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THE SOCIAL LIFE OF METAPHOR

(Thesis format: Monograph)

by

Andrea E. Bowes

Graduate Program in Psychology

A thesis submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

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Abstract

The five experiments in this dissertation examine the social effects of metaphor context production and comprehension. In Studies 1 and 2, participants wrote a meaningful discourse context for metaphorical or literal sentences. Participants providing context for metaphor used more idiomatic emotional expressions, cognitive mechanism words (e.g., "think") and adverbs. Those responding to the literal prompts used physical descriptions. These results are interpreted in light of research that shows idiomatic expressions and cognitive mechanism words are used to express emotion and signal friendship. In Study 2, use of affective content in the metaphor condition was positively correlated with scores on the Reading the Mind in the Eyes task (Baron-Cohen et al., 2001). Participants in the metaphor group also scored higher on this task compared to the literal group. The Eyes findings show writers in the metaphor condition framed their context to engage an ostensive audience. Studies 3 and 4 consisted of reading short scenarios that ended with metaphorical or literal statements, followed by questions assessing social and emotional inferences of the participants. Participants also completed the Eyes task. Use of metaphor by characters in a story was perceived as more emotionally intense and suggestive of interpersonal closeness. Scores on the Eyes task positively and uniquely correlated with social variables (closeness and emotional intensity) when scenarios ended with metaphor, but not when they ended with literal statements. These correlations show those who perceived metaphor as socially informative were more accurate at identifying emotions in others. Study 5 tested the premise that even out of context, metaphor comprehension proceeds through inferences of an implicit intention (e.g., Katz, 2005; Ritchie, 2006). After reading metaphorical or literal sentences, the participants completed the Eyes task

and a non-social, creativity task (wherein participants provided nouns in response to verb prompts). Participants who read metaphor did better on the Eyes task than those who read literal counterparts, supporting the claim that, even out of context, metaphor conveys an interpersonal intention. Additionally, compared to the literal group, participants in the metaphor group provided more "social" words in response to verb prompts. Results are discussed in light of embodied cognition.

Key words: figurative language; metaphor; Theory of Mind; pragmatics; emotion; social cognition

Co-authorship statement

The data presented in this dissertation were obtained in collaboration with Dr. Albert N. Katz. The written material in this dissertation is my own work, however Albert Katz provided assistance in revision of the content.

List of abbreviations

CMT- Conceptual metaphor theory

ToM – Theory of Mind

LIWC – Linguistic Inquiry and Word Count

LSA- Latent Semantic Analysis

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Chapter One

Traditional approaches to the study of language tend to focus on literal words or phrases. These literal elements correspond to the dictionary definition of a given concept and are thought to constitute a mental lexicon or some other symbolic store. The idea that we store and access dictionary definitions has long influenced research on reading and writing in the cognitive sciences. The role of figurative language has been minimized in much of this research. Figurative elements were generally considered distracting, aesthetic embellishments that were not useful in communication because of their inherent ambiguity (a perspective summarized by Gibbs, 1994). Consequently, the traditional study of meaning has been closely associated with literal language (Gibbs, 1994).

In contrast to literal language, figurative language is a broad category of language that deviates in some way from dictionary definitions of words. This type of language changes or enhances the meaning of a single word or phrase and, in context, is often not literally true. Consider for instance the Shakespearean metaphoric expression “Juliet is the sun”, in which a person is compared to an astronomical entity. The intention of the writer is not a literal one. To understand the statement, the reader must know what the sun is, know that Juliet is not an astronomical body, and yet connect the two. Because the intention is non-literal, metaphor can be considered a basic form of pretense: the act of saying one thing but intending something else. The ability to understand even simple acts of pretense like this Shakespearean metaphor requires social and inferential skill (Oately, 1999).

This thesis explores the idea that metaphorical expressions implicitly convey emotional and interpersonal information. Despite some of the seemingly obvious communicative benefits of being literal and direct, we use metaphoric expressions frequently to express a variety of abstract concepts. To "stomp out racism", to "carry a grudge", and to "wander lonely as a cloud" are all metaphorical actions that never actually occur in a world constrained by physics. Metaphorical expressions thus involve word-play and pretense that is imaginative in nature. The act of pretending objects are something that they are not is fundamental to thought (Leslie, 1987). The cognitive ability to understand pretense, and thus the groundwork for metaphor comprehension, develops early in life (around age 4, according to Vosniadu, 1987). Metaphor's subsequent use in discourse is ubiquitous, suggesting this type of pretense is widely useful. In fact, some researchers suggest we use pretense in communication for a variety of purposes including to reach some satisfactory comprehension of events in the world or to express social or emotional experience (Gallese, 2007; Oately, 1999).

Philosophers have suggested that metaphoric expression is an important part of communication because it conveys social and interpersonal perspectives and opinions. On metaphorical comparisons such as that of man to wolf, Turbayne (1962, p. 15) muses "I do not merely pretend that man shares the properties of wolves; I intend it. I intend that he shares some properties of wolves but not enough of them to be classified as an actual wolf". In Turbayne's (1962) example, acts of pretense serve some communicative purpose such as expressing intention. Cohen (1978) characterizes the process of understanding intention as highly social, indicating, "I want to suggest a point in metaphor which is independent of the question of cognitivity and which has nothing to do

with its aesthetic character. I think of this point as the achievement of intimacy. There is a unique way in which the maker and the appreciator of a metaphor are drawn closer to one another." He adds, "literal discourse is so pervasive and routine [it goes] unremarked" (p. 8). Taken together, these philosophers' comments are suggestive of metaphor's role in communicating an intention and providing insight into beliefs held by others. These conceptions of metaphor suggest non-literal interpretation requires general social skills like Theory of Mind (ToM; i.e., the ability to identify emotional states and beliefs held by others and one's own states and beliefs; e.g., Baron-Cohen et al., 2001).

Extending philosophical observations, psychological researchers have since provided their own insights into why we use metaphorical expression, claiming that it (and other forms of non-literal language) "conveys special pragmatic effects that no other kind of speech can easily communicate" (Gibbs & Colston, 2012, p.10). To date, there is a small but growing literature that shows the importance of pragmatic social knowledge in the comprehension of different types of non-literal language. For instance, sarcasm is used in conversation to either signal friendship (Pexman & Zvaigzne, 2004) or ridicule victims (Bowes & Katz, 2011). Knowledge of a person's occupation invites one to comprehend a given statement as either metaphor or irony, even at early processing stages in comprehension (Katz & Pexman, 2007; Pexman, Ferretti & Katz, 2000; Katz, Blasko & Kazmerski, 2004). Indeed, Ortony (1975) suggests metaphor is used to effectively express abstract ideas and make topics of discussion more vivid. As a result, metaphor's effects may be socially motivated and designed to inspire reactions in others. Although these findings are interesting, few researchers have experimentally investigated social effects of metaphor production and comprehension. The studies presented in this

dissertation represent a significant step towards situating metaphor production and comprehension in a fundamentally interpersonal framework.

In considering metaphor's interpersonal effects, I take a different approach from much of the extant research. A popular approach to metaphor research is Conceptual Metaphor Theory (CMT) wherein researchers connect patterns of metaphor use to ostensive underlying conceptual structures in the mind (see, e.g., Lakoff & Johnson, 1980). For instance the metaphorical expressions "we've reached a crossroads", "we're on a crash course" and "our relationship has hit a few roadblocks" reflect the underlying conceptual mapping of love to the concrete experience of a journey (LOVE IS A JOURNEY). Under this perspective, thought is fundamentally metaphoric and all instances of communication reflect the use of basic conceptual structures. Although CMT is a compelling line of inquiry, the research presented in this dissertation takes a different view of metaphorical communication. In conceptualizing all language as fundamentally metaphorical, CMT misses the variability of metaphor use in everyday language. For instance, other research in the field shows that there is variability in when we chose to use indirect language such as irony, sarcasm or metaphor compared to when we opt for a more direct approach (see e.g., Horton, 2007, Gibbs, 2004). This variability tends to correspond with intimacy and closeness between speakers. Therefore, my research reflects an analysis of the downstream pragmatic effects of using metaphor and not necessarily its connection to conceptual metaphor structures. The general approach I employ characterizes metaphors as linguistic expressions used to reach certain communicative goals. Indeed when I use the term "metaphor" throughout this

dissertation, I am referring to the metaphoric expression and not the hypothesized underlying conceptual metaphor.

This thesis explores the role of social effects that follow from comprehending metaphoric expressions. A social action is something that has meaning for both the person producing the action and the person perceiving and interpreting that action. In the course of a day, we perform many social actions that are intended for others to interpret. These include smiling and saying "hi", sending emails or telling a friend about weekend plans. In performing any number of social actions, we let people know how we are feeling and what we are thinking. In turn, these people are, to different degrees, affected by our actions. I hypothesize that metaphor has social communicative effects on others that are not readily produced by literal language. As Gibbs (1994) indicates, metaphor's expressive function is two-fold: it allows the speaker to express an attitude (or, more specifically, intention) and prompts the listener to interpret and perceive that attitude (or intention). As a result, I believe both interlocutors are drawn closer together. I posit that the use of metaphor results in social effects such as greater interpersonal closeness between the speakers and greater perceived emotional intensity. This dissertation will show that these effects are more powerful than saying something literally.

To explore metaphor's social function, I intend to show that this type of language has powerful interpersonal effects in both production and reading comprehension studies. The following review provides a basis for the idea that metaphor permits the expression of thoughts and feelings to others and thus serves to create a sense of interpersonal closeness and convey emotional intensity. I will draw on studies that show metaphor is used with friends and in-groups, as indirect support of the social effects of metaphor.

Additionally, I will connect metaphor to embodied cognition and ToM, in order to provide the basic mechanisms by which metaphor shows social effects. I will conclude with an outline of the five studies in this dissertation.

The Role of Context and Intention

Non-literal language includes acts found in speech and writing such as sarcasm, irony, metaphor, metonymy and hyperbole. Early theories of language comprehension proposed that literal meaning is always accessed first and non-literal interpretation of an utterance follows under special circumstances, signaled by cues in conversation (e.g., Grice, 1985). Metaphorical expressions were initially characterized as disruptive to interpersonal communication because these phrases are literally false and, therefore, take longer to comprehend (detailed by Grice, 1985). Some assumptions of this traditional perspective are not supported by empirical evidence. For instance, metaphor can be read as quickly as literal sentences when supported by sufficiently elaborate discourse context (Inhoff, Lima, & Carroll, 1984) and is not perceived as disruptive to conversation (Hussey, 2008, Study 3). Nonetheless, the importance of understanding a speaker's intention or perceiving some extra-linguistic cues is still considered an important part of metaphor comprehension (e.g., Katz, 2005; Ritchie, 2006).

From early on, researchers have suggested that metaphor has special communicative qualities. For instance, unlike literal language, metaphor is thought to produce a cognitive tension when two dissimilar concepts are compared (Richards, 1936). The interpretation of metaphorical meaning releases this tension, resulting in satisfaction in reaching an appropriate interpretation. Some researchers suggest the

cognitive work required in comprehending metaphor results in a new meaning or experience that is useful for the person expending this effort (Berggren, 1962). For instance, aesthetic qualities are thought to emerge from the cognitive activity of connecting "Juliet" to "the sun" (Black, 1977). Others suggest that understanding the social and emotional intention of the speaker is an inseparable part of metaphor interpretation (Sopory, 2005; Cohen, 1978). As a whole, these lenses of inquiry suggest that metaphor comprehension involves cognitive work beyond the sole application of lexical or "semantic" knowledge. Moreover, the implication is that metaphor is used in communication to achieve some interpersonal effect that is more cognitively or emotionally powerful than when communicating literally (e.g., Cohen, 1978; Ortony, 1975).

Support for the social effects of metaphor can be found in theories that incorporate social and discourse contexts into models of comprehension. Underscoring much of the research on metaphor is the role of contextual knowledge such as interpersonal and pragmatic information and how this knowledge aids in interpretation (Katz, 2005). "Context" can refer to a number of constraints, including knowledge of the preceding utterances, social setting, cultural assumptions, beliefs about the speaker's intention and even emotional content. Essentially, context captures many elements outside of a strictly defined lexicon or semantic memory. Context models show that metaphor is used and comprehended socially. Therefore, the desire to produce effects or deduce the intention associated with a metaphorical comment is explained, in part, by contextual factors like the relevance of the comment and common ground between speakers. Metaphor comprehension likely uses semantic knowledge but is also

constrained by social, pragmatic and contextual knowledge. As Katz (2005, p. 185) indicates, "even when presumably out of context, the interpretation of a given statement is inextricably linked to the manner in which it is presented, and when an explicit context is not available, one is constructed during the act of comprehension". Context models therefore emphasize the idea that metaphor is a highly social act and is understood largely through social and extra-linguistic information.

Context models suggest that basic social processes for effective communication require the interlocutors to grasp what is relevant and what they should attend to. Relevance Theory (Sperber & Wilson, 1986) places metaphor comprehension in the context of interaction and inferential processing. Comprehension follows from the pragmatic knowledge of the speaker and listener, often through interpretation of the intended meaning. According to Sperber and Wilson (1986), metaphor is an act that draws attention to itself (e.g., ostensive) and the costs and benefits of comprehending this extra information are weighed by the interlocutor. Interpretation of ostensive acts requires both knowledge of the current interpersonal context as well as a search for meaning that is congruent with this context. For instance, consider an exchange between friends, where one friend says to another, "you're an angel". For comprehension to proceed, the target of the statement "seeks a *mutually* salient cognitive environment in which that phrase[…] is relevant" (Ritchie, 2006, p.83, emphasis added). The tenets of Relevance Theory are significant to the social hypothesis that I am extending. That is, I argue that metaphor demands social attention as an ostensive act. Additionally, metaphorical meaning is situated and is partially (if not fully) computed by considering another's perspective and intention.

