
When entailments abandon ship: Resolution of semantic conflict through Entailment Transfer Metonymy

Sean Green\(^1\), Gail Mauner\(^1\) & Jean-Pierre Koenig\(^2\)

\(^1\)Department of Psychology
\(^2\)Department of Linguistics

And Center for Cognitive Science

University at Buffalo, The State University of New York

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Abstract

The sentence “The ship confronted the storm.” must be interpreted nonliterally since confronting something requires intention. This sentence represents Entailment Transfer Metonymy (ETM), a previously undescribed variant of metonymy. Unlike other metonymy variants, with ETM, neither an NP nor a predicate undergoes semantic change. Instead, a literal subject NP satisfies the verb’s requirement for an agent argument, while an entity evoked by the referent of that NP (e.g. the ship’s crew) satisfies the intentionality entailment imposed by the verb.

Experiment 1 examined readers’ judgments for rationale clauses requiring a grammatically available intentional agent to show that nonliteral interpretation of ETMs preserves the literal meaning of subject NPs. Experiment 2 provides indirect evidence that readers may to construct Entailment Transfer metonyms soon after encountering the verb. The results of these two experiments demonstrate that ETM can enable figurative interpretation, not through meaning change but by changing the role that semantic information plays in the interpretation of the sentence.
Many sentences we encounter, if interpreted literally, are either not coherent or do not accurately convey a speaker or writer’s intended meaning. To be successfully interpreted, such sentences have to undergo some sort of meaning adjustment. Researchers have identified a number of word and sentence classes that undergo systematic meaning adjustment. These include synecdoche, as illustrated in (1a), in which a part (blade) is used to refer to a whole (sword); metonymy, as illustrated in (1b), in which the thing ordered (ham sandwich) stands in for the orderer; and metaphor, as illustrated in (1c), in which the properties associated with one entity are likened to those of another. In this case, the property of frequent reproductive activities of a pet cat is likened to a property typically associated with rabbits.

1. a. The knight wielded the blade easily.
   
   b. The ham sandwich at table 7 left a lousy tip.
   
   c. Since coming into heat, my pet cat Peaches is a regular rabbit.

   In each of these examples, the meaning adjustment can be conceptualized in terms of one entity standing in for or being likened along some dimension to the entity introduced by an NP. However, there also exist sentences in which the predicate, rather than an NP, appears to undergo some meaning adjustment. Examples of these include Stallard’s (1993) predicative metonymy shown in (2a) (for a similar idea, see Pustejovsky’s (1995) discussion of logical metonymy), and Gentner and France’s (1988) verb mutability, as shown in (2b). Unlike the metonym in (1b), the referent of the NP in these latter two examples does not change. Specifically, the referent of Nixon is still Nixon, and the referent of the lizard is still the lizard. However, in (1b), the referent of the ham sandwich is decidedly not the ham sandwich.


   b. The lizard worshipped.
Furthermore, and in contrast to examples (1a-c) where there is either some implied or mentioned entity that serves as the object of comparison or that supplies the reference for the NP undergoing meaning adjustment, the examples in (2) illustrate that there is often no clear implicit entity (e.g., sword, orderer, or pet cat) serving as an object of comparison or referent for the word undergoing meaning adjustment. For instance, it seems that bomb in (2a) means something like ordered to bomb. Likewise, in (2b), what the lizard is doing is something like worshipping. Yet since lizards cannot hold religious beliefs toward deities or experience feelings of great respect, admiration or reverence, worshipped in (2b) instead seems to mean something like act in a way that outwardly resembles the behavior of worshippers.

In this paper, we focus on a form of metonymy, exemplified by sentence (3), which has not, to our knowledge, been described in the literature on figurative language. This sentence may seem unremarkable at first. It may not even be immediately obvious that a literal interpretation is impossible. However, a moment’s reflection makes clear that a coherent interpretation of this sentence must be nonliteral. This is because ships do not have the right properties to satisfy the semantic requirements of a verb like confront; namely, that its agent be able to place itself in opposition to something, and that it be able to do so volitionally. While a ship has the capacity to place itself in opposition to a storm by moving into its path and holding its position, it cannot do so intentionally. Thus, it cannot satisfy the second requirement of the verb confront, that the action it describes be performed intentionally. We note in passing here that while this form of metonymy has not been previously studied, it is well attested to. We include, in Appendix C examples that have been culled from a Google search of Entailment Transfer metonyms that are similar to most of our constructed materials.

3. The ship confronted the storm.
In this paper, we present the results of two studies that examine figurative interpretation that permits sentences such as (3) to be acceptable. The purpose of the first study is to clarify the nature of the meaning adjustment that these metonyms must undergo. The second experiment was conducted to ascertain where in the sentence the meaning adjustment occurs. We will begin by briefly reviewing some literature on how metonymies are represented to draw attention to what is unique about metonyms like example (3) and to precisely identify the aspect of meaning that must undergo adjustment.

Many researchers have considered how figurative interpretations for metonymies might arise (e.g., Lakoff & Johnson, 1980; Leech, 1974; Ruiz de Mendoza Ibañez, 2001; Nunberg, 1975, 1995; Stallard, 1993; Ward, 2004). We will not dwell on differences across specific proposals here except to the extent that they are relevant to the hypotheses we will advance. Rather, we will focus on their commonalities and theoretical assumptions to underscore unique aspects of the metonymy exemplified by (3).

A number of researchers (e.g., Lakoff & Johnson, 1980; Nunberg, 1975; 1979; 1995) consider metonymy to involve a mapping or correspondence between a literal referent (or in Lakoff & Johnson’s terminology, source), that is, the ham sandwich in (1b), and a nonliteral deferred referent or, in Lakoff and Johnson’s terminology, a target, that is, the orderer of the ham sandwich within a given schema or complex of associations referred to as a domain. For example, the domain for (1b) would be RESTAURANT (Lakoff & Johnson, 1980). Some attention has been devoted to how the literal and deferred referents interact as the reader arrives at an interpretation for a referential metonymy (e.g., Nunberg, 1979; Leech, 1974; Fauconnier, 1985). Many analyses of referential metonymy involve the idea that the name of one entity (e.g., the ham sandwich) is used to refer to an associated entity. However, Nunberg (1995) has argued
for an alternative possibility, property transfer, in which referent of the subject NP remains the same while the meaning of the predicate changes. In property transfer, the name of a property possessed by one entity is used to refer to a property possessed by an associated entity. To illustrate, the sentence “I am parked out back” does not mean ‘My car is parked out back’ but rather ‘I am the owner the car that is parked out back.’ Thus, a predicate depicting a property possessed by the car (its location) is used to refer to an associated property possessed by the speaker (ownership of a car at that location). Like Stallard’s (1993) predicate metonymy, property transfer involves adjustment of the predicate while maintaining the literal referent of the subject NP.

Various linguistic diagnostics have been employed to show that some kind of transfer of meaning or reference is required in referential metonymies. For example, Nunberg (1995) has used coordination to argue for a transfer of a property from a deferred to a literal referent. To illustrate, in example (4a), coordination is acceptable as long as both co-ordinates describe the speaker. But in example (4b), coordination fails because one coordinate literally refers to the deferred referent, the car, while the other refers to the literal referent, the speaker. The failure of coordination in (4b) suggests that reference is not transferred from the deferred referent (the car) to I in metonyms like “I am parked out back.” If it had been, then the coordination would have been successful.

4. a. I am parked out back and have been waiting for 15 minutes.
   
   b. #I am parked out back and won't start.

In contrast to Nunberg, Ward (2004) uses evidence from quantifier scoping and anaphora with proper names to argue for reference transfer, at least for some cases of metonymy. The examples in (5) (from Sag (1981) ex. 24) are used to illustrate Ward's quantification argument.
The key point here is that the meaning of the underlined quantifiers in these sentences is associated with the deferred referent (i.e. the orderer) and not the literal referent (i.e., the sandwiches). In particular, the scope of these quantifiers is restricted not by the literal referents (the sandwiches) but by the nonliteral or deferred referents (the orderers). Thus, five in (5a) denotes the number of customers, not the number of sandwiches. Likewise, every in (5b) signifies that the predicate is a woman holds for every customer who ordered a sandwich rather than to the sandwiches.

5. a. There are five sandwiches sitting at Table 9.
   b. Every sandwich at that table is a woman.

