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# The Role of Mental Imagery in Understanding Unknown Idioms

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## Abstract

In studies of the cognitive processing of idioms, the role of mental imagery in understanding idioms remains a controversial issue. Cacciari and Glucksberg (1995) conducted an experimental study to investigate whether generating mental images of idioms can facilitate their comprehension. Their results appeared to reject both the possible connection between the literal mental image of an idiom and the figurative meaning of the idiom, and the facilitatory effect of mental imagery on comprehension. Our study aims at exploring the facilitatory role of mental images in understanding unknown idioms. We used a paraphrase verification task for transparent and opaque unknown idioms translated from foreign languages into Bulgarian. The results demonstrate that literal mental images of transparent unknown idioms can facilitate their comprehension in terms of error scores in a simple paraphrase verification task. No facilitation effect for opaque unknown idioms was obtained. This points towards a link between the literal mental images of transparent idioms and their figurative meanings.

## Introduction

The bulk of cognitive research on idioms is devoted to comprehension processes. Some have investigated the contribution of the literal and figurative meanings of idioms in the comprehension process, and whether both meanings are computed serially or in parallel (Needham, 1990; Estill&Kemper, 1982; Glass, 1982; Swinney&Cutler, 1979); other studies have shown that at some recognition point literal processing stops and the figurative interpretation becomes available (Cacciari&Tabossi, 1988; Tabossi&Zardon, 1993; Titone&Connine, 1994). Another research area explores the tenet that conceptual metaphors constrain or mediate our understanding of idioms (Gibbs&O'Brien, 1990; Nayak&Gibbs, 1990; Gibbs, 1992). Finally, researchers have also studied the strategies that people use to understand tropes and idioms, for example, using the semantics of the constituent words, analogies, metaphorical extensions, etc. (Cacciari, 1993; Flores d'Arcais, 1993). However, relatively little attention has been paid to the role of mental imagery in the process of understanding figurative language. In some theoretical frameworks, imagery is regarded as an important component

in discovering the figurative meaning of tropes and idioms (Lakoff, 1994; Paivio&Walsh, 1998), although experimental studies have produced contradictory results (Gibbs&O'Brien, 1990; Cacciari&Glucksberg, 1995).

Following Lakoff and Johnson's framework (1980), Gibbs and O'Brien (1990) argue that the meanings of idioms are motivated by conceptual metaphors. For example, the idiom *spill the beans* is motivated by the CONDUIT metaphor which specifies the conceptual mapping that THE MIND IS A CONTAINER and IDEAS ARE ENTITIES. Their claim is that people have conventional images and knowledge for the meanings of idioms. To test this, in Gibbs and O'Brien's experiment, subjects were asked to form a mental image of an idiom and describe it verbally. The results suggest that these images have a dynamic nature and people are able to determine the causes and consequences of the actions in them. The data obtained also confirm the expectation of a high degree of consistency in mental images for idioms with similar figurative meanings. Thus, Gibbs and O'Brien (1990) emphasize that conventional images are "unconscious, automatic, and independent of modularity" (p. 39). They do not propose any algorithm of constructing mental images for idioms but they investigate "the products of speakers' mental images for idioms as a way of discovering the knowledge and information that potentially motivate the figurative meaning of idiomatic phrases in English" (ibid.). Finally, they do not claim that people use mental imagery during 'normal' idiom comprehension given that idioms are processed very rapidly. It is children and non-native speakers of a language but not experienced speakers that may form mental images as a way of understanding idioms.

Contrary to the findings of Gibbs and O'Brien (1990), Cacciari and Glucksberg (1995) claim that the images associated with idioms do not reflect their meanings, moreover, forming mental images does not facilitate the comprehension of idioms. They argue that people cannot bypass the literal meaning when processing idioms and forming a mental image, and that it is much easier to form a literal image of an idiom than a figurative abstract one. In this case the images that reflect the literal meaning of an idiom could not refer to the underlying conceptual

metaphors and should interfere with the comprehension of the figurative meaning of an idiom. Thus, these “wrong” literal images would make comprehension more difficult. Note, however, that Lakoff (1994) does not claim that these conventional images must be figurative; on the contrary, they are rather “literal” and include our general knowledge about the world which maps onto the knowledge of the corresponding conceptual metaphor.