In addition to relevance, other context based research expands on the mutual understanding required in metaphor comprehension and interpretation. The creation of a mutual understanding of what is being discussed is captured by "common ground" or the shared knowledge on which the interaction rests (Clark, 1996). Common ground can be assumed (e.g., when conversing with friends) or "created" through linguistic choices that emphasize shared understanding and social closeness. Although all acts of communication require some shared common ground, metaphor is thought to be particularly constrained by this experience because, as discussed above, comprehension is strongly inferential (Gibbs & Gerrig, 1989). The act of interpreting metaphors such as 'you're an angel' results in small 'aha' moments between two people (Jung-Beeman et al., 2004) and subsequently creates or reinforces common ground (Horton, 2007). Once again, metaphor comprehension relies on a shared sense of meaning that incorporates interpersonal and pragmatic information. The social result of contextually constrained and highly inferential meaning is the creation of a unique type of interpersonal closeness (Gibbs & Gerrig, 1989).

Social information is so important to metaphor comprehension that Ritchie (2006) claims metaphor has its origins in social interactions such as conversation. Consequently, he states non-literal interpretation is strongly tied to an explicit or implicit (e.g., inferred) context. According to his Context-limited simulation theory, what an interlocutor interprets in conversation relies heavily on the conversational context or the frame of the talk. Memories, emotion, cultural constraints and inferences about the mental state of the interlocutor are factors that can be incorporated in conversation even in the absence of overt contextual information, where these extralinguistic cues must be inferred. Working

memory holds relevant emotional and linguistic information. Inferences are made in real time as information is exchanged in conversation. Although all language at some level requires inferential processing, Ritchie's (2006) theory suggests that metaphor strongly relies on introspective and emotional simulation. As a consequence, metaphor is both cognitive and social, and exerts interpersonal effects beyond speaking literally.

Although largely untested, Ritchie's (2006) model unites ideas from many context models of comprehension. For instance, common ground and the interpretation of ostensive acts are basic to his theory. Likewise, his model is congruent with constraint based approaches that indicate non-literal interpretation relies on many different contextual constraints (e.g., who is speaking, where and why). Ritchie (2006) proposes that, based on context, metaphor comprehension proceeds through embodied interpretations of the material (discussed in more detail in the next sections) and introspective qualities like emotional experience and intention of the speaker. These introspective qualities suggest metaphor might result in social effects (explored in the next section). Therefore based on the tenets of Context-limited simulation and other context models (e.g, Katz, 2005), the work in this dissertation tests the idea that social and emotional information is activated in metaphor comprehension.

In sum, context theories suggest the interpretation of metaphorical utterances require some representation of the speaker's attitudes and beliefs as well as the creation of common ground on which the interaction rests. According to Cohen (1978, p. 9), the process of comprehension "initiates the cooperative act of comprehension which is, in any view, something more than a routine act of understanding". Consequently, metaphoric language does not only highlight these social bonds, but does it more strongly

than literal language (Gibbs & Gerrig, 1989). The implication from context models is that metaphor should show interpersonal effects such as greater perceived closeness or more emotional intensity compared to literal counterparts. The next two sections explore the limited empirical evidence for the social consequences of metaphor use, and the role of embodied cognition in comprehension.

Social consequences

Context models provide support for the social effects of metaphor because they incorporate social acts such as understanding another's perspective, re-affirming common experience, building emotional connections and, broadly, maintaining relationships. Consequently, metaphor conveys subtle social information. In a related stream of research, Ortony (1975, p. 45) posited that "metaphor is an essential ingredient in communication". Under this rubric, he proposed that metaphor has three significant effects that are largely social and expressive in nature. The compactness hypothesis suggests metaphor compacts information, allowing the speaker to say more using fewer words. Accordingly, the listener can unpack the comment given his or her own motivation and effort to understand it. Literal language does not compact information because it has a more narrow inferential scope (Gibbs, 1994). The vividness hypothesis suggests another effect of metaphor is to enhance the topic of conversation and make certain aspects more emotionally or cognitively vivid. Finally, the expressibility hypothesis states that metaphor enabless speakers to effectively express abstract topics of conversation such as thoughts and feelings or intangible concepts such as "justice" or "time". Based on these three hypotheses, Ortony (1975) posits that metaphor has great communicative potential because it widens the scope of what interlocutors can discuss.

This thesis explores the communicative aspects of metaphor that result in social and interpersonal effects. The working hypothesis of the work presented here is that the proposed effects such as Ortony's (1975) three hypotheses draw the interlocutors together in shared experience of meaning.

Indirect support of the claim that metaphor inspires interpersonal closeness in a more significant way than literal language comes from the fact that groups of friends show considerable metaphor use in discourse (Gibbs, 2000). Fussell and Krauss (1989) demonstrated that, when asked to describe abstract drawings, speakers tend to use more metaphor when they are talking to people they know than with strangers. Moreover, researchers suggest that the use of metaphor enables interlocutors to uniquely express emotional experience in order to emphasize closeness and to build friendships (Gibbs, Leggitt & Turner, 2002).Therefore, the willingness to use metaphor with friends suggests common ground is already established and metaphor further reminds the interlocutors of their closeness.

Additional indirect support of the social effects of metaphor comes from research that shows non-literal language plays subtle roles in demarcating broad social ingroups and outgroups. Gibbs and Nagaoka (1985) showed non-literal slang (e.g., he's on a trip) in conversation was more memorable than literal equivalents because it connoted a certain attitude on the part of the speaker that was ostensibly shared with other ingroup members. The authors suggest slang metaphor is memorable because it conveys interpersonal information. Similarly, other research shows that neighbors use metaphors such as "keep an eye out" to build a sense of community and group safety (Ritchie, 2011). These patterns of communication help identify group members, strengthen bonds

and guard against uncertainty (Ritchie, 2011). Whether within groups of friends or larger communities, metaphor is, arguably, used to establish, to enhance or to re-experience interpersonal closeness.

Metaphor is also used in ambiguous social situations and can result in interpersonal and social effects (e.g., Gibbs, 1994; Horton, 2007). In one study (Horton, 2007), participants read short scenarios describing interactions between two people whose relationship was ambiguous. Some of these encounters ended with a literal statement and some with a metaphorical statement. Interlocutors who used metaphors were rated as "closer" or better friends than those using literal language. Additionally, Gibbs, Kushner and Mills (1991) show that mere knowledge of intentional agents aids in comprehension and interpretation of metaphor. In one of their studies, participants in two groups read the same metaphors. One group was told the metaphors (e.g., "A family album is a museum") were written by poets and the other was told the metaphors were generated by a computer program. Participants who believed they were reading poets' metaphors rated these as more meaningful and produced more interpretations than when they thought metaphors were generated by a computer program. Taken together, these findings are broadly supportive of Ritchie's (2006) claim that, even given a metaphor in isolation or ambiguous situations, we imagine the content is produced by an intentional agent or we infer other socially informative elements (e.g., interpersonal closeness).

In sum, metaphor exerts subtle, but powerful interpersonal effects. Why might metaphorical language result in these types of effects? Based on the review presented here, the answer to this question o lies in a number of different research streams. First, metaphor requires some cognitive work on the part of the interlocutors that includes the

application of contextual and extralinguistic knowledge (Katz, 2005). Interpretation of these ostensive acts may result in the comprehension of an abstract cognitive concept or a vivid experience of what was said (Ortony, 1975). Extending Ortony's (1975) ideas, the use of metaphorical expressions helps strengthen bonds or remind the interlocutors of their relationship to one another (Gibbs, Leggitt & Turner, 2002). Moreover, intention is inferred in the absence of unambiguous interpersonal information, as in Gibbs, Kushner and Mills (1991) computer/poet research. Indeed, Katz (2005) claims that, even in the absence of clear contextual cues, these cues are inferred. Cues can include introspective qualities like emotion and intention (Ritchie, 2006; Sopory, 2005). Taken together, these studies suggest metaphor requires a unique ability to identify thoughts and feelings in others. I posit that the result of the interpretation of others' thoughts and emotions are social effects like emotional closeness. These effects might be best explained by the role of embodied experience of meaning and Theory of Mind. The next sections explore these topics.

Embodied mechanisms in the experience of metaphor

Given the eclectic bits of evidence for the social effects of metaphor, it is no surprise that the literature offers no principled account of the mechanisms by which metaphor displays these effects. The social effects of metaphor described in the previous sections could result solely from propositional information or feature lists in semantic memory. However, the importance of context, common ground and intention suggest this perspective is inadequate. A propositional account does not capture the richness of metaphor, the associated imagery, sensations, attitudes and emotional impact. Instead, metaphor comprehension likely involves a vivid experience of the subject matter that

uses "perceptual, proprioceptive and introspective simulations" (Ritchie, 2006, p.172). In fact, Ortony's (1975) proposed effects of metaphor, including vividness and expressibility, might best be considered embodied experiences of language (Cicciarci, Massironi, & Corradini, 2004; Muran & DiGuiseppe, 1990). Therefore, in my opinion, the strongest explanation for social effects may be captured by an embodied view of cognition[1].

The embodied cognition perspective has recently been applied to metaphor comprehension and provides a logical and powerful explanation of metaphor's cognitive and emotional effects (for summary of embodied cognition see: Barsalou, 2008; Gibbs, 2006; Lakoff & Johnson, 1980; Ritchie, 2006). According to embodied cognition, the stimuli we encounter and subsequently re-encounter are stored and represented in a diffuse network in the brain (Barsalou, 2008). The embodied network connects physical, perceptual, emotional and language areas, which are activated every time new stimuli are processed (Niedenthal, Winkeilman, Mondillon & Vermeulin, 2009). This perspective contrasts the approach that suggests the brain primarily uses abstract symbols or propositions (e.g., a mental lexicon) that are removed from the perceptual, emotional and episodic areas that initially encoded the stimuli. According to embodied cognition, the brain coordinates multimodal information not captured by amodal accounts in order to

[1] Embodied cognition (or grounded cognition) is gaining research interest in the cognitive sciences. Although it is a strong account for a vast array of psychological findings, Barsalou (1998) does admit some weaknesses (e.g., the mechanisms by which the simulations run are underspecified). Nonetheless, he feels embodied cognition accounts for perspective taking and the interpretation of abstract and metaphorical stimuli. For instance, he provides an account of why false belief tasks might be embodied (p. 645-646). That said, I take an embodied approach throughout this dissertation, but admit this account is by no means complete. More work should be done on the role of embodied cognition and metaphor and the embodied mechanisms that underlie both metaphor and ToM (if indeed it is embodied). I speculate on the mechanisms in chapter 5 to prompt further research.

compute meaning out of raw data and to ground experience in embodied simulation (Barsalou, 2008). Comprehension via simulation involves reliving or reimagining pertinent information associated with the stimulus. An example of embodied effects is, for instance, the activation of the same areas of the brain when experiencing pain as when watching a loved one experience that same discomfort (summarize in Lieberman, 2007). Embodied effects are also reflected in patterns of language use that connect physical and abstract experiences, such as characterizing life as a physical journey or the heart as the centre of emotion (Lakoff & Johnson, 1980).

One could argue that, if knowledge is constrained by physical experience, it would be improbable to simulate or embody something that is not literally true (e.g., life is not actually a journey) because non-literal language is not directly, physically experienced. In contrast, Wilson and Gibbs (2007) state that the imaginative nature of non-literal language is the reason we *must* simulate metaphor in diffuse brain regions (although they do not provide a complete account of the information we use to do so). They argue that we apply what we know about the physical world to engage metaphorical comprehension using cognitive work of a different kind than literal language. Therefore, in order to understand the metaphorical phrases “grasp the concept” or “stomp out racism”, we simulate actual movement of grasping or stomping. Indeed, when participants are primed with grasping certain objects, they respond faster to metaphors using the word “grasp” (Wilson & Gibbs, 2007; see also Boulenger, Hauk & Pulvermuller, 2009).

There is evidence to suggest that interpretation of metaphor is also embodied at the level of interpersonal expression. Some researchers characterize the perception of

communicative intention as a strongly embodied experience (e.g., Gallese, 2007). Embodied simulation has powerful implications for the expression of intention associated with metaphorical language. Wilson and Gibbs (2007) and Gibbs and Colston (2012) suggest metaphor comprehension involves an imaginal "as if" (p. 217) or "what it must be like" (p.218) simulation process to compute meaning and interpret an interlocutor's thoughts and intentions. This simulation involves imagining "being part of the action depicted in the linguistic expression", as though the interlocutor is "immersed in the discourse situation" (p. 217-218). Therefore, I posit this "as if" simulation is not simply the comprehension of metaphor out-of-context or without extralinguistic knowledge. It is the act of taking another's perspective to understand the intention of the comment. Although not explicitly stated in their work, the imaginal processing seems to be linked to empathy, ToM ability and other useful social information. In an interpersonal exchange, important social information is likely simulated in addition to requisite sentence level and featural information. For instance, similar areas in the brain are active when we both produce an emotional facial expression and perceive one (Gallese, 2008). One could speculate that, to some extent, metaphor comprehension recruits brain areas that are also used in other social or empathic processes like identifying emotional states. Therefore, metaphor comprehension simulates relevant information at both the cognitive and interpersonal level.

