

Idioms in Sentences: Effects of Frequency, Literalness, and Familiarity

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This study investigated the relationship between subjective frequency of literal usage (literalness), subjective frequency of figurative usage (familiarity), and mean Kucera and Francis (1967) word frequency for idiom phrases. Kucera and Francis frequency was found to be independent of both familiarity and literalness. Furthermore, it was found that literalness, but not the Kucera and Francis frequency of the words in the phrase, affected reading time for literal uses of idioms. For figurative uses of idioms, familiarity and written frequency interacted. A model of idiom processing consistent with the current results and previous results is proposed. In addition, subjective familiarity and literalness norms are provided for 245 idioms.

The study of ambiguous items has stimulated a vast amount of research in recent years. Ambiguity of one sort or another is common in our language, yet it is rarely noticed by skilled language users. It is therefore of extreme importance that models of language comprehension adequately accommodate the processing of ambiguous stimuli. Recently, a great deal of research has focused on the ambiguity of individual words (Seidenberg, Tanenhaus, Leiman, & Bienkowski, 1982; Swinney, 1979). Ambiguity can occur at many levels other than that of the word, however.

Portions of the normative study were based upon subjects in Schweigert and Cronk (1992).

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Single letters can be ambiguous, especially when written by hand. Only with the appropriate context are we able to disambiguate the form of the letter. Sentences (Rumelhart, 1977) and even entire paragraphs (Bransford & Johnson, 1973) are also often ambiguous.

One type of ambiguous item that has not been extensively studied is the ambiguous phrase. In particular, idiom phrases, which have both a figurative meaning and a literal meaning, can provide valuable insight into our ability to comprehend ambiguous language. Even though idioms have been studied by psycholinguists for over 20 years, no universally accepted conclusions have been drawn. In fact, three general models of idiom processing have emerged, and each has received some empirical support (Bobrow & Bell, 1973; Gibbs, 1980; Schweigert, 1992; Swinney & Cutler, 1979). Recently we have demonstrated that the stimuli in these past experiments may not have been adequately controlled. Specifically, we showed that both the subjective familiarity of an idiom's literal meaning (literalness) and the subjective familiarity of an idiom's figurative meaning (familiarity) affect reading time for sentences containing idioms, with high-literalness idioms being read more quickly than low-literalness idioms, and with high-familiarity idioms being read more quickly than low-familiarity idioms. In addition, these two variables interacted, indicating the importance of controlling both (Cronk & Schweigert, 1992).

Because a wealth of studies have shown that the frequency of a word affects processing time in a lexical decision tasks (e.g., Forster & Chambers, 1973; Foss, 1969; Rubenstein, Garfield, & Millikan, 1970; Stanovich & West, 1981), it has become the standard practice in conducting psycholinguistic research to control the frequency with which the stimuli occur in the language. To this end, lists of frequencies such as those developed by Kucera and Francis (1967) and Thorndike and Lorge (1944) are commonly used. For phrases, however, there are not any published lists of frequencies. This lack of frequency norms for phrases in general, and specifically for idioms, may contribute to the failure to control for idiom frequency. Also, it remains to be seen whether the rated literalness or familiarity of an idiom phrase is related to the frequency of the individual words. It is, after all, possible that separate ratings for idioms are not necessary, and that mean Kucera and Francis frequency of the words in a phrase can be used instead of either subjective or objective ratings for phrase frequency. Research investigating the subjective familiarity of homophones, for example, has found that subjective ratings are highly correlated with Kucera and Francis frequency (Kreuz, 1987). Therefore, the first step of the current investigation was to conduct

a normative study to evaluate the relationship between rated familiarity and literalness and Kucera and Francis frequency.

NORMATIVE STUDY

Method

Subjects. Seventy-six undergraduate students at Bradley University participated. Subjects received extra credit for their participation. All subjects were native speakers of English.

Materials. The idioms used were 388 of the idioms used by Schweigert (1986) in previous normative studies, and were originally chosen from *A Dictionary of Idioms for the Deaf* (Boatner, 1969). The 388 idioms were randomly divided into four lists of 97 items each.

Procedure. Subjects were given two lists of idioms, so that each list was rated by a total of 38 subjects. For one of their two lists, subjects were asked to rate each idiom for how often they had heard it used figuratively (familiarity rating). For the other list they were asked to rate each idiom for how often they had heard it used literally (literalness rating). No subject received the same list twice. The familiarity rating task involved using a 5-point scale where 1 meant the idiom was often heard used figuratively and 5 meant the idiom was rarely heard used figuratively. The literalness rating task required subjects to rate a different 97 idioms for how often they heard them used literally. A 5-point scale was also used where 1 meant the idiom was heard often used literally and 5 meant the idiom was rarely heard used literally. Subjects were instructed to leave blank any item for which they did not know the appropriate meaning.

Results

The mean familiarity and literalness ratings were calculated for each of the 388 idioms, along with the percentage of subjects responding to each item. In addition, the mean Kucera and Francis (1967) frequency for each idiom was calculated by summing the frequencies of the words composing the phrase and dividing by the number of words in the phrase. Words not in Kucera and Francis were assigned a frequency of zero. Two hundred forty-five idioms were rated by more than 75% of the subjects for both familiarity and literalness. These idioms, along with their familiarity, literalness, and mean Kucera and Francis frequency are presented in Appendix A.

It was found that rated familiarity and literalness are relatively independent [$r(244) = .35$]. In addition, split-half reliability coefficients were computed for both the familiarity and literalness ratings. Familiarity ratings had a reliability of .79 and literalness ratings had a reliability of .68. It was further found that literalness and frequency are completely independent [$r(244) = -.07$], as are familiarity and frequency [$r(244) = -.01$]. This independence also held for log-transformations of the frequency [literalness and log-frequency $r(244) = -.02$; familiarity and log-frequency $r(244) = .01$]. Figures 1 and 2 illustrate the independence of these rated values from the mean frequency.

