Comparing the Online Interpretation Processes of Metaphors and Similes

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ABSTRACT

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Metaphors take the form 'topic x is vehicle y' (e.g. *life is a journey*). Similes add "like" (e.g. *life is like a journey*). A reading experiment (self-paced moving-window paradigm) tested online interpretation of metaphors and similes followed by explanations; for example, *John says life is (is like) a journey because it has many directions.* Vehicles were read faster in metaphors than in similes. Explanations (*it has many directions*) were slower in similes than in metaphors. Frequency, but not aptness, was a predictor of reaction time; while aptness, but not frequency, was a predictor of agreement judgements. Aptness was also a more important predictor than frequency in affecting whether participants prefer a statement as a metaphor or a simile. Results are discussed in reference to Direct Statements theory (Chiappe & Kennedy, 2001), which argues that metaphors are processed like categorical statements, while similes are processed like comparison statements.

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Table of Contents

"language interpretation takes place in real time ranging from the first milliseconds of processing to long-term reflective analysis" (p.116).

-Gibbs, 1994

Metaphors and similes are figurative tropes which relate a topic (such as *lawyers*) to a vehicle (such as *sharks*). While metaphors express such comparisons without any hedge (e.g. *lawyers are sharks*), corresponding similes (similes with the same topic-vehicle pairs) do hedge statements because the word *like* is stated before the vehicle (e.g. *lawyers are like sharks*). Chiappe, Kennedy, and Chiappe (2003) found that participants preferred topic-vehicle pairs as similes when comprehension was more difficult (as indicated by participants' low comprehension ratings). When Roncero, Kennedy, and Smyth (2006) compared metaphors and corresponding similes collected from the Internet, the simile form was found to be more frequently followed by explanations (e.g. *time is like money because it's a limited commodity and requires thoughtful analysis and planning*). Thus, it seems that people may choose to use a simile when they expect comprehension to be difficult, and add an explanation to aid comprehension. While Chiappe et al. (2003) found topic-vehicle pairs to be preferred as similes when participants had given low comprehension ratings to certain topic-vehicle pairs, metaphors and corresponding similes were not found to have significantly different comprehension levels; thus, if participants rated a topic-vehicle pair to lack comprehensive ease as a simile, corresponding metaphors were rated as equally incomprehensible. Consequently, metaphors and corresponding similes should have similar comprehension levels, and require a similar number of explanations to aid

comprehension when people expect comprehension to be difficult. Why then did Roncero et al. find a larger number of explanations after the similes? In this study, online interpretation processes for metaphors and similes were examined to help determine if differences in processing difficulty could lead to a greater need for explanations after similes.

Are metaphors and similes processed differently?

Aristotle (trans. 1926) argued that no processing differences existed between metaphors and similes because metaphors were shortened similes: "simile . . . is a metaphor differing only by the addition of a word" (p.397). Two modern theories, Class-Inclusion theory (Glucksberg & Keysar 1990, 1993; see also Glucksberg, 2003) and Career of Metaphor Theory (Bowdle & Gentner, 2005), have similar assumptions regarding metaphors and similes because both theories argue that processing metaphors and corresponding similes will have the same result (i.e. the same mental representation). The theories disagree, however, on how these figurative tropes are processed. However, a third theory to be discussed later, Direct Statements Theory (Chiappe & Kennedy, 1999, 2001), disagrees with this assumption, and argues that processing a metaphor versus a corresponding simile can result in a different mental representation. Class-inclusion theory postulates that concepts have dual reference: two levels of meaning, where one levels encodes denotative features, and another level encodes connotative features. Denotative features are those associated with a word's dictionary definition: a prototypical mental picture marked by specific distinctive features which classify the word's referent (Danesi, 1998), whereas connotative features are more subjective and typically emotional. As an example, for the concept *cat*, denotative features may include

mammal, *four legs*, *feline*, and so on; while connotative features would encompass features like *silly*, *sly*, and *arrogant*. Class-Inclusion theory further argues that metaphors are processed by applying the connotative features of the vehicle to the topic, while denotative features are inhibited; thus, for *my job is a jail*, denotative features like *steel bars* would be inhibited, while connotative features like *confining*, *stifling*, and *against your will* would be projected onto the topic to express the claim that *my job is confining, stifling, and against my will.* The word *jail* is used because it acts as a prototypical exemplar for the category of things which are *confining*, *stifling*, and *against your will*, and brings these features to consciousness in the same way that the statement *tuna is a fish* brings to mind features representative of *fish*. Class-Inclusion theory argues that similes are processed by first converting them into metaphors: "*S is like P* will . . . be converted . . . into the original metaphor form, *S is P*" (Glucksberg & Keysar, 1993, p.408). Subsequently, the simile will processed in the manner just described for metaphors; hence, *my job is like a jail* is first converted into *my job is a jail*, and then processed as if it had originally been presented as *my job is a jail.*

Career of Metaphor Theory argues that metaphors and similes are processed by identifying shared relations. During a comparison stage, the knowledge domains of the topic and the vehicle will be accessed, and shared relations will be mapped. For example, in the metaphor, *men are wolves*, the shared relation *prey on* is identified between *men* and *wolves*– in the conceptualization that *men prey on women* like *wolves prey on animals*. Then, the non-identical arguments of this relation are aligned (i.e. *men* with *wolves*, and *women* with *animals*) to create the analogy that men prey on women like

wolves prey on animals. Therefore, in this theory, metaphors are understood by the creation of analogies (Jones & Estes, 2005).

Career of Metaphor Theory also argues that this processing stage can be influenced by a vehicle's conventionality level: defined as how easily connotative features associated with the vehicle are brought into processing during comprehension. When conventionality is high, it is because a vehicle has been frequently used in expressions, and its associated shared relations (e.g. *prey on* for *wolves*) have been stored in memory with the vehicle concept. Consequently, the search for shared relations is not required because they can be simply retrieved from memory, thus eliminating the need for the comparison stage. At this level of conventionality, metaphors and similes are processed as categorical statements in the manner proposed by Class-Inclusion theory. But processing similes is more laborious than metaphors because their linguistic form resembles a comparison statement and initiates a comparison stage when none is needed. Metaphors are easier to process because their resemblance to categorical statements initiates categorical processing and bypasses the comparison stage. At low levels of conventionality, where a comparison stage is required, metaphors are predicted to be more laborious than similes because they initiate a categorical process when in fact a comparison process is required. The simile form, however, initiates the needed comparison process and does not initiate a categorical process, making it easier to process.

The hypothesis that conventionality affects processing speed, however, has recently come under empirical criticism. As mentioned, Career of Metaphor Theory predicts metaphors and similes to be processed without a comparison stage when vehicle conventionality is high, with a processing advantage for metaphors. Metaphors and

similes should both be processed with a comparison stage when vehicle conventionality is low, with a processing advantage for similes. However, Jones and Estes (2006) noted that previous studies which found support for this hypothesis (e.g. Bowdle & Gentner, 2005) had not controlled for the aptness levels of the statements: the extent to which the comparison captures salient aspects of the topic (Chiappe & Kennedy, 1999). Consequently, they replicated the study by Bowdle and Gentner (2005) controlling for aptness levels, and found no significant interaction between conventionality and type of expression (simile vs. metaphor). Thus, there appears to be no advantage for one linguistic form over the other at different levels of conventionality. Assuming that this finding is correct, Career of Metaphor Theory can still argue that metaphors and similes are processed with no comparison stage when vehicle conventionality is high, and with a comparison stage when vehicle conventionality is low. But no significant difference between metaphors and similes with the same vehicles should be found because the level of conventionality remains constant.

Both Class-Inclusion theory and Career of Metaphor Theory have trouble explaining how processing differences between metaphors and similes can lead to similes requiring explanations more often than corresponding metaphors (Roncero et al., 2006). Class-Inclusion theory argues that similes must be converted into metaphors to be processed, but it is unclear why this process would lead to similes requiring explanations. Assuming explanations are used to aid comprehension, if both forms are eventually processed as categorical statements, their respective levels of comprehension should be the same. Similarly, Career of Metaphor Theory, despite results suggesting otherwise (i.e. Jones & Estes, 2006), argues that similes are more laborious than metaphors when

vehicle conventionality is high, but it is unclear why switching from an unneeded comparison process to a categorical process would require that explanations be added to similes when again, both are eventually processed as categorical statements and should ultimately have equal levels of comprehension. Indeed, Chiappe et al. (2003) found equal comprehension levels for metaphors and corresponding similes; thus, this result does not contradict the predictions by Class-Inclusion theory and Career of Metaphor Theory that comprehension levels should be equal. Consequently, a theory is required to explain how individuals can believe to have comprehended metaphors and corresponding similes equally, yet still explain why speakers choose to follow similes with explanations.

Why do speakers follow similes with explanations?

