

Metaphor in Idiom Comprehension

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Psycholinguistic research has shown that people's tacit knowledge of conceptual metaphors, such as ANGER IS HEATED FLUID IN A CONTAINER, partly motivates how they make sense of idiomatic phrases like *blow your stack* and *flip your lid*. But do people quickly access conceptual metaphors each time an idiom is encountered in discourse? The present studies used a priming method to examine the role of conceptual metaphors in immediate idiom comprehension. Experiment 1 showed that people access conceptual metaphors when understanding idioms, but significantly less so when processing literal paraphrases of idioms. Experiment 2 demonstrated that people access the appropriate conceptual metaphors, such as ANGER IS HEAT, when processing some idioms, such as *blow your stack*, but not when they read idioms, such as *jump down your throat*, which have similar figurative meanings that are motivated by different conceptual metaphors (e.g., ANGER IS ANIMAL BEHAVIOR). The findings from these studies provide important evidence on the constraining role that common patterns of metaphorical thought have in figurative language understanding. © 1997 Academic Press

An important idea in contemporary cognitive science is that metaphor is not just an aspect of language, but constitutes a significant part of human cognition (Gibbs, 1994; Johnson, 1987; Lakoff, 1987; Lakoff & Johnson, 1980; Sweetser, 1990). Many concepts, especially abstract ones, are partly structured via the metaphorical mapping of information from a familiar source domain onto a less familiar target domain. For instance, people often metaphorically conceptualize love by mapping their knowledge of physical journeys onto their knowledge of love (i.e., LOVE IS A JOURNEY). Our metaphorical conceptualization of love partly motivates the creation and use of linguistic expressions found in everyday speech and literature that refer to love and love relationships (e.g., *Our marriage is off to a great start*, *Their relationship is at a cross-roads*, *Her marriage is on the rocks*, *After seven years of marriage, we're spinning our wheels*, and *We're back on track again*).

What role does metaphorical thought, such

as our metaphorical concepts for love, play in how people use and understand language? There are, at least, four different hypotheses that address this question (Gibbs, 1994):

- H1. Metaphorical thought plays some role in the historical evolution of what words and expressions mean.
- H2. Metaphorical thought motivates the linguistic meanings that have currency within linguistic communities, or is presumed to have some role in people's understanding of language.
- H3. Metaphorical thought motivates an individual speaker's use and understanding of why various words and expressions mean what they do.
- H4. Metaphorical thought functions in people's immediate on-line use and understanding of linguistic meaning.

These hypotheses are not mutually exclusive of one another but reflect a hierarchy of possibilities about the interaction between metaphorical patterns of thought and different aspects of language use and understanding. Several kinds of empirical evidence from cognitive linguistics and psycholinguistics support some of these ideas. Linguistic studies on the role of metaphor in semantic change

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support Hypothesis (1) (Sweetser, 1990), while other research on the systematicity of different linguistic expressions demonstrates a tight link between conceptual metaphors and speakers' presumed understanding of various verbal expressions as suggested by Hypotheses (2) and (3) (Lakoff, 1987; Lakoff & Johnson, 1980). Many psycholinguistic experiments support the claim in Hypothesis (3) that metaphoric thought motivates why many words and expressions mean what they do to contemporary speakers and also influences people's learning of different linguistic meanings (Gibbs, 1994). However, it still is unclear whether metaphoric thought is accessed in people's immediate production and understanding of linguistic meaning (Hypothesis 4).

Our goal in the studies we report was to examine whether pre-existing conceptual metaphors affect immediate idiom comprehension. Most figurative language scholars do not view idioms as being especially metaphorical because these phrases are classic examples of dead metaphors (see Gibbs, 1993, 1994 for discussions of the traditional view of idiomaticity). Idioms might once have been metaphorical, but over time have lost their metaphoricality and now exist in our mental lexicons as frozen, lexical items. Yet a closer look at idiomaticity, one that seeks important generalizations across different idiomatic phrases, reveals that idioms do not exist as separate semantic units within the lexicon, but actually reflect coherent systems of metaphorical concepts. For example, the idiomatic phrases *blow your stack*, *flip your lid*, *hit the ceiling*, *get hot under the collar*, *lose your cool*, and *get steamed up* appear to be motivated by the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER, which is one of the small set of conceptual mappings between different source and target domains that form part of our conceptualization for anger. Even though the existence of these conceptual metaphors does not predict that certain idioms or conventional expressions *must* appear in the language, the presence of these independent conceptual metaphors provides a partial motivation for why specific phrases (e.g., *blow*

your stack) are used to refer to particular events (e.g., getting very angry).