Example (6) from Ward (2004, ex. 35) illustrates the possibility of metonymy even when there is no common noun to serve as the basis for property transfer to the NP being interpreted figuratively. Ward’s argument rests on the well-accepted assumption (Mill, 1843; Kripke, 1972) that proper names refer but do not have senses, and therefore, they have no transferable properties. Ward concludes that the only (nondeviant) possibility in cases such as (6) is that reference has been transferred from one discourse referent (the dog) to another (the dog’s owner).

What is common across Ward’s and Nunberg’s different explanations for metonymies involving NPs is that successful interpretation of a metonym involves a transfer of some sort. Our explanation for metonyms such as that in (3) will also involve a transfer, although not a transfer of either reference or sense from a deferred to a literal referent.

6. [pet owner to friend in veterinarian’s waiting room where each pet is in a cage in front of its owner with its name clearly marked on it]
   Wow—I wouldn't mind getting to know Rover over there.
Many of the linguistic diagnostics for referential metonymies cannot be easily applied to non-referential metonymies such as the one illustrated in example (2a) because they do not involve both a literal and a deferred referent. However, Stallard (1993) used one diagnostic — anaphor resolution — to illustrate how predicative metonymies differ from referential metonymies. Stallard noted that in predicative metonymies such as (2a), a subsequent anaphor agrees with the literal NP rather than a possible deferred referent. As illustrated in example (7), this pattern contrasts with what is typically found for referential metonyms. Example (7a) shows that a pronoun following a referential metonym refers to the nonliteral or deferred referent, not the literal referent. However, example (7b), which involves one of Stallard's predicative metonyms, shows that the pronoun refers to the literal referent and not to some deferred referent (i.e., the bomber crew). Examples like (7b) suggest that Nixon retains its literal meaning and that there has been no reference or meaning transfer from Nixon to the bomber crew.

7. a. The ham sandwich on table #7 left a lousy tip because he/it was unhappy with the service.

b. After Nixon bombed Hanoi, the protestors were angry at him/them (them = bomber crew)

Now let us consider how examples such as (3), which exemplify what we have dubbed Entailment Transfer Metonymy (ETM) for reasons that we will discuss below, compare with both referential and nonreferential metonyms. We will first consider whether ETM involves a deferred referent. Example (8a) shows that a pronoun is acceptable when it refers to a literal referent (i.e., the ship). Example (8b) shows that a pronoun that could potentially refer to a deferred referent (e.g. the crew or captain of the ship) is not acceptable. Moreover, like the predicative metonyms in (2), the referent of the ship is clearly the ship itself. Thus, at first blush,
it appears that ETM may not evoke a deferred referent, and hence, there is no possibility of reference transfer. Thus, we must consider three things: (1) whether it is the predicate rather than the subject NP that undergoes meaning adjustment, (2) what sort of meaning adjustment occurs, and (3) what sort of conceptual mapping underlies the nonliteral interpretation.

8. a. The ship confronted the storm but it was in bad shape.
   
   b. #The ship confronted the storm, but they were/he was in bad shape.

One possible form of predicate meaning adjustment that does not require any conceptual mapping is what Gentner and France (1988) refer to as verb mutability. Verb mutation occurs when there is a semantic mismatch between a noun and a verb, in which case the dominant interpretive strategy is for the verb to undergo meaning adjustment to fit with the meaning of the noun. However, verb mutations are quite constrained. Gentner and France found that only the aspect of the verb’s meaning that clashed with the noun was altered in the interpretation of sentences with verb-noun mismatches – an interpretive process they dubbed minimal subtraction.

As we have already noted, there is a semantic mismatch between the noun and verb in the Entailment Transfer metonym shown in (3) and in the main clauses the sentences in (8). In particular, the verb confronted semantically requires an entity capable of volitional action. But, because ships are inanimate, they do not satisfy this requirement. It may be that successful figurative interpretation of Entailment Transfer metonyms like (3) involves a relaxation of the verb’s semantic requirement of volitional agency. However, as example (9) demonstrates, this does not seem to accurately capture what is happening in the figurative interpretation of an Entailment Transfer metonym. Note that in this sentence, when the possibility of any intentional agent is explicitly denied, neither the literal nor the metonymic interpretation is possible. Thus, while there may be no anaphorically accessible deferred referent capable of volitional action in
ETM, critically, the existence of an evoked entity capable of volitional action is required for successful figurative interpretation.

9. #The abandoned ship confronted the storm.

The interpretive failure of sentences such as (9) establishes that a valid figurative interpretation crucially depends on an implicit agent that is capable of acting volitionally and that is evoked by or associated with the literal referent of the subject NP. Thus, in contrast to minimal subtraction, the volitionality entailment is not simply discarded. Instead, it is satisfied by the evoked agent. It is the evocation of an unexpressed agent (e.g. the crew) bearing some domain-specific relationship to the inanimate subject NP (e.g., the ship) that places Entailment Transfer Metonymy within the realm of metonymy rather than other forms of figurative language.

Entailment Transfer Metonymy can also be distinguished from reference transfer since entailment transfer does not make a contribution to the semantic content of the subject NP. It is perhaps less straightforward to distinguish ETM from property transfer since both involve semantic adjustment of the predicate. However, example (9) demonstrates that a subtle difference does exist. In ETM, although the predicate is not interpreted literally, the verb retains its status as the main verb of the sentence and continues to denote an action performed by the referent of the subject NP. In contrast, in a property transfer metonym such as I am parked out back, the literal referent I is not interpreted as the entity that is actually parked. Additionally, the sentence is interpreted as an equative, i.e., as ‘I am the owner of the car that is parked out back.’ But in the sentence illustrated in (3), which we argue undergoes ETM, there is no equative interpretation, and the agent of the event described by the sentence remains the ship. The difference between ETM and property transfer metonymy can be more clearly illustrated by considering the meaning of sentence (9) if it were to be interpreted as a property transfer
metonym. Imagine a context in which two WWII era destroyers are being displayed as part of a museum exhibit. A veteran notices that all of the visitors are flocking to one of the ships and ignoring the other one. The veteran turns to his friend, points to the ship that is being ignored and says, “I can’t believe that nobody wants to see that one over there. That empty ship confronted two Japanese aircraft carriers and made it through with hardly a scratch.” In this case, the adjective empty does not preclude property transfer because it does not require that the referent of the subject NP (the empty ship that the veteran pointed to) perform the act of confronting. Instead, the sentence merely equates the ship with a past incarnation of itself that possessed a crew in the past. Thus, unlike ETM, property transfer does not require that the referent of the subject NP evoke an associated entity. ETM is unique among the forms of metonymy discussed here in that the semantic adjustment is predicative but a conceptual mapping at the subject must also occur.

The failure to achieve an acceptable figurative interpretation of (9) also argues against a metaphoric interpretation of ETM. If (9) were interpreted metaphorically, as in the storm raged then the absence of a crew should not conflict with a metaphoric interpretation. However, it could be argued that an implicit agent is necessary for reasons other than a metonymic mapping. For instance, if (3) is due to personification of the ship, (9) might fail simply because abandoned ships are harder to personify. If this were the case, the personified ship should be interpreted as acting intentionally. In Experiment 1, we addressed this possibility by examining whether the ship was interpreted as acting intentionally, as predicted if personification had taken place.

Although the linguistic evidence for sentences (8) and (9) support the conclusion that ETM is occurring in sentences such as (3), the exact nature of the evoked agent is not clear. One question we might ask is whether these evoked agents are analogous to either the implicit agents
seen in short passives (e.g., the ship was sunk) or those seen in middles (e.g., the bread sliced easily). Mauner and Koenig (2000) demonstrated that the lexical semantic representations of passive verbs are the source of implicit agents in short passive sentences that Mauner, Tanenhaus, and Carlson (1995) had shown were encoded as part of the representation of short passive sentences. More importantly for the current discussion, Mauner, Koenig, Melinger, and Bienvenue (2003) demonstrated that the implicit agents in short passives are grammatically accessible while the implicit agents in middles are not. Grammatically accessible implicit agents are those that can participate in or influence other grammatical processes. For example, the implicit agents introduced in short passive sentences are grammatically accessible because they license the interpretation of infinitival rationale clauses (i.e., clauses which convey the reason for which an action was performed, such as The ship was sunk to collect the insurance money). In contrast, logically required implicit agents in middles are not grammatically accessible because they do not influence or license any grammatical processes. Our first experiment was conducted to determine whether the agents evoked in ETM are more akin to implicit agents that are grammatically accessible or to those that are grammatically inaccessible.