In contrast to the interpretation of metaphor, Gibbs and Colston (2012) suggest direct communication, such as literal language, "is often vague and weak" (p. 216). Literal statements do little to change the cognitive experience of the comprehender (see also Wharton, 2008) and may not strongly require an "as if" simulation. Metaphor is

especially powerful in discourse, these authors propose, because it does a great deal to change cognitive experience or to make manifest any number of possible interpretations that require cognitive work on the part of the interlocutors. Similarly, these authors suggest that metaphor can capture attention in a way that other types of language do not. Both Ritchie (2006) and Gibbs and Colston (2012) propose that the requisite cognitive work is done (at least in part) through an embodied simulation of meaning that is bound by the context in which it is used. Gibbs and Colston (2012) posit that, depending on his or her motivation, the listener interprets the intentions of the speaker via an "as if" simulation that draws the interlocutors together. This simulation allows the interlocutors to project themselves into other "minds and worlds" (Gibbs & Colston, p. 218); something that direct, literal speech does not necessarily invite to the same degree. I posit that the result of the "as if" simulation is a greater perceived interpersonal closeness between the interlocutors and a more intense sharing of emotional experience.

It is possible that humans have a general purpose system that could be involved in both embodied cognition and Gibbs and Colston's (2012) "as if" simulation. Theory of Mind, a requisite of empathy, is the ability to recognize or infer mental states in others (Call & Tomasello, 1999). Mental states can include emotions, beliefs, desires and intentions (e.g, Baron-Cohen et al., 2001). Researchers in this area tend to distinguish between first order and second order abilities. First order ToM involves the attribution of a mental state (e.g, she's happy) and second order ToM involves inferences about why someone is feeling a certain way (she's happy because she got a tenure track position) (see e.g., Baron-Cohen et al., 2001).

Theory of Mind is a powerful social tool for humans and recent research suggests the processes that engage ToM might be strongly embodied (based on foundational work on the mirror neuron system in humans and non-human primates by di Pellegrino et al., 1992; Lieberman, 2007 but for an alternate, non-embodied account see Leslie, Friedman & German, 2004). Moreover, ToM is required in the interpretation of interpersonal expression: "embodied simulation and the mirror system underpinning it provide the means to share communicative intentions, meaning and references, thus granting parity requirements for social communication" (Gallese, 2007, p. 659). Theory of Mind thus allows us to empathize with others, to predict behavior and to conform to social norms. Moreover, it is required for communicative processes like interpretation of emotional facial expressions and language (Gallese, 2007).

Emergence of ToM ability in young children tends to correlate with language development and is often demonstrated when children use mental state words (e.g., use of abstract, cognitive words such as "see", "think", "feel"; Bartsch & Wellman, 1995). Notably, an inability to make social inferences due to diminished ToM ability is a cue to psychological and developmental problems such as psychopathy, autism and selective language impairment (Miller, 2004). These clinical populations also have difficulty interpreting non-literal language such as metaphor and irony (Happe, 1993). Indeed, Happe (1993) suggests metaphor cannot be properly understood or used without ToM because the speaker's mental state is crucial for comprehension. Literal interpretation will not provide adequate information. In fact, one way we become experts at identifying intentions, beliefs and desires in others is through a "learning process [that] greatly benefits from the repetitive exposure to the narration of stories about actions of various

characters" (Gallese, 2007, p. 667). Once again, pretense is the method by which we learn to make social inferences. The connection between ToM and metaphor is, thus, a logical extension of Gallese's (2007) premise. Acts of pretense, such as through metaphor, may aid in the development of social skills and subsequently require ToM ability for comprehension.

Given the potential role of ToM in metaphor comprehension, what might be simulated in an "as if" simulation? Gibbs and Colston (2012, p. 217) indicate metaphor carries an ostensive message that demands attention in a way that literal language does not and comprehension "may generally function along the lines suggested by Relevance Theory, but with the addition of an embodied simulation process". Additionally, Gibbs (1994) suggests that the social function of metaphor is twofold: metaphor allows the speaker to express his or her attitude (or, presumably, intention) and allows the target of the statement to understand this attitude (or intention). This parity maps onto ToM ability. For instance, the same brain areas are activated when one performs an action and when one watches another perform that same action (di Pellegrino et al., 1992; Gallese, 2008). Extending this parity to metaphor interpretation, Ritchie (2006) suggests that embodied "introspective qualities" like intention and emotional content are activated when one produces or interprets metaphorical comments. Therefore, the studies in this dissertation explore the role of intention in metaphorical comments and the resultant social effects like perceived interpersonal closeness and emotional intensity associated with metaphor use. The working hypothesis is that these introspective qualities are a part of the "as if" simulation and are experienced by both the person who produces the metaphorical expression and the person who deduces the meaning of this expression.

Testing metaphor's effects

The general method of testing the social effects of metaphor in this dissertation is taken from the embodied cognition literature. The basic premise of embodied cognition is that whatever relevant information is simulated in one task can show effects on other tasks. Moreover, there does not have to be an obvious connection between the two tasks, and indeed, there is no attempt to overtly connect the tasks. For instance, consider again Wilson and Gibb's (2007) work. Participants in that study were first required to make bodily movements like grasping and pulling. The movements, in effect, primed the participants to read metaphorical references (e.g., "grasp the concept") faster than a group that did not perform congruent movements. Extending this embodied premise, the research presented in this dissertation often has participants read metaphor and then complete other social tasks. Participants are not told these tasks are related. The act of reading metaphor, which prompts emotional reliving and introspective inferences, is thought to "spill over" to these other tasks. The methodology used in the specific studies in this dissertation is detailed in the next section.

To test the embodied "as if" simulation of others' thoughts and feelings, I include a measure of social intelligence in a number of studies in this dissertation. The hypothesis here is that the reader or writer of metaphorical sentences simulates introspective qualities that include emotional content as well as another's perspective or intention (Ritchie, 2006; Wilson & Gibbs, 2007). The simulation of thoughts and feelings is predicted to impact other social and non-social tasks. The Reading the Mind in the Eyes

task (also called the Eyes task)[2] is used in this dissertation as a proxy to assess the "as if" simulation of introspective qualities. The task assesses first order ToM by having participants choose the correct emotion from four options for sets of eyes. Scores on this task have been shown to be independent of IQ (Baron-Cohen et al., 2001) and general intelligence (Richell et al., 2003), independent of executive functioning (Gregory et al., 2002) and performance on stroop interference tasks (Mimura, Oeda, & Kawamura, 2006). However, as predicted, Eyes scores correlate negatively with scores on the Autism Quotient (AQ) scale (Baron-Cohen et al., 2001). Performance on the Eyes task is thought to involve activation of the amygdala (Stone et al., 2003); an area of the brain responsible for emotional processing and social knowledge (Adolphs, Tranel & Damasio, 1994).

The Eyes task was therefore chosen for the studies in this dissertation because it uniquely assesses "social intelligence in otherwise normally intelligent adults" (Baron-Cohen et al. 2001, p 247). The eyes signal thoughts and feelings and are subtle, but informative, indicators of social and emotional content. Relatedly, researchers propose the reason we use metaphor is to both express abstract thought and inspire emotional reactions in others (Ortony, 1975). Connected to these reactions is the idea that we must use ToM processes to understand metaphor and to perceive another's intention (Happe, 1993). If we do project ourselves into the minds of others (Gibbs & Colston, 2012) when processing or using metaphor, and do so more strongly than with literal language, I anticipate higher scores on the Eyes task after reading metaphor and that ratings of

[2] Permission to use the Eyes task was granted from the Autism Research Centre at Cambridge (www.autismresearchcentre.com).

metaphorical contexts will correlate with the Eyes task (predictions for each study described in detail below).

Operational goals and an overview of the Experiments

The operational goal of this dissertation is to address the gap in the literature that has overlooked the social effects of metaphor production and comprehension. Based on the evidence reviewed, metaphor is framed with another's perspective in mind and requires some understanding and representation of a speaker's intention. Therefore both the creator of the metaphor and the perceiver of the metaphor activate ToM processes. The representation of intention, be it by the speaker or by the target, can result in any number of effects including emphasizing subject matter or drawing emotional reactions from interlocutors (Ortony, 1975). Therefore, metaphor comprehension and use can draw attention to the subject matter being discussed and result in, as this dissertation will show, interpersonal and emotional effects.

The research in this dissertation is organized as follows. In the first set of studies, I intend to show that the contexts for metaphorical expression differ from the contexts of literal expression. Study 1 and 2 are production studies wherein participants are instructed to write a meaningful discourse context for metaphorical or literal sentences. These studies test Ortony's (1975) hypotheses that posit metaphor is used because it permits the vivid expression of abstract thought *to others*. I predict participants providing context for metaphorical prompts will use markers of speech that add social and emotional emphasis (e.g., cognitive and emotion words and adverbs). In contrast, those responding to the literal prompts should use simple, physical descriptions of action

(congruent with findings from Cameron's 2008 corpus research). These studies are intended to show metaphorical contexts are emotionally intense and enable the writer to express abstract thought. Study 2 connects metaphor context production to social ability (as assessed by the Eyes task). If metaphor prompts a deployment of attention to social contexts, I predict the amount of affective and cognitive content used to create contexts for metaphors will be positively correlated with scores on the Eyes task (Baron-Cohen et al., 2001). Such results would be supportive of the idea that metaphor permits the expression of thoughts and feelings to others, and that the contexts associated with metaphor activate an "as if" simulation of the kind Gibbs and Colston (2012) propose.

Studies 3 and 4 use reading tasks wherein the information conveyed by contextual content is reduced to exert tighter experimental control. The intention here is to assess the reader's social and emotional inferences that are prompted by metaphor and how these inferences relate to ToM ability. Following methodology typically used in non-literal language research, participants in Studies 3 and 4 will read short scenarios that end with metaphorical or literal statements and will subsequently answer questions assessing social and emotional experiences (on likert type scales). A novel contribution to reading studies in general, is the inclusion of an individual differences measure of social ability; the Reading the Mind in the Eyes task. Use of metaphor by characters in a story is predicted to be perceived by the participants as indicating greater emotional intensity and interpersonal closeness. Additionally, scores on the Eyes task are predicted to positively correlate with relevant social variables (closeness and emotional intensity) in the metaphor but not the literal condition. Such a correlation would support the idea that those who perceive social and emotional information conveyed by metaphor also tend to

be more accurate at identifying others' thoughts and emotions. Once again, the results will be taken as supportive of the social effects of metaphor comprehension and thus complement the production findings of the first two studies.

The study in the final chapter tests Gibbs and Colston's (2012) "as if" simulation of metaphor more directly. Some researchers (e.g., Katz, 2005; Ritchie, 2006) have indicated that, even out of context, metaphor comprehension proceeds through the assumption or creation of relevant contextual and pragmatic information. "Context" is a broad term that, for the operational purposes of this dissertation, includes introspective qualities like emotion and human intent (see e.g., Ritchie, 2006). In the final study, metaphor is presented without context and is read word-by-word on a computer screen. The motivation to present metaphor without context is to further assess the strength and versatility of the social effects. The participants will again complete the Reading the Mind in the Eyes task and a non-social, creativity task (noun-generation task, in which participants provide nouns in response to verb prompts). If relevant contextual information is simulated when reading metaphor, then metaphor should prompt social effects as measured by these other tasks. For instance, participants in the metaphor group should do better on the Eyes task than the literal group because of the requisite inferential interpretation. Additionally, compared to the literal group, participants in the metaphor group are expected to provide more "social" words in response to verb prompts. The results would be suggestive of an "as if" (Gibbs & Colston, 2012) simulation despite the constrained content that the participants are given.

Taken together, the experiments in this dissertation aim to demonstrate social effects of metaphor comprehension and production. Moreover, the work here represents

one of the few attempts to directly connect metaphor comprehension with social processing that relies on ToM ability. These experiments are intended to provide an answer to why we might use metaphor and why it is a “special” method of communication that conveys an interpersonal sentiment.

Chapter Two

Study 1

In the two studies presented in this chapter, I test the idea that 1) the contexts in which metaphor is used are highly social and emotional and 2) that, due to social and emotional content, the creation of metaphor contexts impacts other social tasks. These social effects are measured with the inclusion of two individual differences measures in the second study (the Eyes task and the emotional self-disclosure scale). Context production in this chapter assesses, albeit indirectly, Gibb's (1994) broad claim that metaphor permits the expression of a writer (or speaker's) attitude or intention.

To understand the motivation to use metaphor, first consider the reason we use language to communicate. The way we express ourselves conveys much about our thoughts, feelings and understanding of the world. Moreover, our manner of speech informs our relationships with others (Pennebaker, 2012). Language is thus a good proxy to convey our psychological states and, consequently, acts as a powerful social tool (Chung & Pennebaker, 2007). For instance, there are markers of speech that differ when we talk to a boss, a stranger, or a friend. Compared to strangers, with friends we tend to use more sarcasm and irony (Roberts & Kreuz, 1994), novel metaphor (Hussey & Katz, 2009), idioms (Bell & Healy, 1992) and other potentially confusing non-literal tropes. Linguistic choices therefore inform and direct many social interactions.

