg*.
- a) The robot made me lose my arm and a leg.
 - b) The robot was easy to make.
 - c) The robot was cheap.
 - d) The robot was expensive.
16. Bill, *hold your horses* please!
- a) Bill, keep your horses still!
 - b) Bill, don't rush your decision!
 - c) Bill, don't rush your horses!
 - d) Bill, quickly, make a decision!