Direct Statements Theory (Chiappe & Kennedy, 1999, 2001) agrees with Class-Inclusion theory regarding how metaphors are processed, but argues that metaphors and similes are processed differently: metaphors are processed like categorical statements, but similes are processed like comparison statements. Let us examine how processing metaphors like categorical statements and similes like comparison statements could cause the need for explanations. If a person says *A robin is a bird*, the hearer will retrieve from memory the concept *bird* and apply those features from *bird* which define a robin as a *bird*.[1] If, however, a person hears the statement *a robin is like a blue jay*, the hearer will need to search within the concept *bird* and seek out a feature which makes the comparison true (e.g. that robins and blue jays have similar nest structures). The contrast, therefore, is that for a comparison statement, the listener must seek out a feature which makes the statement true, while in a categorical statement, the listener need only retrieve

[1] Clearly, the exact process remains unclear, and one may question if the notion of features is correct; for this reason, emphasis is placed on possible differences when processing a categorical statement as opposed to a comparison statement, rather than the exact mechanisms involved.

a set of features which are relevant to the topic. An analogy can be made for metaphors and similes.

Upon presentation of a metaphor, such as *a lawyer is a shark*, the listener will need to seek out those features in the vehicle that can be applied to the topic; thus, features like *fins* and *is a fish* will probably not be applied since such features are not applicable to lawyers, while features like *cunning* and *ruthless* could be applied. Crucially, the listener does not search for a *particular* feature, but instead seeks out *a set* of applicable features when comprehending the expression. This process is analogous to categorical statements: the person retrieves the features related to *bird*, and applies them to *robin*, but the set of features applied in a metaphor differs from categorical statements because certain features, as a result of their denotative nature, cannot be applied to the topic. When a simile is presented, as in *a lawyer is like a shark*, the listener will engage in a process analogous to comparison statements. Rather than retrieving a set of features associated with the vehicle, which can then be applied to the topic, the listener will seek out a feature which makes the simile true. This process, consequently, is more laborious than that involved with a metaphor, because the person must search within the vehicle's semantic set, and select a particular feature, as opposed to simply applying all applicable features.

Now imagine the following scenario, where a person when viewing a new singer could say to a friend either *that singer is an Elvis* or *that singer is like an Elvis*. The metaphor would imply that the singer possesses all of the applicable features associated with *Elvis*, while the simile would suggest that the singer possesses only some of the applicable features associated with *Elvis*, with the listener (the friend) left to his or her

own devices to decipher which feature the speaker believes the singer to have in common with *Elvis*. For either statement, the listener will be deemed to have understood the statement because upon hearing the metaphor he or she will apply all applicable features, while upon hearing the simile, he or she will apply the feature which, for the listener, makes the statement true. Rather than simply allowing the listener to interpret the meaning of the speaker's sentence, however, the speaker will add an explanation to clarify the statement; therefore, explanations aid comprehension by clarifying for the listener which feature is believed to be in common. This hypothesis is consistent with the Gricean maxim of manner, Clarity, in that individuals should avoid ambiguity (Grice, 1975).

Direct Statements Theory formulates this hypothesis because it argues that metaphors result in all applicable features being applied to the topic, while in a simile only a particular feature is selected. In contrast, both Class Inclusion Theory and Career of Metaphor Theory argue that all of the vehicle's applicable connotative features are always applied: Class Inclusion Theory argues this occurs by processing both metaphors and similes as categorical statements, while Career of Metaphor Theory argues this occurs via the creation of analogies. Direct Statements Theory can also explain why metaphors and corresponding similes have similar comprehension levels: people feel they have understood metaphors when they have applied the vehicle's applicable features, and people feel they have understood similes when they apply a feature which makes the statement valid. The feature chosen, however, may not be the one the speaker wished to make salient, so the speaker adds an explanation to clarify to the listener which feature makes the statement true.

Although Direct Statements Theory provides an explanation for the simile-explanation cooccurrence, it has not yet been clearly demonstrated that metaphors are processed categorically, while similes initiate a comparison process (Jones & Estes, 2006). Previous studies have compared comprehension latencies for metaphors and similes, where participants are asked to press a button once they believe they have understood the statement (e.g. Chiappe et al., 2003, Jones & Estes, 2006). These studies found no difference between metaphors and similes, suggesting that metaphors and similes are not processed differently. But the offline nature of the task also makes possible that processing differences while reading the two statements were not captured by the omnibus reaction time.

In order to investigate the online processing involved when reading metaphors and similes, the present study employed a moving-window paradigm, in which participants read metaphors and similes word by word. We used this paradigm in order to compare the reading times for metaphors and similes at the position of the vehicle, where the features applicable to the topic are assumed to be retrieved.

Class Inclusion Theory and Direct Statements Theory both predict longer reading times for simile vehicles, but for different reasons. Class Inclusion Theory predicts longer vehicle reading times for similes because they must first be converted into a metaphor to be processed; whereas metaphors require no such process. Direct Statements Theory would also predict longer reaction times for simile vehicles, but because the selection process for a particular topic-applicable feature with similes will take more time than simply retrieving all topic-applicable features, as done with metaphors. It is important, therefore, to differentiate whether the vehicle reaction times reflect categorical processing

or comparison processing to differentiate the hypotheses by Class-Inclusion theory and Direct Statements Theory. For this reason, in the present study, metaphors and similes were presented with accompanying explanations.

Earlier it was stated that speakers will follow similes with explanations to clarify which semantic feature makes the simile true (e.g. robins are like blue jays because they have similar nest structures). Prior to receiving the explanation, however, the listener may have already selected a different feature (e.g. that both robins and blue jays live in the woods); thus, the feature made explicit by the explanation can contradict the feature which the listener had selected. When reading a metaphor, however, the person simply projects all topic-applicable features, rather than selecting a particular feature; thus, the explanation merely increases the saliency of a feature already brought into consciousness. Consequently, similes are expected to have a contradiction-resolution stage when the explanations are read, because the listener's chosen feature can contradict the feature stated in the explanation, while no such stage is expected for metaphors. This difference will cause shorter reading times for explanations when they are read after metaphors. If, however, metaphors and similes are both processed categorically (as described in Class Inclusion Theory), then simile vehicles should take longer than metaphor vehicles, but no reading time differences should be found for explanations because both metaphors and similes will have been processed like categorical statements, and a contradiction-resolution stage will be absent for both linguistic forms.

In summary, Career of Metaphor Theory predicts no differences between metaphors and similes because both are processed in the same manner when the vehicle conventionality level is the same. Class-Inclusion theory predicts simile vehicles to take

longer than metaphor vehicles because similes need to be converted into metaphors, but it predicts no difference for explanation reading times because both will have been processed like categorical statements. Lastly, Direct Statements Theory predicts simile vehicles to take longer than metaphor vehicles because similes require a search within the vehicle's set of applicable features to select a particular feature, while explanations will have longer reading times following a simile because the feature made salient in the explanation may contradict the feature which had previously been selected; no contradiction occurs for metaphors because the listener does not select a particular feature as the feature that makes the statement valid. These predictions are summarized in the table 1.

Table 1

Vehicle and Explanation Reading Time Predictions for Metaphors and Similes

Theory	Vehicle Reading Time	Explanation Reading Time
Class-Inclusion	M < S	M = S
Carer of Metaphor	M = S	M = S
Direct Statements	M < S	M < S

Note. M = metaphor reading time, S = simile reading time

Possible processing speed mediators: Aptness and Frequency

Because metaphors and similes both necessitate the retrieval of topic-applicable features, salient features should be retrieved faster than non-salient features (Giora, 1997). For example, the relevant feature in *cherries are like olives* and *olives are like cherries* could be *has pits*, but comprehension is easier for *cherries are like olives* because *has pits*

is a more salient feature of olives than of cherries (Chiappe, Kennedy, & Smykowski, 2003). Similarly, in *lawyers are snakes* and *roads are snakes*, the comprehension level of these metaphors with the same topics, but different vehicles, differs because the saliency of the vehicle's topic-applicable feature is different (i.e. *viciousness* in *lawyers are snakes*, *curviness* in *roads are snakes*). Aptness is defined as the extent to which a comparison captures salient features of the topic in question (Chiappe & Kennedy, 1999); thus, this definition argues that aptness and saliency co-exist: aptness ratings increase as the number of salient features in the vehicle increases. Does aptness have an effect on processing speed? If it does, then reading times should be shorter when aptness is high. This finding was found by Blasko and Connine (1993); when aptness was high, response times for moderately-frequent items were smaller. Furthermore, two studies (Chiappe, Kennedy, & Chiappe, 2003; Jones & Estes, 2006) found that participants comprehended metaphors and similes faster when they were apt.