One might think that the failure of evoked agents to support anaphor resolution in example (8a) strongly favors a syntactically inert implicit agent such as are found in middles. However, the picture is more complex. Mauner (1996) has shown that implicit agents facilitate the construction of discourse referents for indefinite pronouns like they, which are quite permissive with respect to the antecedents that are acceptable (e.g., I need a plate. Oh, they’re in the cupboard). Yet, Mauner and Koenig (2005) have observed that the interpretation of definite pronouns like he is far more difficult when a referent must be constructed from the discourse role provided by a syntactically active implicit agent. In fact, Koenig & Mauner (1999) argue that
syntactically active implicit agents are α-definites. What this means is that they can satisfy a verb’s thematic role requirements but they do not have the referential force on which pronouns depend for the resolution of their referents. The status of syntactically active implicit arguments as α-definites explains why readers have difficulty resolving the reference for definite pronouns—α-definites do not provide a referent for them. Thus, the anaphor resolution failure with ETMs may not be a good diagnostic for whether or not the evoked agent is grammatically accessible.

A better test of whether the evoked agents in ETM are grammatically accessible would be to ascertain whether they can license the interpretation of the understood subjects of rationale clauses. A rationale clause is an infinitive clause that conveys the reason for an action described in an adjoining clause (Jones, 1991). For a rationale clause to be acceptable, the representation of the main clause to which it is attached must provide either an explicit or a grammatically accessible implicit agent capable of volitional action for the interpretation of its understood subject (i.e., PRO) (Jones, 1991; Mauner et al., 1995). The interpretation of PRO in rationale clauses does not require an explicit referent but only that its thematic restrictions for a potentially intentional agent be satisfied (Koenig & Mauner, 1999). Thus, in our first experiment we examined the acceptability of rationale clauses following Entailment Transfer Metonyms and control sentences to determine whether their evoked agents are syntactically active, as in the case of short passives, or, instead, are syntactically inactive, as in the case of middles.

Our second study was conducted to determine the point at which people begin to construct figurative interpretations for Entailment Transfer metonyms. Our motivation for this study was to test the prediction that readers begin to develop a figurative interpretation at the verb. Evidence for this hypothesis will be indirect because it comes from cases in which readers
failed to interpret the metonymy successfully. This was done by examination of region-by-region acceptance rates.

Since the intent of this paper is to introduce ETM as a novel class of figurative language, it is premature to consider the full range of factors that may influence readers’ use of ETM. The present study investigated whether interpreting a sentence figuratively through Entailment Transfer metonymy places additional cognitive demand on readers. Thus, we examined short Entailment Transfer metonyms presented without extrasentential context relative to similar controls that were interpreted literally.

Experiment 1

We have hypothesized that Entailment Transfer metonyms only satisfy the volitionality requirement of verbs like brave vicariously, via an association with an implied agent capable of acting intentionally. However, this hypothesis does not specify what the nature of the evoked or implied agent is. If the agents evoked by Entailment Transfer metonyms such as the one in (10a) are syntactically active a-definites, then a subsequent rationale clause like (10d) should be successfully interpreted and should be comparable to when that rationale clause follows a sentence that provides an explicit agent for its interpretation, such as (10b). In contrast, if the evoked agents are not syntactically active a-definites, then we would expect the interpretation of the rationale clause to fail as it would if the rationale clause were preceded by a sentence like (10c) that provides an inanimate entity incapable of volitional action. Since ETM does not involve a change of reference of the subject NP, we predict that Entailment Transfer metonyms such as (10a) will be no more able to license a rationale clause than literal sentences with inanimate agents such as (10c). In contrast, rationale clauses following sentences with an agent that is capable of intentional action, as illustrated by (10b), should be judged acceptable. The
predicted inability of sentences like (10a) to support a rationale clause is crucial to distinguishing ETM, in which the figurative interpretation does not alter or add to the semantic content of the subject NP, from other forms of metonymy in which the reference, meaning, or properties are transferred from an evoked entity to the subject NP.

10. a. The tank braved the violent firefight.

   b. The marine braved the violent firefight.

   c. The tank neared the violent firefight.

   d. to rescue the trapped soldiers after receiving the order.

Method

Participants. Fifty-nine undergraduate students at the University at Buffalo participated in this experiment in exchange for partial course credit in psychology.

Materials. Eighteen sets of sentence triples, such as those shown in example (10a-d), were constructed. Within each triple, all sentences began with a main clause, were followed by a rationale clause, and ended with a sentence-final adjunct. Sentences within a triple differed from one another in the following respects. Hypothesized metonyms like (10a) had inanimate subjects (e.g. tank, truck) and verbs that entailed an intentional agent (e.g., braved, chased). Inanimate control sentences like (10c) had the same inanimate subjects as the metonyms and their verbs permitted, but did not require, their agents to act intentionally (e.g., neared, blocked). Animate control sentences like (10b) had an animate subject (e.g., marine, woman) and the same verb, which entailed an intentional agent, as the metonyms. The regions that were used for presentation and analysis are delimited by vertical lines in example (10). The first region consisted of the entire main clause so that we could examine whether our metonyms were successfully interpreted and determine whether readers took longer to accept these sentences
than controls. The next region was the to of the rationale clause. It was followed by the rationale clause's verb, which is the first point in the rationale clause that differences might be observed that were due to interpreting the understood subject of the rationale clause. This region was followed by a verb complement region consisting of a direct object, sentential complement, or prepositional phrase. The last region consisted of an adjunct phrase. This region was included so that end of clause wrap-up effects (Just & Carpenter, 1980) would not obscure reading times in the verb complement region. A full set of materials for is provided in Appendix A.

Construction of materials, which had to meet a number of criteria, involved by a number of norming studies. To ensure that the verbs used in the metonymy sentences required intentionality of their agents, verbs that were selected for metonyms met Koenig, Mauner, & Bienvenue's (2003) semantic criteria for obligatory intentionality. In particular, all situations described by a verb required an agent capable of volitional action. Similarly, the verbs for inanimate control sentences met Koenig et al.'s semantic criteria of being optionally intentional.

To ensure that our metonyms would be likely to be interpreted figuratively, while our animate controls would be interpreted literally, a separate group of University at Buffalo undergraduates rated 24 sentence pairs like those in example (11).

11 a. The tank braved the firefight.

b. The marine braved the firefight.

Members of each sentence pair were counterbalanced across two presentation lists so that each participant read no more than one sentence from each pair. Sentences were pseudo-randomly intermixed with 42 distractor sentences. Fourteen of these had a literal meaning and no clear figurative interpretation, as illustrated by sentence (12a). Fourteen had a salient figurative interpretation but no plausible literal interpretation, as illustrated by sentence (12b). An
additional fourteen had both salient figurative and literal meanings, as illustrated by sentence (12c).

12. a. The ball rolled to the foul line.
   
   b. The White House solicited money for the election.
   
   c. The pool hall fell silent when the gangsters came in.

   On a 7-point Likert scale, with 1 indicating a strongly literal interpretation and a 7 indicating a strongly figurative interpretation, metonyms elicited a mean figurativity rating of 4.81, (range: 3.44 -6.11), while the animate sentences had a mean figurativity rating of 2.65 (range: 1.61 - 3.78). Although the metonyms were not universally rated figuratively, these data may include data from readers who did not successfully arrive at a figurative interpretation. Since readers who do so were expected to reject these metonyms outright, the mean figurativity itself does not preclude the suitability of these materials. Ratings for all but four sentence pairs differed significantly (t(17) = 2.27, p < .05), with four exceptions showing numerically higher figurativity ratings for the metonyms that fell short of significance: (truck chased/blocked, t(17) = 2.06, p = .06; glider ventured/circled, t(17) = 1.66, p = .12; church guided/inspired, t(17) = 1.68, p = .12; prison frisked/scared, t(17) = 1.10, p < .29. To minimize the effect of the small overlap in ranges and the variability between literal and figurative sentences, stimuli were assigned to presentation lists for Experiment 1 and 2, such that the mean difference in figurativity ratings across lists, as well as the mean rating for each list, were roughly equal.

   An additional constraint imposed on our main clauses was that the rationale provided by the rationale clause had to be equally plausible for the events described by our obligatorily and optionally intentional verbs. For example, if to rescue the trapped soldiers provides a better rationale for braving a violent firefight than for nearing a violent firefight, participants might
prefer the metonymy sentence, “The tank braved the violent firefight to rescue the trapped soldiers” to The tank neared the violent firefight to rescue the trapped soldiers. This could lead to higher rejection rates for inanimate control sentences, regardless of any differences due to figurative interpretation. A norming study was conducted to ensure the acceptability of the rationale clauses with respect to each verb in Experiment 1. For this norming study, the subject was always animate, to minimize the chance that a participant would rate a sentence as unlikely simply because s/he interpreted the sentence as depicting an unintentional action. One sentence from each pair was presented to participants on two lines, as illustrated in sentences (13a-b). Participants were asked to rate the extent to which the second part of the sentence was a reasonable continuation of the first. Sentences were rated on a Likert scale, with 1 indicating that the rationale clause was very unlikely as a continuation of the main clause, and 7 indicating that the sentence was very likely as a continuation of the main clause. Two stimulus lists were constructed, and each was counterbalanced such that each participant saw one sentence from each sentence pair and saw 12 animate sentences and 12 animate/possible sentences overall.  