The early tradition in psycholinguistic research was to examine elements of language without any contextual information in order to determine the fundamental processes involved in the comprehension of a word or phrase. In fact, from this

perspective, context was viewed as a nuisance variable. Metaphor and other types of non-literal language challenge this perspective. Although, in truth, most language is rarely encountered in a pure, context free manner, metaphor is thought to be particularly constrained by social information such that contextual factors may be vital to comprehension (Ritchie 2006; Katz, 2005). Contextual information includes knowledge of the speaker, setting and introspective qualities like emotional expression and interpersonal intent. Contextual information can be explicitly present in an interaction (knowledge that you are talking to your best friend) or implicitly inferred (a conversational style, like use of irony, that suggests the interaction is amicable; Pexman & Zvaigzne, 2004). Therefore, in addition to semantic knowledge, we rely strongly on contextual, extralinguistic and pragmatic knowledge to comprehend a metaphorical comment. Metaphor is a powerful linguistic tool that is made meaningful by the context in which it appears (Cohen, 1978; Horton, 2007).

Despite the powerful role of contextual information, research has done little to assess how a writer might contextualize metaphorical and literal statements. Although researchers often provide some contextual information, they tend to present participants with short vignettes that end in metaphorical or literal comments and then ask questions related to intent or meaning. These vignettes are created based on the researcher's intuition or other assumptions from the literature. Although this technique can be an effective way to present metaphorical stimuli (and in fact a method used in Studies 3 and 4 of this dissertation), it may overlook some important social inferences and psychological elements associated with metaphorical language. Therefore, the aim of this chapter is to systematically assess the nature of the contextual information by simply

providing participants with metaphorical or literal sentences and asking them to create a short, meaningful context (2-4 lines) in which they would find these sentences. The analytical emphasis of these studies assesses whether the metaphor and literal contexts created by the participants differ in social and emotional content. Study 2 assesses how the inclusion of certain types of social and emotional content by the writer relates to his or her scores on a ToM test and thus serves to test embodied social effects.

Although a production study may seem like an obvious first step, to date, few researchers have considered this methodology when studying metaphorical language (but see Campbell & Katz, 2012; Hussey & Katz, 2006). Additionally, although analyses using corpora can provide contextual information, these are difficult tools to use because many programs do not provide a way to search for and identify metaphorical instances. Researchers who use corpus methodology tend to pick one type of conceptual metaphor (e.g., "LIFE IS A JOURNEY") and search for patterns of use in relevant corpora (Deignan, 2008). These methodological constraints limit the generalizability of this type of work. In sum, many researchers tend to avoid corpus and production studies because these methods involve a host of factors that are difficult to control or quantify.

Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis & Booth, 2001) provides a method to identify patterns of language production. Linguistic Inquiry and Word Count is a text analysis program that outputs the percentage of words from a range of different categories (e.g., articles, pronouns, punctuation, emotional words and mental state terms called "cognitive mechanisms"). This methodology has been successfully used by Campbell and Katz (2012) in determining the requisite context that makes a comment sarcastic, and by many others outside of the non-literal language field (led by

work from Pennebaker and colleagues). The program divides markers of speech into style and content categories. Content (e.g., nouns, verbs and adverbs) refers to what one discusses and style (e.g., pronouns) refers to how one is communicating (e.g., formally versus interpersonally). Dividing the analysis of the two studies in this chapter into content and style categories provides a nuanced view of the nature of literal and non-literal expression. Both LIWC categories are intended to capture the psychological perspectives of the writer (Pennebaker, Mehl & Niederhoffer, 2003). Linguistic Inquiry and Word Count is thus a good way to objectively quantify social and emotional elements of language while retaining experimental control.

Metaphor in context

To understand the nature of what might be included in a meaningful metaphorical context, consider first the motivation to use metaphor. Recall, Ortony (1975) provides three roles of metaphorical language that are largely social in nature because these functions are expressive. First, the compactness hypothesis states metaphor enables the speaker to say more using fewer words. The metaphor "Juliet is the sun" compacts information in a way that directly listing features (e.g., attractive, alluring, bright) of the character would not. Second, metaphor bridges complex or ill-defined abstract concepts and the physical world. This expressibility hypothesis suggests metaphor concretizes thoughts and feelings (e.g., Love is a drug) and anything else we have trouble expressing literally. "Expressibility" functions largely by connecting abstract concepts (love) to concrete domains (the physical experience of a drug) and, as a consequence, is considered an embodied experience of otherwise abstract language (Gibbs, 1994). The third function of metaphor is enhancement of a concept or idea; the so-called vividness

hypothesis. Comparing “Juliet” to the “sun” highlights certain perceptual and emotive features of both Juliet and the sun, resulting in an expression that is more vivid than a literal approximation. In Ortony’s (1975) view, vividness impacts all sensory modalities, thus making metaphor especially powerful in conversation. Importantly, associated with this function is an often intense emotional and “embodied” experience of the topic of discussion (Gibbs, 2006). The research in this chapter explores the latter two hypotheses (expressibility and vividness), by analyzing what the writer includes in a metaphorical or literal context.

Ortony (1975, p. 50) sums up his position on the importance of metaphor, stating “because of a metaphor’s greater proximity to perceptual experience and consequently its greater vividness, the emotive as well as the sensory and cognitive aspects are more available”. In fact, Ortony (1975) posits that metaphor provides a closer approximation to vivid, emotional experience than a literal expression. Additionally, his work suggests metaphor is framed with a communicative intention or psychological effect in mind, thus emphasizing metaphor’s utility in interpersonal expression. For instance, inspired by these hypotheses, researchers characterize metaphor as a means to inspire strong reactions in the listeners (see e.g., Gibbs, 1994; Gibbs & Colston, 2012). This strong arousal is arguably due to the combination of emotional content and the “as if” simulation process of comprehension, based on the comprehender’s motivation to understand what was said (Gibbs & Colston, 2012). In the studies presented in this chapter, the “as if” simulation is extended to the writer’s motivation to include certain social elements in metaphor contexts. The general idea here is that contextual content will broadly support Ortony’s (1975) claims about metaphor.

The limited experimental research supporting Ortony's (1975) hypotheses, however, has tended to use pre-constructed short stories that may not capture the ecology in which metaphorical and literal language is used. Likewise, researchers often have not used adequately controlled stimuli that are matched on important psycholinguistic variables (e.g., emotional intensity, use of pronouns or social words). Without matched stimuli, one cannot be sure if the expressibility and vividness effects are due to the non-literal language manipulation or some other psycholinguistic variable. Moreover, some of the research has been merely post-hoc and observational. Using tighter experimental control, a production study can provide a window into the subtle social effects associated with using metaphor. Specifically, participants in the studies in this chapter are given metaphorical or literal sentences and asked to create a likely discourse context for each sentence. Linguistic Inquiry and Word Count will be used to analyze the differences between the two groups. The analytical emphasis in these studies will focus on what the writer includes in discourse contexts.

Linguistic Inquiry and Word Count content predictions

The vividness hypothesis suggests writers may include markers of language that enhance a metaphorical message in some way. Ortony (1975) and others (Gibbs, Leggitt & Turner, 2002; Kovesces, 2002; Sopory, 2005) tie metaphor to emotion, suggesting a metaphor is vivid and memorable partly because of its affective content. An analysis of descriptions of emotional experience shows consistent metaphorical patterns of expression (Lakoff & Johnson, 1980). Emotion is metaphorically characterized as losing control (e.g. being overcome with emotions), originating in the body (e.g., heartbroken), or as an opponent (e.g., struggling with one's feelings). In fact, some conceptual

metaphor theorists claim emotions are understood and expressed wholly through metaphorical references to physical and bodily experiences (Lakoff & Johnson, 1980).

Gibbs, Leggitt and Turner (2002) tested the idea that embodied metaphorical expressions of emotion convey intense experiences and are thus more strongly felt than literal equivalents. In their study, undergraduate students who listened to statements that were either literal ("I was really angry"), conventional metaphor ("I hit the ceiling") or novel metaphor ("I was a live grenade") rated both metaphor types as more emotionally intense than literal equivalents. Research has also assessed what writers include in emotional contexts. When asked to describe emotional autobiographical memories, participants tended to use more figurative language than when describing the actions they took when experiencing these strong emotions (Fainsibler & Ortony, 1987). The authors suggest that metaphor is used because it effectively communicates otherwise abstract experiences. Taken together, these perception and production studies show the use of metaphor conveys emotions that may be more strongly felt than literal equivalents. Moreover, Gibbs, Leggit and Turner (2002) suggest the expression of emotion with metaphor serves to convey interpersonal closeness and remind interlocutors of their relationship.

Based on the connection between metaphor and emotion, I intend to examine the affective nouns (e.g., happy, sad, angry) participants use in the creation of metaphorical and literal contexts. However, given that LIWC (and most other programs of its kind) cannot identify metaphor, it may underestimate some of its use when placed into context. That is, terms such as "blue", "cold" and "heart" as well as phrases such as "He's so *into* playing hockey" are commonly used metaphorically to describe some emotional

experience. There are two ways around LIWC's limitation that I will employ in the two studies presented in this chapter. One is to code idiomatic expression of emotion (e.g., "I can't stand it anymore!"). Idioms are social phrases that signal emotions and are considered unique ways to express interpersonal closeness (Hopper, Knapp & Scott, 1981). For instance, idioms are used in intimate relationships to express emotion and promote cohesiveness (Hopper, Knapp & Scott, 1981). Additionally, idiomatic speech is used to signal one's social presence in online communities, suggesting this type of speech can capture an audience's attention (e.g., Delfino & Manca, 2007). Idiomatic phrases may therefore be used in addition to simple affect nouns in order to emphasize the writer's perspective and insert emotional content.

Another sign of emotion intensity in text is the use of adverbs. Adverbs add emphasis to speech and text and tend to occur with emotionally intense experiences (Gayle & Priess, 1999). They are found in non-literal language use in computer mediated communication with friends (Whalen, Pexman & Gill, 2009) and are thus an effective method of enhancing emotion while maintaining clarity (Hancock, 2004). Therefore, the LIWC adverb category will also be included in the reported analysis. In sum, I anticipate participants will insert affect nouns, idiomatic expressions of emotion and adverbs in metaphorical contexts as a method of enhancing emotional intensity. Taken together, these predictions will serve to test Ortony's (1975) vividness hypothesis.

Recall that metaphor also facilitates the expression of abstract thought and intention (based on the expressibility hypothesis). To test this hypothesis, analysis will focus on content that references cognitive processes (that tend to co-occur with and describe emotional experiences: Pennebaker & Stone, 2003). As Ortony (1975) indicated,

metaphor is useful in expressing the otherwise inexpressible such as thoughts, intentions and imagination. Consequently, many metaphorical expressions deal with abstract and intangible experiences. Brandt and Brandt (2005, p 219) suggest that a powerful function of metaphor is the intention "to share some content of thought with an addressee in a semiotic exchange", the result of which is metaphor employed as a social tool. Expression of mental content activates ToM and perspective taking in others[3] (Saxe & Kanwisher, 2005). Metaphor is likely one process by which we frame our thoughts and intentions and make it clear to an audience what we are thinking. In turn, the target of our metaphorical statement can experience our thoughts and is able to enact what Gibb and Colston (2012) call an "as if" simulation of the speaker's intention.

According to Pennebaker (2012), we use cognitive mechanism words such as "think", "feel" and "intend", when we are conscious of what we are saying in order to frame our message (Pennebaker, Slatcher & Chung, 2002). These words are highly important in social perception for a number of reasons (Berry et al., 1997). For instance, use of mental state terms is predictive of ToM ability in children (Adrian et al., 2005). Cognitive mechanism words tend to be found in social contexts, such as blogs and conversation, but less frequently in factual or literal documents such as scientific articles and non-emotional writing (Pennebaker, et al., 2007). Greater use of cognitive mechanism words has been found with friends compared to strangers (Marsh, Tversky & Hutson, 2005). Interestingly, high rates of cognitive mechanism words are also found in pretense and lies (Newman, Pennebaker, Barry & Richards, 2003): two processes that are

[3] To anticipate the coming studies, about 30 percent of the correct answers in the Reading the Mind in the Eyes task (studies 2 through 5 of this dissertation) are classified by LIWC as cognitive mechanism words. The Eyes task thus assesses a combination of thoughts and emotions.

highly social and require ToM ability to comprehend (Winner et al., 1998). Given that the cognitive mechanism category in LIWC includes words such as “imagine”, “intend”, “imply” and “infer”, this category is a strong proxy for the expression of intention. Taken together, the research suggests these words are social and expressive in nature and therefore might be employed in metaphorical contexts.

In addition to the categories used as tests of Ortony’s (1975) expressibility and vividness hypotheses, a final content category will also be considered. The social category deals primarily with non-first person roles (e.g., doctor, lawyer, girl, boy) and some social verbs (call, share). On the surface, this seems like an important category for comparison between the two language groups. However, the social category is not widely reported as a variable that predicts psychological states or social ability. The literature shows that the role of “social words” in communication and expression is somewhat unclear. Like emotional content and cognitive mechanism words, social words tend to be used in blogs but less so in formal, scientific writing (Pennebaker, et al., 2007). However, generally speaking, emotional content and cognitive mechanism categories are more widely reported as predictors of social and psychological experience than the social category. Limited research suggests the influence of social words on social processes is, at best, indirect (Pressman & Cohen, 2007). Therefore, although the social category is included in the analysis, it should be noted that the investigation of its role is somewhat exploratory in nature.