Various psycholinguistic evidence supports the idea that metaphors such as ANGER IS HEATED FLUID IN A CONTAINER are really conceptual and not, more simply, generalizations of linguistic meaning. These include studies that have looked at people's mental imagery for idioms (Gibbs & O'Brien, 1990), people's context-sensitive use of idioms (Nayak & Gibbs, 1990; Gibbs & Nayak, 1991) and euphemistic phrases (Pfaff, Gibbs, & Johnson, in press), people's folk understanding of how the source domains in conceptual metaphors constrain what idioms mean (Gibbs, 1992), people's use of conceptual metaphors in organizing information in text processing (Allbritton, McKoon, & Gerrig, 1995), and people's use of conceptual metaphors in drawing inferences when reading poetic metaphors (Gibbs & Nascimento, 1996). Together these psycholinguistic findings lend credence to the hypothesis that different kinds of metaphoric thought partly explain why many metaphors and idioms have the meanings they do for contemporary speakers (Hypothesis 3 above).

Although preexisting conceptual metaphors appear to influence many aspects of how people make sense of idiomatic meaning, some scholars have criticized the conceptual metaphor approach as a theory of immediate metaphor and idiom comprehension (Glucksberg & Keysar, 1990; Glucksberg, Keysar, & McGlone, 1992; Glucksberg, Brown, & McGlone, 1993; Kreuz & Graesser, 1991; McGlone, 1996). These researchers argue that even though pre-stored metaphorical mappings may be available, such knowledge may not always be accessible and used in any given context. Under this claim, the above Hypothesis (3) may be true, but not for Hypothesis 4. One recent set of studies, for example, showed that conceptual metaphors influence people's judgments of the appropriateness of idioms in different contexts, but do not appear to be accessed during immediate idiom comprehension, at least as measured by global reading times for idioms in different metaphoric

contexts (Glucksberg et al., 1993). Although Gibbs (in press) also failed to find a reading time advantage for idioms in contexts that depicted similar metaphorical conceptualizations, Pfaff et al. (in press) found in a full-phrase reading task that euphemisms were understood more quickly in contexts that depicted similar metaphors than in contexts that conveyed different conceptual metaphors.

The conflicting findings from this research suggest that global reading time measures of comprehension may not provide the best method for assessing whether conceptual metaphors are accessed during immediate idiom comprehension. The main goal of the present studies was to employ a more sensitive, on-line priming measure to examine the role of conceptual metaphors in immediate idiom processing. As we'll point out in the General Discussion, the evidence that people appear to access conceptual metaphors during idiom comprehension does not necessarily imply that idioms are only understood via conceptual metaphors. It may even be the case that conceptual metaphors do not especially facilitate on-line processing of idiomatic meaning. But, for now, our aim is to demonstrate that conceptual metaphors are tightly linked to idioms and are often accessed when idioms are understood.

EXPERIMENT 1

The purpose of Experiment 1 was to investigate whether people access metaphorical knowledge during on-line processing of idioms. Participants in this study read simple stories, one line at a time on a computer screen, which ended in one of three different phrases: an idiomatic expression, a literal paraphrase of the idiom, or a control sentence. Immediately after reading the final phrase and pushing the comprehension button, the participants were presented with a letter string and had to decide as quickly as possible if the letter string constituted an English word (i.e., a lexical decision task). These letter strings or targets were words that were related to conceptual metaphors

motivating appropriate idioms (e.g., *heat* which represents ANGER IS HEATED FLUID IN A CONTAINER that motivates *blow your stack*), or were word that were unrelated to these conceptual metaphors (e.g., *lead*).

If people actually access specific conceptual metaphors (e.g., ANGER IS HEATED FLUID) during understanding of idiom phrases (e.g., *He blew his stack*), then this activated metaphorical knowledge should facilitate or prime participants' responses to the related targets (e.g., *heat*) compared to the time it takes people to respond to the unrelated targets. Moreover, people should be faster in responding to the related targets having read idioms than when they read either literal paraphrases (e.g., *He got very angry*) or control sentences (e.g., *He saw many dents*). Overall, we expected evidence of an interaction between the type of final phrase (i.e., idioms, literal phrases, and control phrases) and type of target (i.e., related and unrelated).

The self-paced reading task followed by the visual lexical decision task we employed is not the only way to explore cognitive factors in on-line language processing. For example, psycholinguistic studies that focus on immediate lexical processing often employ auditory or cross-modal priming methods to examine the activation of different conceptual or linguistic information (Cacciari & Tabossi, 1988; Tabossi & Zardon, 1993). However, our interest in the role of conceptual metaphors in processing of complete idiom phrases necessitated that we get some measure that people actually understood these figurative phrases before they responded to the target strings. For this reason, it seemed most appropriate as a first step in this research program to employ a self-paced reading task in combination with the lexical decision or priming task.

Method

Subjects. Thirty-four undergraduate students attending the University of California, Santa Cruz participated as subjects. All of the participants were native English speakers.