Discussion

Values for rated literalness and familiarity of idiom phrases were found to be independent of the average frequency of the words in the phrase. In previous research, rated familiarity and literalness have been found to influence reading times for sentences containing idioms (Cronk & Schweigert, 1992; Schweigert, 1986). The possibility exists, however, that both the subjective rating and mean word frequency affect processing of idioms. To investigate this possibility, subjective familiarity and mean

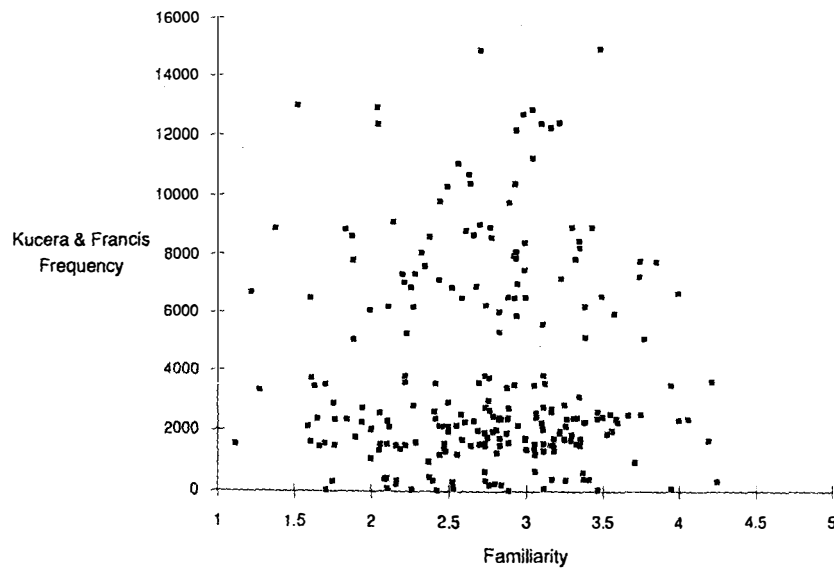


Fig. 1. Kucera and Francis (1967) frequency as a function of rated familiarity (1 = often heard used figuratively, 5 = rarely heard used figuratively).

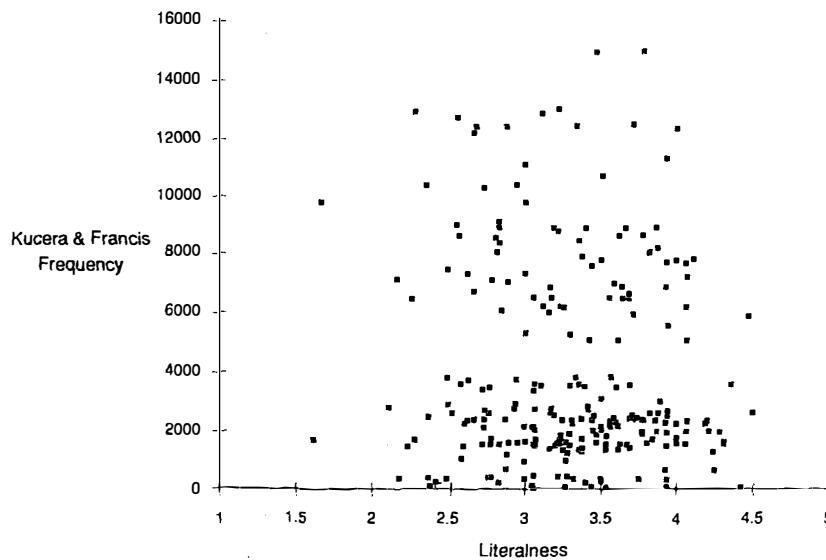


Fig. 2. Kucera and Francis (1967) frequency as a function of rated literalness (1 = often heard used literally, 5 = rarely heard used literally).

word frequency were varied in sentences containing figurative uses of idioms. In addition, subjective literalness and mean word frequency were varied in sentences containing literal uses of idioms.

EXPERIMENT

Method

Subjects. Subjects were 32 undergraduate students at the University of Wisconsin-Milwaukee. Subjects received extra credit for their participation. None of the subjects had been involved in the normative study, and all were native speakers of English.

Materials. Idioms used in the experiment were selected from the idioms in the normative study. In order to investigate the effects of familiarity and word frequency, four lists containing 10 idioms each were created. Familiarity and frequency were orthogonally varied in a 2×2 design and matched for rated literalness. These 40 idioms were incorporated into 40 sentences biased toward a figurative interpretation of the idiom. In order to investigate the effects of literalness and word fre-

quency, four other lists containing 10 idioms each were created. For these items, literalness and frequency were orthogonally varied in a 2×2 design and matched for familiarity. These 40 idioms were incorporated into 40 sentences biased toward a literal interpretation of the idiom phrase. The distribution of mean frequencies and familiarity/literalness are presented in Figs. 3 and 4.

Sentences containing idioms were balanced for the number of syllables preceding the onset of the idiom phrase. The idiom was placed last in the sentence whenever possible to maximize the effects of context and minimize the effects of position in the sentence. In addition, 40 sentences not containing idioms were created as filler items. All of the sentences used in the experiment are presented in Appendix B.

Procedure. The moving window paradigm was used to obtain reading times for individual words in the sentences. Results obtained using this method have been found to correlate highly with results obtained using an eye-tracker (Just, Carpenter, & Woolley, 1982). This method has also been used in the study of idioms and has produced useful results (Cronk & Schweigert, 1992).

Subjects were seated in front of a computer monitor. They were

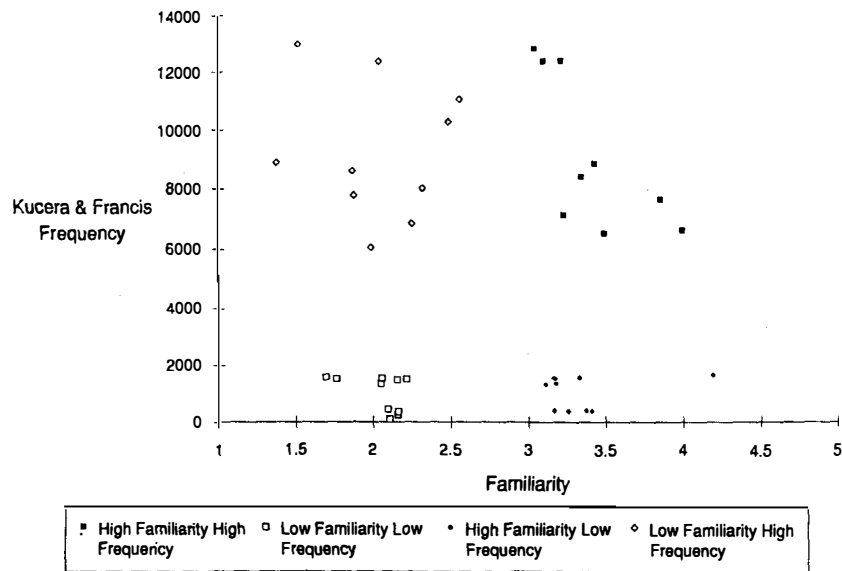


Fig. 3. Mean Kucera and Francis (1967) frequency and subjective familiarity for the 40 items used figuratively.