Cacciari and Glucksberg's (1995) study includes three experiments. In the first experiment, subjects were asked to give a paraphrase of the idiom, to form a mental image and describe it. Results showed that of the two -- literal vs. figurative -- predominantly images reflecting the literal meanings of the phrases were generated.

Cacciari and Glucksberg's (1995) second experiment explored the issue whether literal images can facilitate comprehension. They reason that if literal images reflect somehow conceptual analogies, then such images would facilitate comprehension; otherwise, if literal images are unrelated to figurative meanings, they would interfere with comprehension or, at the very least, make it more difficult.

Cacciari and Glucksberg (1995) used a sentence-verification task. Subjects were presented with a sentence which they read and then presented with a second sentence that was either a paraphrase of the first sentence or not. In a between-subject design, subjects either performed the verification task while also generating an image of the first sentence; or without generating images. The results show that verification times were longer when influenced by imagery. In addition, the longer times were not associated with a reduction of errors. It is worth noting here that the rate of errors for idioms did not exceed 3% in any of the conditions, although they used four different types of idioms: familiar transparent, familiar opaque, unfamiliar transparent, and unfamiliar opaque. One possible explanation for the strikingly low rate of comprehension mistakes may be that all idioms were in fact highly familiar since in the familiarity pre-test, subjects were explicitly asked to rate their frequency and not familiarity; alternatively, the idioms were semantically transparent.

Overall, Cacciari and Glucksberg's (1995) results obtained suggest that mental imagery interferes with comprehension and does not facilitate it whether measured by reaction time or by error rate, and literal images of idioms have nothing in common with figurative meanings.

In our view, however, forming literal mental images may facilitate the understanding of completely unknown idioms. If images involve general knowledge of the world, if they can be involved in understanding metaphors alongside linguistic knowledge, then understanding may be an interaction of several processes such as applying knowledge, reasoning, mapping, associations. This combination of processes does not necessarily mean that they entail an equally active participation in comprehension. The degree of involvement may depend on the idiom that is being perceived and its properties, as well as on individual experience and contextual factors.

Let us consider the cognitive processing of an unknown idiom. If the unknown idiom reflects a well-known situation, or if it requires reasoning, applying knowledge, or making associations, then it may be that a literal mental image of the idiom can facilitate the comprehension process. For example, consider the Russian idiom *плавает как монот* (“swims like an axe”). One possible way to understand it is to imagine an axe in water and “see” the axe sinking immediately. The next step could be realizing that the idiom could be referring to a person who cannot swim. So, the concrete-literal mental image can, in principle, lead to an abstract-figurative meaning.

This path from the literal image of an unknown idiom to its figurative meaning, may certainly depend on what kind of idiom it is. Not all idioms have a literal meaning, hence, a literal image that could be created. Moreover, even if such images are easy to produce, not all imageable unknown idioms could thus be understood. For instance, it is hard to understand the Armenian idiom *if a donkey falls, it will break all its teeth* although it is absolutely cartoon-imageable but not transparent in meaning (the idiom refers to ‘a very rocky area’). So, if foreign/unknown idioms are to be understood, they should be semantically transparent and may include some culturally shared concepts. This study attempts to answer some of these controversial issues.

The main aim of the study is to investigate whether generating a literal image of an unknown foreign idiom can facilitate its comprehension. Facilitation here is measured by the error rate and not differences in processing speed. Cacciari and Glucksberg's (1995) line of reasoning that the two phrases to be compared would need to have the same coded representation is indeed convincing. Here an error is defined as failure to recognize the paraphrase of an idiom.

Another purpose of the study is to examine the differences (if any) in comparing an idiomatic meaning with either a literal paraphrase or with an idiomatic equivalent. Such differences may arise because a literal phrase is much more concrete and clear than an idiom. In the case of idioms, often the exact meaning is known but sometimes difficult to put into words, to explain in a succinct and precise form in a short period of time (an analogy with the recognition and naming of a picture). Moreover, idiomatic meanings are often semantically much richer than literal phrases, and idioms can readily map onto much more diverse situations than literal phrases. Hence, comparing the meaning of a known (or the possible meaning of an unknown) idiom to the overall idiomatic meaning of its equivalent would be different from comparing the meaning of an idiom with a literal paraphrase in terms of reaction times (RTs) and/or in terms of the error rate (in percentages).