Linguistic Inquiry and Word Count: Style predictions

Style markers (e.g., pronouns) differ from content because they capture the manner in which the message is delivered. Compared to content markers, style markers tend to go unnoticed in speech, but are socially informative and good predictors of social and psychological states (Pennebaker, 2012). Style markers of speech imply (or produce) varying degrees of closeness between writer (or speaker) and reader (or listener) and therefore may be particularly relevant in conveying content in metaphorical contexts. Given that style markers such as pronouns have not been investigated in relation to metaphor use, the following predictions are largely exploratory in nature.

Pennebaker (2012) suggests that, although pronouns are often so rapidly processed such that they pass almost unnoticed, they are strongly social and thus highly informative elements of conversation. The use of personal pronouns (particularly the first person pronoun) is the style marker of interest in the present research because these pronouns convey a personal perspective of the writer (Van hell et al., 2005). Texts using first person pronouns tend to be highly emotional, suggesting use of pronouns help convey the author's feelings and attitudes. Moreover, personal pronouns "reveal how the writers view themselves, their relationships with readers and their relationship to the discourse community in which they belong" (Kuo, 1999, p.123). These pronouns enhance common ground (Jucker & Smith, 1996) and help an audience embody a speaker or writer's perspective (Brunye, Ditman, Mahoney, Augustyn & Taylor, 2009).

Compared to third person pronouns, the use of the first person pronouns creates different relationships between the reader and writer, resulting in different cognitive and

social effects. “I” pronouns suggest self-disclosure and immediacy (Kuo, 1999) and help the writer emphasize his or her own existence in the text (Bartak & Rutter, 1974). Third person perspective tends to be more formal and less emotional and reflective (Pennebaker, 2012). The psychology qualities of first person pronouns are congruent with social elements of metaphor use. Metaphor is an effective way to convey the attitude of the writer (Gibbs & Colston, 2012) and may be informal and personal due to its “play on words” quality. Therefore, based on the implications of these studies, first person pronoun use in metaphorical texts will be considered as indicative of engagement and embodied experience of the material. In contrast, literal contexts may be simply physically descriptive, formal and use fewer “I” references.

Summary and Predictions

This first study systematically assesses what participants produce in discourse context in which they embed metaphoric or literal expressions they have just read. Participants in this study are asked to write 2-4 lines of context for metaphorical or literal sentences. They are explicitly asked to create a discourse context in which they think the target sentence would occur. Additionally, they are told to make their context comprehensible. No mention is made of the literal or non-literal nature of the stimuli. Given the challenge to create equivalent material, the prompt sentences were taken from a recent norming study (Cardillo et al., 2010) and are the best controlled literal and non-literal stimuli currently available. These simple sentences are written in past tense, are about seven words long and are matched on important psycholinguistic variables (discussed in greater detail in the methods section).

Using LIWC categories, a priori predictions are as follows. Contexts produced in response to metaphorical sentences will include more emotional and cognitive content. Emotional content in LIWC's affective category include positive emotion ("happy"), negative emotion ("abandon", "sad"), anxiety ("afraid"), anger ("abuse") and sadness ("ache"). Associated with affect words, participants will use significantly more adverbs in the metaphorical condition (very, extremely, truly) (based on work by Hancock, 2004). Additionally, idiomatic uses of emotion that LIWC would miss (e.g., "cold", "blue") will be coded by two raters, with the prediction that the metaphor group will use more idiomatic emotional language. Cognitive content includes cognitive mechanisms such as "think", "feel", "intend" and "imagine". Based on the expressibility hypothesis of non-literal language, I predict greater use of cognitive mechanism words in the metaphor condition. Additionally, participants will insert more first person personal pronouns (e.g., I) into the metaphorical context as a means to convey their attitude and embodied experience of the subject matter. Finally, the social category will also be analyzed with the prediction that the metaphor group will use more social words.

Predictions of the content produced in response to literal sentences are difficult because the literal manipulation acts as a catchall category. Instead of emotional and cognitive content, participants in this group are predicted to use simple descriptions of the situation (e.g., physical descriptors). Cameron (2008) reports that stretches of literal language tend to be physically descriptive in nature (e.g. travel arrangements or meeting plans). The LIWC motion category (e.g. "carry", "jump", "crawl") captures "simple, concrete actions" (Newman, Pennebaker, Berry & Richard, 2003, p. 667) that are less complex and more accessible than cognitive mechanism words. Motion words tend to be

used when participants are asked to describe “an object or event in an unemotional way” (Pennebaker et al., 2007, p.9). The motion category is thus a logical contrast to the metaphor predictions given that if we are not “thinking” or “feeling” we are usually “doing”. Literal stimuli are predicted to prompt descriptions of the type of action captured by LIWC’s motion category, given that this category tends to describe how characters are behaving in text.

Method

Participants

Seventy-two participants (47 females; mean age: 23.34; *SD*: 7.79) from Western University, with English as a first language, were recruited using posters placed around campus (36 participants in each group). Two participants were removed from subsequent analysis for failing to produce complete, sensible content in the study. Participants completed the study online and had their name entered into a draw for a $50 gift card. Ethical approval for this experiment is presented in Appendix A.

Materials

Stimuli were short sentences, taken from Cardillo et al.’s norms (2010 e.g., Metaphorical: The woman dove into her knitting, Literal: The woman dove into the pool. See Appendix B for more examples). These sentences are written in third person and are matched on familiarity based on 1 (not familiar) to 7 (familiar) ratings (*M*met= 5.15, *SD* = 1.00, *M*lit= 5.51, *SD* = .87, $t(30) = 1.11$, $p = .26$) and emotional valence (based on the proportion of participants who indicated the stimuli had a positive valence; *M*Met = .22, *SD*= .23, *M*Lit= .19, *SD* = .30, $t(30) = .30$, $p = .75$). Cardillo et al. (2010) report that the

metaphorical sentences generally have good interpretability. To supplement information on Cardillo et al.'s (2010) norms, the sentences were analyzed with LIWC and were found to be matched for number of pronouns and personal pronouns, affective words, adverbs, cognitive mechanism words and social and motion words (see Table 1 for means and standard deviations)[4]. The sentences are thus tightly matched and, in fact, are some of the best controlled metaphorical stimuli currently available.

Procedure

In a between group design, participants were presented with either 16 metaphorical and 16 literal sentences, one at a time. Participants were provided the following instructions: "In this study you will read short sentences and will create a context or scenario in which you think these sentences would occur. You will write approximately 2-4 lines per scenario. You can write anything you want as long as it is able to be comprehended". Participants were not informed of the literal or non-literal nature of these sentences.

Participants accessed the study through a link they obtained from posters placed around the Western university campus. The posters provided tabs with an equal number of links to the metaphorical or literal condition. Participants had no way of knowing the condition of the study based on the tab they pulled from the poster. Upon accepting the terms of consent, they completed the context building task, provided their age, gender and first language, and were subsequently debriefed online.

[4] Although the literal stimuli tended to have more emotion words, this contrast did not reach significance. The difference is not problematic given that the stimuli are matched on the psychological variable of emotional valence based on Cardillo et al.'s ratings and are, in any event, in the opposite direction than would be predicted.

Table 1

LIWC analysis of the mean number(standard deviation) of stimuli used in Studies 1 and2

	Metaphor	Literal
All Pronouns	5.06 (7.77)	6.10 (10.17)
Personal Pronoun	5.06 (7.77)	5.06 (7.77)
She/He pronouns	5.06 (7.77)	5.06 (7.77)
Adverbs	0.00 (0)	2.08 (5.69)
Affect	5.06 (9.86)	9.07 (11.95)
Cognitive mechanisms	4.58 (11.01)	5.06 (7.77)
Motion	.89 (3.57)	1.04 (4.16)
Social	11.36 (13.22)	10.53 (12.79)

Results

Text analysis: Participants created short narratives similar to those found in other studies using LIWC methodology (e.g., Campbell & Katz, 2012). One notepad file was created for each participant's set of 16 responses (for examples of responses from each category see Table 2). The metaphorical or literal prompt sentences (if used by the participant) were removed from the analysis (following methods similar to those employed by Campbell & Katz, 2012). The 2007 LIWC dictionary was used for all of the reported analyses. The total word count in the written content did not differ between the two groups (metaphor: M = 345.36 words SD =146.84; Literal: M = 326.33, SD = 125.71, $t(70) = .59$, $p = .60$). This equivalence indicates that any group differences on the predicted factors are not due to differences in word count.

Idiomatic expression of emotion

Two coders (myself and a second person) read through the stories and coded the content for idiomatic expressions of emotion that would be missed by LIWC. Idiomatic expressions include words and phrases such as "I couldn't stand it anymore" and "she recoiled", along with references to the heart and body as the center of feelings. The intraclass correlation between the raters was .90, suggesting high agreement (Fleiss, 1986). The second coder identified metaphorical content that is so entrenched in language that it is captured by relevant LIWC categories (e.g., "impressed") and hence her coding overlapped with data reported in the next section. Therefore, the numbers reported are based on my coding. Numbers in this section are reported as count data wherein one

Table 2

Examples of responses produced in metaphorical and literal contexts

	Stimulus	Response
Metaphorical Context		
'I'	The reception was a snore	"I'm so excited to get to the presentation, but why are they spending so much time on things that don't matter?"
Cognitive Mechanisms	The rejection letter was a slap	"She thought she would make it into the pet psychic academy."
Adverbs	The case worker trudged through the files	"Though the work was tedious, it was extremely important"
Idioms	His poetry was a cathartic moan	"Everyone in the class could not stand another hour of listening to him read his poem."
Affect	The reader raced through the novel	"His hands were sweaty as he turned the next page. Would it be a happy ending or would true love die?"
Literal Context		
Motion	The man raced past the empty lot	"A robber was running after a man for his money."
Social	His only communication was a moan	"A man is being prodded by his friends after being found passed out after a house party. He is half-on the sofa, with silver glitter all over his chest, holding a box of Twinkies."

expression (e.g., “I couldn’t stand it anymore”) is counted as one unit (instead of counting the individual words in each trope).

As predicted, the metaphor group produced significantly more idiomatic expressions of emotion (M = 3.38, SD= 2.90) than the literal group (M = 1.63, SD = 1.49), $t(70) = 3.21$, $p = .002$. In contrast, the literal group remained fairly factual and direct, choosing to avoid potentially confusing non-literal styles in their contexts.

Content differences

The numbers analyzed in this section are mean percentage[5] of words in a given LIWC category (see Table 3 for all LIWC means and standard deviations). The following was observed. The total amount of affect words did not differ between the two groups, $t(70) = .96$, $p = .34$. However, participants inserted a greater number of adverbs into their metaphorical contexts, $t(70) = 2.30$, $p = .03$ (e.g., “It was undeniably satisfying”). Additionally, the use of adverbs tended to correlate with the use of affect words in the metaphorical group $r(34) = .29$, $p = .07$, but not in the literal condition, $r(34) = .08$, $p = .68$. Taken together, the results suggest that, whereas both groups discussed emotion, the discussion in the metaphorical group tended to be more emotionally vivid (through the use of adverbs and idiomatic emotional expressions).

Additionally, those providing context for the metaphorical prompt sentences used significantly more cognitive mechanism words to convey thoughts and feelings (e.g., “what people don’t *know* can’t hurt them- or so he *thought*”), $t(70) = 3.40$, $p = .001$. The finding is supportive of the expressibility hypothesis.

[5] All LIWC analyses in this dissertation report percentages.

Table 3

LIWC analysis: Differences between metaphorical and literal contexts for Study 1 (Standard deviations in brackets)

	Metaphor	Literal
Adverb	4.24 (1.51)*	3.48 (1.28)
'I' pronoun	1.21 (1.49)*	.41 (1.00)
Cognitive Mechanisms	16.15 (3.60)**	13.09 (3.90)
Motion	1.59 (.85)**	2.76 (1.24)
Affect	6.29 (1.74)	5.94 (1.31)
Social	13.55 (2.67)**	16.42 (2.93)

*<.05 **<.01

Style differences

The metaphor group used the "I" pronoun significantly more than the literal group (e.g., "I've never read something more hurtful. Emotions are overcoming my body and I've never felt so hurt"), $t(70) = 2.66$, $p = .009$.

Literal Group

In contrast to the metaphor group, the literal group used significantly more descriptive, action words from the category of motion words (e.g., carry, jump, crawl) (e.g., "The woman *walked* out of the change room and set her stuff down. She then put sunscreen on and *walked* to the deep end"), $t(70) = -4.60$, $p = .001$. This pattern of results confirms research by Cameron (2008), who suggests literal discourse tends to be physically descriptive. The literal group also produced significantly more social words than the metaphor group $t(70) = -4.33$, $p = .001$ (e.g., "Louis was nervous about meeting her *parents*. He was never good with *parents*"). In contrast, use of social words in the metaphor group tended to be negatively correlated with use of the "I" pronoun (r (34) = -.27, $p = .11$), suggesting the metaphor group inserted themselves in the context in place of social words. The same negative relationship is not found the literal group, r (34) = .19 ($p = .26$).