Aptness could also predict when people agree with a statement. Numerous studies find that aptness levels predict when people will prefer a claim as a metaphor or a simile (Chiappe & Kennedy, 1999; Chiappe & Kennedy, 2001; Chiappe, Kennedy, & Chiappe, 2003; Chiappe, Kennedy, & Smykowski, 2003; Jones & Estes, 2006). Rather than being an indication of comprehension, this preference may involve an assessment of the comparison's merit. For example, a person can understand the sentence *crime is like a disease*, but choose to reinforce their agreement with the statement when they find it particularly apt by converting the simile into a metaphor: *crime isn't just like a disease, crime is a disease*; while upon hearing someone say *that musician is an Elvis*, the listener can understand the statement, but express their disagreement by converting the metaphor

into a simile: *I wouldn't say that musician is an Elvis, I would say he is like an Elvis* (Chiappe, Kennedy, & Smykowski, 2003). In this manner, aptness theory predicts that people's agreement with a statement will reflect the extent to which the vehicle captures significant features of the topic. To examine the affect of aptness on comprehension and agreement in the present study, participants were asked after each statement if they agreed with the claim.

Frequency

Career of Metaphor Theory argues that when a vehicle is used repeatedly, its applicable connotative features will simply be projected onto the topic, which will lead to shorter processing times because projection is easier than the more laborious comparison stage. Certain studies have found conventionality to predict metaphors preference and comprehension latencies (e.g. Bowdle & Gentner, 2001; Bowdle & Gentner, 2005), but as already mentioned, these studies did not control for aptness. In a series of experiments, Jones and Estes (2006) showed that when aptness levels are controlled, conventionality ceases to significantly correlate with both metaphor preference and comprehension latencies.[2]

Retrieving the same set of features from a vehicle multiple times will probably lead to faster processing, but the same features will be retrieved only when the topic is the same. Therefore, processing speed for a topic-vehicle pair will be faster when the same topic-vehicle pair has been previously read. While familiarity ratings have been

[2] Career of Metaphor Theory's Achilles' heel may be its emphasis on the vehicle, while not considering the impact of the topic. For example, although "volcano" is rated as a conventional vehicle (Jones & Estes, 2006), it seems obvious that the metaphor "anger is a volcano" is more comprehensible than "sadness is a volcano" because the connotative features associated with "volcano" are more easily applied to the topic "anger" than to "sadness", but because the vehicles are the same, Career of Metaphor Theory predicts equal comprehension levels.

found to correlate with shorter reaction times (Blasko & Connine, 1993), it is unclear if this finding will occur for vehicle and explanation reading times because the reaction times in the study by Blasko and Connine represent lexical decision tasks for words following auditory presentation of a literal categorization statement or a metaphor, rather than reaction times for the figurative statements themselves. Also, familiarity ratings may be contaminated because a participant could deem a statement familiar when they also find it apt and comprehensible. To avoid such problems, rather than obtaining subjective familiarity ratings, frequency counts of topic-vehicle pairs as metaphors and similes were obtained by counting the number of times each occurred on the Internet.

NORMING STUDY

Method

Participants

Ninety-Six university students from Concordia University were recruited, and given monetary compensation for participating in the study. They were all natives speakers of English and had normal or corrected-to-normal vision.

Stimuli

The stimuli consisted of 52 topic-vehicle pairs from Chiappe, Kennedy, and Smykowski (2003), hereafter called "literature items." 18 topic-vehicle pairs were also taken from Experiment 2 of Roncero et al. (2006), which had been collected from the Internet. A further 34 topic-vehicle pairs from the Internet were obtained by typing the search phrases *common metaphor*, *common simile*, *an example of a metaphor is*, and *an example of a simile is* into the Google search engine. The first 34 topic-vehicle pairs with a minimum total of three metaphor and simile statements combined were those used in

the studies. This process made equal the number of literature and Internet items, and allowed a comparison of their frequency and aptness levels (see Appendix A).

Procedure

Three booklets were created to obtain aptness ratings: one presented topic-vehicle pairs as metaphors (*life is a journey*), one presented the topic-vehicle pairs as similes (*life is like a journey*), and one presented the topic-vehicle pairs as simply words pairs (e.g. *life-journey*); this latter format was used as a baseline to check if presenting topic-vehicle pairs as figurative statements affects aptness ratings. Below each item, a scale ranging from 0 to 10 was presented, with participants asked to circle their aptness ranking (0 representing low aptness, and 10 representing high levels of aptness). Each participant completed only one booklet (see appendix B).

A decision was made to also examine if aptness or frequency was a more important predictor of metaphor preference. Therefore, a fourth booklet was created to obtain metaphor preference ratings by presenting metaphor and simile versions of each topic-vehicle pair side-by-side, and then asking participants to circle the form they preferred (see appendix B). Participants who completed this booklet did not complete an aptness rating booklet. All four booklets presented all 104 items (52 literature, 52 Internet), with literature items alternating with Internet items.

Frequency Counts

Frequency counts were obtained by employing the method used in Roncero et al.'s (2006) method. Metaphors (e.g. *rage is a volcano*) and similes (e.g. *rage is like a volcano*) were searched on Google. The search engine displayed a list of websites that contained each sentence and its linguistic context (the order in which Google presents websites is

determined by the number of links to that page by pages that have many links). A count of the websites containing the searched item constituted the frequency count for that sentence. But to ensure that the frequency count included only relevant productions of metaphors and similes, the following constraints (the same used in Roncero et al., 2006) were used to determine whether or not a specific production could be included in the frequency count.

Constraint 1: The principle of 1 website = 1 production. Productions listed within the same website were recorded as a single production. Thus no single website could dominate the recorded frequency.

Constraint 2: The "no example" principle. Productions that were *examples* of figurative claims were excluded. For example, a website would not be counted if it included the sentence: *The metaphor life is a journey can be rewritten as the simile life is like a journey.* For this reason, productions from psychology articles, websites, and academic discussion of figurative language were not included.

Constraint 3: The "identical syntax" principle. A production may have used the same word order as the search sentence, but it was not counted if it was not syntactically the same sentence. For example, if the expression *wisdom is like an ocean* was found in a sentence such as: *The person who doubts he will receive wisdom is like an ocean wave that is driven and tossed,* it was not used. In this case, the expression *wisdom is like an ocean* is not a constituent of the found sentence.

Constraint 4: The principle of unclear context. The production was not counted if it could not be determined whether it was a use of figurative language or an example of figurative language (as defined in constraint 2).

Constraint 5: The principle of 1 referent = 1 production. Productions with the same referent were recorded as a single production. For example, several websites could include the book title *wisdom is an ocean,* but each refers to the same token.

Constraint 6: The principle of 1 context = 1 production. Metaphors and similes repeated with the same linguistic context were recorded as a single production. By this rule, all instances of *the mind is an umbrella – best when open* should be recorded as a single production. This prevents a few uses of an expression dominating the results.

Constraint 7: The principle of different semantics. Productions may match the target sentence in word order, but have a different meaning. For example, if the target sentence was *time is a thief* and the found sentence was *If time is a thief of memory, I've been royally fleeced,* then the sentence was not counted because while the produced sentence still refers to *time* as *a thief,* the addition of the prepositional phrase *of memory* restricts the meaning of *thief* in a way not relevant to the target sentence.

Because Google often produces many instances of a particular topic-vehicle pair, only the first 30 legitimate productions of each metaphor and simile were counted. This cut-off seems correct because only 16 topic-vehicle pairs (out of 104) ever reached the cut-off point of 30 for both metaphors and similes.

Results

Aptness Ratings

Aptness rating data were computed as the mean rating (between 1 and 10) for each of the three expressions (metaphor, simile, word pair). Table 2 shows the rating data.

Table 2

Mean Aptness Ratings for Metaphor, Simile, and Word Pair Items

Item Type	Mean	SD
Metaphor	5.84	1.76
Simile	5.65	1.61
Word Pair	6.10	1.47

A 3 x 2 factorial anova with item type (metaphor, simile, word pair) and source type (literature, Internet) as the between-subject factors found a main effect of source type (F (1, 306) = 26.73, $p < .001$) while the main effect for item type was not significant (F (2, 306) = 2.24, $p = .108$) nor was the interaction (F (2, 306) = 3.79, $p = .209$). To test for the effect of presenting topic-vehicle pairs as metaphors and similes, the metaphors and simile aptness ratings were averaged and compared to the ratings for word pairs. This difference was not significant (t (206) = 1.678, $p = .095$). To compare the aptness levels of literature and Internet items, the aptness ratings for metaphors, similes, and word pairs were averaged to avoid issues of multi-collinearity because their average inter-correlation was high (.792). The literature items had an average aptness rating of 6.32 (SD = 1.46), while the average aptness rating for Internet items was 5.41 (SD = 1.41). This difference was significant (t (206) = 3.23, $p < .001$).

Frequency Counts

The average frequency score for metaphors was 12.58 (SD = 12.52) for metaphors, and 9.48 (SD = 11.85) for similes. The distributions were u-shaped and extremely

platykurtic, disallowing the use of parametric tests. The non-parametric Mann-Whitney test was used, and the difference between metaphors and similes was not significant (U = 4732.5, z = -1.581, p = .114). Because the distributions were not normal, spearman correlations were used for correlations with frequency counts. The correlation between metaphor and simile frequency counts was large and significant (r_s = .827, p < .001). To compare the frequency counts of Internet and literature items, frequency counts were averaged to again avoid issues of multi-collinearity. Literature items had an average frequency count of 6.17 (SD = 9.85), while the average frequency count for Internet items was 15.88 (SD = 10.8). The Mann-Whitney compared these averages, and the difference was significant (U = 549, z = -5.25, p < .001).