Stimuli and design. Fifteen brief stories, av-

eraging seven lines in length, were written that described ordinary events (e.g., people lending their cars to other people). These stories were written in a neutral manner and did not provide any specific metaphorical information on how the topic of the final phrase should be conceptualized. Each story ended in one of three final expressions: an idiomatic phrase, a literal statement that conveyed the same meaning as the idiom, or a control sentence. All of the idiomatic expressions were selected from standard idiom dictionaries (Boatner, Makkai, & Gates, 1975; Long & Summers, 1979). People were equally familiar with these idioms as determined by a separate norming study with 18 UC Santa Cruz undergraduate students. The literal paraphrases were taken, in most cases, from previous research that specifically rated the equivalency of idioms with different literal phrases (Gibbs, 1992; Gibbs & O'Brien, 1990). A rating study with 14 undergraduate students showed that the idioms and literal paraphrases were generally equivalent in meaning. A list of control phrases was also constructed which fit with the story contexts, but were not similar in meaning to the other final phrases. The three types of final phrases (i.e., the last line presented for each story) were roughly equal in length as assessed by the number of characters in each expression (18.4 for the idioms, 17.5 for the literal phrases, and 19.1 for the control phrases).

The word targets were selected in the following manner. Previous research in linguistics and psycholinguistics suggested the different conceptual metaphors that motivate the 15 idioms used as stimuli in this study. For example, it is widely recognized that the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER partly motivates the idiom *blow your stack*. Although it is difficult to capture the meaning of an entire metaphor by a single word target, we attempted to do this for the conceptual metaphor that partly motivated each of the 15 idioms used as final sentences. We presented 20 UC Santa Cruz students with 15 conceptual metaphors that previously were seen as motivating the idioms

(Gibbs, 1992; Gibbs & O'Brien, 1990), along with several words. For example, in the case of ANGER IS HEATED FLUID IN A CONTAINER, we presented participants with the words *heat*, *fluid*, and *container*. The participants were told to select one word that best captured the overall meaning of the conceptual metaphor. An analysis of participants' choices indicated that one word for each conceptual metaphor was selected by at least 80% of all the participants. We used these words as the related targets in the main experiment. The unrelated words were selected by choosing words that differed in meaning, but were roughly equivalent in length as the related targets. An analysis of the overall frequencies of the related ($M = 974$) and unrelated ($M = 939$) target words showed that these did not statistically differ. Finally, in addition to the experimental stimuli, a group of 15 stories were written that ended with the same three types of final sentences, but which were followed by letter strings that did not form English words. Participants were expected to respond "no" to the targets in these filler stories. Appendix A presents the final phrases and target words used as the experimental stimuli in this study.

All together there were 30 stories, 15 experimental and 15 filler, and these were divided in a counterbalanced manner into six lists. Each list contained 5 stories ending with idioms, 5 ending with literal paraphrases, and 5 ending with control phrases in addition to the 15 filler stories. For any group of 5 final phrases in a list, either 3 ended in related targets (and 2 ended in unrelated targets) or 3 ended in unrelated targets (and 2 ended in related targets). Across the 6 lists of stories, though, equal number of participants saw equal numbers of the same types of final phrases and targets.

Procedure. Participants were randomly assigned to one of the counterbalanced lists of stories. The scenarios were presented one line at a time on the CRT that was under the control of an IBM Personal System/2 Model 30 computer system. Participants were asked to read each line of the story as it appeared and

to press a designated button as soon as they understood it. When the designated key was pressed the next sentence of the scenario appeared. Participants read through the stories in this line-by-line manner until they read the final phrase. They were instructed to give their comprehension responses as quickly as possible, but to be sure that they understood each line before pushing the designated button. Response latencies were measured from the onset of the phrase to when the participants pressed the response key. Immediately after pushing the comprehension button for the final phrase, a beep tone sounded and a letter string appeared in the middle of the CRT ($ISI = 0$ ms). The participants were instructed to make a lexical decision response to this letter string as quickly as possible by pushing one of two designated buttons on a keyboard. Following this lexical decision response, there was a delay of four seconds and then the first line of the next story appeared. The stories were presented in a different random order for each subject. Participants were given eight practice trials before the main experimental session.

The participants were warned in the instructions that they should pay attention to the stories because at the end of the experimental sessions they would be asked questions about what they read. Immediately after the main experimental session, the participants were presented with 32 stories, each printed on a card. Half of these stories and their final phrases were presented in the experiment and half were new. The new ones were close derivations of stories the participants already saw. The participants' task was to correctly recognize the stories they had just read. No participant failed to correctly recognize 75% of the stories (hits and correct rejections) and so all the subjects were included in the data analysis. The experiment took about 25 min to complete.