Discussion

Recall that participants were asked to create a plausible discourse context to make a metaphorical or literal expression meaningful. The goal of this study was to systematically assess the claim that metaphorical contexts are more socially and emotionally expressive than literal equivalents. More broadly, the study tests the idea that

writers use metaphorical contexts as a medium to express an attitude and intention in their writing (Gibbs, 1994).

The results show that participants provided different content when creating a metaphorical or literal scenario, despite the prompt sentences being closely matched on content and valence. Contrary to initial predictions, participants in the metaphor group did not use more affect words (e.g., "sad", "happy") compared to the literal group. Participants in the metaphor group did, however, use more emotional idiomatic language and adverbs. This finding is consistent with research that shows people use idiomatic language to express emotion and inspire emotional reactions in others (Delfino & Manca, 2007; Hopper, Knapp & Scott, 1981). Greater use of adverbs and the positive correlation between the use of adverbs and affect words are consistent with research that shows adverbs co-occur with descriptions of intense emotional experience (Gayle & Priess, 1999). Additionally, the findings are consistent with research that shows adverbs are inserted in text to emphasize content and cue non-literal intent (Whalen, Pexman & Gill, 2009). Taken together, use of idiomatic emotional language and adverbs found in the present study support the prediction that metaphor contexts are used to express a vivid emotional experience to others. The findings are congruent with Ortony's (1975) vividness hypothesis.

Participants in the metaphor group also drew attention to abstract thoughts and intentions through a greater use of cognitive mechanisms words compared to the literal group. Previous research shows that cognitive mechanism words tend to co-occur with emotional experience and are used to draw attention to the goals of the message or share the writer's thoughts (Pennebaker, Slatcher & Chung, 2002). Additionally, past research

shows use of these types of mental state terms tends to activate Theory of Mind processes (Saxe & Kanwisher, 2005). The finding of greater use of cognitive words by the metaphor group is thus supportive of the idea that participants used metaphorical context as a medium through which to express abstract thought, ostensibly to an audience (Berry et al., 1997). More broadly, use of cognitive mechanism words in the present study is supportive of the expressibility hypothesis that states metaphor is used to express abstract thoughts and emotions (Ortony, 1975).

As predicted, participants in the metaphor group used significantly more personal pronouns. This prediction was largely exploratory in nature, but can be interpreted in light of some of the research on personal pronouns. Past research shows that the "I" pronoun is used when writers intend to informally express their experience with the text, insert their opinion and connect with an ostensible audience (Kuo, 1999; Van Hell et al., 2005). In the present research, the use of the "I" pronoun in the metaphor group suggests an obvious expression of the intention of the message and as though the writers are attempting to speak to a putative reader. Additionally, the finding suggests that the participants were embodying the context they created by inserting themselves in it (Brunye et al., 2009).

In contrast to the metaphorical group, the literal group used more "motion" words. These words are simple, physical descriptors (Newman et al., 2003). This finding can be in interpreted in light of past research that shows literal discourse tends to be physically descriptive (Cameron, 2008). Additionally, use of the motion category suggests that the literal group wrote with directness and less complexity in thought (Newman et al., 2003).

Unexpectedly, the literal group also used more words from LIWC's social category. The social category includes third person roles (e.g., mother, father, brother). Recall that the social category does not seem to be widely predictive of psychological states. In the present study, greater use of words from the social category by the literal group can be interpreted in contrast to the metaphor group, who tended to use more "I" pronouns in place of this category (based on the negative correlation between the use of social words and the first person pronoun in the metaphor group). In contrast, the literal group's use of the social category invokes a third person perspective. This perspective suggests writing was more formal and less interpersonal (Pennebaker, 2012). Therefore, although both contexts had some social elements, the metaphor contexts were emotional and interpersonally expressive whereas literal contexts were physically descriptive.

Taken together, the differences between the two groups can be interpreted in light of past research that shows cognitive mechanism words, adverbs and idiomatic language are all used to a greater extent with people to whom we are socially and emotionally close (e.g. friends or romantic partners see: Whalen, Pexman & Gill, 2009; Marsh, Tversky & Hutson, 2005). Because these markers tend to signal intimacy, the context participants created for metaphorical language in the present study suggest the content was framed with an interpersonal intention in mind. Participants in the metaphor condition used cognitive words ("think" and "feel") and idiomatic phrases that suggest closeness to the putative reader. These findings contrast the literal group, who tended to describe social actions using words from LIWC's social category. The use of the social category does not necessarily suggest closeness to the reader, but appears to act as merely descriptive of the events in the story. In sum, the findings from Study 1 support the contention that there

are important features of metaphor that may have been overlooked in previous research. Specifically, the findings show social and emotionally intense elements in figurative language contexts, supporting Ortony's (1975) vividness and expressibility hypotheses.

It could be argued that the greater use of words from the social category in the literal group is more consistent with social expression and works against the general hypotheses of this dissertation. Given the limitations of the social category discussed in the introduction of this chapter, I do not take this position. I argue that the metaphorical group used other important social markers (e.g., cognitive mechanisms and idioms) to emphasize interpersonal perspectives. Likewise, the negative correlation between social words and the "I" pronoun in the metaphor group suggests this group used personal pronouns in place of social words in order to express their own experience of the text. Therefore, overall, the metaphor context had more social elements than literal contexts. The next study in this chapter further investigates social and emotional expression in metaphorical contexts to provide additional support to the social hypothesis of metaphor that I am testing.

The results of the first study suggest that metaphorical contexts are highly social and framed with another's perspective in mind. These findings imply that the writer's motivation to include certain content differs between metaphorical and literal prompts. A related question, then, is what goes on in the writer's mind when creating these contexts? Presumably, the creator of metaphorical contexts embodies an "as if" simulation that includes the desire to express certain thoughts and emotions to others. To assess the nature of this simulation, the next study incorporates the Reading the Mind in the Eyes task (Baron-Cohen et al. 2001). A different set of participants will once again create

discourse contexts. This task will be followed by the Eyes task. Recall that a basic premise of embodied cognition research suggests that relevant information simulated in one task can show effects on another. This methodology will help determine if writing metaphorical contexts "spills over" to scores on a measure of social intelligence, such that participants in the metaphor group are prompted to be more sensitive to others' thoughts and feelings and thus score higher on the Eyes task.

Additionally, given the tendency to use more "I" pronouns, the next study also assesses participants' tendency toward emotional self-disclosure using questions adapted from the emotional self-disclosure scale (Snell, Miller & Belk, 1988). These scales assess the likelihood of expressing happy or angry states to a same sex friend. Previous research has shown that these subscales are reliable measures of social expression (see e.g., Snell, Miller, Belk, 1998). Once again, participants will respond to these scales after they perform the writing task. This methodology will determine if the act of creating metaphorical contexts prompts greater emotional self-disclosure compared to literal contexts.

Study 2

The working hypothesis of this dissertation is that metaphor has social effects. The first study shows that the metaphorical and literal contexts differed systematically on social and expressive variables. Using the same writing task with the same stimuli, Study 2 incorporates two individual differences measures that are correlated with social sensitivity and interpersonal expression (The Eyes task and emotional self-disclosure). The second study of this dissertation tests the idea that social effects result from the

writer's expression of his or her perspective or attitude (Gibbs, 1994). That is, what the writer embodies while creating metaphorical contexts can transfer to these measures of social intelligence.

Recall there is good reason why metaphor (and its associated context) might be more strongly embodied than literal language. For instance, Ortony's (1975) hypotheses suggest that metaphor is used for communicative purposes such as making a comment more vivid and expressing abstract thoughts and intentions to others. Ritchie (2006) suggests that embodied "introspective qualities" like intention and emotional content are activated when one produces or interprets metaphorical comments. Extending Ritchie's (2006) premise, Gibbs and Colston (2012) posit an "as if" simulation of others' thoughts and feelings when comprehending metaphorical comments. This simulation of thoughts and feelings likely occurs with both the speaker and target of the message (Gibbs, 1994). Their work suggests a writer might simulate another's perspective when he or she creates a metaphorical context. Taken together, the literature supports the premise that metaphorical contexts are motivated by the writer's intention to capture the audience cognitively and emotionally.

In this second study, Ritchie's (2006) and Gibbs and Colston's (2012) work is extended to the intention of the written message that participants provide given metaphorical and literal prompts. Specifically, I test the idea that metaphorical contexts invite writers to simulate others' perspectives and prompt them to use emotive content that would engage an ostensive audience. This simulation will be assessed implicitly with the inclusion of the Eyes task. Recall, the Eyes task (Baron-Cohen et al., 2011) is a first order ToM task that requires participants to correctly identify emotions expressed in sets

of eyes (see Appendix C for examples). Scores on this task have been shown to be independent of IQ (Baron-Cohen et al., 2001) and general intelligence scores (Richell et al., 2003), as well as independent of general executive functioning tasks (Gregory et al., 2002) and Stroop interference tasks (Mimura, Oeda, & Kawamura, 2006). The Eyes test thus measures "subtle impairments in social intelligence, in otherwise normally intelligent adults" (p. Baron-Cohen et al. 2001, p 247). Although superficially, the task seems unrelated to metaphor production, eyes can serve as a powerful social tool that show "different levels of signal value depending on the status, disposition and emotional state of the sender and receiver of such signals" (Emery, 2000, p. 581). The ability to read others' facial expressions is related to social astuteness and ToM skill.

To assess the premise that elements used in the metaphorical condition are framed with another's perspective in mind, Study 2 investigates the relationship between the use of social LIWC variables (affect and cognitive mechanisms) and scores on the Eyes task. If metaphor prompts written content that is designed to engage an ostensive audience, this content may be related to general social intelligence, like ability to identify emotions in others. Therefore, scores on the Eyes task are predicted to uniquely and positively correlate with the percentage of affect and cognitive mechanism words used in the metaphorical but not literal condition. Additionally, if metaphor prompts a stronger embodied "as if" simulation of other perspectives, participants in this condition may actually do better on the Eyes task compared to the literal group. Therefore, overall group performances on the Eyes task will be assessed with the prediction that the metaphor group will be more accurate at identifying emotions in this task. Taken together, this

analysis will serve to test the "as if" simulation of the writers and extend the findings of Study 1.

The results of Study 1 also showed participants in the metaphor group inserted themselves in the scenarios they created and did so to a greater extent than those in the literal group (with greater use of the "I" pronoun). The metaphor group, in the first study, was more likely to embody the context and see themselves in it. It is possible that writing metaphorical contexts prompted the desire to self-disclose. To test the relation between the willingness to disclose personal emotional experience and written content, two scales from the emotional self-disclosure scale were included in Study 2 (Snell, Miller & Belk, 1988). The ten questions assessed the willingness to disclose times when one is feeling happy and times when one is angry to same sex friends using 1-5 Likert ratings (see Appendix D). The second study assessed differences in self-disclosure between the two groups. Additionally, the correlations between certain LIWC categories ("I" pronouns and affect) and scores on the disclosure task were considered.

Method

Participants and procedure

Sixty-nine participants from Western University (49 females, Mean age 18.00, *SD* = 2.40), with English as a first language, took part in the study. Participants completed the study online for course credit. Once they signed up, they were provided a link that randomly assigned them to a metaphor (n = 33) or literal (n = 36) condition with the related counter-balancing of the individual differences measures. Baron-Cohen et al. (2001) report that scores on the Eyes task in undergraduate and normal populations fall

between 17 and 35 out of a possible 36. Five participants were eliminated from subsequent analysis because their scores fell below 17. The eliminated participants also generally failed to produce complete content in the writing portion of the study (i.e., they produced nonsense or one word answers).

Participants were told they were going to complete a writing task followed by two questionnaire tasks. They were not made aware of the social nature of these questionnaire tasks. The procedure employed for the context creation task was the same as Study 1. Participants first completed the writing task followed by the addition of the Reading the Mind in the Eyes task and the emotional self-disclosure task (counterbalanced). Upon completion, participants were debriefed online. Ethical approval for this experiment is presented in Appendix E.

Results

As in Study 1, one wordpad file was created for each participant's set of results and analyzed with LIWC. Once again, target sentences were removed from the analysis (if they were used by the participants). Again results show that participants used the same number of words in metaphorical (M = 383.94, SD = 144.62) and literal (M = 329.91, SD = 135.53) conditions, $t(67) = 1.60$, $p = .12$. This equivalence indicates that any group differences in content are not due to word count differences. It is important to note, unlike Study 1, this difference is borderline, with participants tending to produce more content in the metaphor group.

Replication of Study 1

Replicating Study 1 (see Table 4 for means and standard deviations), participants in the metaphor context building condition used significantly more cognitive mechanism words, $t(67) = 4.22$, $p = .001$. As in Study 1, participants in both groups used an equal number of affect words, $t(67) = .27$, $p = .78$, but once again, the metaphor group used significantly more idiomatic emotional expressions ($M = 1.70$, $SD = 1.77$) than those in the literal group ($M = .69$, $SD = .82$), $t(67) = 3.14$, $p = .003$ (with the intraclass correlation of .90 between raters). Additionally, once again adverbs tended to be inserted to a greater extent in metaphorical context, although this time the contrast failed to reach significance, $t(67) = 1.09$, $p = .24$. Greater use of the "I" pronoun by the metaphor group failed to replicate, $t(67) = -.98$, $p = .35$. As in Study 1, the literal group used more motion verbs, $t(67) = -5.28$. The use of social words did not differ between the two groups; literal ($M = 15.20$, $SD = 2.73$), metaphor ($M = 14.06$, $SD = 3.08$), $t(67) = -1.67$, $p = .10$. The use of social words is borderline, with the literal group once again tending to use more.