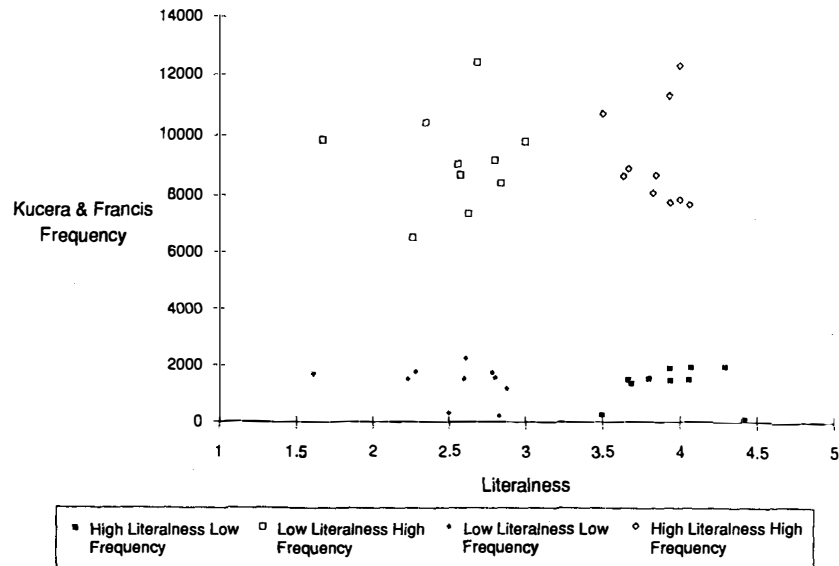


Fig. 4. Mean Kucera and Francis (1967) frequency and subjective literalness for the 40 items used literally.

instructed to read the sentences presented on the computer, pressing a key to uncover the next word. To assure that subjects were carefully reading each sentence, they were required to repeat the sentence they just read to the experimenter at random intervals. Each subject received all 120 sentences in random order. Five practice trials were included at the beginning to familiarize the subject with the procedure. All subjects were able to correctly repeat the previous sentence when requested.

Results

Mean reading time per word for the idiom phrase was used as the dependent measure. The 40 figurative items and the 40 literal items were analyzed in two separate analyses of variance.

Familiarity and Frequency. A 2×2 within-subjects ANOVA was calculated for the 40 items in the figurative condition. Whereas main effects were found for both rated familiarity and mean frequency [$F(1, 31) = 39.05, p < .001$; $F(1, 31) = 43.08, p < .001$ respectively], the most interesting finding is the substantial and significant interaction that was found [$F(1, 31) = 41.89, p < .001$] that can be best seen in Fig.

5. It appears that reading times are relatively slow unless the idiom is both high-frequency and high-familiarity.

Literalness and Frequency. A 2×2 within-subjects ANOVA was calculated on the mean reading time per word for the 40 literal items. A main effect for literalness was found [$F(1, 31) = 27.48, P < .001$], with high-literalness idioms being read more quickly than low-literalness idioms. Unlike the finding with figurative uses of idioms, however, no effect of frequency was found [$F(1, 31) = .21, p = .65$] and no significant interaction between the variables was present [$F(1, 31) = 3.22, p = .08$]. The mean reading times per word for each condition can be seen in Fig. 6.

Discussion

Consistent with previous research (Cronk & Schweigert, 1992), both subjective familiarity of figurative meaning and subjective literalness had significant effects on reading time for idiom phrases. With figurative uses of idioms, low-familiarity idioms were read more slowly than high-familiarity idioms, although this effect was reduced for low-frequency idioms. For literal uses of idioms, literalness affected reading time re-

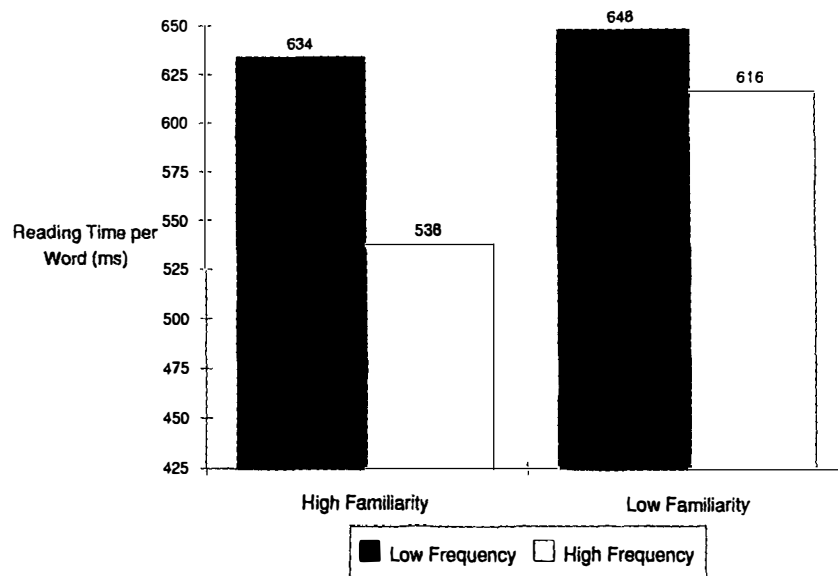


Fig. 5. Familiarity and frequency effects for idioms used figuratively.

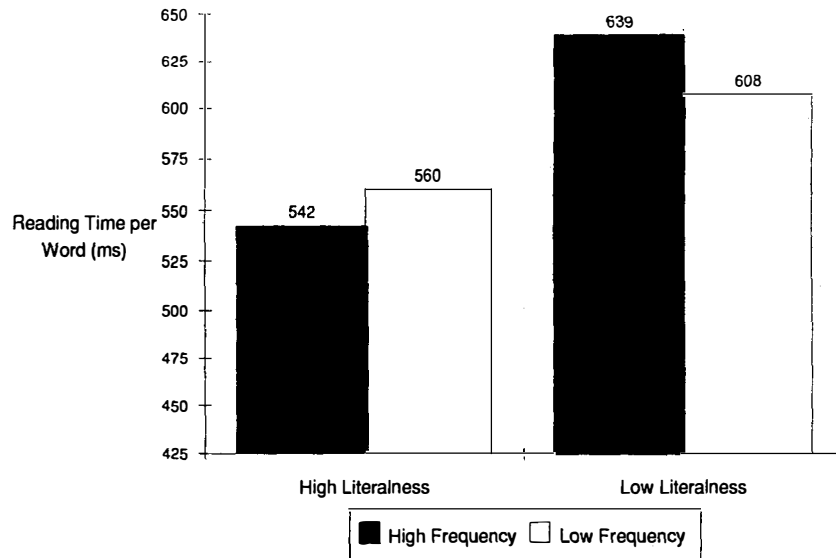


Fig. 6. Literalness and frequency effects for idioms used literally.

ardless of frequency. High-literalness idioms used literally were read more quickly than low-literalness idioms used literally.