Results and Discussion

Reading times longer than 3 s (less than 1% of all responses) and lexical decisions longer than 2.5 s (less than 1% of all responses) were eliminated from the analyses. These outliers

TABLE 1
RESULTS IN MILLISECONDS FOR EXPERIMENT 1

	Related target	Unrelated target
Reading times for final phrases		
Idioms	1139	1122
Literal paraphrases	1215	1277
Control sentences	1367	1378
Lexical decision times for targets		
Idioms	752 (.04)	929 (.03)
Literal paraphrases	921 (.02)	880 (.04)
Control sentences	986 (.04)	954 (.06)

Note. Error rates are in parentheses.

represented cases in which experimental instructions could not have been followed, as when participants' attention wandered from the task. The times to read the last lines of the stories and the latencies to make the lexical decision responses are presented in Table 1. Only reading times and lexical decision times in which participants subsequently made a correct lexical decision are included in the analyses.

For both the reading and the lexical decision times, two analyses of variance were performed: once treating subjects as a random factor while collapsing over materials ($F1$), and once treating materials as the random factor while collapsing over subjects ($F2$). An analysis of the reading times for the three types of final sentences showed that these varied significantly, $F1(2,66) = 7.52, p < .001$; $F2(2,84) = 3.42, p < .05$. There was no effect of target type, nor was the interaction of target type and final phrase significant (all F s < 1). Newman-Keuls tests revealed that the reading times for the idioms were significantly faster than for the control sentences ($p < .05$ across both subjects and items). The difference between the literal phrases and the control phrases was not significant ($p > .10$ across subjects and items). These data are consistent with earlier findings showing that idioms take no longer to process than literal paraphrases of

idioms (Gibbs, 1980, 1986; Ortony, Schallert, Reynolds, & Antos, 1978).

An analysis of the time it took participants to make their lexical decisions to the different targets showed that people were faster overall in responding to the related than to the unrelated targets, although this effect was only significant in the subject analysis $F(1,33) = 4.37, p < .001, F(2,84) = 1.03, p > .10$. There were significant differences in the response times to the two targets across the three different final sentences, $F(2,66) = 7.04, p < .01, F(2,84) = 4.39, p < .05$. The critical interaction of target type and final sentence was also reliable, $F(2,66) = 13.61, p < .001, F(2,84) = 3.97, p < .05$. Newman-Keuls tests showed that people were faster in responding to the related targets than the unrelated ones after reading the idioms ($p < .001$ across both subjects and items for both comparisons), but not when they read either the literal paraphrases or control sentences. The participants were also significantly faster making lexical decisions to the related targets having read the idioms than when they read the literal paraphrases or control sentences ($p < .001$ across both subjects and items for both comparisons). Finally, analysis of the error rates for the lexical decision task revealed no reliable effects.

The results from this study suggest that conceptual metaphors are accessed during people's normal comprehension of idioms. These priming effects were found under conditions in which participants were not alerted to the metaphorical nature of idiomatic phrases.

One alternative explanation of the priming effects in Experiment 1 is that people should be fast in responding to a related target such as *heat* when they read *blew his stack* because of their association of one literally blowing stacks and the idea of heat, not because people access their metaphorical concept of ANGER IS HEATED FLUID IN A CONTAINER. This is an important, but difficult, hypothesis to examine experimentally. The best way to test this idea would be to place the same final idioms in contexts that induced literal readings of these phrases (e.g., to put *blow your stack*

in a context so that it means something like "push down a stack with wind"). In this situation, we would not expect priming of the metaphorically relevant word *heat* because the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER would not be activated; as the phrase *blow your stack* would only have a literal meaning. We attempted to do this in the following study.

In this control study, 24 UC Santa Cruz students read different stories than were used in Experiment 1. The stories in this control study created literal readings for phrases such as *blew his stack*. An example of one story inducing an idiom's literal meaning is given in the following:

John and Fred were chimney sweepers.

They worked on the big chimneys at large factories.

They would scrape the insides with long poles.

To remove the debris when they were done, they would

blow the stack. (literal use of idiom)

vacuum the dirt. (literal paraphrase)

get a big truck. (control phrase)

After reading each final phrase, participants responded to the related and unrelated targets used in Experiment 1. If people were faster making lexical decisions to the related targets (e.g., *heat*) having read a literal version of an idiom than when they read a literal paraphrase of this idiom (e.g., *vacuum the dirt*), the results of Experiment 1 may not be due to participants inferring the underlying conceptual metaphors of idioms. These predictions follow from earlier evidence that the inferences readers draw during reading can be influenced by lexical priming (McKoon & Ratcliff, 1992).

Before running this control study, we first asked a different group of 12 undergraduate students to rate the "naturalness" of the three final phrases in context. Participants made these ratings on a 7-point scale, with higher ratings reflecting their judgments of greater "naturalness." Analysis of these ratings showed no statistical differences in the means

TABLE 2
RESULTS IN MILLISECONDS FOR CONTROL STUDY
IN EXPERIMENT 1

	Related target	Unrelated target
Reading times for final phrases		
Idioms	1576	1601
Literal paraphrases	1493	1487
Control sentences	1513	1499
Lexical decision times for targets		
Idioms	899 (.05)	914 (.03)
Literal paraphrases	933 (.04)	879 (.06)
Control sentences	917 (.04)	890 (.05)

Note. Error rates are in parentheses.

for the three final phrases (4.77 for idioms, 5.04 for literals, 4.95 for controls).