The Reading the Mind in the Eyes task

The website's randomization resulted in more participants completing the self-disclosure task first and the Eyes task second. Therefore, order of the task was included as a covariate in overall group difference analyses. Participants in the metaphor group did reliably better on the Eyes task ($M = 27.69$, $SD = 3.13$) than those in the literal group ($M = 25.75$, $SD = 4.30$); $F(1, 66) = 4.22$, $p = .04$. Performance on the Eyes task was significantly positively correlated with the percentage of affective words used in the metaphorical condition, $r(31) = .39$, $p = .03$. No such correlation was found with the

Table 4

LIWC Analysis: Mean scores of content used in metaphorical and literal contexts for Study 2 (standard deviations)

	Metaphor	Literal
Adverb	3.97 (1.62)	3.53 (1.65)
'I' pronoun	.26 (1.02)	.57 (1.49)
Cognitive Mechanisms	15.96 (2.98)**	12.32 (4.05)
Motion	1.77 (.76)**	3.10 (1.27)
Affect	5.83 (1.42)	5.72 (1.60)
Social	14.06 (3.08)	15.20 (2.73)

*<.05 **<.01

literal group, $r(34) = -.03$, $p = .82$. Performance on the Eyes task did not correlate with the percentage of cognitive mechanism words used in either group, (Metaphor: $r(31) = .02$, $p = .90$; Literal: $r(34) = -.001$, $p = .99$). To explore the potential role of social words, I correlated that category with scores on the Eyes task. Performance on the Eyes task did not correlate with words from the social category in either group, (Metaphor: $r(31) = .05$, $p = .78$; Literal: $r(34) = .02$, $p = .88$).

Self-disclosure

Recall two scales adapted from the emotional self-disclosure task (Snell, Miller & Belk, 1988; see Table 5 for all correlations) were used in this study (e.g., On a scale from 1-5, what is the likelihood you would talk about times you are feeling angry with a same sex friend?). Neither scale correlated with affect words used in the metaphor or literal condition nor with participants' Eyes scores in the metaphorical or literal condition. Scores on these disclosure scales did not correlate with the use of the "I" pronoun in either condition, likely because of the low use of first person pronouns. Overall, metaphor and literal groups did not differ on their tendency towards self-disclosure on happy, $F(1, 66) = .01$, $p = .90$, or angry scales, $F(1, 66) = 2.24$, $p = .13$. The mean for happy disclosure in the metaphor group was 4.32 ($SD = .63$); the literal mean was 4.31 ($SD = .78$). The mean for angry disclosure were 3.36 ($SD = .74$) in the metaphor group and 3.05 ($SD = 1.01$) in the literal group[6].

[6] The participants' scores on angry self disclosure are similar to the numbers Snell, Miller and Belk (1988) report. However, scores on the happy self-disclosure subscale found in the present work are somewhat higher than what those authors report.

Table 5

Correlations of happy and angry self-disclosure subscales to LIWC variables and the Eyes task

	Happy		Angry	
	Literal	Metaphor	Literal	Metaphor
Affect	-.03	-.16	-.005	-.02
I	-.21*	.19*	.08	.20
Eyes	-.30	-.13	-.20	-.08

Discussion

Replicating Study 1, LIWC analysis shows participants in the metaphor group used more emotional idiomatic language and cognitive mechanism words compared to the literal group. These findings can be interpreted in light of research that shows idiomatic language and cognitive mechanism words are used to express abstract thought and emotion to others (e.g., Pennebaker, 2012). Like Study 1, those providing context for literal prompts used significantly more motion words that, as Newman et al. (2003) indicate, are simple, descriptive words. As in Study 1, neither group differed on the number of affect words they used. Thus, Study 2 generally replicates the content findings of Study 1.

Greater use of idiomatic expressions and cognitive mechanism words suggests the contexts the participants provided in the metaphor condition were emotionally vivid and expressed abstract thought. These findings are generally supportive of Ortony's (1975) expressibility and vividness hypotheses. Additionally, the use of idiomatic language and expression of thought can be interpreted in light of research that shows idiomatic language allows the writer to insert his or her personality into their writing (Delfino & Manca, 2007). Likewise, cognitive mechanism words tend to be used with friends (e.g, Marsh, Tversky & Hutson, 2005), further supporting the contention that metaphor prompts an interpersonal style of communication. Metaphor contexts therefore contain social elements and are used to express abstract thought. It seems that participants who created these contexts were conscious of the intention of the message, resulting in writing that had social content.

Recall the Eyes task was included in this study to determine the reason participants might insert social and emotional elements into the metaphorical contexts they created. The first finding to note is that participants in the metaphorical condition did better on the Eyes task compared to the literal group. The metaphor group was thus more accurate in identifying emotions in others. This finding can be interpreted in light of previous research that suggests that writers may simulate another's perspective when they include emotional or cognitive content (e.g., Gibbs & Colston, 2012). The finding that the metaphor group was more accurate on the Eyes task suggests stronger activation of ToM processes prompted by the creation of metaphoric context compared to the literal context. Activation of ToM during the writing task suggests the content that the metaphor group included was intended to express social and emotional information to others. The finding that the metaphor group did better on the Eyes task ultimately suggests metaphor prompts social effects that, up to now, have been overlooked in the literature.

The second finding to note is that the use of emotion words (e.g., sad, happy, angry) by the metaphor group correlated with the Eyes task, despite the fact that overall percentage of affect words did not differ between the two groups. These results suggest context associated with metaphor prompt a type of emotional expression that is highly social and framed with Ortony's (1975) psychological effects in mind. In contrast, the creation of literal contextual information did not activate ToM processes nor motivate affective content as strongly as metaphorical language. Once again, these data suggest metaphorical scenarios orient the writer to an ostensive reader and a consciousness of the emotional impact of the message. The writers in the metaphor group were, at some level conscious of the idea that what they wrote was intended to be understood by others and

thus included emotional content for that reason. The literal group, in contrast, was not conscious of an ostensive audience to the same degree.

Why might writing metaphorical context result in effects on the Eyes task? Writing tasks are often used in psychological research to induce emotional frames of mind in the participants (e.g., Pennebaker, 2012) or to assess feelings (Lepore, 1997). Writing studies show these effects because the writer embodies (and re-lives) certain emotional experiences (Barsalou, 1999). I extend the embodied effects of writing tasks to the metaphorical contexts participants created in this study. It is likely that writing metaphorical context prompted an "as if" simulation connected to general social and emotional processes like ToM. That is, participants simulated perspective taking, the act of story-telling and emotional introspective qualities. The finding that participants in the metaphor group did significantly better on the Eyes tasks suggests the content produced by the metaphor group activated a social consciousness and desire to express intention. Therefore, at some level, they were conscious of the idea that what they wrote was intended to be understood by others. The communicative potential of what they wrote arguably prompted a deployment of attention to social contexts more strongly than those creating literal contexts. The result of this deployment to social contexts was higher scores on a measure of social intelligence. Other relevant LIWC variables (cognitive mechanism and social words) did not correlate with this task, suggesting the primary goal of participants' written work was to express an emotionally vivid sentiment to others.

Recall participants also completed a self-disclosure measure (Snell, Miller & Belk, 1988). This measure was included to determine if the act of writing metaphorical context prompted higher ratings of the participants' own self-disclosure. Participants in

both the metaphor and the literal groups reported they were willing to self-disclose personal information and disclose times when they were happy or angry to same sex friends. The groups did not, however, differ from each other on mean willingness to self-disclose (on either scale). Metaphor did not promote a greater willingness to self-disclose, as was initially predicted. Emotional self-disclosure (both happy and angry subscales) did not correlate with the LIWC variables of interest (e.g., personal pronouns or affect) in either group (see Table 5). Therefore, any tendency towards self or emotional disclosure in the writing task did not "spill over" to higher scores on these scales.

Although the core findings of Study 1 replicated in the second study, it is important to note some of the effects did not replicate. The second study failed to show greater use of the "I" pronoun and adverbs in the metaphor group. I can only speculate on the differences between the two samples. The first study was run in the summer semester and advertised broadly to both undergraduate and graduate students. The group in the first study was slightly older (mean age = 23.34 vs. mean age =18.00) and likely had additional years of writing experience compared to the second sample. Moreover, participants in the first study were likely intrinsically motivated to complete the task because the pay-off was a 1 in 72 chance to win a prize. The second sample consisted solely of first year psychology students who received a course credit regardless of how motivated they were to complete the study. Moreover, anecdotally speaking, the writing in the first study seemed to have fewer grammatical and spelling errors suggesting greater consciousness of the content. It is therefore possible that some of the differences between metaphorical and literal language are found when the writers are more engaged with the

task and have more experience with writing for an ostensive audience (as, presumably, the upper year students in the first study did).

General Discussion for Studies 1 and 2

The two studies assessed the social nature of metaphorical contexts. Ortony (1975) proposed that metaphor has interpersonal expressive qualities that convey abstract thought and enhance vividness in communication. I characterize these effects as social in nature. Metaphor is thought to be particularly socially informative because comprehension involves a simulation of introspective qualities such as emotional content (Ritchie, 2006) and the intention of the message (Cohen, 1978). In the two studies presented in this chapter, I tested the idea that 1) the contexts in which metaphor is used are highly social and emotional and 2) that, due to social and emotional content, the creation of metaphor contexts impacts other social tasks resulting in social effects. These social effects were measured with the inclusion of two individual differences measures (the Eyes task and the emotional self-disclosure scale).

Studies 1 and 2 provide support for the claim that metaphorical contexts differ on social and emotional variables. LIWC content analysis showed that participants used language that was more vivid (idiomatic language, adverbs for emphasis) and expressed abstract thought (e.g., cognitive mechanism words) when creating meaningful contexts in which metaphor is employed. The second study also provides support for the claim that the creation of meaningful metaphorical contexts affects other social tasks. The expression of emotion (use of affect words in Study 2) was correlated with a ToM task wherein participants were required to identify the emotions expressed in sets of eyes.

Additionally, participants in the metaphor group did better on the Eyes task than those in the literal condition. In sum, although both literal and metaphorical language can be socially informative, the current findings suggest metaphor and its associated context more strongly orient the writer to their target audience compared to literal discourse.

The novel contribution of these findings should be highlighted. First, Ortony's (1975) hypotheses have not been adequately tested using experimentally controlled stimuli. Studies 1 and 2 suggest these hypotheses may be best interpreted in light of the interpersonal expression associated with metaphor. Additionally, to date, no research has examined ToM processes in a normal adult population using a metaphor context production study. In fact, few researchers have *experimentally* shown the social consequences of metaphor production. The current work suggests metaphorical stimuli prompted a deployment to social contexts to which it can be used, and supports researchers' (Katz, 2005; Ritchie, 2006) speculation on the role of pragmatic knowledge that informs metaphor context production and interpretation. The research in this chapter is broadly supportive of the role of context and more specifically, the activation of cognitive and emotional information in metaphor context production and comprehension. In sum, the results are novel and represent a first attempt at explaining why we might choose to use non-literal language to communicate ideas to others.

In Study 2, the metaphor group performed better on the Eyes task than the literal group. These finding support Ritchie's (2006) speculation that metaphor use requires simulation that includes emotional content and intention. The findings are also generally supportive of Gibbs and Colston's (2012) work. These authors propose an "as if" simulation that allows one to take another's perspective in a way that may be unique to

non-literal language. This "as if" simulation presumably requires general social abilities such as those required for ToM. The results presented here suggest metaphor activates ToM and result in a deployment of attention to social contexts. More broadly, the results suggest metaphor may act as a point in conversation or reading to draw attention to one's motivation or inspire reactions in others. Extended processing of metaphor, as in fictitious narratives, may prompt a mode of thought that is distinct from more literal modes (e.g., Bruner, 1986; Gerrig 1993). This story-telling mode allows the writer or reader to strongly simulate interpersonal knowledge and may explain why the metaphor group scored higher on the Eyes task.

The results also speak to the special communicative elements of metaphor. Early theories on metaphor suggested metaphor comprehension and production involved extra or "special" cognitive work (e.g., Ortony, 1975). Proponents of these theories suggest that metaphor is special in that it allows the speaker to express what is not easily expressed with literal language (Gibbs & Colston, 2012). The nature of this cognitive work has been, at best, underdeveloped. Researchers, at different times, have suggested that imageability, familiarity, expressibility and vividness are important components of comprehension that may make metaphor "special" (e.g., Ortony, 1975; Katz et al.,1988). The first studies in this dissertation suggest that this extra cognitive work is, at least in part, social in nature. Metaphor orients a writer to consider his or her audience and the impact of the message. Therefore, non-literal language provides a unique way to express an interpersonal stance and results in social effects (like higher scores on the Eyes task).

There is one potential confound in the two studies presented in this chapter. It is not clear whether reading the metaphor on its own, or producing the associated context,

or both, impacted the Eyes task. For instance, use of affect words in the metaphor condition, and not metaphor itself, correlated with Eyes scores. Although I believe both reading metaphor and producing context play a role in the results, the data presented here cannot disentangle the roles played by each. Therefore, the next studies exert greater experimental control on the contextual information by matching contexts between metaphorical and literal language (Studies 3 and 4) or removing it completely (Study 5).