Metaphor Preference

All three aptness ratings (metaphor, simile, word pairs) and both frequency counts (metaphor, simile) were entered into a multiple regression with metaphor preference as the dependant variable; the resulting R = .750 (R^2 = .562) was significant (F (5, 98) = 25.17, p < .001). Significant coefficients were metaphor aptness ratings (t = 3.77, p < .001), metaphor frequency (t = 6.22, p < .001), and simile frequency (t = -3.87, p < .001); non-significant coefficients were simile aptness ratings (t = .358, p = .721) and word-pair aptness ratings (t = .120, p = .905). To examine if these aptness ratings failed to have significant coefficients because metaphor aptness ratings left no independent variation to explain, a series of hierarchical regressions were run. We found that word pairs could significantly correlate with metaphor preference when it was the only predictor, but not if the simile aptness ratings were added as a predictor; while neither the simile nor word-pair aptness ratings would be significant predictors when metaphor

aptness ratings were added. We also compared R^2 with only metaphor aptness ratings (.380) to R^2 with all three aptness ratings (.386), and the R^2 change was not significant (R^2 change = .005, F change (2, 100) = .432, p = .650). These results argue that the covariance between metaphor aptness ratings and metaphor preference ratings captured all of the covariance between object-pair aptness ratings and metaphor preference ratings, as well as between simile aptness ratings and metaphor preference ratings. Consequently a hierarchical regression was run with metaphors aptness ratings as the only aptness predictor.

Metaphor aptness ratings were added first, followed by metaphor frequency, and then simile frequency. The overall regression was significant: R = .749 (R^2= .561), F (3, 100) = 42.62, $p < .001$. Coefficients alone could not be used to rank the importance of the predictors because there was a significant correlation between metaphor aptness ratings and metaphor frequency (r_s = .265, $p < .01$). Darlington (1990) argues that squared semi-partial correlations can be used to order the importance of the individual predictors, and this method was used to determine which predictor was the most important. Employing this procedure, aptness was found to be the most important predictor of metaphor preference with a squared semi-partial correlation of .26, followed by metaphor frequency (.17), and simile frequency (.07).

Discussion

In this study, form of presentation (metaphor, simile, word-pairs) did not affect aptness ratings. This result is consistent with two previous studies (Chiappe & Kennedy, 1999; Chiappe & Kennedy, 2001), but it contradicts two other studies which found that similes were rated more apt than metaphors (Chiappe, Kennedy, & Smykowski, 2003;

Chiappe, Kennedy, & Chiappe, 2003). Because this study used the same items as Chiappe, Kennedy, and Smykowski (2003), plus Internet items, the aptness ratings for metaphors and similes were compared again, but only for the items used by Chiappe, Kennedy, and Smykowski (2003). The difference remained non-significant (t (50) = 1.109, p = .270). One possible explanation is a lack of power in this study. Here, aptness ratings were provided by 24 participants, whereas the ratings in Chiappe, Kennedy, and Smykowski were provided by 38 participants. Therefore, a real difference may exist, but requires a larger participant pool to be found.

The frequency counts for metaphors and similes were not significantly different. This result is interesting because previous studies have consistently shown clear metaphor-simile preferences for different topic-vehicle pairs; therefore, one may expect a significant negative correlation, such that, when similes are preferred, the frequency count for metaphors will be low, and when metaphors are preferred, the frequency count for similes will be low. Instead, there was a significant positive correlation between metaphor and simile frequency counts (.827); indicating that as the number of metaphors increases, the number of similes also increases. One possible explanation is that similes have different functions at different levels of aptness. When aptness is low, similes will be used with accompanying explanations to aid comprehension, but when aptness is high, similes will be used to highlight a non-salient feature (Roncero et al., 2006). For example, Roncero et al. found that apt topic-vehicle pairs were often not followed by explanations when written as metaphors, but were followed by explanations when they were written as similes. It is possible that certain metaphors, after frequent use, have developed their own cliché meaning (Gibson, 1979), and the simile is used to create creative or far-fetched

accounts, which specify less salient aspects. For example, Roncero et al. found *time is like money* to be followed by explanations like *the less we have of it to spare the further we make it go* and *once it's spent it's gone*; specifying the less salient aspects of money: *scarcity*, *investment*, *running out of money*, and so on. Therefore, apt metaphors and less apt metaphors can both have an equal number of corresponding similes because these similes serve different functions: as explanations to aid comprehension when aptness levels are low, and as linguistic devices to express less salient aspects when aptness levels are high.

Literature items were found to be more apt than Internet items, while Internet items had higher frequency counts than literature items. These differences could reflect the selection procedures employed. Past researchers probably chose to include statements that they deemed apt and comprehensible, while in this study we accepted a topic-vehicle pair as legitimate if we found a minimum total of three metaphor and simile versions on the Internet. Because each topic-vehicle pair's intrinsic aptness value was not questioned, not doing so probably allowed a number of topic-vehicle pairs into the study which were deemed apt on their respective websites, but less apt when viewed by a general audience.[3] In terms of frequency counts, the minimum total criteria probably biased the frequency count to be larger for Internet items: for Internet items, the minimum average frequency count was three, but zero for literature items, as certain literature items were never produced on the Internet.

Lastly, aptness was more important than frequency as a predictor of metaphor preference. This result reinforces the finding by Chiappe and Kennedy (2001) where aptness was more important than familiarity as a predictor of metaphor preference. It was

[3] I thank Norman Segalowitz for this insight.

argued that frequency counts are perhaps more accurate because they are more objective than familiarity ratings, which are more susceptible to contamination from external variables like comprehension and aptness. Indeed, while Chiappe and Kennedy found a strong correlation between similarity ratings (aptness) and familiarity ratings (+.840), the correlation in this study was lower ($r_s = .622, p < .001$). Furthermore, when Chiappe and Kennedy used a commonality analysis to determine the importance of aptness and familiarity, it was found that the correlation between familiarity ratings and preference ratings was mediated by aptness: "the 33% of the variance in the preference scores explained by familiarity is decomposed into 0% unique variance and 33% ($p < .001$) variance shared with the number of common properties ratings" (p. 263). The use of frequency counts from the Internet allowed the effect of past experience to be examined in a more objective manner, and less contaminated by subjective aptness levels. Previous experience with a topic-vehicle pair as a metaphor increases preference for that pair as a metaphor, while previous experience with the pair as a simile can decrease this preference. Indeed, while aptness may be more important predictor than frequency for metaphor-simile preferences, certain expressions may be frozen as metaphors and similes for certain individuals because they quote the statement in the form they first heard the statement; for example, the simile from Forest Gump: *life is like a box of chocolates – you never know what you are gonna get* and the metaphor *life is just a bowl of cherries* from Irma Bombeck's book.

In order to understand how metaphors and similes are processed online and how aptness and frequency may influence processing time when these expressions are followed by explanations, we ran a self-paced reading experiment.

READING TIME STUDY

Method

Participants

Thirty-two Concordia University students participated in the reading time study. Students who participated in the norming study were not allowed to participate in the reading time study. Students either participated in exchange of class credit or monetary compensation. They were native speakers of English and had normal or corrected-to-normal vision. None of the participants reported having a reading disability.

Materials and Procedure

The stimuli were the same 104 topic-vehicle pairs employed in the norming study presented in sentences as similes or metaphors (e.g. *life is a journey* or *life is like a journey*). The 104 topic-vehicle pairs were inserted into sentences with the following structure, with + representing the position boundaries (i.e. parts of the sentence which were visible at one point or another):

Introduction + topic + (*is / is like*) + vehicle + *because* + explanation + closing statement.

Crucially, metaphor and simile sentences differed only at the (*is / is like*) position. For example, the topic-vehicle pair *life-journey* when written as a metaphor sentence was *Bob says life is a journey because each choice we make is like taking a new path. It was yelled at a friend*, and when written as a simile sentence, it was *Bob says life is like a journey because each choice we make is like taking a new path. It was yelled at a friend.* Introductions always consisted of two words, and had the form *Bob says*, *Mary thinks*, *Ted believes*, and so on. Closing statements had the form "*It was* _____" with the blank filled by a phrase that provided the statement a sense of time or place; for example, *It was*

written on a website; *It was uttered to a man*, and so on. Reading times for the word *because* were later analyzed for possible spillover effects from the vehicle, and the closing statements were used to capture possible such effects after the vehicles and explanations.