While an advantage for high-familiarity idioms has been found consistently in the past, it appears as if the effect may have been diluted if any idioms containing low-frequency words were included as stimuli. Therefore, mean frequency of the words in the phrase can affect the magnitude of the familiarity effect, and should be considered in experiments dealing with figurative uses of idiom phrases. With literal uses of idioms, however, the mean frequency of the words composing the phrase did not alter the effect of literalness. Furthermore, the mean frequency of the words in the phrase did not significantly affect reading times for literal uses of idioms.

As expected, controlling for the frequency of the words composing an idiom phrase is not equivalent to controlling for subjective familiarity or literalness. With literal uses of idioms, literalness is of primary importance. With figurative uses, however, both rated familiarity and frequency are important in that an idiom must be both high-frequency and high-familiarity to be read quickly.

Literalness and frequency are independent, as are familiarity and frequency. Any model of idiom comprehension must incorporate the

independence of these effects, as well as the joint effects of familiarity and frequency. We propose the model presented in Fig. 7 as the one most consistent with both past data and the data of the current experiments. Past research has alternated between support for models in which the figurative meaning is processed first (Gibbs, 1980), models in which the literal meaning is processed first (Bobrow & Bell, 1973), and models in which both meanings are computed simultaneously (Swinney & Cutler, 1979). Recent work by Cronk and Schweigert (1992) has supported a simultaneous processing model.

The results of the current study also support a simultaneous processing model of idiom comprehension. The model is envisioned as follows: An idiom phrase is encountered while reading and the phrase processor begins searching through the general lexicon for the figurative meaning as well as searching for the meanings of the individual words and computing the literal meaning. Figurative meanings are seen as being stored as single lexical items with less frequently used idioms (low familiarity)

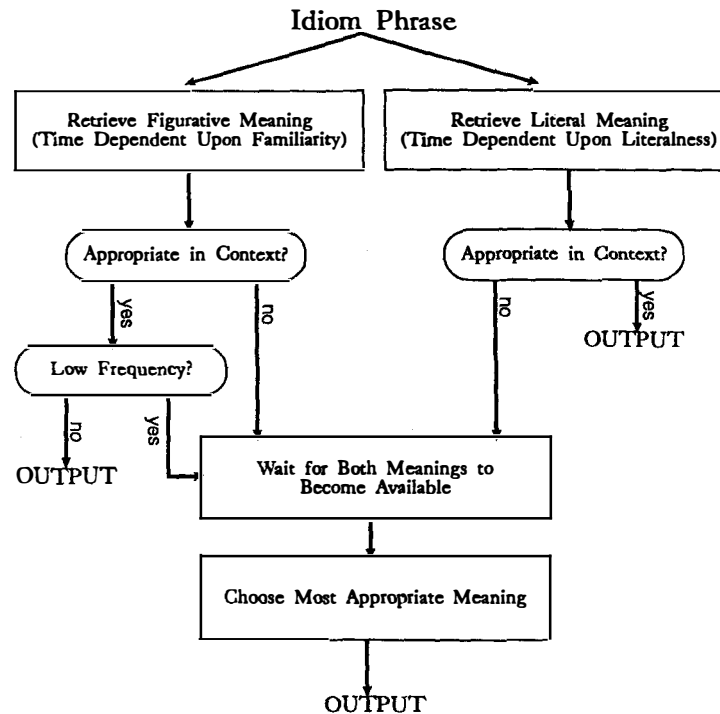


Fig. 7. Proposed idiom processing model.

being harder to locate than more frequently used idioms (high familiarity). Retrieval time for literal uses of idioms is dependent upon literalness rather than frequency because of the biasing context of the phrase itself. For example, *bucket* is easily predictable following *kick the*, thereby confounding the frequency of the individual words. This phenomenon is seen as being related to both spreading activation and semantic priming (Collins & Loftus, 1975; Meyer & Schvaneveldt, 1971), and is consistent with research that has found reduced or absent frequency effects for words in sentence context (Baldwin & Schatz, 1985; Becker, 1979; Grosjean & Itzler, 1984; Kinoshita, 1985; Lucas, 1987; but see Carpenter & Daneman, 1981) and when there is no opportunity for parafoveal preview, as in the current experiment (Inhoff & Rayner, 1986).

Because of the parallel nature of the phrase processor, the figurative and literal processes are not necessarily independent subsystems throughout the phrase identification process. In fact, the ability of the phrase processor to identify a potential idiom phrase prior to analysis of the entire phrase may also be a byproduct of semantic priming. For example, when the phrase *kick the bucket* is encountered, the phrase processor begins processing the phrase from the left and continues to the right. For the first few words (e.g., *kick the*), both the figurative and literal processes may be combined in a single process. After a critical point in the phrase (e.g., after *kick the*), the process may split into figurative and literal subprocesses, each responsible for attempting to compute the meaning of the entire phrase. Thus, the ability of the phrase processor to identify a potential idiom is simply a byproduct of the general functioning of the phrase processor. This hypothesis is supported by the work of Cacciari and Tabossi (1988), who found that subjects could identify the figurative meaning of an idiom faster than the literal meaning when they could accurately guess the last word based upon the first several words. For example, the word *heaven* is easily predictable following *he was in seventh* (the actual stimuli were Italian idioms). In such cases, Cacciari and Tabossi found that the figurative meaning was primed more than the literal meaning. With less predictable idioms (none of which had an idiomatic English translation), Cacciari and Tabossi found that the literal meaning was primed more than the figurative meaning.