Table 2 presents the data from this control study. Analyses of variance indicated that the reading times for the final sentences showed no main effects or interaction, all $F_s < 1$. Similar analyses on the lexical decision times also showed no reliable effects, all $F_s < 1$. Finally, there were no reliable effects in the error rates for making the lexical decisions.

The results of this control study showed that the priming effects noted in Experiment 1 are not simply due to activation of the literal meanings of idioms, but can be best attributed to the access of conceptual metaphors during people's immediate comprehension of idioms. In a way, the null effects in this control study are somewhat remarkable because several lines of research have shown that people often do a "double-take" when reading idioms in literal contexts (Gibbs, 1980, 1986). That is, people quickly access the conventional, figurative meanings of idioms at the same time, or even before, they process the literal meanings of these expressions, one reason why literal uses of idioms take longer to read than conventional, figurative use (Gibbs, 1980, 1986). At the same time, some literal uses of idioms actually express both literal and figurative meanings. Thus, when one is literally skating on thin ice, one is also in a dangerous

situation (i.e., the figurative meaning of the phrase *skating on thin ice*). A look at the idioms in this study suggests that few, if any, of them convey both idiomatic and literal meanings when seen in strong literal contexts. It is possible that reading other idioms in literal situations would activate some aspects of their underlying conceptual metaphors. In any event, it appears that even if people process literal uses of idioms and access some aspects of what these phrase figuratively mean, this does not necessitate that people quickly access something about the conceptual metaphors underlying these figurative meanings. These findings suggest that people are not making their lexical decision responses to the metaphor targets in Experiment 1 simply because of processing of these phrases' literal meanings. This conclusion makes good sense given that, as earlier studies show (Gibbs, 1980, 1986), people do not ordinarily process the entire literal meanings of idioms during their speeded comprehension of these phrases' figurative interpretations.¹

EXPERIMENT 2

Experiment 2 provided another test of the idea that conceptual metaphors are quickly accessed during idiom comprehension. Participants read the same stories used as stimuli in Experiment 1. This time, however, the stories ended in one of two idiomatic phrases, both of which expressed roughly the same figurative meaning. For example, a story about a person getting angry because of some event ended in either *blew his stack* or *jumped down his*

¹ A further experiment examined the possibility that in Experiment 1 the contexts alone primed people's lexical decision judgments. To test this, we ran a separate study where 24 participants read the same stories as shown in the other conditions, but we added a condition in which people also read the stories without the final phrases. If the stories themselves primed the related targets, then participants should give faster lexical decision responses to the related targets in this story-alone condition than in the control condition. However, the results showed this not to be true. This finding implies that the priming effects noted in the study are not due to information in the stories themselves apart from the final phrases participants read.

throat. Immediately after reading the final phrases in each story, participants made a lexical decision to a related or unrelated target. The related target reflected a conceptual metaphor that motivated only one of the idioms. Thus, *heat* reflected the metaphor ANGER IS HEATED FLUID IN A CONTAINER which motivates *blew his stack*, while the other idiom *jumped down his throat* is motivated by a different metaphor, ANGER IS ANIMAL BEHAVIOR. If conceptual metaphors are quickly accessed during idiom processing, then people should be faster to make lexical decisions to the related targets that are consistent with an idiom's underlying metaphor than when they read an idiom with similar figurative meaning but which is motivated by a different conceptual metaphor. However, when people read idioms motivated by conceptual metaphors inconsistent with the related and unrelated targets, they should not differ in the speed with which they make their lexical decisions. Once again, we expected an interaction in the lexical decision latencies between final phrase (i.e., consistent idiom and inconsistent idiom) and target type (i.e., related and unrelated).

Methods

Subjects. Thirty-six undergraduates from the University of California, Santa Cruz participated as subjects. All were native English speakers, and none had served as subjects in Experiment 1.

Stimuli and design. The primary stimuli for this study were 16 stories that described ordinary events. Each story ended in one of two idiomatic phrases, both of which expressed the same figurative meaning (e.g., "to get very angry"). One idiom (e.g., *blow your stack*) was recognized as being motivated by one conceptual metaphor (e.g., ANGER IS HEATED FLUID IN A CONTAINER), while the other idiom was motivated by a different metaphorical mapping (e.g., ANGER IS ANIMAL BEHAVIOR). Idioms that were motivated by the same conceptual metaphors reflected in the word targets were the *consistent* phrases, while the idioms that were motivated

by a different conceptual metaphor were the *inconsistent* phrases. Ten of the story contexts were taken directly from Experiment 1. These stories ended in idioms for which it was relatively easy to find an additional idiom that had a similar figurative meaning but which was motivated by a different conceptual metaphor. As described earlier, these stories were written in neutral manner so as to not provide any specific metaphorical information on how the main topic (e.g., someone getting angry) should be conceptualized. The five new stories written for this study also ended with one of two idioms, again, both of which expressed similar figurative meaning but were motivated by different conceptual metaphors. Across the 14 stories, the consistent idioms were 19.1 characters in length and the inconsistent phrases were 20.9 characters in length. Overall, this study incorporated a 2 (idiom type: consistent and inconsistent) \times 2 (target: related and unrelated) design.