This experiment examines the on-line processes of generating images, understanding idioms and comparing meanings with two kinds of paraphrases: literal and idiomatic. The method is similar to that used by Cacciari and Glucksberg (1995). The main difference is that unknown foreign idioms were used as target phrases. These idioms were translated from Armenian and Russian word-

by-word into Bulgarian. Subjects had to verify paraphrases under two main conditions, one with, and the other without forming a literal mental image of the target idiom (in a within-subject design). The following is an example of the experimental material (the set) and its translation.

**target idiom**

*чета проповед в ухото на глух*

(to read a sermon into a deaf person's ear)

**paraphrases:**

**related**

**idiomatic phrase** *преливам от пусто в празно*

(to pour from one empty place to another)

**literal phrase** *правя усилия безполезно*

(to make useless efforts)

**unrelated**

**idiomatic phrase** *хвърлям последния си коз*

(to throw down one's last trump card)

**literal phrase** *не си върша задълженията*

(to not complete one's duties)

## Method

**Subjects** A total of 80 subjects (28 males and 52 females) participated in the experiment. All were native Bulgarian speakers, university students. The age range was from 17 to 28. Subjects were paid for their participation.

**Design and Stimuli** A factorial 2x2x2x2 design was used, with RTs and rate of errors as dependent variables. The within-group factors were Imagery task (Imagery, Non-imagery), Source Language of the target idiom (Foreign, Bulgarian), Type of Paraphrase (Literal, Idiomatic), Relatedness of paraphrase to the target (Related, Unrelated). The stimuli consisted of the word-by-word translations of 30 foreign target idioms (16 Armenian and 14 Russian) and 30 Bulgarian target idioms. All target idioms had the form V(PP)NP, and the verb-form was in the first person, singular, present tense. 30 literal and 30 idiomatic paraphrases for the targets were used in the Related paraphrase condition, and 30 literal and 30 idiomatic phrases were used as "false" paraphrases, i.e., unrelated to the target. The average length (in words) of target phrases was 4.2, of literal paraphrases - 2.9, and of idiomatic paraphrases - 3.7 words. The selected foreign target stimuli did not include similes, and paraphrases did not include words semantically related to the targets.

All 150 Bulgarian idioms were selected after a pre-test with independent familiarity and frequency ratings using a 5-point scale (5 -- most familiar or most frequent, respectively). A total of 28 subjects participated in the pre-test. The age range was from 18 to 30. None of them participated in the main on-line experiment later. The idioms thus selected from the pre-test had the mean value of 4.3 for familiarity and of 3.2 for frequency of use.

**Procedure** 16 randomized lists of 60 sets of stimuli each were constructed so that each subject was presented with all the 60 target idioms and one out of four paraphrases. The

experiment was divided into two main parts, named Non-imagery and Imagery, after the two tasks. Every subject was run on both parts. In the first Non-imagery condition the procedure was the following. The target idiom appeared on a white background, at the center of the screen. Subjects had to read the idiom, decide whether they know it or not (familiarity decision) and press a corresponding button (Yes or No). Immediately after the response (zero inter-stimulus interval), a paraphrase appeared on a light grey background. Subjects then performed a phrase-verification task, i.e., they had to decide whether the meaning of the paraphrase matches the meaning of the target idiom, and press the corresponding button (Yes or No). Each trial began with a central black fixation marker ('+') for 500 ms and the inter-trial interval was 3 sec. The reaction time was measured from the onset of the stimulus (paraphrase) till the subject's response. After the first Non-imagery condition, subjects had a 5-minute break. In the second, Imagery condition, subjects had to read the target idiom, imagine it as a "picture" and press a Yes button immediately afterwards. The remaining procedure was the same as in the first experimental condition (Non-imagery), i.e., subjects performed a phrase verification task. Both experimental conditions started with 8 practice trials.