Therefore, after a split into subprocesses, both processes work simultaneously, and whenever either process discovers the potential meaning of the idiom phrase, a stage of context checking occurs. For literal uses of idioms, if the constructed meaning is appropriate it serves as the output. Thus, only literalness affects reading time for sentences containing literal uses of idioms. For figurative uses, however, if the figurative

meaning is judged to be appropriate in context, an additional frequency check occurs. This frequency bias, present in our data, is envisioned as a conservative bias against figurative interpretation of less common words. For example, concepts novel to the reader will be low-frequency, and a misinterpretation would be easy if only the figurative meaning was considered. Thus, phrases containing low-frequency words will be treated as if they are contextually inappropriate. Support for this additional step has been provided by Gernsbacher (1983), who demonstrated that low-frequency words vary the most in subjective familiarity.

For contextually inappropriate words, a stage of waiting occurs while both meanings are computed. Thus, if the figurative meaning was arrived at first, but was inappropriate, the phrase processor would wait for completion of construction of the literal meaning before proceeding. Once both meanings are available, another context checking mechanism compares both available meanings and picks the most appropriate meaning given the available context. This situation is similar to work on ambiguous words where it has been determined that both meanings are available for a short time, and then the inappropriate meaning is inhibited (Swinney, 1979).

While this model adequately explains both the data of the current experiments and several previous investigations (Cronk & Schweigert, 1992; Schweigert, 1986), the frequency bias should be replicated in additional work. This study has provided empirical justification for controlling literalness and familiarity in experiments involving idioms, and has validated the usefulness of these subjective ratings over the more objective frequency counts. The paper provides a large corpus of available ratings, and it is hoped that they will be of use to researchers in psycholinguistics.

**APPENDIX A: LITERALNESS, FAMILIARITY, AND
KUCERA-FRANCIS FREQUENCY RATINGS FOR
245 IDIOMS^a**

Idiom phrase	% Lit.	Literal- ness ^b	% Fig.	Famili- arity ^c	Mean Frequency
ace in the hole	89.5	3.2	85.7	3.0	6462.2
across the board	94.7	3.8	94.4	3.3	1652.0
add fuel to the flame	94.7	4.1	100.0	3.4	6141.2
against the grain	83.3	3.1	89.5	3.4	1696.0
along for the ride	100.0	2.6	100.0	2.2	3582.0

at the tip of his tongue	94.7	2.8	100.0	1.4	8879.7
back against the wall	89.5	2.8	85.7	2.7	1547.0
ball of fire	84.2	4.0	94.4	3.2	12236.0
bark up the wrong tree	94.7	3.6	90.5	3.2	1306.4
bend over backwards	100.0	3.3	100.0	2.1	420.7
big head	94.7	2.8	100.0	2.1	392.0
big mouth	100.0	2.4	100.0	2.2	231.5
birthday suit	89.5	3.5	94.4	1.7	33.0
bite off more than he can chew	94.7	3.6	100.0	2.7	2281.6
bite your tongue	89.5	2.5	95.2	1.8	322.7
black and white	94.7	1.7	95.2	2.5	9806.7
blow his own horn	78.9	3.9	88.9	2.7	1958.2
blow the whistle on	89.5	3.4	88.9	3.3	2803.5
bone to pick	94.7	3.2	100.0	2.6	8745.7
born yesterday	94.7	3.1	100.0	2.5	98.0
break the ice	100.0	2.8	100.0	2.1	1522.7
breathe down his neck	94.7	3.4	94.4	2.0	1995.0
bring home the bacon	89.5	3.5	100.0	2.5	1287.5
bring to light	79.0	3.9	76.2	3.3	8880.0
buckle down	89.5	3.1	100.0	2.4	450.0
burn a hole in his pocket	94.7	3.8	85.7	2.7	8615.7
burn out	89.5	2.6	94.4	2.0	1055.5
bury his head in the sand	83.3	3.9	94.7	3.1	5538.5
bury the hatchet	84.2	4.3	94.4	2.6	1481.7
card up his sleeve	94.4	3.9	94.7	2.6	2232.2
carry a torch	78.9	4.0	83.3	3.3	7775.7
catch him with his pants down	94.7	3.9	94.4	2.8	2975.3
chew the fat	84.2	4.0	85.7	3.2	1499.0
chicken feed	88.9	3.9	94.7	3.9	80.0
clean slate	83.3	3.3	100.0	2.4	40.0
climb the walls	83.3	3.7	100.0	2.7	1482.3
clip his wings	94.7	3.8	76.2	4.1	2334.3
coast is clear	83.3	3.6	100.0	1.6	3459.7
come clean	100.0	3.3	90.5	2.7	350.0
come down to earth	89.5	3.6	95.2	3.0	6956.0
cough up	88.9	3.0	84.2	2.4	951.0
cover his tracks	88.9	3.4	100.0	2.4	2361.7
cross his fingers	100.0	2.6	94.4	1.8	2350.7
cup of tea	94.7	2.7	95.2	3.0	12161.3
cut down to size	77.8	3.6	100.0	2.7	6843.5
cut his throat	100.0	3.7	83.3	3.1	2413.3
cut to the bone	78.9	3.9	83.3	3.8	7702.2
dead duck	88.9	3.4	100.0	2.1	91.5
dirty his hands	94.7	3.4	81.0	3.6	2344.3
dose of his own					