13. a. The marine braved the violent firefight  
   to rescue the trapped soldiers after receiving the order.  

b. The marine neared the violent firefight  
   to rescue the trapped soldiers after receiving the order.  

For 18 of the 24 stimulus sentence pairs, a matched sample t-test, \( t(34) = 1.06, \ p > .05 \) revealed no significant differences in the plausibility of rationales provided by rationale clauses for events described by sentences with either intentional verbs (brave) (\( M = 5.08, SD = .91 \)) or possibly intentional verbs (neared) (\( M = 4.71, SD = .59 \)). These eighteen materials were selected for use in this and the next study. Because one of the crucial predictions for this experiment is
that rationale clauses will be unacceptable following Entailment Transfer Metonyms, the results of this norming study minimizes the chance that any failure to accept the rationale clause could be due to differences in the plausibility of the rationale clause with respect to the type of event introduced by our optionally and obligatorily intentional verbs.

Due to constraints imposed by Experiment 2, the verbs (e.g., braved and neared) and nouns (e.g. tank and marine) of the main clauses of the 18 material sets that survived the rationale clause norming were equated for character length and frequency of occurrence, based on frequency norms from Kucera and Francis (1967). The frequencies of occurrence of subject nouns were similarly equated.

Because there were only 18 stimulus sets suitable for inclusion, it was not feasible to conduct a fully crossed 2 (subject animacy) x 2 (verb intentionality) factorial design and retain adequate item power. We omitted the combination of an animate subject and a possibly intentional verb because it was not relevant to our hypotheses.

Sentences in each stimulus set were counterbalanced across three presentation lists such that within each list one member of each set appeared. Each list contained six sentences in each of the three sentence conditions, and across lists, each sentence within a triple appeared once. The order of these sentences was pseudo-randomized along with 60 distractor sentences of similar length and number of presentation regions such that no two experimental items appeared consecutively. Of the 60 distractor items, which were all divided into four, five or six presentation regions, 40 were designed not to make sense. Sentences that did not make sense could go wrong for a number of reasons, including violations of verb agreement (*The baseball player hit a home run with the bases loaded tomorrow night), improper argument structure (*My uncle ate a hot dog to the bleachers during the game last Tuesday), and semantic anomalies
(*The red bicycle laughed when it heard the funny joke this morning*). To disguise systematicities in our experimental materials, distractors included both intransitive clauses and a variety of other syntactic structures, and the region at which an anomaly occurred was varied.

**Procedure.** Sentences were presented using a cumulative, region-by-region display on a PC clone running E-Prime software (Psychology Software Tools, 2002). At the start of each trial, the participant saw a row of left-aligned dashes (or two lines in cases where the final sentence region spilled over onto a second line). Dashes corresponded to the non-white space characters within sentences. Participants began each trial by pressing a “yes” key on the keyboard, at which time the dashes corresponding to the first region were replaced by text. Participants read the region as quickly as possible without sacrificing accuracy and indicated whether the sentence made sense up to that point by pressing the “yes” or “no” key. If the “no” key was pressed, the trial ended at that point and the next trial began. If the “yes” key was pressed, the next region was revealed. The trial continued until the sentence was rejected or the final sentence region was accepted. We used a makes-sense judgment task in this study primarily to demonstrate the general acceptability of the main clauses and to compare the rejection rates at the rationale clause for the metonyms relative to the controls. While it is often the case that reading times to regions that have not been rejected are also analyzed in experiments using the stops-making-sense task, this was not done in this set of studies because of the impossibility of determining whether potentially longer reading times for metonymy sentences relative to control sentences were due to additional time required to construct a figurative interpretation for a metonym or instead to interpretive failure. Prior to the start of the experiment, participants were given instructions, which included example sentences. They also completed 10 practice sentences, five that made sense and five that were nonsensical, to familiarize themselves with the task.
Results

We recorded responses ("yes" or "no") made to each region of a stimulus sentence unless a participant made a "no" judgment in a previous region, which would end the trial at that point. We also recorded response times for regions to which participants made a "yes" response that indicated that the sentence still made sense.

To evaluate "no" judgments statistically, they were transformed into adjusted percentages that reflected the number of remaining possibilities to say "no" at each region using Boland, Tanenhaus, and Garnsey's (1990) procedure. This procedure was adopted to reduce the problem of correlations in percentages of "no" judgments across successive regions of a sentence. Very briefly, for each participant, adjusted percentages were computed by dividing the number of "no" judgments at a given region for a particular experimental condition by the number of opportunities that that participant had for responding "no" at that position. For example, if in the metonymy condition a participant made a "no" judgment at the verb region for one sentence, then the denominator used for calculating the frequency of "no" judgments elicited at the post verbal region would be reduced by 1.

Mean adjusted percentages of "no" responses across participants for each region are shown in Figure 1 for sentences whose subjects were inanimate but whose verbs required an intentional agent (metonymy condition), for sentences whose subjects were animate and whose verbs required an intentional agent (animate control condition), and for sentences whose subjects were inanimate and whose verbs did not require an intentional agent (inanimate control condition). As can be seen, the adjusted frequency of "no" judgments was higher for the metonyms (24%) than either animate (4%) or inanimate (6%) controls in the matrix clauses, suggesting that readers had difficulty interpreting some of our metonyms figuratively. There
were no apparent differences in levels of "no" judgments at the “to” region of the rationale clause. At the verb, postverb, and final adjunct regions, however, metonyms (11%, 21% and 27% respectively) and inanimate controls (13%, 25%, and 29% respectively) elicited adjusted frequencies of “no” judgments that were far greater than the animate controls (4%, 9%, and 18% respectively).

Adjusted percentages of “no” judgments were submitted to two separate 3 (list/item group) x 3 (sentence type) x 5 (region) ANOVAs in which either participants (indicated by $F_1$) or items (indicated by $F_2$) were random variables. List or item group was a between groups variable whereas sentence type and region were repeated measures. List and item group were included as a dummy variables to reduce the effects of variability due to different combinations of participants and items contributing to the analyses of interactions (Pollatsek & Well, 1995).

We observed a significant interaction between sentence type and region, $F_1(8, 448) = 6.48$, $MSE = .026$, $p < .01$; $F_2(8, 120) = 4.31$, $MSE = .012$, $p < .01$. We also observed significant effects of sentence type, $F_1(2, 112) = 19.03$, $MSE = .068$, $p < .01$; $F_2(2, 30) = 12.21$, $MSE = .025$, $p < .01$, and region, $F_1(4, 224) = 49.91$, $MSE = .037$, $p < .01$; $F_2(4, 60) = 18.47$, $MSE = .028$, $p < .01$.

To explore the interaction, we conducted a series of planned comparisons. At the main clause, the effect of sentence type was significant when either participants, $F_1(2, 112) = 36.17$, $MSE = .02$, $p < .01$, or items, $F_2(2, 30) = 13.74$, $MSE = .016$, $p < .01$, were entered as random variables. Metonyms elicited significantly more adjusted “no” judgments (24%) than either animate controls (4%), $F_1 (1, 448) = 48.63$, $MSE = .026$, $p < .01$; $F_2(1, 120) = 30.11$, $MSE =$
or inanimate controls (6%), $F_1(1, 448) = 33.78$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 120) = 23.61$, $\text{MSE} = .012$, $p < .01$. Control conditions did not differ significantly ($F_{s1\&2} < 1.35$).

In comparison to the main clause, no effect of sentence was observed at the “to” region ($F_{s1\&2} < 1$). However, the effect of sentence at the verb region in the rationale clause was significant in both analysis by participants and by items, $F_1(2, 112) = 5.37$, $\text{MSE} = .03$, $p < .01$; $F_2(2, 30) = 5.50$, $\text{MSE} = .008$, $p < .01$. Pairwise comparisons between sentence conditions revealed that this effect was driven by higher levels of adjusted “no” judgments for both metonyms, $F_1(1, 448) = 10.22$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 120) = 4.53$, $\text{MSE} = .012$, $p < .05$, and inanimate controls, $F_1(1, 448) = 8.65$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 120) = 5.79$, $\text{MSE} = .011$, $p < .05$, when they were compared to animate controls. Adjusted rates of “no” judgments to metonyms and inanimate controls did not differ from each other ($F_{s1\&2} < .1$), despite numerical differences in cumulative percentages of “no” judgments.