Every 60-trial list of stimuli was randomly divided into two subsets, consisting of 30 paired stimuli for each of the two experimental conditions (Imagery and Non-Imagery). The assignment of Yes and No values to the buttons was counterbalanced across subjects. The experiment lasted approximately 30-40 min. Subjects were tested individually in a sound-proof room. A Power Macintosh 6400/200 equipped with PsyScope software controlled stimuli presentation, timing, and response collection.

## Results and Discussion

The analysis was carried out by items averaged over subjects. RTs and responses for the phrase verification task were analyzed in a 2 (Imagery vs Non-imagery) x 2 (Foreign vs Bulgarian targets) x 2 (Literal vs Idiomatic paraphrases) x 2 (Related vs Unrelated paraphrases) analysis of variance.

### Analysis of Phrase Verification Task

**Reaction Times (RTs)** Main effects for all four independent variables on RT were obtained. There was a significant main effect of Imagery ( $F_{(1,420)}=37.91$ ;  $p<0.00$ ); the phrase-verification task took longer to complete in the imagery condition (mean response time of 2475 ms,  $SD=589$ ) than in the non-imagery condition (mean  $RT=2179$  ms,  $SD=537$ ). This may mean that the mental image of the target idiom interferes with the linguistic representation of the paraphrase which replicates the results of Cacciari and Glucksberg (1995).

A main effect of Source Language was also obtained ( $F_{(1,420)}=77.46$ ;  $p<0.00$ ). For Bulgarian target idioms, paraphrase verification took less time ( $MRT=2116$  ms,  $SD=506$ ) than for Foreign targets ( $M=2539$  ms,  $SD=578$ ).

Thus, phrase verification was significantly faster for the familiar-familiar pairs than for the unknown-familiar pairs.

The main effect of the Type of Paraphrase also reached significance ( $F_{(1,420)}=8.16$ ;  $p<0.00$ ). The mean RT for verification of literal paraphrases was shorter (2259 ms,  $SD=617$ ) than for idiomatic paraphrases (2396 ms,  $SD=542$ ). This may be due to the different lengths of the paraphrases and/or the less ambiguous meaning of the literal phrase compared with the idiomatic one.

The main effect of Relatedness of Paraphrase was also significant ( $F_{(1,420)}=14.72$ ;  $p<0.00$ ). The mean RT for the Related Paraphrase condition was faster (2235 ms,  $SD=602$ ) than for Unrelated (2420 ms,  $SD=552$ ).

A significant interaction between Source Language and Relatedness ( $F_{(1,420)}=18.60$ ;  $p<0.00$ ) was also found, i.e. the main effect of Relatedness of Paraphrase was not observed in the Foreign condition. Mean response times are presented in Table 1.

Table 1: Mean RTs (ms) for Source Language by Relatedness

	Bulgarian	Foreign
Related	1917 ms	2551 ms
Unrelated	2314 ms	2537 ms

The main effect of Relatedness is visible in these results as well in that the phrase verification task took less time when there was a real paraphrase (the phrase was related to the target). Note, however, that this effect holds only for the familiar Bulgarian targets. Relatedness did not make a difference to the processing of the semantic comparison between paraphrases and unfamiliar targets. Not surprisingly, the task was performed overall faster with familiar than with unfamiliar targets.

**Error Rate (%)** Three main significant effects were found. In the main effect of Source Language the familiarity (Bulgarian target) advantage was obtained ( $F_{(1,420)}=50.20$ ;  $p<0.00$ ); the error rate was lower for Bulgarian targets (12.5%) than for foreign ones (24.6%). The main effect of Type of Paraphrase ( $F_{(1,420)}=16.87$ ;  $p<0.00$ ) showed the advantage of literal paraphrases (15.3% error rate) over idiomatic ones (21.9%). The main effect of Relatedness ( $F_{(1,420)}=37.40$ ;  $p<0.00$ ) revealed fewer comprehension errors for unrelated paraphrases (13.6% of "false alarms") vs. related ones (24.0% of "misses"). These results may be partly explained by the fact that unrelated literal paraphrases were concrete and unusual to serve as possible paraphrases of idioms. Subjects may have chosen a strategy to reject these cases due to their obvious unrelatedness to the target idioms. No significant overall main effect of the Imagery factor was found.