Explanations for topic-vehicle pairs were obtained by writing the topic-vehicle pair as a simile into the Google search engine. Similes were used because explanations are easier to obtain when searching with similes than with metaphors (Roncero et al., 2006). The first explanation presented by the search engine was accepted if it did not violate the following constraints from Roncero et al.:

Constraint 9: Elaboration rather than explanation. Some productions are elaborations of the metaphor or simile, not explanations. Their relative clauses are introduced by complements other than *because*, and when replaced by the complement *because* they become ungrammatical. For example, *Time is like a thief that steals everything away* violates this constraint because it is ungrammatical as *time is like a thief [because] steals everything away.* An explanation which does not violate this constraint is *Music is like medicine as it takes away the pain* since it is grammatical as *Music is like medicine [because] it takes away the pain.*

Constraint 10: no synonym. An explanation was rejected if it simply replaced the vehicle with a synonym; for example, *God is a rock, that is to say, a stone.*

If the first explanation presented by the search engine violated these constraints, the next explanation was checked, and so on, until an explanation which did not violate the constraints was found. If no explanation appeared on the Internet, a reasonable

explanation was created. The metaphor version of the stimuli with their accompanying explanations are presented in Appendix C.

Procedure

Stimuli were presented on a 20" viewsonic monitor attached to a Macintosh computer running PsyScope (Cohen, MacWhinney, Flatt, & Provost, 1993). Responses were collected on a CMU response box which had three buttons. The middle button was used to collect reading times and the two other buttons were used to collect decision times (left- no, right- yes). The experiment lasted 30 minutes without a break.

Participants were explained the moving-window paradigm (see appendix D for the instructions given), and then read 15 practice items consisting of both metaphors and similes to familiarize themselves with the moving-window paradigm. The sentences were first presented completely as dashes, with the dashes replacing each letter in the sentence. Once the participant pressed a button, the introduction would appear, while the rest of the sentence would still be represented as dashes. When the participant pressed the button a second time, the topic would appear, and the introduction would be replaced with dashes. Therefore, only one position was ever present on the screen at one time. Once the participant had read the closing statement and pressed the button, the sentence *do you agree?* appeared on the screen, and the participant pressed the button corresponding to either a *yes* response or a *no* response. Each participant read 52 metaphor sentences, 52 similes sentences, 52 filler metaphor sentences, and 52 filler simile sentences. Half of the filler items and half the practice items were written to elicit a "no" response (e.g. *Bob says robins are like penguins because they both live in Antarctica. It was said at the mall.*).The 52 metaphors and 52 similes were counter-balanced across participants, such

that metaphors read by participant 1 would be read as similes by participant 2, and so on. Filler and practice items remained constant.

Results

Outlier Removal

For 32 participants reading 104 items, each with seven sentence positions and one agreement judgement, a total of 53,248 reading times (RTs) were collected. To eliminate outliers, we first removed those cells that were excessively large or small: those suggesting the participant was not intentionally doing the task; for example, just pressing the button without reading, or taking a break mid-sentence. RTs shorter than 200 ms were removed (n = 559). These accounted for 1.1% of responses. To decide when RTs were excessively large, the metaphor and simile RTs at position 1 (Bob says) were graphed, as well as the metaphor and simile RTs at position 2 (life). About 95% of the data at both positions, for both metaphors and similes, was below 1000 ms. Specifically, 5.1% of the reaction times for metaphors at position 1 were above 1000 ms, 5.2% for metaphors at position 2, 5.05% for similes at position 1, 5.3% for similes at position 2. This finding suggests that the number of excessively large RTs at each linguistic-form by position interception was roughly 5%. Furthermore, these first two positions occur prior to the (is/is like) position; thus, excessively large RTs at position 1 and 2 can be attributed to erroneous variation, rather than variance caused by the independent variable (since none is yet present other than position). Consequently, we chose to assume that the top 5% of reaction times at each linguistic form by position interception were outliers. This procedure eliminated 1328 RTs deemed as excessively large.

Next, the linguistic form by position means were calculated, based on the remaining RTs, and RTs were removed if they were larger than the mean plus 2.4 standard deviations, or smaller than the mean minus 2.4 standard deviations. This standard deviation value is the number recommended by Van Selst and Jolicoeur (1994) for the removal of outliers in a sample size of this magnitude. This procedure resulted in a further 4567 RTs being removed. RTs removed at this stage were replaced with the boundaries (i.e. M + 2.4305 SD for RTs greater than this value, and M - 2.4305 SD for RTs smaller than this value). From these values, the linguistic form by position means were calculated, and used in all subsequent analyses.

For Agreement judgements (yes / no responses), if the reaction time for that judgement was eliminated during outlier removal, the judgement made was also eliminated and not replaced with any value. Responses and their associated RTs were also eliminated when the participant pressed the wrong button to give a response (i.e. the button used to read the next position in the sentence). For this reason, a further 48 cells and their associated judgements were removed from subsequent analysis. Consequently, a total of 6502 reaction times were removed as outliers (n = 12.2%).

Analyses

Average reading times for positions 4-7 are displayed in Table 3:

Table 3

Mean Reading Times (and Standard Deviations) for Sentence Constructions in four positions.

	Sentence Position			
	4. Vehicle	5. *because*	6. Explanation	7. Closing Explanation
Metaphor	574 (173)	435 (43)	1690 (458)	721 (94)
Simile	599 (146)	435 (47)	1814 (579)	743 (120)

A two-way repeated measures anova, with position and linguistic form as main factors, was run. Macauley's test of sphericity was significant ($p < .001$); thus, Greenhouse-Geisser levels of significance were used. Not surprisingly, with different blocks having different word lengths, a main effect of position was found (F (1.28, 39.77) = 22.764, $p < .001$); and with similes sentences having an extra word, it was not surprising to find a man effect for linguistic form (F (1, 31) = 237.376, $p < .001$). Crucially, the interaction was significant (F (1.31, 40.62) = 6.456, $p < .05$). Paired t-tests, with a Bonferroni correction, were run to compare metaphor and simile RTs at positions subsequent to the (*is/is like*) position: positions 4-7. The difference between metaphor and similes at the vehicle (position 4) was significant (t (31) = -3.292, $p < .01$). RTs for position 5 (*because*) were virtually identical (t (31) = .122, p = .503). For position 6 (the explanations), the difference in RTs was significant (t (31) = -2.794, $p < .01$). For block 7 (closing statement), the result was not significantly different (t (31) = -1.921, $p = .064$).

For agreement judgements, "no" judgements were coded as 0, and "yes" judgements were coded as 1. For metaphors, the agreement average was 0.63 (SD = .17), and 0.69 (SD = .13) for similes. This difference was significant (t (31) = -2.78, $p < .01$). The mean response time for participants answering the question "do you agree?" was 564.42 ms (SD = 144.65) for metaphors, and 560.15 ms (SD = 155.81) for similes. This difference was not significantly different (t (31) = .458, $p = .650$).

For frequency counts and aptness ratings, correlations were run for those positions where a significant difference had been found (positions 4, the vehicle, and 6, the explanation), as well as agreement judgements. Both the frequency counts and the aptness ratings, however, had high inter-correlations (.827 for frequency counts, .792 for

aptness ratings); therefore, to avoid multi-collinearity problems, the frequency counts and the aptness ratings were averaged. Also, Spearman correlations were used for frequency counts because their distribution was not normal. Vehicle RTs correlated negatively with frequency counts for both metaphors and similes (metaphors, r_s = -.250, $p < .01$; similes, r_s = -.213, $p < .05$), but did not significantly correlate with aptness ratings (metaphors, r = .119, p = .228; similes, r = .154, p = .118). Metaphor and simile explanations correlated positively with frequency counts for both metaphors and similes (metaphors, r_s = .229, $p < .05$; similes, r_s = .392, $p < .001$), but again did not significantly correlate with aptness ratings (metaphors, r = .011, p = .911; similes, r = .015, p = .879). In stark contrast, agreement judgements did not significantly correlate with frequency counts (metaphors, r_s = .026, p = .790; similes, r_s = -.104, p = .292), but did correlate with aptness ratings (metaphors, r = .361, $p < .001$; similes, r = .363, $p < .001$).

General Discussion

Reading times for the same vehicles were longer when written within similes than within metaphors. This finding goes against Career of Metaphor Theory which argues that if the vehicle is the same, processing speed should also be the same. This finding does support both Class-Inclusion theory and Direct Statements Theory, but for different reasons. Class-Inclusion theory argues that vehicles are processed longer within similes because similes need to be converted into metaphors before being comprehended. Direct Statements Theory argues that vehicles are processed longer within similes because the search process for a feature that makes the statement valid, occurs for similes, but not for metaphors. To determine which type of processing took place for similes (categorical or comparison), participants read explanations after both metaphors and similes. If both

metaphors and similes are processed categorically, then no significant difference should occur at the explanation position, but if processing similes, unlike metaphors, includes the selection of a particular feature, this feature can contradict the feature made explicit in the explanation, leading to longer explanation RTs for similes. Our results support Direct Statements Theory: explanations took longer when they were preceded by similes. Furthermore, the lack of a significant difference at the *because* position argues that this difference cannot be a spill-over effect from the vehicle position; processing differences between metaphor and simile vehicles seem to be resolved quickly.