At the post verbal region, a significant effect of sentence type was observed in both analyses, $F_1(2, 112) = 13.17$, $\text{MSE} = .048$, $p < .01$; $F_2(2, 30) = 10.76$, $\text{MSE} = .013$, $p < .01$. Pairwise comparisons at this region revealed that, relative to the animate control sentences, adjusted frequencies of “no” judgments were higher for metonyms, $F_1(1, 448) = 34.35$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 60) = 14.16$, $\text{MSE} = .012$, $p < .01$, and inanimate controls, $F_1(1, 448) = 39.54$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 60) = 20.15$, $\text{MSE} = .012$, $p < .01$. However, “no” judgments for the metonyms and inanimate control sentences did not differ ($F_{s1\&2} < .53$).

In the adjunct region we once again observed a main effect of sentence type, $F_1(2, 448) = 7.01$, $\text{MSE} = .063$, $p < .01$; $F_2(2, 60) = 3.35$, $\text{MSE} = .036$, $p < .05$. In pairwise comparisons both metonyms, $F_1(1, 448) = 27.87$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 120) = 14.52$, $\text{MSE} = .012$, $p < .01$, and inanimate control sentences, $F_1(1, 448) = 23.44$, $\text{MSE} = .026$, $p < .01$; $F_2(1, 120) = 15.47$,
\[ \text{MSE} = .012, p < .01 \] elicited higher rates of “no” judgments relative to the animate control sentences, but did not differ from each other, \( F_{5,2} < .2 \).

**Discussion**

The main finding to emerge from this study is that responses to rationale clauses following Entailment Transfer Metonyms patterned with inanimate control sentences rather than animate controls in judgments. More specifically, readers began rejecting rationale clauses following successfully interpreted metonyms and inanimate control sentences at the postverbal region in the rationale clauses. In contrast, animate control sentences elicited fewer “no” judgments in rationale clauses. This pattern of results clearly demonstrates that the agents that are implied by Entailment Transfer metonyms are not a-definites, unlike the implicit agents of short passives. Instead, they are more like the implicit agents in middles in that they appear to be grammatically inaccessible. The finding that the metonymy sentences did not license rationale clauses provides confirmation that Entailment Transfer metonyms do not involve any transfer of reference and that the subject NPs are not metaphorically interpreted as intentional entities through personification.

We can eliminate the possibility that rationale clauses are simply not acceptable when their understood subjects target a referential metonym formed via transfer of reference or meaning. As one can see from the example sentence in (14), rationale clauses are perfectly acceptable when their understood subjects must be identified with the metonymic referent of *ham sandwich* in (14a) but unacceptable when the only possible referent is the actual ham sandwich, as shown in (14b). Experiment 1 is therefore consistent with the view that the evoked entity that allows Entailment Transfer Metonymy to take place is not grammatically accessible, as distinct from the metonymic referent in (14b).
14. a. The ham sandwich at table #7 left a lousy tip to indicate displeasure with the service.
   b. The ham sandwich that had been left on the table was stale to indicate displeasure with the service.

It may seem initially surprising that readers rejected only about 60% of the sentences in both the metonymy and inanimate controls. However, these judgments are consistent with previous studies using rationale clauses as a diagnostic for a volitional agent. For example, Mauner, Tanenhaus and Carlson (1995) found that rationale clauses following Subject NPs that were clearly incapable of volitional action (e.g. The inner tube floated to demonstrate how to rescue someone who might be drowning) showed cumulative rejection rates between 40% and 50% by the end of their rationale clause regions across three experiments. Readers may not reject rationale clauses whose interpretations are not supported by an accessible agent in an adjoining clause for a number of reasons. They may be waiting for a subsequent region to rescue the interpretation of the rationale clause, they may employ a lax acceptance criterion, they may not be sensitive to the requirements of the rationale clause, or they may have interpreted the sentence in some other way.

The inanimate control accounts for acceptance of the sentence due to these factors, since readers like those above would be likely to accept inanimate control sentences as well. In fact, one could argue that this control provides a high benchmark for rejection, since the presence of a verb that requires volitionality should, if anything, encourage a careless reader to accept a rationale clause. Thus, if readers reject metonyms as frequently as inanimate controls, this clearly indicates that they do not have access to a volitional entity capable of licensing the rationale clause.
The 24% rejection rate for metonym main clauses might initially strike the reader as surprising as well. However, one must keep in mind that while a metonymic interpretation for these sentences is possible, there is no guarantee that a reader will be able to interpret these sentences figuratively. And even when readers may be able to develop a figurative interpretation, the sensicality judgment task may bias readers who adopt particularly strict criteria to reject sentences whenever they experience difficulty in interpretation. We will take advantage of this possibility in Experiment 2, which employed the same paradigm for a region-by-region presentation of the main clauses from Experiment 1 to investigate when readers begin to generate figurative interpretations of the metonyms.

Experiment 2

Experiment 1 showed that rationale clauses are not felicitous following the metonyms used in these sentences. This is consistent with our hypothesis that an entailment of volitionality is transferred to a grammatically inaccessible evoked agent. However, since participants in Experiment 1 read the main clauses as a single region, it was not possible to precisely localize the point in the sentence at which readers began to construct these metonymies. Our main goal for our second experiment was to determine when readers generate a figurative interpretation for Entailment Transfer Metonyms. Given that the readers rejected 40% of metonymic main clauses in Experiment 1, we reasoned that the point at which readers begin to reject these sentences in greater proportions than they do control sentences could serve as an indirect index of success in developing a figurative interpretation. In particular, we expected more “no” judgments at the verb in metonymic sentences than in control sentences for readers who are aware of the semantic mismatch between a volitional verb and an inanimate subject, but who are nonetheless unable to construct a figurative interpretation at that point.
Method

Participants. 59 undergraduate psychology students at the University at Buffalo participated in exchange for partial course credit. All participants reported that they were native English speakers.

Materials and Procedure. Entailment Transfer Metonyms and their animate and inanimate control sentences from Experiment 1 were altered by eliminating the rationale clause between the main clause and the sentence-final temporal adjunct. An example set is provided in (15). Vertical bars indicate the four regions that were used for presentation and analysis. The first region included the subject, and the second region consisted of the verb. The third, post-verb region consisted of a short phrase, such as a direct object, prepositional phrase or sentential complement, and did not vary across conditions within a sentence triple. As in Experiment 1, region four, which was also invariant across sentences within each materials set, was a temporal adjunct that was included to avoid sentence wrap-up effects at the final region. A full set of experimental sentences is listed in Appendix B. The procedure was identical to that of Experiment 1.

15. a. The tank | braved | the violent firefight | after receiving the order. |

   b. The tank | neared | the violent firefight | after receiving the order. |

   c. The marine | braved | the violent firefight | after receiving the order. |

Judgment data were adjusted using the procedure described in Experiment 1. For each participant, at each region of a stimulus sentence, the adjusted percentages of “no” judgments were tabulated. Mean percentages of unadjusted “no” responses across participants are shown in Figure 2 for sentences whose subjects were inanimate but whose verbs required an intentional agent (metonymy condition), for sentences whose subjects were animate and whose verbs
required an intentional agent (animate control condition), and for sentences whose subjects were inanimate and whose verbs did not require an intentional agent (inanimate control condition). As can be seen, metonymy sentences, whose inanimate subjects conflicted with requirements that the agents of the verb be capable of acting intentionally, elicited more “no” judgments at the verb, post verb, and adjunct region. Overall, sentences in the metonymy condition elicited an overwhelmingly higher cumulative frequency of rejection (58%) relative to the animate (23%) and inanimate (24%) controls. Rejection rates were negligible (< 2%) in all conditions at the subject region. At the verb, postverb and sentence final adjunct regions respectively, adjusted rejection rates were higher in the metonymy condition (18%, 27% and 28%) than in the animate (<1%, 9%, and 15%) and inanimate control (2%, 8% and 14%) conditions.