medicine	83.3	3.7	100.0	1.8	8844.2
down his alley	84.2	3.9	94.4	2.8	2633.3
down the line	77.8	3.3	84.2	2.9	1876.0
draw blood	100.0	2.4	94.7	3.1	88.5
draw the line	94.7	2.9	100.0	1.6	1596.3
eat like a bird	84.2	3.3	100.0	2.3	6154.7
eat like a horse	89.5	3.2	94.4	2.1	6176.2
eat out of one's hand	94.7	4.1	94.4	2.9	7799.8
end of the line	100.0	2.9	100.0	2.9	10388.5
end of the road	89.5	2.4	95.2	2.7	10363.2
face the music	78.9	4.0	100.0	3.0	1674.0
facts of life	94.4	2.9	100.0	2.1	12375.3
fall by the wayside	84.2	3.9	83.3	3.7	2472.2
fall down on the job	89.5	3.7	88.9	3.8	2491.4
feel in his bones	83.3	4.1	84.2	3.8	7138.5
feet on the ground	94.7	2.9	95.2	2.5	2911.5
fish out of water	84.2	3.0	90.5	2.9	9746.0
foam at the mouth	89.5	3.5	95.2	3.6	2488.2
follow his nose	84.2	3.7	100.0	3.3	2384.7
from the ground up	84.2	3.1	94.4	3.1	2721.2
get away with murder	78.9	3.0	100.0	2.6	2142.5
get down off your high horse	77.8	3.9	100.0	2.7	636.8
get his feet wet	84.2	3.1	100.0	3.1	2020.7
get his goat	77.8	4.5	89.5	3.5	2584.3
get off it	94.7	2.7	94.4	2.9	3381.7
get off on the wrong foot	84.2	3.5	100.0	2.4	2127.5
get off the ground	83.3	2.6	94.7	3.2	1502.5
get off the hook	78.9	3.2	100.0	1.7	1457.2
get sacked	89.5	2.8	81.0	3.4	375.0
get the ball rolling	89.5	3.4	100.0	2.1	1328.5
get the message	100.0	2.3	100.0	1.9	1749.7
get to first base	105.6	2.8	94.7	2.4	7087.5
give a buzz	84.2	3.4	83.3	2.9	7880.3
give a hand	89.5	2.8	100.0	2.3	8019.7
give the shirt off his back	83.3	3.6	89.5	1.9	2242.7
go fly a kite	100.0	3.2	100.0	2.8	5974.0
go jump in the lake	100.0	3.0	100.0	2.8	5296.0
go off the deep end	100.0	3.4	100.0	2.8	1243.8
go straight	100.0	2.4	83.3	3.3	370.0
go to town	94.7	2.6	85.7	2.7	8995.7
go under	84.2	2.9	88.9	3.1	666.5
green thumb	77.8	4.4	100.0	2.3	63.0
hair stands on end	89.5	3.2	95.2	3.3	1825.0
hard nut to crack	84.2	3.7	94.4	4.0	6596.7
have a ball	94.7	2.8	95.2	2.2	9096.0
have a screw loose	94.7	3.2	94.4	2.5	6813.0

have all his marbles	89.5	3.3	100.0	2.9	3484.7
have his hands full	94.7	2.1	100.0	2.3	2792.0
have his hands tied	94.7	3.2	90.5	2.7	2734.5
head above water	94.7	3.2	88.9	3.4	387.3
hit below the belt	94.4	2.9	94.7	2.4	1181.0
hit the ceiling	100.0	3.2	100.0	3.1	1527.0
hit the hay	78.9	3.8	94.4	2.7	1523.0
hit the nail on the head	89.5	3.4	100.0	2.9	2692.8
hit the road	78.9	3.3	94.4	2.3	1582.3
hit the sack	94.7	3.1	94.4	2.1	1519.3
hit the spot	94.7	2.7	94.4	1.1	1535.7
hold a candle to	77.8	3.7	89.5	3.2	12393.2
hold his horses	89.5	3.6	100.0	2.8	2388.7
hold his tongue	89.5	3.7	88.9	3.5	2400.3
hold the line	84.2	3.0	76.2	4.2	1634.0
honeymoon is over	94.7	3.3	94.4	3.1	3782.0
hopped up	78.9	3.3	77.8	3.7	950.0
if the shoe fits	94.7	3.2	94.4	2.6	1662.0
in a fog	94.7	3.8	77.8	3.5	14867.7
in a nutshell	89.5	3.5	100.0	2.7	14859.3
in black and white	84.2	2.6	94.4	3.0	12690.2
in deep water	105.6	2.6	100.0	2.2	7297.3
in hot water	100.0	3.0	100.0	2.3	7304.3
in the bag	100.0	2.6	94.4	1.9	8606.0
in the doghouse	84.2	3.6	100.0	2.4	8592.0
keep his shirt on	100.0	3.1	88.9	3.1	3507.5
keep the ball rolling	94.7	3.3	100.0	2.6	1207.0
kick himself	78.9	3.9	94.4	2.5	309.5
kick in	84.2	3.5	77.8	2.6	10678.5
kick in the pants	89.5	3.6	83.3	2.9	6450.2
kick the bucket	89.5	3.1	85.7	2.2	1486.0
kick up his heels	88.9	4.2	100.0	3.1	2227.0
knock him off his feet	100.0	3.1	100.0	2.5	2110.6
know enough to come out of the rain	84.2	3.2	76.2	3.4	8863.0
know which side his bread is buttered on	89.5	4.3	77.8	4.2	3563.0
land on his feet	89.5	3.1	81.0	2.7	3559.7
last straw	88.9	3.5	94.7	2.2	345.5
lay an egg	88.9	3.2	94.7	3.1	1299.3
lay his cards on the table	84.2	3.5	94.4	3.3	3085.2
leave a bad taste in his mouth	100.0	2.5	89.5	3.0	7440.6
leave no stone unturned	84.2	4.3	90.5	3.4	616.0
let his hair down	94.7	3.6	90.5	3.3	2106.0
let off steam	89.5	3.0	95.2	2.4	346.7
let off the hook	100.0	3.2	100.0	2.2	1365.7
let the cat out of the					

bag	77.8	3.9	100.0	2.3	6832.3
lick his chops	77.8	3.9	89.5	2.9	2333.3
little frog in a big pond	84.2	4.1	77.8	3.9	7632.3
look at the world with rose colored glasses	79.0	4.2	95.2	4.0	2296.7
looking for a needle in a haystack	89.5	3.0	90.5	2.6	11070.3
lose his grip	100.0	2.7	94.4	2.8	2358.3
lose his head	84.2	3.2	90.5	2.6	2493.0
lose his shirt	89.5	3.7	76.2	3.3	2360.7
make his ears burn	77.8	4.2	84.2	3.6	1951.5
make his mouth water	100.0	2.7	94.4	2.1	2084.0
middle of the road	94.7	2.7	85.7	2.5	10290.2
not the only fish in the sea	89.5	3.3	94.4	2.2	5242.4
on cloud nine	77.8	4.1	100.0	2.1	2283.7
on the nose	94.4	2.9	94.7	1.6	3745.7
on the other hand	94.7	3.1	100.0	1.3	3327.5
on the road	84.2	2.5	83.3	2.7	3791.3
on the rocks	100.0	2.6	94.4	2.8	3725.7
on the town	84.2	3.6	100.0	2.2	3796.3
one foot in the grave	83.3	4.5	100.0	2.9	5834.2
open his eyes	100.0	2.4	90.5	2.8	2438.7
open the door	100.0	1.6	84.2	3.3	1688.7
out in left field	100.0	2.8	100.0	2.0	6047.7
out in the cold	100.0	2.9	94.7	2.2	7010.7
out of circulation	89.5	3.1	94.4	3.1	12841.0
out of hand	94.7	3.2	94.4	1.5	12979.3
out of line	94.7	2.3	95.2	2.1	12935.0
out on a limb	89.5	3.8	100.0	2.9	8020.0
over his head	94.7	2.5	100.0	1.8	2885.7
over the hump	78.9	3.9	83.3	2.7	1891.0
pain in the neck	100.0	2.3	100.0	1.6	6486.2
paint the town	78.9	3.5	100.0	2.9	1561.3
play with fire	94.4	2.8	94.7	2.1	2558.7
pound the pavement	84.2	4.1	77.8	3.4	1491.3
pull his leg	94.7	2.7	95.2	1.7	2368.7
pull out of a hat	100.0	3.3	94.7	3.1	12370.2
pull the rug out from under	94.4	3.8	100.0	2.8	1945.2
pull the wool over his eyes	94.7	3.6	85.7	3.0	2121.5
pulling teeth	100.0	3.1	83.3	3.5	51.5
put his foot down	100.0	3.1	94.4	2.5	2099.7
put that in your pipe and smoke it	78.9	3.4	100.0	2.8	8870.6
raise eyebrows	94.7	3.1	94.4	2.9	26.0
reach for the sky	89.5	3.4	94.4	1.7	3522.0
rob the cradle	84.2	3.6	94.4	1.8	1487.0