The only significant interaction obtained was that between Relatedness and Source Language ( $F_{(1,420)}=5.06$ ;  $p<0.03$ ). Mean rates of errors are presented in Table 2.

Table 2: Mean Percentage of Errors for Source Language by Relatedness

	Bulgarian	Foreign
Related	16 %	32 %
Unrelated	9 %	18 %

Significant differences across all combinations of the four conditions were found (except for Bulgarian Related and Foreign Unrelated conditions). In both cases unrelated paraphrases were verified with better success than related ones. This again may be partially explained by the way the unrelated literal paraphrases were selected. Overall, paraphrases for Bulgarian target idioms were verified with a lower error rate than the foreign ones.

### Separate analysis by Source Language, Error Rate (%)

In order to reveal the contribution of imagery, a separate analysis over the two levels of Source Language was conducted. For Bulgarian target idioms, no effect was found but for Foreign target idioms, there was a main effect of Imagery ( $F_{(1,215)}=3.94$ ;  $p<0.05$ ). The Imagery condition showed an advantage (only 22% of errors) over the Non-imagery condition (27% error rate). The absence of the imagery effect on Bulgarian targets showed that imagery had no facilitatory effect on the processing of familiar idiom but it did on unfamiliar ones.

To explore the nature of the Imagery effect further, a post-test on the levels of transparency of foreign idioms was carried out.

**Post-test** The 30 foreign idioms were randomly assigned to two separate questionnaire lists, with each idiom placed on a separate sheet of paper. Subjects were 26 native Bulgarian speakers who were asked to guess the meanings / paraphrases of these unfamiliar idioms. There was no time limit in completing the task. The responses were evaluated for accuracy by two independent judges and averaged as the percentage of correct answers for each idiom. On this basis, idioms were categorized as transparent (correct guesses exceeding 60%) and opaque (lower than 60%). As a result, 15 transparent (Mean=74%,  $SD=14$ ) and 15 opaque (mean=20%,  $SD=14$ ) idioms were identified.

### Analysis of Phrase Verification for Foreign targets only

Responses and RTs for items averaged over subjects for the phrase verification task were analyzed in a 2 (Imagery vs Non-imagery) x 2 (Transparent vs Opaque) x 2 (Literal vs Idiomatic paraphrases) x 2 (Related vs Unrelated) analysis of variance.

**Reaction Times (RTs)** The overall main effect of imagery on RT was repeated here as well ( $F_{(1,207)}=19.79$ ;  $p<0.00$ ) with subjects being faster in the Non-imagery condition (2375 ms,  $SD=503$ ) than the Imagery (2706 ms,  $SD=601$ ) one. A significant two-way interaction of Transparency and

Relatedness ( $F_{(1,207)}=15.22$ ;  $p<0.00$ ) was also found. Mean response times are presented in Table 3.

Table 3: Mean RTs (ms) for Transparency by Relatedness

	Transparent	Opaque
Related	2364 ms	2731 ms
Unrelated	2647 ms	2432 ms

There were significant differences across all combinations of the four conditions. It is important that a similar trend is observed here in verifying familiar-familiar pairs and transparent unknown-familiar pairs. In both cases Related paraphrases were verified faster than Unrelated (cf. Tables 1 and 3), with the implication that transparent idioms may be treated as familiar, and similar mechanisms may be involved in their processing in the verification task. For Opaque idioms, the verification time changed in the opposite direction.