Several norming studies were conducted with the experimental stimuli. Sixteen UC Santa Cruz undergraduates rated on a 7-point scale each pair of idioms as to their degree of familiarity. The results of this norming showed that overall the consistent (3.81) and inconsistent (3.74) idioms in each story were equally familiar. A second rating task asked the same participants to judge the similarity of meaning between the consistent and inconsistent idioms in each story context. These ratings, again given on a 7-point scale, showed that the 15 pairs of idioms were highly similar in meaning with no pair receiving a mean rating of less than 5.0. Next, we asked, using the same procedure employed in Experiment 1, the same group of participants to choose a word for each new idiom used as stimuli in this study that best reflected the underlying conceptual metaphor motivating that idiom. From this procedure, we found that 80% of the participants agreed on a single word as best representing the conceptual metaphor for the different idiom phrases. Appendix B presents the final sentences and target words for this study.

Procedure. The procedure was identical to that used in Experiment 1.

TABLE 3

RESULTS IN MILLISECONDS FOR EXPERIMENT 2

	Related target	Unrelated target
Reading times for final phrases		
Consistent idioms	1178	1170
Inconsistent idioms	1194	1169
Lexical decision times for targets		
Consistent idioms	744 (.06)	884 (.04)
Inconsistent idioms	886 (.06)	877 (.07)

Note. Error rates are in parentheses.

Results and Discussion

The data were analyzed in the same manner as in the first study. Table 3 presents the mean reading and lexical decision times. Analyses of variance on these findings demonstrated that participants took practically the same time to read the final phrases both when these were followed by consistent and inconsistent targets, both $F_s < 1$.

Examination of the lexical decision times showed a significant effect of final phrase, although this was only reliable in the subjects analysis, $F(1,35) = 32.35$, $p < .001$, $F(1,60) = 2.14$, $p > .10$. The effect of target type was also significant, but again only in the subjects analysis, $F(1,35) = 69.26$, $p < .001$, $F(1,60) = 3.43$, $p < .10$. Nonetheless, the critical interaction of final phrase and target type was significant in both analyses, $F(1,35) = 86.70$, $p < .001$, $F(1,60) = 4.62$, $p < .05$. Newman-Keuls tests revealed that participants were faster to respond to the metaphor targets having read consistent idioms than inconsistent idioms ($p < .01$ across subjects and $p < .05$). The error rates in the four conditions also did not differ significantly. These data demonstrate that people do not quickly access the *same* metaphorical information when they read idioms which are partly motivated by different underlying conceptual metaphors even though these phrases have similar figurative meanings.

GENERAL DISCUSSION

Much of the discussion in psycholinguistics over the role of conceptual metaphor in language understanding has focused on whether preexisting metaphorical knowledge influences immediate comprehension of idiomatic and metaphoric statements. In recent years, several scholars have presented empirical evidence that casts doubt on the possibility that conceptual metaphors are quickly accessed during metaphor and idiom comprehension. Yet these studies examined people's paraphrases for metaphorical statements and their reading-time for understanding idioms in contexts that were consistent or inconsistent with the metaphorical motivation for these idiomatic phrases. Our research has been conducted in the belief that the previous failures to find evidence that conceptual metaphors play a role in immediate idiom comprehension, including findings from Gibbs (in press; but see Pfaff et al., in press), might be due to the methods used to seek such evidence. The all-visual priming task used in the present studies provide a good place to seek evidence that conceptual metaphors are quickly used in idiom processing.

Our findings show that conceptual metaphors can under some circumstances be quickly accessed during immediate idiom comprehension. This conclusion does *not* mean that pre-existing metaphorical concepts are *automatically* accessed each time an idiom is encountered in discourse. Although people may have quick access to conceptual metaphors during some aspects of idiom processing, this does not imply that idiom comprehension depends on the activation of these conceptual metaphors. It could be the case that there is a strong association between many idioms and certain conceptual metaphors without these conceptual metaphors having to be computed or accessed as a first step in understanding what any idiom means. Earlier studies show that conceptual metaphors clearly help people make sense of why idioms mean what they do (Gibbs, 1994). But it is not as yet clear whether people need to access

conceptual metaphors in order to immediately process idioms.