rock the boat	100.0	3.1	94.4	3.1	1527.3
roll out the red carpet	84.2	3.7	100.0	3.1	1355.2
roll up his sleeves	94.7	2.6	88.9	3.4	2231.7
rub the wrong way	84.2	3.4	94.4	2.5	1369.7
run circles around	84.2	3.5	95.2	2.8	257.7
run into a brick wall	100.0	3.4	85.7	3.4	5083.6
scrape the bottom of the barrel	84.2	3.4	94.4	2.4	7566.0
scratch his back	100.0	2.7	100.0	3.2	2657.7
scratch the surface	100.0	3.2	89.5	2.5	1548.0
see stars	94.4	2.2	94.7	3.2	386.0
see the color of his money	84.2	3.9	77.8	3.4	8170.2
see the light of day	88.9	2.8	100.0	2.8	8527.4
separate the men from the boys	88.9	3.2	100.0	1.8	2333.7
shake a leg	84.2	3.5	100.0	1.9	7770.7
shoe on the other foot	100.0	3.2	89.5	2.4	2592.6
shot in the arm	84.2	3.1	100.0	3.5	6495.5
sing a different tune	89.5	3.7	94.4	3.6	5898.2
sit on his hands	94.7	3.4	85.7	4.0	3451.5
skate on thin ice	89.5	3.2	100.0	2.8	1719.7
skeleton in the closet	84.2	3.7	94.4	2.6	6448.5
skin off his nose	77.8	4.1	94.7	3.2	1935.7
slip through his fingers	94.7	3.1	100.0	2.8	1996.2
snake in the grass	88.9	3.6	94.7	2.9	6468.2
spill the beans	94.4	3.5	100.0	2.2	1478.3
stab in the back	94.7	2.7	100.0	1.2	6686.5
stand on his own two feet	100.0	2.9	100.0	1.9	2725.7
step into his shoes	84.2	4.0	100.0	3.4	2229.7
step on his toes	89.5	2.8	94.4	3.1	3467.5
stir up a hornets nest	88.9	4.1	94.7	3.8	5031.8
swelled head	83.3	3.4	89.5	2.8	213.5
tail between his legs	77.8	4.3	94.7	2.5	1937.7
take a back seat	94.4	3.1	84.2	2.7	6217.2
take for a ride	100.0	2.8	84.2	3.0	8346.5
take his breath away	88.9	3.5	100.0	2.0	2029.2
take his medicine	100.0	2.5	83.3	3.1	2546.0
take note of	84.2	2.7	94.4	3.1	12383.0
take root	84.2	3.8	76.2	4.3	320.5
take the cake	100.0	3.4	94.4	3.2	1686.3
take with a grain of salt	77.8	3.9	100.0	3.1	11270.2
tan his hide	89.5	3.8	80.5	2.8	2342.7
three ring circus	100.0	2.8	100.0	2.8	221.3
throw cold water on	89.5	3.5	83.3	3.5	1849.2
throw himself at her feet	89.5	3.8	100.0	3.2	1868.6
throw up his hands	100.0	3.3	83.3	3.6	2233.5
tie his hands	88.9	3.3	78.9	3.3	2340.0
tie in knots	94.7	2.2	94.4	3.2	7121.3

tighten his belt	88.9	2.9	78.9	3.5	2343.0
tip the scales	89.5	3.3	81.0	3.2	1485.7
too big for his britches	88.9	3.7	100.0	2.4	3535.6
turn the tables	100.0	3.0	95.2	1.7	1556.0
twist his arm	100.0	3.4	100.0	2.9	2369.7
under his belt	89.5	3.8	100.0	3.2	2577.7
under his thumb	89.5	3.9	83.3	3.5	2571.3
under the counter	94.7	2.8	88.9	3.0	1724.3
under the sun	89.5	3.5	88.9	2.8	1751.3
up a tree	94.4	3.4	89.5	3.4	8397.0
up the creek	89.5	3.1	94.4	1.6	2114.7
up the creek without a paddle	94.7	3.6	100.0	1.9	5027.3
water over the dam	84.2	4.3	85.7	3.3	1529.5
water under the bridge	84.2	3.9	94.4	3.2	1420.5
way the wind blows	88.9	3.4	89.5	3.0	1351.7
wear the pants	94.4	2.2	94.7	2.8	1493.3
wet behind the ears	89.5	4.2	88.9	3.1	1186.5

^a Lit. = literal; Fig. = figurative.

^b Literalness = How often the phrase is heard used literally (1 = often, 5 = rarely.).

^c Familiarity = How often the phrase is heard used figuratively (1 = often, 5 = rarely).

APPENDIX B: SENTENCES USED IN THE EXPERIMENT

Low Frequency/Low Literalness/Literal

After art class, John had a *green thumb*.

To escape from prison, the prisoners had to *climb the walls*.

You can tell if your car needs new shock absorbers when you drive *over the hump*.

The construction worker's job was to *pound the pavement*.

Jan didn't want the green one, so she made the salesman *roll out the red carpet*.

The Army drill instructor made the cadets *run circles around* the compound.