**Error Rate (%)** Four significant main effects were found on the rate of errors as a dependent variable: Type of Paraphrase ( $F_{(1,207)}=13.91$ ;  $p<0.00$ ), Relatedness ( $F_{(1,207)}=37.36$ ;  $p<0.00$ ), Imagery ( $F_{(1,207)}=5.38$ ;  $p<0.02$ ), that were replications of the previous discussed, and Transparency ( $F_{(1,207)}=16.65$ ;  $p<0.00$ ) that showed lower rate of errors for transparent idioms than for opaque (20% vs 29%). Two significant two-way interactions were also obtained: Transparency by Relatedness ( $F_{(1,207)}=21.73$ ;  $p<0.00$ ), and Paraphrase by Relatedness ( $F_{(1,207)}=5.97$ ;  $p<0.02$ ). Two significant three-way interactions, Imagery by Transparency by Relatedness ( $F_{(1,207)}=4.38$ ;  $p<0.04$ ) and Imagery by Transparency by Type of Paraphrase ( $F_{(1,207)}=4.03$ ;  $p<0.00$ ), are shown in Figures 1 and 2, respectively. The mean error values for every condition are shown in Tables 4 and 5.

As Figure 1 and Table 4 demonstrate, there was a significant shift in the rate of errors for transparent idioms in the Related paraphrase condition (29% in the Non-imagery vs 14% in the Imagery condition). No imagery effects were found on either semantically transparent or opaque idioms in the Unrelated paraphrase condition, as well as on the opaque idioms in the Related paraphrase condition. The lack of significance and rather low rate of errors in the Unrelated paraphrase condition can be partially attributed to the way the stimuli for the literal unrelated phrases were selected.

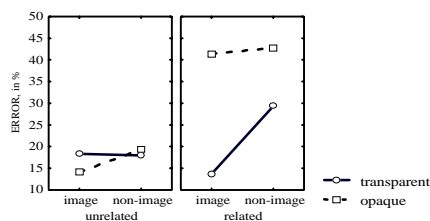


Figure 1: Imagery by Transparency by Relatedness interaction

Table 4: Mean Error Rates for Imagery by Transparency by Relatedness

	Transparent		Opaque	
	Image	N-image	Image	N-image
Related	14 %	29 %	41 %	43 %
Unrelated	18 %	18 %	14 %	19 %

The facilitatory role of imagery (Figure 2, Table 5) was also observed in the verification task results particularly for idiomatic paraphrases of transparent idioms. In the Imagery condition the rate of errors was reduced down to the level of literal paraphrases in both Imagery and Non-imagery conditions. Literal paraphrases of transparent idioms were verified with the same success (low rate of errors) as paraphrases for familiar Bulgarian target idioms (Table 2). There was no imagery effect on opaque idioms although a trend toward improved comprehension in the Imagery condition may be observed in the case of literal paraphrases.

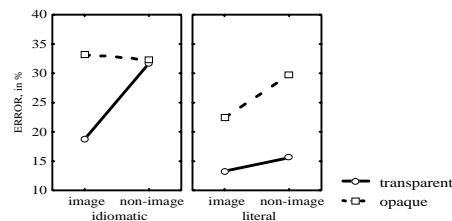


Figure 2: Imagery by Transparency by Type of Paraphrase

Table 5: Mean Error Rates for Imagery by Transparency by Type of Paraphrase

	Transparent		Opaque	
	Image	N-image	Image	N-image
Idiomatic	19 %	32 %	33 %	32 %
Literal	13 %	16 %	22 %	30 %

## Conclusion

The main goal of this study was to explore the facilitatory role of mental images in comprehending unknown idioms. Results have shown that indeed, constructing literal images of unknown idioms can help in understanding the idiom, not in terms of faster processing but in terms of decreasing percentage of mistakes in recognizing a paraphrase of the idiom. This effect is particularly salient in the processing of semantically transparent idioms and is stronger when unknown idioms are compared with an idiomatic paraphrases and not with literal ones. Furthermore, the contribution of mental imagery is such that it produces fewer mistakes of the “miss” type for transparent idioms, i.e., subjects improve their ability to recognize a real paraphrase as equivalent in meaning to the target. Semantically opaque idioms, on the other hand, seem to be indifferent to the imagery task, though a trend toward better

understanding may be observed in the case of literal paraphrases.