This finding seems to contradict previous studies where comprehension latencies between metaphors and similes did not differ (Chiappe, Kennedy, & Chiappe, 2003; Jones & Estes, 2006). Those studies, however, used offline judgements tasks where participants indicated when they comprehended the sentence after reading the entire item, whereas this study examined participants while they were reading the different parts of the figurative statements in real time. The lack of a significant difference at position 5 *because* suggests that the processing difference between metaphors and similes is fleeting, and could ultimately evaporate during the interval between when participants finish reading the sentence and when they judge to have understood the sentence. Furthermore, participants' comprehension ratings and corresponding comprehension latencies are probably affected by how apt they find the statement because these comprehension judgements are probably evaluative and reflective, allowing aptness to influence judgements. Indeed, Chiappe, Kennedy, and Chiappe (2003) found a large correlation between comprehensibility and aptness ($r = .94$, $p < .001$). In contrast, the evaluative and reflective stage was greatly reduced in the current study because participants knew that

the sentence was not finished; thus, participants' efforts were focused on simply reading the statement, rather than indicating when they had comprehended the sentence.

Frequency was found to affect metaphor and simile RTs in similar ways, but differently for vehicles and explanations. Frequency counts correlated *negatively* with vehicle RTs, suggesting that previously retrieving features for a topic-vehicle pair will lead to faster processing (i.e. smaller RTs). Frequency counts, however, correlated *positively* with explanation reaction times. In this case, prior experience had the detrimental effect of slowing down processing speed. For similes, prior experience with a specific simile probably leads to a bias toward a feature as the one which makes the simile true, and a contradiction will be more unexpected (represented by larger reaction times) when that feature is not the one expressed in the explanation. This result is somewhat unexpected for metaphors. If metaphors bring all applicable features into consciousness, then an explanation which highlights a particular feature should not be difficult to process because that feature has already been retrieved. The argument of *all* applicable features, however, is surely an exaggeration. More probably, what is brought into consciousness by metaphors is a set of salient features, and people will process similes by choosing from this set a feature which they deem makes the simile true. Consequently, any explanation which highlights a non-salient feature will cause difficulty for both metaphors and similes. This hypothesis is reinforced by the finding by Roncero et al. (2006) that when explanations are given for apt topic-vehicle pairs, they tend to highlight non-salient features.

This argument suggests that when an explanation highlights a non-salient feature, metaphors and similes will lead to equal levels of difficulty in processing this explanation

because both will need to switch from salient features to non-salient features; yet similes seem to prepare explanations expressing non-salient features better than metaphors. Compare, for example, the sentences: *men are library books, there are still millions you haven't checked out* to *men are like library books, there are still millions you haven't checked out*[4]; the simile seems easier to read than the metaphor. One possible explanation is that the features retrieved from memory by metaphors and similes are different. For example, stating *that drink is a martini* will probably bring to mind the idea that the drink is made with gin and vermouth, and other martini-like qualities; whereas stating *that drink is like a martini* could inhibit such features because the presence of such features would make the drink *a* martini rather than *like a* martini; thus, less salient features as *is served cold, it elevates the spirits*, and *different quantities should be kept in balance*[5], are brought into consciousness before the receiver ultimately selects a feature as the one which makes the comparison valid. Consequently, metaphors are at a disadvantage when the explanation highlights a non-salient feature because these features weren't brought into consciousness, while for similes, although the person did ultimately focus on a single feature, both salient and non-salient features were present in consciousness; thus, making it easier to process the explanation when it specifies a non-salient feature. Obviously, this hypothesis is worth further investigation, and the case where simile explanations are easier to process than metaphor explanations may be isolated to items that highlight very non-salient features (otherwise, one would have expected results opposite to those found in this study where explanations were easier after metaphors).

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[4] Sentence taken from a 12-month 2007 calendar from bCreative Inc. (www.bCreative.com).
[5] These features were ones actually given in explanations after writing into Google the search phrase "is like a martini"

This hypothesis also has ramifications for the argument by Glucksberg and Haught (2006), who argued that metaphors refer to figurative referents, but similes refer to literal referents. The researchers note that when presenting the simile *some ideas are like diamonds*, participants' paraphrases contained several basic-level features (e.g. *shiny*), while the paraphrases for the corresponding metaphor contained more emergent and superordinate features (e.g. *brilliant*). Rather than arguing that metaphors and corresponding similes contain different referents, it may simply be the case that metaphors and similes do bring different sets of features into consciousness.

Aptness and Frequency

Frequency, but not aptness, was found to affect RTs, while aptness, but not frequency, was found to influence agreement judgements. These findings may support an argument by Gibbs (1994), who claimed that comprehension and appreciation operate at two temporal extremes: comprehension emphasizes the initial stages of processing, while appreciation is conscious, reflective, and done at a later stage. It is possible that previous studies, by using an offline task, tapped only into the later reflective stage, despite asking for comprehension judgements, while the online nature of this study was better suited for capturing the initial processing of metaphors and similes. In this manner, it could be argued that frequency is important for the initial processing stage, where features are retrieved from memory, and quickened when this process has been previously executed in the participant's prior experience; while aptness is important at the later conscious stage when these retrieved features are evaluated and the claim itself is judged. At this stage, features have already been retrieved from memory and processed; thus, frequency ceases to have an influence. The ability to agree with the statement, however, will be

increased when you conclude that several salient features in the topic have been captured by the vehicle. In other words, you find the statement to be true because you deem it highly apt, and your ability to agree with the statement is increased.

Lastly, while the norming study did not find aptness ratings for metaphors and similes to be significantly different, the reading time study did find a higher proportion of *yes* responses for similes than for metaphors. Because the only written difference was the word *like* in similes, it follows that something unique to similes makes these statements more plausible. A probable hypothesis is that similes are more plausible because they are less definitive than metaphors, and it is easier to agree with a hedged statement. Consequently, it is possible that any metaphor (e.g. *politicians are snake-oil salesman*) will be more agreeable when hedged; for example: *some politicians are snake-oil salesmen*, *these politicians are snake-oil salesman*, and *politicians can be snake-oil salesmen*.[6]

Metaphors are categorical statements, similes are comparison statements?

> "we have no clear criteria for distinguishing between metaphorical and literal uses of concepts, other than the distinction between linguistic and extra-linguistic meaning . . . perhaps the literal/non-literal distinction should continue to be drawn as a convenient fiction while we devote energies to discovering the processes that people use to understand language use in context" (p.377).
>
> -Glucksberg & Haught, 2006

This present study suggests that Direct Statements Theory is correct in its claim that metaphors are processed like categorical statements, and similes are processed like comparison statements. Thus, in what way do literal and figurative forms still differ? Is it possible to convert the similes *metaphors are like literal categorical statements* and *similes are like literal comparison statements* into the metaphors: *metaphors are literal*

[6] The results for a study examining this hypothesis are currently being analysed in our lab.

categorical statements, similes are literal comparison statements? Indeed, the original theory by Aristotle (trans. 1926) argued that because metaphors were false statements (i.e. lawyers are not literally sharks), they would first be converted into similes to be processed, because any created simile is always valid since two objects can always be similar in some capacity. The only difference, therefore, between literal comparison statements and similes is a smaller semantic distance in literal comparisons (e.g *a robin is like a squirrel* versus *a robin is like a fisherman*). Semantic distance, however, seems shaky ground as a distinction between literal and figurative statements because it is difficult to determine at what distance point the literal comparison becomes a simile. For example, the sentence *a robin is like a squirrel* does seem less figurative than *a robin is like a fisherman*, but if the relevant feature is *both go searching for food*, it is unclear why both statements cannot be considered simply as comparison statements as opposed to one sentence labelled as a figurative comparison while the other is labelled as a literal comparison. A clearer distinction is made between metaphors and categorical statements, where it has been argued that metaphors are not literal categorical statements because they are not literally true. For example, while the statement *a shark is a fish* entails it contains fins, swims in the water, and has gills, the statement *my child is a fish* would be more readily interpreted as a child who perhaps finds tremendous joy swimming in the pool.

Class-Inclusion theory and Direct Statements Theory, however, both adopt the argument that metaphors are processed by the topic defining which vehicle features are applicable to the topic: could not this theory be extended to literal categorical statements? Examine the sentence *Wilbur is a pig*. Is this sentence literal or figurative? Ultimately,

the decision depends on the topic: if *Wilbur* is a person, it is figurative, but if *Wilbur* is the name of a pig, it is literal. In both cases, however, it is the topic which determines which features of *pig* are applicable to *Wilbur*. If you know *Wilbur* is an animal, and you hear *Wilbur is a pig*, than you know you can apply the features that you know about the animal *pig*, but if you know *Wilbur* is a person, and hear *Wilbur is a pig*, you know that certain features aren't applicable, while others are applicable (e.g. *sloppiness*). Similarly, the metaphors *lawyers are snakes* and *roads are snakes* have different meanings because the topic dictates which features in the vehicle are applicable; therefore, the distinction made between different metaphors is the same distinction which can be made between metaphors and literal categorical statements, yet we would not label *lawyers are snakes* a metaphor and *roads are snakes* a literal categorical statement. For both literal and figurative categorical statements, the same process occurs: your stored concept of the topic dictates which vehicle features are applicable. Consequently, if the same process exists, why is there a need to call certain categorical statements literal and other categorical statements figurative? This nomenclature may indeed be pure fiction.