In an attempt to get rid of his acne, he took all of the *skin off his nose*.

In a fit of frustration, the farmer *hit the hay*.

When a dog knows he has done something wrong, he will *put his tail between his legs*.

It can be relaxing to watch *water under the bridge*.

High Frequency/High Literalness/Literal

She wanted a new TV because hers was only *black and white*.

Usually there is a barricade at the *end of the road*.
 Fisherman use a gaff to take their *fish out of water*.
 People who live in the country many times take a weekend and *go to town*.
 It is hard to play that game unless you *have a ball*.
 The best place to catch big fish is *in deep water*.
 The milk spoiled overnight because I left it *in the bag*.
 When I bought a new car, my little brother begged me to *take him for a ride*.
 Jenny went to the doctor because she had a *pain in the neck*.
 As the secretary for the organization, you should *take note of* everything.

Low Frequency/High Literalness/Literal

The man was so paranoid he always stood with his *back against the wall*.
 After going to the dentist, be careful not to *bite your tongue*.
 The Wright brother's first airplane could barely *get off the ground*.
 I wrote it down to be sure you would *get the message*.
 In boxing it is against the rules to *hit below the belt*.
 When I have a lot to carry, it is nice if you *open the door*.
 To keep them from getting dirty, John would *roll up his sleeves*.
 At the turn of the century, the most popular entertainment was the *three ring circus*.
 If you need the key to the back room, it is *under the counter*.
 You look better when you wear that skirt than when you *wear the pants*.

High Frequency/Low Literalness/Literal

After the enormous explosion, the house looked like a *ball of fire*.
 He tried to hide the cigarette and it *burned a hole in his pocket*.
 Before electricity, to see at night you had to *carry a torch*.
 While using the saw at work, his arm was accidentally *cut to the bone*.
 Arthritis is one disease he says he can *feel in his bones*.
 If your dog is missing, you should first look *in the doghouse*.
 To see if it would work, the mad scientist took *a dose of his own medicine*.
 The instructions on the bottle said to *take with a grain of salt*.
 After getting a search warrant, the police could *kick in the door*.
 The firemen rescued the lost cat that was *out on a limb*.

High Frequency/High Familiarity/Figurative

The teacher was upset because her class was *out of hand*.
 The last answer on the test was *at the tip of his tongue*.
 Looking for a lost contact lens is like *looking for a needle in a haystack*.
 One thing parents do not like to do is discuss the *facts of life*.
 After the interview, Wendy knew she had the job *in the bag*.
 If we are going to make it on time, you had better *shake a leg*.
 If it was supposed to be a secret, why did you *let the cat out of the bag*?
 The mad scientist's ideas were *out in left field*.
 She volunteered at the hospital because she wanted to *lend a hand*.
 For a politician, that candidate is really *middle of the road*.

Low Frequency/Low Familiarity/Figurative

At first, everyone thought the new project would never *get off the ground*.
 The fat lady at the carnival would *tip the scales* at 400 pounds.
 The speaker was so disliked, everyone said he would *lay an egg*.
 Things that have already happened are just *water over the dam*.
 The detective could not find a clue because he would always *bark up the wrong tree*.
 Before the fight, one boxer told the other he would *see stars*.
 The alcoholic was trying hard *to go straight*.
 The family was in so much debt they could not *keep their head above water*.
 The employee was so bad we were sure he would *get sacked*.
 The accident made him mad enough to *make his ears burn*.

Low Frequency/High Familiarity/Figurative

The mobster told the informant that he was a *dead duck*.
 Because she could not keep a secret they called her *big mouth*.
 The new salesman was so helpful he would *bend over backwards* to serve.
 Breaking her favorite statue was the *last straw*.
 If you date a 17 year old people say you are *robbing the cradle*.
 If you have waited a half hour its time to *get the ball rolling*.
 Even when you look defeated, there is always a chance to *turn the tables*.
 The chief interrogator made the suspect *spill the beans*.
 The tired group of children just wanted to *hit the sack*.

The candidate looked so old we thought he would *kick the bucket*.

High Frequency/Low Familiarity/Figurative

The movie was so scary our stomachs were *tied in knots*.

The mobster told the informant that he would put him *out of circulation*.

We wondered what trick the super hero would *pull out of a hat*.

The coach thought all the players needed to win the game was *a shot in the arm*.

That new secretary is someone to *take note of*.

If you forget to send her a birthday card you are really *up a tree*.

The ace detective said this case was a *hard nut to crack*.

The old employee could never *hold a candle to* the new one.

When confronted with the media, the new politician did not *know enough to come out of the rain*.

A large university can make you feel like *a little frog in a big pond*.

Control Sentences

My car was so old it would never survive the trip.

Jane was worried because final exams were in six weeks.

The mail never arrived because it was a holiday.

I decided that being late for class was better than not going at all.

The trip to work took her over an hour.

You should come over and listen to my new CD.

My roommate made the best dinner last night.

Sometimes the news is so depressing I don't want to watch it.

We asked John if he liked his new job.

She is at the cleaners getting her jacket dry cleaned.

Our neighbors are really loud on weekends.

Lots of people go to the lakefront when it is warm.

He was upset because his grandmother had just died.

The Japanese economy is in as much trouble as our own.

She is not at work today because she has jury duty.

If you don't hurry up you are going to be late.

There was an interesting article in last night's paper on that.

It is too bad that our president is elected on charisma, not ideas.

She went to the store to buy some new clothes.

I heard a song last night I have not heard in a long time.

I have tried to call but I keep getting the answering machine.

Even though the book was terrible, the author won a Pulitzer Prize.
 It was very late and I was really tired.
 Tom could not get in the house because he lost his keys.
 It is the dream of every child to be an astronaut.
 A really good restaurant just opened down the street.
 It seems like they will never finish fixing the freeways around Milwaukee.
 When I came back from lunch there were several messages for me.
 I hope that you remembered to send your father a birthday card.
 There are lots of options available for summer employment.
 It is important to realize that people don't always agree.
 The secretary called to remind you of your appointment tomorrow.
 Learning a foreign language is a skill that will help you a lot in the future.
 They agreed that their next apartment would have to have a dishwasher.
 The wedding and reception were both very nice.
 In today's cities, not many people have ever been on a farm.
 Joe's mother waited for him every day after school.
 Students get anxious when exams are approaching.
 It seems like that store is always having a sale.
 Everybody was happy after the last class of the semester.

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