Another aim of the study was to test whether different types of paraphrases (literal and idiomatic) could influence the degree of understanding unknown idioms. The hypothesis was that since idioms may be viewed as semantically broader or more vague than literal paraphrases subjects would more readily match idiomatic paraphrases with unknown target idioms than literal paraphrases. As a result they would make fewer mistakes with idiomatic paraphrases than with literal ones. This hypothesis was rejected by the results which revealed the opposite picture - subjects made considerably fewer mistakes with literal paraphrases than with idiomatic ones. One possible explanation derives from the same feature of idioms, i.e., their semantic and 'situational' broadness which may have caused subjects to reach a negative decision on the verification task much more frequently than necessary, hence, these results.

To conclude, the results show that transparency plays only a minor role in comparison with familiarity, and that familiarity itself is only useful as a concept in its own right, not by proxy of frequency. The results also demonstrate that constructing a literal image helps our understanding of unknown transparent idioms whether by unconscious applying general knowledge of the world, unconscious reasoning or some other process involved in understanding. Thus, there exists a close link between figurative meanings of transparent unknown idioms and their literal mental images.

This study, however, has helped to explain further the mechanisms of comprehension of unknown idioms and the role of mental imagery in this process. It remains to be seen whether mental imagery facilitates not only the comprehension but also the process of learning and retrieving from memory of figurative speech.

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### References

- Cacciari, C. (1993). The Place of Idioms in a Literal and Metaphorical World. In C. Cacciari & P. Tabossi (Eds.), *Idioms: Processing, Structure, and Interpretation*. NJ, US: Lawrence Erlbaum Associates, Inc.
- Cacciari, C. and Glucksberg, S. (1995). Understanding Idioms: Do Visual Images Reflect Figurative Meanings? *European Journal of Cognitive Psychology*, 7(3), 283-305.
- Estill, R. B. & Kemper, S. (1982). Interpreting Idioms. *Journal of Psycholinguistic Research*, 11(6), 559-568.
- Flores d'Arcais, G. B. (1993). The Comprehension and Semantic Interpretation of Idioms. In C. Cacciari & P. Tabossi (Eds.), *Idioms: Processing, Structure, and Interpretation*. NJ, US: Lawrence Erlbaum Associates, Inc.
- Gibbs, R.W., JR. & O'Brien, J. (1990). Idioms and Mental Imagery: The Metaphorical Motivation for Idiomatic Meaning. *Cognition*, 36, 35-68.
- Gibbs, Raymond W., JR. (1992) What Do Idioms Really Mean? *Journal of Memory and Language*, 31, 485-506.
- Glass, A. L. (1983). The Comprehension of Idioms. *Journal of Psycholinguistic Research*, 12(4), 429-442.
- Lakoff, G. & Johnson, M. (1980). *Metaphors We Live By*. Chicago: Chicago University Press.
- Lakoff, G. (1994). What is Metaphor? In J. Bardner & K. Holyoak (Eds.) *Advances in Connectionist and Neural Computational Theory. Analogy, Metaphor, and reminding*. Vol.3. Norwood, NJ: Ablex.
- Nayak, N. P. & Gibbs, R. W., Jr. (1990). Conceptual Knowledge in the Interpretation of Idioms. *Journal of Experimental Psychology: General*, 119(3), 315-330.
- Needham, W. P. (1992). Limits on Literal Processing During Idiom Interpretation. *Journal of Psycholinguistic Research*, 21(1), 1-16.
- Paivio, A., & Walsh, M. (1998). Psychological Processes in Metaphor Comprehension. In A. Ortony (Ed.), *Metaphor and Thought*, 2<sup>nd</sup> Ed, Cambridge: University Press.
- Swinney, D. A., & Cutler, A. (1979). The Access and processing of Idiomatic Expressions. *Journal of Verbal Learning and Verbal Behavior*, 18, 523-534.
- Tabossi, P. & Zardon, F. (1995). The Activation of Idiomatic Meaning. In M. Evaraert, E.-J. van der Linden, A. Schenk, R. Shreuder (Eds.). *Idioms: Structural and Psychological Perspectives* NJ, US: Lawrence Erlbaum Associates, Inc.
- Titone, D. A., & Connine, C. M. (1994). Comprehension of Idiomatic Expressions: Effects of Predictability and Literality. *Journal of Experimental Psychology: Learning, memory, and Cognition*, 20(5), 1126-1138.