Second, people may not actually *compute* metaphorical mappings each time they hear or read idiomatic phrases. Thus, people may not compute a source to target domain mapping such as drawing an immediate connection between heated fluid in a container and the concept of anger when processing *blow your stack* or *flip your lid*. People may only access highly conventional metaphorical concepts that have been pre-computed, a possibility that makes good sense given that many conceptual metaphors are ubiquitous in everyday language and thought. Furthermore, the quick speed with which people process idioms compared to literal uses of the same expressions or nonidiomatic equivalents makes it somewhat unlikely that people are actually computing metaphorical mappings each time they read or hear idioms in discourse. What contextual conditions facilitate or inhibit the access of conceptual metaphors in language processing, at what point during the moment-by-moment processing of idioms are conceptual metaphors accessed, and how long does the activation of conceptual metaphors persist when idioms are understood are important questions for future research. One possibility is that conceptual metaphors may be accessed at the point when people encounter the key word, or uniqueness point, in an idiom, an idea that is consistent with the configuration hypothesis (Tabossi & Zardon, 1993).

Our data do not tell us whether people must compute or access an idiom's underlying conceptual metaphor in order to comprehend what the idiom figuratively means during on-line processing. People's familiarity with many idioms suggests that they may not necessarily utilize conceptual metaphors to infer idiomatic meaning each time they hear or read idioms. How people employ conceptual metaphors in

interpreting the variety of meanings often associated with more creative or poetic metaphors remains an open question (but see McGlone, 1996).

Deciding among the above possibilities will require additional research, including studies that assess more micro-aspects of how idioms are understood. There is certainly much more work to do. In any event, the question of whether conceptual metaphors are actually accessed during idiom processing is only one part of the theoretical concern with metaphor's role in language understanding. As stated in the introduction, there are several possible roles that metaphoric thought might have in psycholinguistic theories of language understanding. A great deal of evidence already exists in linguistics and psycholinguistics showing that metaphor influences the historical evolution of linguistic meaning and provides part of the motivation for why many words and expressions mean what they do for idealized, and actual, speakers of the language. The fact that conceptual metaphors appear to have an essential role in motivating linguistic meaning and psychologically real aspects of language understanding highlight the idea that these metaphors are an important, and ubiquitous, part of everyday cognition (see Murphy, 1996; and Gibbs, 1996, for a debate about metaphor in cognition). No matter what the final outcome on the debate on conceptual metaphors in on-line language processing, psycholinguists must recognize that the questions of what motivates linguistic meaning, and the evidence obtained that bears on this question, is an important element in contemporary theories of natural language understanding. The data presented in this article suggest that metaphoric thought may, under many circumstances, have a some role in people's immediate understanding of at least some kinds of idioms in everyday language.

APPENDIX A

*Final Phrases and Targets in Experiment 1**He blew his stack.* (idiom phrase)*He got very angry.* (literal paraphrase)*He saw many dents.* (control phrase).*heat*—related target*lead*—unrelated target

ANGER IS HEATED FLUID IN A CONTAINER—conceptual metaphor

it was a shot in the arm. (idiom phrase)*it was very encouraging.* (literal paraphrase)*she thought he was lying.* (control phrase)*drug*—related target*drag*—unrelated target

ENCOURAGEMENT IS GIVING SOMEONE A DRUG—conceptual metaphor

cross that bridge later. (idiom phrase)*fix that problem later.* (literal paraphrase)*make very small payments.* (control phrase)*water*—related target*waste*—unrelated target

PROBLEMS ARE BODIES OF WATER

took the bull by the horns. (idiom phrase)*worked on the demanding job.* (literal phrase)*sweated when she was working.* (control phrase)*opponent*—related target*oranges*—unrelated target

A PROBLEM IS AN ANIMATE OPPONENT

was wrapped around his finger. (idiom phrase)*was under his firm control.* (literal phrase)*was loaded down with cash.* (control phrase)*touch*—related target*taste*—unrelated target

CONTROL IS TOUCHING

burst her bubble. (idiom phrase)*dispel her vanity.* (literal paraphrase)*made him very happy.* (control phrase)*inflation*—related target*indictment*—unrelated target

PRIDE IS INFLATION

the manager held all the cards. (idiom phrase)*the manager was in total control.* (literal paraphrase)*their complaints were not heard.* (control phrase)*retain*—related target*remain*—unrelated target

CONTROL IS POSSESSION OF SOME OBJECT

she was over the hill. (idiom phrase)*she was getting old.* (literal paraphrase)*she needed to review.* (control phrase)*journey*—related target*january*—unrelated target

LIFE IS A JOURNEY—conceptual metaphor

left a bad taste in his mouth. (idiom phrase)*made him feel very disgusted.* (literal paraphrase)*seemed like overkill to him.* (control phrase)*eat*—related target*see*—unrelated target

ACCEPTING SOMETHING IS EATING IT—conceptual metaphor

carry a torch for him. (idiom phrase)*be in love with him.* (literal paraphrase)*be a complete dupe.* (control phrase)*warm*—related target*worm*—unrelated target