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Appendix A

Topic-vehicle pairs used in the norming and reading time study. The average aptness rating is the average rating for an item as a metaphor, simile, and word pair (maximum possible is 10). The average frequency count is the average frequency for an item as both a metaphor and a simile (maximum possible is 30).

Literature Items	Average Aptness Rating	Average Frequency Count
Alcohol-crutch	7.07	7.5
Beauty-passport	5.33	2.5
Billboards-warts	3.8	0
Cigarettes-time bombs	7.87	0
Cities-jungles	8.28	4
Crime-disease	6.9	17.5
Deserts-ovens	6.14	0
Desk-junkyard	4.38	1
Education-stairway	8	1
Exams-hurdles	7.94	1
Eyelids-curtains	7.43	2.5
Faith-raft	5.78	0
Families-fortresses	6.86	0.5
Fingerprints-portraits	6.22	0
Genes-blueprints	8.94	18
Giraffes-skyscrapers	5.81	0
Greed-buzzard	4.78	0
Health-glass	4.25	0
Hearts-closets	4.78	0
Highways-snakes	4.26	0
Insults-daggers	7.99	0.5
Jealousy-infection	6.8	1.5
Job-jail	4.42	0.5

Knowledge-light	8.33	22.5
Lawyers-sharks	7.93	15
Life-journey	9.45	30
love-drug	8.28	30
Memories-sponge	6.58	0
Minds-computers	7.99	27
Music-medicine	7.12	29
Obligations-shackles	6.03	0.5
Pepper-fire	4.82	0.5
Perjury-boomerang	4.07	0
Rage-volcano	7.84	0
Runners-torpedoes	5.01	0.5
Salesman-bulldozers	4.8	0
Schools-zoos	6.48	6
Sermons-sleeping pills	5.78	0
Smog-shroud	5.95	0.5
Soldiers-pawns	7.16	10.5
Teachers-sculptors	7.32	4
Television-candy	5.57	2
Time-money	7.38	30
Time-snail	4.38	0.5
Time-thief	5.3	15.5
Tree trunks-straws	3.43	0
Trees-umbrellas	6.74	5
Trust-glue	6.16	3.5
Typewriters-dinosaurs	5.1	0
Wisdom-ocean	6.62	3
Words-daggers	6.68	27.5
Wrestlers-gorillas	6.48	0

Internet Items	Average Aptness Rating	Average Frequency Count
Anger-fire	8.17	19.5
Anger-heart	3.01	0
Arguments-war	6.64	0.5
Bible-sword	5.41	13
Christ-door	4.71	6
Christians-salt	2.78	15
Clouds-cotton	6.51	1.5
Debt-disease	5.63	8.5
Dreams-water	4.61	4
Education-tree	6.54	2
Friendship-money	2.87	1.5
Friendship-rainbow	5.88	7
God-fire	4.81	23
God-parent	6.48	30
God-rock	5.51	30
Hair-rainbow	2.93	6.5
Heart-stone	3.29	30
Heaven-treasure	7.07	11.5
Knowledge-money	6.14	17.5
Knowledge-power	8.46	17.5
Knowledge-river	4.35	8
Lawyers-snakes	6.64	11
Life-beach	5.39	21
Life-bottle	2.74	1.5
Life-dream	5.42	30
Life-joke	5.23	30
Life-river	7.32	30
Love-child	6.32	14
Love-flower	7.16	30
Love-gold	6.51	30

Love-melody	6.33	19.5
Love-ocean	5.96	30
Love-oxygen	6.28	24
Love-rainbow	5.71	29.5
Love-river	5.36	30
Love-rose	6.54	30
Man-island	4.97	16
Man-lion	5.38	3
Memory-river	4.45	2
Men-fish	2.62	6.5
Money-oxygen	3.9	17.5
Peace-river	5.42	13
Pets-kids	6.26	18.5
Science-politics	4.12	9.5
Skating-flying	4.36	5
Store-zoo	5.12	2.5
Time-river	5.97	30
Tongues-fire	4.46	2
Tv-drug	7.39	26
Winter-death	5.39	13
Women-cats	4.41	30

Appendix B

For the metaphor aptness ratings booklet, participants received the following instructions:

You will be presented with linguistic statements of the form "X is Y." For example, *life is a box of chocolates*. These statements can be considered as containing two parts: the topic and the vehicle. The topic is the subject of the sentence, for example, *life* in the sentence *life is XXXXXX*. The vehicle in the sentence is the object being compared to the topic. For example, *box of chocolates* is being compared to *life* in the sentence *life is a box of chocolates*.

In summary,

Sentences: *Life is a Box of Chocolates,*
Topic: *Life*
Vehicle: *Box of Chocolates*

For each of the following sentences, your task is to rate each statement for the extent to which the vehicle captures important features of the topic on a scale from 1 to 10. 1 meaning it captures no features, and 10 meaning it captures many features. For example, some people view politics as a place full of multiple personalities that often has various individuals competing with each other for space and resources. A similar type of environment might be observed in a jungle. Consequently, an apt statement could be *politics is a jungle* because the vehicle *jungle* captures important aspects of *politics*. A less apt statement would be *politics is a beach* because the beach is seen as a place intended for fun and enjoyment. The vehicle does not capture important aspects of the topic, thus, it would receive a lower rating than *politics is a jungle*. Enjoy!

The instructions for the simile aptness ratings booklet were identical, but all metaphor forms were replaced with simile forms (e.g. "X is Y" was written as "X is like Y", and "life is a box of chocolates" was written as "life is like a box of chocolates"). For the word-pairs booklet, participants were given the following instructions:

For the following word pairs, your task is to rate the extent to which the second word captures important features of the first word on a scale from 1 to 10. 1 meaning it captures no features, and 10 meaning it captures many features. For example, some people view politics as a place full of multiple personalities that often has various individuals competing with each other for space and resources. A similar type of environment might be observed in a jungle. Consequently, the word *jungle* captures important features of the word *politics*. In contrast, the beach is seen often as a place intended for fun and enjoyment. Consequently, the word *beach* does not capture important features of the topic *politics*, and thus, would receive a lower rating on the scale. Enjoy!

The following instructions were given for the metaphor preference booklet:

You will be presented with sentence pairs of the form "X is Y" and "X is like Y." For example, *life is a box of chocolates, life is like a box of chocolates.* You will be presented with these two variant forms side by side, and your task will be to circle the form that you prefer most. Although making a choice for each sentence pair may be difficult at times, you must indicate a preferred form for every pair. Enjoy!

Appendix C

Metaphor versions of the topic-vehicle sentences used in the reading time study with their associated explanation. Simile version was identical except *is*, *are* was replaced with *is like*, *are like*

"Bob says life is a journey"	"because each choice we make is like taking a new path"
"Mary thinks time is money"	"because the less we have of it to spare, the further we make"
"Tim feels a tree is a straw"	"because it sucks up nutrients"
"Steve believes the bible is a sword"	"because it helps fight against temptation"
"Bob feels hair is rainbow"	"because there are many different colours"
"Mary believes alcohol is a crutch"	"because it is used during difficult situations"
"Tim says anger is fire"	"because it burns it all clean"
"Steve thinks anger is a heart"	"because it is filled with passion"
"Bob believes arguments are war"	"because two sides engage in battle"
"Mary feels beauty is a passport"	"because it gives you access to certain social circles"
"Tim thinks billboards are warts"	"because they hinder the landscape"
"Steve says Christ is a door"	"because we go to heaven through him"
"Bob thinks Christians are salt"	"because they add flavour and preserve what is good"
"Mary says cigarettes are time bombs"	"because it can eventually kill you"
"Tim believes cities are jungles"	"because wild animals wait at every corner"
"Steve feels clouds are cotton"	"because they look fluffy"
"Bob believes crime is a disease"	"because if not checked it will spread"
"Mary feels debt is a disease"	"because if not completely cured, it will reappear"
"Tim says deserts are ovens"	"because there is intense heat"
"Steve thinks a desk is a junkyard"	"because unneeded items accumulate there"
"Bob feels dreams are movies"	"because the sights and sounds are so real"
"Mary says dreams are water"	"because they are colourless and dangerous"
"Tim thinks education is a stairway"	"because it moves you up the corporate ladder"
"Steve believes education is a tree"	"because it can produce great products"
"Bob says exams are hurdles"	"because they can hinder progress"