Adjusted percentages of “no” judgments were submitted to two separate 3 (list/items group) x 4 (sentence type) ANOVAs in which either participants or items were random variables. List and item group were between groups variables whereas sentence type and region were repeated measures. Overall, sentence type interacted with region, $F_1(6, 336) = 8.99$, $MSE = .017$, $p < .01$; $F_2(6, 90) = 6.01$, $MSE = .01$, $p < .001$. There were also significant main effects of both sentence type, $F_1(2, 112) = 68.33$, $MSE = .015$, $p < .01$; $F_2(2, 30) = 11.67$, $MSE = .035$, $p < .01$, and region, $F_1(3, 168) = 34.52$, $MSE = .032$, $p < .01$; $F_2(3, 45) = 19.91$, $MSE = .022$, $p < .01$.

We explored the sentence type by region interaction via analyses of variance conducted at the verb, postverb, and adjunct region. At the verb, there was a significant effect of sentence, $F_1(2, 112) = 76.03$, $MSE = .008$, $p < .01$; $F_2(2, 30) = 11.26$, $MSE = .015$, $p < .01$. Pairwise comparisons showed that the metonymy sentences elicited more ‘no’ judgments than either the
animate controls, $F_1 (1, 336) = 54.71, \text{MSE} = .017, p < .01; F_2 (1, 90) = 26.07, \text{MSE} = .01, p < .01$, or inanimate controls, $F_1 (1, 336) = 46.49, \text{MSE} = .017, p < .01; F_2 (2, 30) = 22.55, \text{MSE} = .01, p < .01$. Judgments to control sentences did not differ ($F_{S1&2} < .4$).

At the postverb region there was also an effect of sentence type, $F_1 (2, 112) = 30.11, \text{MSE} = .022, p < .01; F_2 (2, 30) = 11.82, \text{MSE} = .027, p < .01$. Again, pairwise comparisons revealed that metonyms elicited more “no” judgments than either animate, $F_1 (1, 336) = 59.15, \text{MSE} = .017, p < .01; F_2 (1, 90) = 45.46, \text{MSE} = .01, p < .01$, or inanimate control conditions, $F_1 (1, 336) = 60.2, \text{MSE} = .017, p < .01; F_2 (1, 90) = 48.82, \text{MSE} = .01, p < .01$. Judgments to control sentences did not differ ($F_{S1&2} < .06$).

A similar pattern was observed at the adjunct region. There was a significant effect of sentence type, $F_1 (2, 112) = 5.86, \text{MSE} = .038, p < .01; F_2 (2, 30) = 4.34, \text{MSE} = .022, p < .05$. Again, the metonymy condition elicited more no judgments than either the animate, $F_1 (1, 336) = 17.89, \text{MSE} = .017, p < .01; F_2 (1, 90) = 13.73, \text{MSE} = .01, p < .01$, or inanimate controls, $F_1 (1, 336) = 19.98, \text{MSE} = .017, p < .01; F_2 (1, 90) = 14.83, \text{MSE} = .01, p < .01$. There were no significant differences between the control conditions ($F_{S1&2} < .06$).

Since two items (“the microphone listened” and “the station wagon loitered”) elicited high rates of rejection in Experiment 1, we repeated this analysis with these items removed to ensure that the pattern of results was not driven primarily by these items. These reanalyses led to a similar pattern of judgments.

**Discussion**

The goal of Experiment 2 was to determine when readers begin to interpret Entailment Transfer metonyms figuratively. The finding that some metonyms were rejected at the verb suggests that readers become aware of the entailment mismatch upon encountering the verb.
Although this does not prove that readers are forming figurative interpretations at the verb, it provides indirect support for this conclusion. Presumably, readers who accept the sentences must arrive at an acceptable interpretation fairly quickly or else they too should have rejected the sentence at the verb or soon afterward.

General Discussion

This study investigated a previously undescribed form of metonymy, termed Entailment Transfer Metonymy, exemplified by sentences like The ship confronted the storm. Entailment Transfer Metonymies are triggered by a mismatch between the lexically encoded entailments of a verb and the semantic properties of an NP. The Entailment Transfer Metonyms that we examined involved a mismatch between an inanimate subject NP and a verb that requires intentionality on the part of its agent. We proposed that the semantic requirements of the verb, which are normally fulfilled by the literal referent of the subject NP are instead jointly fulfilled by its literal referent and an additional entity that is evoked by the literal referent. Specifically, an inanimate subject NP, which is interpreted literally, satisfies the agent requirement of the verb but does not satisfy the requirement that this agent act volitionally. The requirement that the agent be intentional is instead satisfied by the evoked agentive entity. This bifurcation allows the resolution of the entailment mismatch without relaxing the verb’s entailments. Hence, the verb does not undergo any mutation in meaning. Recall from the discussion of example (9) that there must be an evoked agent for Entailment Transfer metonymies to be figuratively interpretable since interpretative failure results when the evocation of such an agent is not possible.

This analysis of Entailment Transfer Metonymy was supported by the pattern of judgments to rationale clauses following Entailment Transfer metonyms, and animate and inanimate control sentences observed in Experiment 1. In this experiment, the interpretation of
rationale clauses was used to investigate to both whether the subject NPs of Entailment Transfer metonyms undergo meaning change and whether the evoked agent that satisfies the volitionality requirement of the verb is a-definite (Koenig & Mauner, 1999). We found that judgments to rationale clauses following Entailment Transfer metonyms patterned with judgments to rationale clauses following inanimate controls rather than to those following animate controls. Two conclusions can be drawn from this pattern. First, the subject NPs of ETMs do not undergo any meaning change since they retain their literal interpretations and do not acquire the ability to act volitionally. The second is that the agentive entity that must be evoked in order for an Entailment Transfer Metonymy to be successfully interpreted is not an a-definite (Koenig & Mauner, 1999). Had the subject NP changed in meaning and acquired the ability to act volitionally or had the evoked agent been an a-definite implicit agent, then the judgments to rationale clauses following Entailment Transfer metonyms would have patterned with judgments to rationale clauses following animate control sentences.

Experiment 2 was conducted to determine when in a sentence readers construct Entailment Transfer Metonyms. The point at which “no” judgments to metonyms began to sharply diverge from “no” judgments to control sentences provides indirect evidence that the interpretation of Entailment Transfer Metonyms, at a minimum, may begin at the verb. In particular, when readers failed to successfully interpret an Entailment Transfer Metonym figuratively, these failures began emerging at the volitionality entailing verb. This suggests that it is at the verb in Entailment Transfer Metonyms that readers first begin to construct a figurative interpretation for these sentences that would lead them to continue to find them acceptable.

The results from Experiment 1 place Entailment Transfer Metonymy in a class apart from other metonymies previously described in the literature. As we have already argued, ETM does
not conform to any previously described variant of metonymy or meaning adjustment. In contrast to referential metonymy in which reference or sense is transferred from a deferred referent to the literal referent of the subject NP, in ETM, the literal subject retains its literal meaning and does not acquire properties that would allow it to fulfill the requirements of the verb. However, ETM is not simply meaning adjustment of the predicate either, as is illustrated by the failure of metonymy when context precludes the existence of an implicit, animate entity (e.g., #The abandoned ship confronted the storm). Therefore Entailment Transfer Metonymy cannot be attributed to meaning adjustment of the predicate or the subject alone.

Some aspects of ETM raise questions that have implications for figurative language in a broader sense. For instance, ETM contrasts with the metonymies discussed in the introduction in that they do not have a readily describable literal meaning. To illustrate, the property transfer involved in a figurative interpretation of “I am parked out back” can be expressed by saying that the sentence means something like, “I am the owner of the car that is parked out back.” Entailment transfer metonyms cannot be easily paraphrased in this way because the property being transferred is not expressed in the figurative meaning of the sentence. Entailment Transfer Metonymy is thus an example of a “behind the scenes” transfer that facilitates and influences understanding of the sentence without apparently contributing to the sentence’s propositional content. At this point, we do not know whether ETM is unique among forms of figurative language, or whether others exist that also do not make clear semantic contributions to a sentence. We also do not know whether Entailment Transfer is restricted to the agent entailment of intentionality, or whether other entailments might also participate in this phenomenon.

ETM differs from other types of metonymy that have received more attention in the literature in other ways as well. One important difference between ETM and some more well-
studied forms of metonymy is that Entailment Transfer Metonyms are not conventionalized and do not correspond to conventionalized mappings like the “PRODUCER FOR PRODUCT” mapping (McElree, Frisson, & Pickering (2006), place-for-institution mapping (Frisson & Pickering, 1999) or place-for-event mapping (Frisson & Pickering, 1999). In fact, for the metonymies investigated in some of these studies, not only were the mappings fairly conventionalized but, in some cases, the specific instantiation of the mapping itself was well-established. For example, Frisson and Pickering (1999) examined referential metonyms such as Vietnam standing in for the Vietnam War and Woodstock standing in for the 1969 music festival at Woodstock. Metonyms such as this one are highly conventionalized, to the point where a younger reader could conceivably arrive at more or less correct figurative interpretations of them without knowing anything about the country of Vietnam or the town of Woodstock.