AFFECTION IS HEAT—conceptual metaphor

cast her special spell. (idiom phrase)*made him fall in love.* (literal paraphrase)*eaten his french fries.* (control phrase)*trick*—related target*stick*—unrelated target

LOVE IS MAGIC—conceptual metaphor

look on the bright side. (idiom phrase)*remain very optimistic.* (literal paraphrase)*say the funniest things.* (control phrase)*light*—related target*great*—unrelated target

OPTIMISM IS LIGHT—conceptual metaphor

got the hang of it. (idiom phrase)*started doing well.* (literal paraphrase)*quit in frustration.* (control phrase)

grasp—related target

grape—unrelated target

CONTROL IS GRASPING—conceptual metaphor

stand his ground. (idiom phrase)

defend his ideas. (literal paraphrase)

change the subject. (control phrase)

battle—related target

bottle—unrelated target

MAINTAINING BELIEFS IS DEFENDING TERRITORY

She kept him at arms length. (idiom phrase)

She remained aloof from him. (literal paraphrase)

She showed him her best dress. (control phrase)

distance—related target

damaged—unrelated target

LACK OF EMOTIONAL INTIMACY IS PHYSICAL DISTANCE

APPENDIX B

Final Sentences and Conceptual Metaphors for Experiment 2

Bob blew his stack (consistent idiom)

ANGER IS HEATED FLUID IN A CONTAINER

Bob bit her head off (inconsistent idiom)

ANGER IS ANIMAL BEHAVIOR

heat—related target

lead—unrelated target

It was a shot in the arm (consistent idiom)

ENCOURAGEMENT IS GIVING SOMEONE A DRUG

It really got her going (inconsistent idiom)

ENCOURAGEMENT IS HELPING SOMEONE START A JOURNEY

drug—related target

drag—unrelated target

they would cross that bridge later (consistent idiom)

PROBLEMS ARE BODIES OF WATER

they would puzzle it out later (inconsistent idiom)

PROBLEMS ARE PUZZLES TO BE SOLVED

water—related target

waste—unrelated target

she took the bulls by the horn (consistent idiom)

A PROBLEM IS AN ANIMATE OPPONENT

she was able to carry the load (inconsistent idiom)

A PROBLEM IS A PHYSICAL BURDEN

opponent—related target

oranges—unrelated target

The lyrics really rang a bell (consistent idiom)

REMEMBERING IS HEARING A SOUND

The lyrics definitely hit home (inconsistent idiom)

REMEMBERING IS ARRIVING AT A LOCATION

sign—related target

sole—unrelated target

their marriage was falling apart (consistent idiom)

MARRIAGE IS A BUILDING

their marriage was on the rocks (inconsistent idiom)

MARRIAGE IS A JOURNEY

building—related target

bowling—unrelated target

burst her bubble (consistent idiom)

PRIDE IS INFLATION

took her down a notch (inconsistent idiom)

PRIDE IS BEING VERTICALLY HIGH

inflation—related target

indictment—unrelated target

the manager held all the cards (consistent idiom)

CONTROL IS POSSESSION OF SOME OBJECT

the manager had the upper hand (inconsistent idiom)

CONTROL IS BEING PHYSICALLY OVER SOMEONE OR THING

retain—related target

remain—unrelated target

over the hill (consistent idiom)

LIFE IS A JOURNEY

in her twilight years (inconsistent idiom)

LIFE IS A DAY

journey—related target

january—unrelated target

he really couldn't swallow it (consistent idiom)

ACCEPTING SOMETHING IS EATING IT

it was really hard for him to buy (inconsistent idiom)

ACCEPTING SOMETHING IS PURCHASING IT

eat—related target

see—unrelated target

carry a torch (consistent idiom)

AFFECTION IS HEAT

under her skin (inconsistent idiom)

AFFECTION IS AN IRRITATION

warm—related target

worm—unrelated target

cast a spell (consistent idiom)

LOVE IS MAGIC

swept him off his feet (inconsistent idiom)

LOVE IS A PHYSICAL FORCE

trick—related target

stick—unrelated target

look on the bright side (consistent idiom)

OPTIMISM IS LIGHT

keep your spirits up (inconsistent idiom)

OPTIMISM IS BEING PHYSICALLY HIGH

light—related target

great—unrelated target

stand his ground (consistent idiom)

MAINTAINING BELIEFS IS DEFENDING TERRITORY

hold his course (inconsistent idiom)

MAINTAINING BELIEFS IS STAYING ON A SPECIFIC COURSE

battle—related target

bottle—unrelated target

She kept him at arms length (consistent idiom)

LACK OF EMOTIONAL INTIMACY IS PHYSICAL DISTANCE

She gave him the cold shoulder

LACK OF EMOTIONAL INTIMACY IS PHYSICAL COLDNESS

distance—related target

damaged—unrelated target

Note: The final phrase was deleted in the story-alone condition

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