"Mary thinks faith is a raft"	"because it carries you through rough times"
"Tim says families are fortresses"	"because they offer protection"
"Steve feels fingerprints are portraits"	"because they are unique to the individual"
"Bob thinks friendship is money"	"because it is easier made than kept"
"Mary believes friendship is a rainbow"	"because it is bright and full of colour"
"Tim says genes are blueprints"	"because they determine our appearance"
"Tim feels giraffes are skyscrapers"	"because they are very tall"
"Steve believes God is fire"	"because he burns the unrighteous"
"Mary says God is a parent"	"because he watches us, but allows us to mistakes"
"Bob thinks God is a rock"	"because he is unmoving and solid"
"Mary feels Greed is a buzzard"	"because more is always desired"
"Tim says health is a glass"	"because it is very fragile"
"Steve believes hearts are closets"	"because they can keep things inside"
"Bob feels a heart is a stone"	"because it can not be easily softened"
"Mary says heaven is a treasure"	"because you have to search for it"
"Tim thinks highways are snakes"	"because they are often curvy and treacherous"
"Steve believes insults are daggers"	"because they can hurt you"
"Bob says jealousy is an infection"	"because it spreads and is hard to remove"
"Mary believes a job is a jail"	"because it is confining and supervised"
"Tim feels knowledge is light"	"because it can enlighten people everywhere"
"Steve thinks knowledge is money"	"because the more you get, the more you crave"
"Bob believes knowledge is power"	"because it is rarely transferred, and almost always taken"
"Mary thinks knowledge is a river"	"because its nature is to flow"
"Tim says lawyers are sharks"	"because they are relentless"
"Steve feels lawyers are snakes"	"because the smaller they are, the more poisonous they can be"
"Mary says life is a bottle"	"because it needs to be savoured"
"Bob believes life is a beach"	"because sometimes you just like to look at it"
"Steve thinks life is a joke"	"because you only understand it when it once it is finished"
"Tim believes life is a dream"	"because you watch it and can do nothing to change it"
"Mary believes love is a child"	"because it longs for everything it can come by"

"Bob feels life is a river"	"because there are many curves and bends"
"Tim says love is a drug"	"because once you have it, you are on a natural high"
"Steve says love is a flower"	"because you have to let it grow"
"Bob thinks love is gold"	"because there is not enough of it to go around"
"Mary thinks love is a melody"	"because it does not require words"
"Tim thinks love is an ocean"	"because it can become very deep"
"Steve thinks love is oxygen"	"because you can not live without it"
"Bob feels love is a rainbow"	"because it has many different colours and shades"
"Mary feels love is a river"	"because it becomes greater with time"
"Tim feels love is a rose"	"because it is beautiful on the outside, but there is always "
"Steve feels man is an island"	"because he lives in isolation"
"Bob says man is a lion"	"because he can do terrible things during a rage"
"Mary says memory is a sponge"	"because it can absorb many things"
"Tim says memory is a river"	"because it is alive when it is moving"
"Steve says men are fish"	"because they are caught by women"
"Bob believes minds are computers"	"because what we put in them, stays there"
"Mary believes money is oxygen"	"because you can not live without it"
"Tim believes music is medicine"	"because it is designed to uplift"
"Steve believes obligations are shackles"	"because they are constraining"
"Bob feels peace is a river"	"because it never stops flowing unless the source is destroyed"
"Mary feels peppers are fire"	"because they are very hot"
"Tim believes perjury is a boomerang"	"because the lies come back to haunt you"
"Steve feels pets are kids"	"because they need attention and love all the time"
"Bob believes rage is a volcano"	"because it builds up until it explodes"
"Mary believes runners are torpedoes"	"because they run fast in a straight line"
"Tim feels salesman are bulldozers"	"because they overpower customers"
"Steve believes schools are zoos"	"because they act like minimum security detention centres"
"Bob thinks science is politics"	"because research results are shaped by ideology"
"Mary thinks sermons are sleeping pills"	"because they are very boring"
"Tim thinks skating is flying"	"because your body travels very fast"

"Steve thinks smog is a shroud"	"because it creates a large cover"
"Bob says soldiers are pawns"	"because they are used by those in power"
"Mary says a store is a zoo"	"because it is jam packed with people everywhere"
"Tim says teachers are sculptors"	"because they shape minds"
"Steve says television is candy"	"because it is both addictive and harmful"
"Bob feels time is a river"	"because it flows in one direction"
"Mary feels time is a snail"	"because it passes very slowly"
"Tim feels time is a thief"	"because it steals your youth"
"Steve feels tongues are fire"	"because they can unleash lies and insults"
"Bob believes umbrellas are trees"	"because they protect you from the rain"
"Mary believes trust is glue"	"because it holds people together"
"Tim believes TV is a drug"	"because it makes you feel good while watching it"
"Steve believes typewriters are dinosaurs"	"because they are old and extinct"
"Bob thinks winter is death"	"because everything dies"
"Mary thinks wisdom is an ocean"	"because it is very vast"
"Tim thinks women are cats"	"because they chase after men"
"Steve thinks words are daggers"	"because they can inflict pain"
"Bob says wrestlers are gorillas"	"because they are big and strong"

The following closing statements were used, where the order presented matches the order of the sentences presented above.

It was yelled at a friend
It was written on a website
it was jotted on a postcard
It was written it in a book
It was written in an e-mail
It was written in an article
It was written in a text message
It was written in a note
It was written in a memo
It was whispered to the neighbour
It was voiced to a friend
It was vocalized for a listener
It was verbalized for a teacher
It was vented out last Tuesday
It was uttered to a man
It was unearthed during research

It was typed in a memo
It was transmitted over the internet
It was told to a friend
It was told around the office
It was taken down by the secretary
It was stated in an interview
It was stated during a webex
It was stated during a speech
It was squealed by a spy
It was spread around as gossip
It was sent in a telegraph
It was sent in a letter
It was said over msn
It was revealed at the party
It was reported yesterday
It was reported by a student
It was reported by a friend
It was remarked by some observers
It was recounted by a co-worker
It was recited in a play
It was read in a book
It was read by a co-worker
It was published under a pseudo name
It was publicized in an article
It was proclaimed by a supervisor
It was posted on the net
It was posted on myspace
It was posted on livejournal
It was posted on a messageboard
It was penned in a short story
It was passed on to a friend
It was overhead during a coffee break
It was noted in the yearbook
It was muttered at breakfast
It was murmured during a meeting
It was messaged to a friend
It was mentioned to a friend
It was mentioned in a voicemail
It was mentioned at the store
It was leaked in a memo
It was heard over the speakers
It was heard on the radio
It was heard on a TV show
It was heard in a movie
It was heard by a friend
It was formulated in a poem
It was expressed in confidence
It was enunciated for the crowd
It was divulged at the bus stop
It was discussed at a meeting
It was disclosed at a conference
It was declared by some associates
It was conveyed by the manager

It was confessed to a priest
It was communicated at gathering
It was broadcast over a speaker
It was blabbed around the office
It was attached to an autograph
It was articulated on a show
It was announced at a gala
It was alleged by a victim
It was aired out to the public
It was affirmed by a witness
It was advertised on a poster
It was admitted during a trial
It was acknowledge during dinner
It was relayed over the telephone
It was scribbled down yesterday
It was advertised in a commercial
It was mentioned in a speech
It was found in a note
It was left in a voicemail
It was faxed to the boss
It was delivered in a telegram
It was sung in a jingle
It was debated during a talk show
It was conveyed to the public
It was announced at a press conference
It was noted during a slide show
It was on the first page of a book
It was recited during a poetry reading
It was told in a story
It was faxed to the office
It was sent in an e-mail
It was the headline on a newspaper
It was remarked by the professor
It was flashed on the screen
It was part of the witness's testimony

Appendix D

The following instructions were given for the reading time task:

Greetings! Today, you will be presented with various sentences, where a certain claim is being presented. The people saying the claims are all fictitious, and the sentences have been placed together for the purpose of this study. Your task is to read each sentence, and then indicate whether you agree with the claim being made. The sentences are read section by section, so you will not see the entire sentence at any given time. Instead, when you have understood the first section presented to you, press the yellow button to move on to the next section, and so on, until a prompt is presented, which asks you if you agree or disagree with the claim. If you agree with the statement you just read, press the green button to indicate "yes – I agree" or, if you do not agree with the statement you just read, press the red button to indicate "no – I do not agree." We ask that you restrict yourself to one finger: your index finger on your right hand if you are right-handed, or the index finger on your left hand if you are left-handed. IMPORTANT: You are answering if you agree or disagree with the claim being made. NOT whether the person actually said that statement, or if he or she agrees with that claim, but rather if YOU agree with the claim. Also, you will be given information about when and how the claim was made, BUT THIS SHOULD NOT INFLUENCE YOUR JUDGEMENT. Judgments should be based entirely on the claim being made, and nothing else. For example: Forrest Gump said life is like a box of chocolates, you never know what you are going to get. It was said while sitting on a bench. Your task is not to judge whether Forrest Gump actually said this statement, or if it was said on a bench. Your task is to state whether you agree or disagree with the claim that "life is like a box of chocolates, you never know what you are going to get." This may all sound a little complicated right now, so we will first present to you some practice items before starting the study, so you can become familiar with the process.