In contrast, ETM does not seem to have this level of conventionalization. This observation may, in part, account for why our Entailment Transfer metonyms were not always successfully interpreted in Experiments 1 and 2. Studies have shown that conventionalization, at a minimum, can determine whether figurative interpretations of proverbs (Katz & Ferretti, 2001), irony (Giora & Fein, 1999a), metaphor (Giora & Fein, 1999b), and idioms (Schweigert, 1986) are achieved concurrently with literal ones and that conventionalized figurative language might not even rely on conceptual mapping (Keysar, Shen, Glucksberg & Horton, 2000) or may, in some cases, involve a substantially different form of figurative interpretation (Bowdle & Gentner, 2005). In short, conventionalization increases the ease with which some types of figurative expressions are processed and the fact that the Entailment Transfer Metonyms we studied are not conventionalized may have lead to greater processing difficulty and higher rates of interpretative failure than is sometimes seen in investigations of other types of metonymy.
It is also worth considering how ETM relates to other forms of figurative language such as metaphor and personification. One question that arises is whether a conceptual mapping across domains (Lakoff & Johnson, 1980) could also license entailment transfer. Clearly, there are metaphorical analogs of referential metonymy (“The swine at table five left a lousy tip”) and predicative metonymy (e.g., “Tina is currently weaning her latest child,” where the predicate refers to her work on a scientific theory that Tina is working on; from Keysar, Shen, Glucksberg & Horton, 2000). However, there is reason to think, in principle, that there is no clear metaphoric analog of ETM. This is because the evoked entity that satisfies the entailment of volitionality is actually capable of playing a causal role in the event described by the ETM. That is to say, the crew is able to interact with the storm in a volitional manner. In metaphor, the domains are separate by definition, so any entity, no matter how clearly evoked, would not be able satisfy a verb’s entailments.

Perhaps the closest one can come to a figurative analog of ETM is personification. In the case of personification, human-like qualities may be ascribed to inanimate objects, such that death for instance can be thought of as a reaper, harvesting souls as a person might harvest grain. Lakoff (1993) considers personification to be the result of an “EVENT FOR ACTION” mapping. So, for instance, you could say something like, “A storm confronted Odysseus on his way home,” the EVENT, the occurrence of the storm, is mapped onto the ACTION of an obstinate, belligerent and wholly fictive person. The difference between personification and ETM is most readily apparent if you interpret the sentence, “A storm confronted Odysseus on his way home,” as the ancient Greeks might have, that is, as a consequence of the fact that Odysseus has angered the sea god, Poseidon. By elevating the fictive entity to the status of a real (albeit mythological) entity, it now falls within the SEA domain, and the figurative interpretation is now an Entailment
Transfer Metonymy. Since the act of confrontation is now viewed as instigated by Poseidon, the entailment can be fulfilled without personifying the storm. If this example seems too fanciful, consider a sentence like, “A hail of arrows confronted the knights on the first day of the siege,” compared to “A sudden storm confronted the knights on the first day of the siege,” to more clearly distinguish between ETM and personification. A storm can be personified but cannot evoke a volitional agent, while the opposite is the case for a hail of arrows.

This Poseidon example just discussed illustrates a few interesting points. First, it underscores the semantic foundation of ETM, namely, that there is a decoupling between intention and agenthood. The storm performs the action, and the action is intended, but the intention comes from outside the purview of the sentence. To an audience that understands the appropriate conceptual mapping, ETM is powerful and efficient tool of expression. In the case above, ETM allows the speaker or writer to – without adding a single word and without distracting the focus of the sentence from the event at hand – bring to bear upon the sentence not only general intentional qualities but a specific causal force and all the baggage that comes with it. With respect to the practical and symbolic implications of the sentence, an angry storm is one thing; an angry god is something else. Our claim about the utility of ETM may seem like a bit of overstatement given that this form of metonymy has, to our knowledge, never been studied before. However, it is not difficult to demonstrate that ETM, if not ubiquitous, is at least not uncommon. To demonstrate this for ourselves, we used the volitionality entailing verbs from metonymy sentences from Experiments 1 and 2 along with their inanimate subject NPs (or closely related NPs) as keywords in a Google search to determine whether they would yield any Entailment Transfer Metonyms. We were successful in finding examples of ETM for 15 of our 18 noun-verb combinations. These examples and their sources are provided in Appendix C.
One ongoing debate in the figurative language processing literature, namely whether figurative language processing occurs after processing of the literal meaning (i.e., the Standard Pragmatic Model; Katz, 1977; Searle, 1978; Grice, 1975) or concurrent with literal processing (i.e., the Direct Access View; Gibbs, 1990, 2002; Nayak & Gibbs, 1990) is not addressed by the current studies. Although we collected reading time data for sentences that participants found acceptable, because of the relatively high rejection rates, these data yielded only weak trends indicating that processing in ETM was more resource consuming than processing literal controls sentences. Additionally, given the relatively high rates of rejection, longer reading times cannot be clearly interpreted as supporting the hypothesis that figurative expressions require more processing resources during interpretation than literal controls since longer times could instead presage interpretive failure. It should be noted that recent work argues that literal and figurative language comprehension are fundamentally similar (Giora, 2002) and calls into question the clear conceptual distinction between figurative and literal meaning (Ariel, 2002 and a number of studies suggest that some figurative interpretations are generated automatically (Gildea & Glucksberg, 1983; Glucksberg, Gildea & Bookin, 1982) and rapidly during reading (Blank, 1988; Cacciari & Tabossi, 1988). Factors such as salience (Ortony, 1979, Giora, 2002), conventionalization (Keysar, Shen, Glucksberg & Horton, 2000) and aptness (Blasko & Connibine, 1993) have been shown to influence when and whether figurative interpretations are constructed. We will conclude by noting that Entailment Transfer Metonymy suggests a wider role for the within-domain conceptual mapping envisioned by Lakoff & Johnson (1980). ETM reminds us that the figurative interpretation serves not merely to denote or refer to a literal meaning but to anchor the sentence more firmly to its surrounding context and to widen the implications of what is said or written. It is easy to imagine that similar effects exist beyond the
conditions examined here. We hope that this introduction to the phenomena of Entailment
Transfer Metonymy will serve to stimulate some of these investigations.
References


Appendix A

Experimental sentences for Experiment 1. The first sentence in each group of three sentences is in the animate condition, the second is in the metonymy condition, and the third is in the inanimate condition.

The warden frisked all of the new inmates to punish them for their disobedience after the riot.
The prison frisked all of the new inmates to punish them for their disobedience after the riot.
The prison scared all of the new inmates to punish them for their disobedience after the riot.

The old chauffeur loitered in the driveway to relax after a long drive this evening.
The station wagon loitered in the driveway to relax after a long drive this evening.
The station wagon stopped in the driveway to relax after a long drive this evening.

The priest guided the artist's style to nurture a spiritual quality in his work when he was in Rome.
The church guided the artist's style to nurture a spiritual quality in his work when he was in Rome.
The church inspired the artist's style to nurture a spiritual quality in his work when he was in Rome.

The informant listened in the alley to investigate who was behind the assassinations last week.
The microphone listened in the alley to investigate who was behind the assassinations last week.
The microphone remained in the alley to investigate who was behind the assassinations last week.
The woman chased the movie star to make sure that he gave an autograph last night.

The truck chased the movie star to make sure that he gave an autograph last night.

The truck blocked the movie star to make sure that he gave an autograph last night.

The canoeist steered past the sharp rocks to navigate the dangerous rapids a few hours ago.

The canoe steered past the sharp rocks to navigate the dangerous rapids a few hours ago.

The canoe drifted past the sharp rocks to navigate the dangerous rapids a few hours ago.

The scientist assessed the brittle rocks to search for proof of life during the mission.

The Mars rover assessed the brittle rocks to search for proof of life during the mission.

The Mars rover crushed the brittle rocks to search for proof of life during the mission.

The experienced pilot ventured behind enemy lines to eavesdrop on troop movements before the attack.

The miniature glider ventured behind enemy lines to eavesdrop on troop movements before the attack.

The miniature glider circled behind enemy lines to eavesdrop on troop movements before the attack.

The teenager vandalized the gravestone to antagonize the religious cult just after midnight.

The bulldozer vandalized the gravestone to antagonize the religious cult just after midnight.

The bulldozer overturned the gravestone to antagonize the religious cult just after midnight.
The astronaut studied the asteroid field to identify valuable minerals trapped within on the day the mission began.

The spaceship studied the asteroid field to identify valuable minerals trapped within on the day the mission began.

The spaceship entered the asteroid field to identify valuable minerals trapped within on the day the mission began.

Pierre contacted the supermodel to persuade her to remain in the country over the weekend.

Paris contacted the supermodel to persuade her to remain in the country over the weekend.

Paris thrilled the supermodel to persuade her to remain in the country over the weekend.

The tour bus driver accepted the sightseers to earn more fares than the competition that day.

The double-decker bus accepted the sightseers to earn more fares than the competition that day.

The double-decker bus impressed the sightseers to earn more fares than the competition that day.

The boss argued that the employee was unqualified to justify firing him yesterday

The memo argued that the employee was unqualified to justify firing him yesterday

The memo showed that the employee was unqualified to justify firing him yesterday.

The author endorsed the industry study to belittle the work of the independent lab last month.

The article endorsed the industry study to belittle the work of the independent lab last month.

The article included the industry study to belittle the work of the independent lab last month.
The quick-fingered dealer bamboozled the tourists to swindle them out of their money until the cops arrived.

The quickly-moving cards bamboozled the tourists to swindle them out of their money until the cops arrived.

The quickly-moving cards distracted the tourists to swindle them out of their money until the cops arrived.

The manager tyrannized the workers to cheat them out of a fair wage for several months.

The schedule tyrannized the workers to cheat them out of a fair wage for several months.

The schedule overwhelmed the workers to cheat them out of a fair wage for several months.

The crew confronted the storm to prove that the journey was possible fifty years ago.

The ship confronted the storm to prove that the journey was possible fifty years ago.

The ship withstood the storm to prove that the journey was possible fifty years ago.

The marine braved the violent firefight to rescue the trapped soldiers after receiving the order.

The tank braved the violent firefight to rescue the trapped soldiers after receiving the order.

The tank neared the violent firefight to rescue the trapped soldiers after receiving the order.
Appendix B

Experimental sentences for Experiment 2. The first sentence in each group of three sentences is in the animate condition, the second is in the metonymy condition, and the third is in the inanimate condition.

The warden frisked all of the new inmates as they arrived.
The prison frisked all of the new inmates as they arrived.
The prison scared all of the new inmates as they arrived.

The old chauffeur loitered in the driveway for ten minutes.
The station wagon loitered in the driveway for ten minutes.
The station wagon stopped in the driveway for ten minutes.

The priest guided the artist's style when he was in Rome.
The church guided the artist's style when he was in Rome.
The church inspired the artist's style when he was in Rome.

The informant listened in the alley all night.
The microphone listened in the alley all night.
The microphone remained in the alley all night.
The woman chased the movie star as he walked to his car.
The truck chased the movie star as he walked to his car.
The truck blocked the movie star as he walked to his car.

The canoeist steered past the sharp rocks a few hours ago.
The canoe steered past the sharp rocks a few hours ago.
The canoe drifted past the sharp rocks a few hours ago.

The scientist assessed the brittle rocks while exploring the crater.
The Mars rover assessed the brittle rocks while exploring the crater.
The Mars rover crushed the brittle rocks while exploring the crater.

The experienced pilot ventured behind enemy lines before the attack.
The miniature glider ventured behind enemy lines before the attack.
The miniature glider circled behind enemy lines before the attack.

The teenager vandalized the gravestone just after midnight.
The bulldozer vandalized the gravestone just after midnight.
The bulldozer overturned the gravestone just after midnight.

The astronaut studied the asteroid field before sending a radio signal.
The spaceship studied the asteroid field before sending a radio signal.
The spaceship entered the asteroid field before sending a radio signal.
Pierre contacted the supermodel over the weekend.

Paris contacted the supermodel over the weekend.

Paris thrilled the supermodel over the weekend.

The tour bus driver accepted the sightseers before leaving the station.

The double-decker bus accepted the sightseers before leaving the station.

The double-decker bus impressed the sightseers before leaving the station.

The boss argued that the employee was unqualified after the performance review.

The memo argued that the employee was unqualified after the performance review.

The memo showed that the employee was unqualified after the performance review.

The author endorsed the industry study last month.

The article endorsed the industry study last month.

The article included the industry study last month.

The quick-fingered dealer bamboozled the tourists on Thursday night.

The quickly-moving cards bamboozled the tourists on Thursday night.

The quickly-moving cards distracted the tourists on Thursday night.

The manager tyrannized the workers for several months.

The schedule tyrannized the workers for several months.

The schedule overwhelmed the workers for several months.
The crew confronted the storm during the voyage.

The ship confronted the storm during the voyage.

The ship withstood the storm during the voyage.

The marine braved the violent firefight after receiving the order.

The tank braved the violent firefight after receiving the order.

The tank neared the violent firefight after receiving the order.
Appendix C

Examples of Entailment Transfer Metonymies garnered from a Google search using volitionality entailing verbs and inanimate NPs (or close semantic relatives of these NPs) from 15 of the 18 Entailment Transfer Metonymies used as stimuli in Experiments 1 and 2. The left column provides the original NP and verb from the stimulus set, the right column provides a Google hit (in italics) and its source.

<table>
<thead>
<tr>
<th>Original NP and Verb</th>
<th>Google Hit</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>church guided</td>
<td>The day when the church guided our actions</td>
<td><a href="http://www.fawm.org/songs.php?id=1495">www.fawm.org/songs.php?id=1495</a></td>
</tr>
<tr>
<td>station wagon loitered</td>
<td>the car loitered in the area for two hours</td>
<td><a href="http://www.commondreams.org/headlines03/0729-07.htm">www.commondreams.org/headlines03/0729-07.htm</a></td>
</tr>
<tr>
<td>microphone listened</td>
<td>a microphone listened to his heartbeat</td>
<td>news.bbc.co.uk/onthisday/hi/dates/stories/december/13/newsid_3240000/3240133.stm</td>
</tr>
<tr>
<td>canoe steered</td>
<td>a fishing canoe steered warily through the relatively quiet surf</td>
<td><a href="http://www.classiccrimefiction.com/freeman-certain.htm">www.classiccrimefiction.com/freeman-certain.htm</a></td>
</tr>
<tr>
<td>truck chased</td>
<td>The truck chased the victim's car down Vichy Road</td>
<td>campus.umr.edu/police/9ca01.html</td>
</tr>
<tr>
<td>glider ventured</td>
<td>In January, Scimitar [the name of a glider] ventured to New Zealand for the 1995 world glider championships.</td>
<td><a href="http://www.designnews.com/article/CA151453.html">www.designnews.com/article/CA151453.html</a></td>
</tr>
</tbody>
</table>
bus accepted  The bus accepted our invalid ticket

www.travelblog.org/Europe/Denmark/

spaceship studied  a British ship studied the Southern Ocean

www.citedelamer.com/uk/ocean_connaissances/
dossiers/oceanographie/oceans.asp

memo argued  A leaked Pentagon memo argued that presidential authority is above the law

www.yuricareport.com/PrisonerTortureDirectory/
AuthorizingTortureLeakedMemo.html

bulldozer vandalized  an Israeli army bulldozer vandalized 40 dunums of tomato fields

domino.un.org/UNISPAL.NSF/5ba47a5c6ce541b802563e000493b8c64c8032b80c6365c0525680706936d3!OpenDocument

article endorsed  The article endorsed the recent Pennsylvania court decision

gadflyer.com/flytrap/index.php?Week=200603

schedule tyrannized  The medieval age was tyrannized by a demand for spiritual perfectionism

www.policyreview.org/dec04/kaplan.html

tank braved  it was a DUKW [a kind of tank] that braved high seas and sixty knot winds

www.d-daytanks.org.uk/articles/dukw.html

ship confronted  the ship confronted the direst of all emergencies

http://gaslight.mtroyal.ab.ca/titnch22.htm
Figure Captions

Figure 1: Adjusted percentages of “No” judgments for the main clauses of metonymy sentences and inanimate and animate control sentences and the “to”, verb, post-verb and adjunct regions of the rationale clauses that followed them in Experiment 1.

Figure 2: Adjusted percentages of “No” judgments for metonymy sentences and inanimate and animate control sentences across subject, verb, post-verb, and adjunct regions for Experiment 2.