In sum, the two studies in this chapter address what writers insert in metaphorical text to make that content emotionally and cognitively vivid. The research prompts the question: what do readers infer from metaphorical expressions? The next chapter examines the perception of closeness between interlocutors and emotionality in text. Using methods typically found in the non-literal language literature, participants will read experimentally controlled text that differ only in one literal/non-literal statement and answer questions on relevant social variables. This methodology will further explore the idea that metaphor expresses social information and conveys emotional intensity.

Chapter Three

Study 3

The two studies presented in the previous chapter show that participants created contexts for metaphors that were social and emotional in nature. The number of affect words produced in the metaphor condition correlated with scores on a measure of social ability (the Eyes task), suggesting that writers embodied others' perspectives resulting in social effects. These effects were not found in the literal condition, where content was direct (based on low use of idiomatic emotional language) and participants lacked a desire to express emotional and cognitive content to others (as shown by lower use of cognitive mechanisms). The studies in this chapter extend the idea that metaphor conveys a greater emotional intensity and interpersonal closeness to the readers of such comments. Although the first studies assessed what the writers included in a metaphorical context to convey social and emotional information, it is not clear what the reader infers from metaphorical language. Moreover, do the inferences required in interpreting metaphorical language relate to social ability like ToM? Asking participants questions about their experience of metaphorical and literal texts will assess what the readers infer from non-literal language use.

In the studies reported next, participants will read pre-written contexts (that include a non-literal language manipulation) and answer questions assessing relevant social inferences using likert type scales (e.g., how close are these two speakers?). This methodology has been widely used in language research to assess what readers infer in short written work and is considered especially useful in quantifying interpretations of

non-literal language (see e.g. Bowes & Katz, 2011; Horton 2007; Gibbs, Leggitt & Turner, 2002 for examples). It should be noted that, following standard experimental procedure, the discourse contexts used in the present studies are kept the same and the only difference between the conditions is the target statement. Therefore, this methodology eliminates differences in the type of information found in the context building studies described in the previous chapter (e.g., greater use of cognitive mechanism words and adverbs). Keeping discourse context the same except for the last sentence ensures differences are due to the target itself and its interpretation within the preceding context. I used this approach to retain experimental control and stay consistent with other work in the non-literal language field. The focus in the studies presented in this chapter is on the inferences drawn by the participants reading metaphorical and literal targets when those targets are not supported by differences in the preceding context. A secondary question is whether, in the absence of textual markers associated with metaphorical expression, the use of metaphor still conveys social information.

Answers to questions like the ones posed in these studies are considered representative of some of the general considerations involved in determining the motivation of the characters in text. The questions used here assess two related aspects of social cognition. Three questions assess ToM processes or the ability to identify thoughts and feelings in others. Related to ToM, two questions also assess the ability to reflect on one's own thoughts and feelings (metacognition; Flavell, 2000). To date only two studies (Gibbs, Leggitt & Turner, 2002; Horton, 2007) have examined the perception of metaphor using social and emotional questions. The work presented here will extend these findings through the inclusion of the Eyes task.

The addition of the Eyes task is intended to explore the relation of general social skills to the perception of metaphor (Gibbs & Colston, 2012). Recall, metaphor interpretation is thought to require emotive and cognitive inferences in communicative discourse (e.g., Ritchie, 2006). Because of these inferences, metaphor may involve perspective taking and other related social skills. Therefore, connected to the ability to interpret metaphor is the general ability to attend to and process social information. Here, I test the idea that the perception of emotional intensity and interpersonal closeness associated with metaphor is related to general social intelligence such as ToM. The prediction follows: participants who perceive greater closeness and emotionality when characters speak metaphorically should also be more accurate at identifying emotions in sets of eyes.

In the studies presented in this chapter, metaphorical and literal sentences are written into discourse contexts in which two characters interact. Research has shown that readers infer extra-linguistic, pragmatic information from even short pieces of writing (e.g., Horton, 2007). For instance, use of novel metaphor suggests the writer is male (Hussey & Katz, 2009) whereas use of indirect and affective language is perceived as feminine even in the absence of explicit mention of gender (Mulac, Bradac & Gibbons, 2001). In fact, Katz (2005) suggests a number of different constraints facilitate metaphorical interpretation in reading tasks, including perception of a speaker's occupation, status and gender. This type of information is subsumed under pragmatics of language – the host of elements that go beyond sentence level information to aid comprehension.

Reading thus involves much more than a simple interpretation of the words on the page. Comprehension requires a considerable amount of extralinguistic and pragmatic knowledge. In fact, without this inferential, background knowledge, some researchers suggest that readers would never be able to reach a coherent meaning of the text (Marmolejo-Ramos, De Juan, Gygax & Madden, 2009). Classic research shows that, during the reading process, we first form a surface-based model of the words on the page, followed by a textbase model resolving structural ambiguities. Relevant to the studies in this chapter is the ensuing situation model (e.g., Zwann, 1999) that incorporates inferences about the text. It is at this point in the reading comprehension process that readers can infer gender, personality traits (Rapp, Gerrig & Prentice, 2001) and emotional states (Gernsbacher, Goldsmith, & Robertson, 1992) of the characters. All of these inferences are motivated by a desire to understand what is happening in the text beyond the words on the page.

The questions in the two studies presented here are designed to draw the reader's attention to different perspectives and emotional content that is not presented explicitly but can only be inferred from the written contexts. When we take characters' perspectives, we can relate to their thoughts and feelings and make inferences about their motivation (e.g., Zwann & Radvansky, 1998; Oately, 1999). Inspired by the embodied perspective, recent research suggests that actions and emotions of the text can leak into the reader's perceptual and emotional responses. For instance, a common technique to induce positive or negative mood is to have participants read stories with those corresponding emotions. One theory for why this technique works effectively is that readers simulate or embody what is happening in the text, such that they reenact it using

emotion processing areas of the brain (e.g., Barsalou, 2008; Zwann, 1999). Additionally, description of characters' emotions can exert a subtle, but powerful effect on the reader. For instance, Gernsbacher, Goldsmith and Robertson (1992) had participants read stories that implied an emotional state in the characters (e.g., guilt). Participants then read a short sentence that either included a congruent or incongruent emotional word. The sentences with the congruent emotion were read faster than the incongruent condition, despite that word not having appeared in the initial story. Participants in this study inferred an emotion even when the task did not seem to require it. Taken together, the results are suggestive of embodied and inferential cognition even when participants read short sentences.

Gibbs (2006, all quotes from page 200-201) states the embodied experience of language and reading helps the reader "create meaningful construals by simulating how objects and actions depicted in language relate to embodied possibilities". Thus, readers use their embodied experience to "soft-assemble" meaning, rather than merely activate pre-existing abstract, conceptual representations. Gibbs and Colston (2012) extend this experience to an interpersonal level of communication, proposing an "as if" simulation to interpret others' feelings and perspectives. In fact, people who report that they read a lot of fiction tend to embody experiences and take others perspectives so frequently that they tend to score high on social measures such as the Eyes task (Oatley, 1999).

All language and discourse is ultimately social, requiring elements of ToM for comprehension. Why might metaphorical language be special? Recent research suggests metaphor is more strongly felt (or embodied) than literal language. Ritchie (2006, p.117) explains that environment is rich with information and we have many schemas (e.g.

conversation context, relationship to the speaker, etc.) that inform our knowledge of the world. However, we are often not conscious of these schemata and have no need to perform much cognitive or embodied work at any given time to understand what is happening. Applying this perspective to language, Ritchie (2006) explains attention can be captured by certain salient aspects of communication. He suggests metaphor is one of the experiences in communication that, where relevant, can capture the reader's attention and prompt elaborate cognitive and inferential work. Gibbs and Colston (2012) additionally suggest that metaphor carries an ostensive message that demands attention in a way that literal language does not and processing is, in part, based on the comprehender's willingness to make sense of what is said. According to these researchers (Ritchie, 2006; Gibbs & Colston, 2012) the result of this attentional capture is a requisite embodied simulation of the content of the sentence and why it was said.

The result of attending to metaphor is an emotive and cognitive experience of the content that is more powerful than a literal approximation (e.g., Ortony, 1975). As the first studies in this dissertation showed, contexts associated with metaphor included cognitive and emotional content that was social. The social inferences associated with metaphor production are extended to the reading comprehension tasks in this chapter. Readers likely engage an "as if" simulation to embody the content of the metaphorical message and the intention of the speaker (Gibbs & Colston, 2012). Metaphor may therefore be perceived as expressing emotional and interpersonal content because it is strongly embodied and allows the reader to infer a range of intention and emotion (Gibbs & Colston, 2012; Mar et al., 2006).

Given that the social and emotional inferences associated with metaphor may be more strongly felt (or embodied) compared to literal language, two broad predictions follow. First, I predict participants will perceive greater closeness and emotionality in metaphorical compared to literal statements (gauged by likert type ratings). This interpersonal information will not be explicitly marked anywhere in the text. If the predictions are confirmed, social and emotional inferences should emerge from an interpretation of the use of metaphor. Such findings will be congruent with Horton (2007), who showed that interlocutors (whose relationship in the text was ambiguous) are perceived as better friends when metaphor is employed. The second prediction extends Horton's (2007) findings by considering the relation of scores on the Reading the Mind in the Eyes task to the emotional and social ratings that the participants provide. I predict that participants who perceive greater closeness and emotionality when characters speak metaphorically will also be more accurate at identifying emotions in sets of eyes. This correlation will show that the inferences associated with metaphor are associated with general social processes like ToM.

Method

Participants

Participants were 40 undergraduate students (23 Females) from Western University with English as a first language (Mean Age = 19.37, *SD*= 2.80). Participants received 1 research credit for completing the study. Ethical approval for both experiments in this chapter is presented in Appendix F.

Materials and Procedure

Materials were short scenarios created by the researcher. In the studies presented in this chapter, Cardillo et al.'s (2010) norms were not used because those stimuli do not fit easily into a conversational exchange without having to provide participants with a considerable amount of preceding context. Additionally, using Cardillo's (2010) stimuli would mean each metaphorical and literal stimulus would be presented in a different context that varies on the factors discussed in the previous chapter or even other factors that have not been considered. Although the results of the first two studies may be more ecologically valid, presenting readers with stimuli using that type of context may cause a loss of experimental control. Therefore, the next studies were intended to balance these concerns and show metaphor's social effects with different, more constrained contexts. As a pretest, a separate set of 24 participants provided ratings on the metaphorical and literal comments out of context. They rated these sentences on exaggeration, emotional intensity and familiarity (using 1-5 Likert type scales). The final stimulus set consisted of eight metaphorical and eight literal statements matched on these variables (see Table 6 for mean ratings).

The eight metaphorical and eight literal phrases were each placed in an interpersonal context involving two friends. Two versions for each context were created. One scenario ended metaphorically and the other context ended literally. These contexts had two friends interacting with one another and ended with an interlocutor commenting about the situation with a literal or metaphorical statement (see Appendix G for

Table 6

Mean ratings for stimuli used in Studies 3 and 4 based on participants' ratings (with standard deviations in brackets)

	Familiarity	Emotionality	Exaggeration
Metaphor	3.58 (.85)	3.24 (.70)	2.79 (.80)
Literal	3.30 (.85)	3.02 (.50)	2.50 (.70)

N for each comparison = 16

examples). Participants saw only one version of each scenario (the language manipulation constituted a within subjects design). Eight filler scenarios were also created which consisted of a description of two friends who shared an experience but did not speak directly to one another. Filler scenarios were not included in any reported analysis but were simply used to ensure the participants did not develop strategies when providing ratings in the literal or metaphorical contexts.

Participants answered five questions, three of which assessed their perception of the interlocutors in the text and two assessing their own experience of the text. Text-level questions were designed to tap into ToM processes because they require the participant to recognize thoughts and emotions in others (Call & Tomasello, 1999). The three text-level questions (inspired by the work of Gibbs, Leggitt & Turner, 2002 and Horton, 2007) include the degree of perceived emotional intensity, closeness of the speakers and the degree the friend of the speaker could relate to the speaker's experience. "Relate to" was defined as follows: Sometimes when we read stories we find we can relate to a person's thoughts and emotions. This means we feel empathy for that person. Empathy is the ability to identify certain feelings in someone and to share these individual's experiences.

The remaining two questions assessed the experience of the participant while reading the text (reader-level questions). Reader-level questions tap into metacognition or the ability to think about one's own thoughts. Metacognition is related to ToM (see e.g., Flavell, 2000). The participants were also asked if they could relate to the speaker (using the same criteria of "empathy" as described above) and if the speaker might be like someone they know.

At the outset of the study participants were not made aware of the nature of the Eyes task. Instead, participants were told they were going to be completing a few different tasks and that each would be explained in turn. Using a within subject manipulation, participants first read short stories that ended with literal or metaphorical comments. Following each story, participants answered the text-level and reader-level questions. They then completed the Eyes task. The study took approximately 45 minutes to complete.

Results

The first set of analyses examines ratings on the five questions that assess social and emotional inferences of the text (On 1-5 Likert type scales). The intercorrelations among the five questions between the different conditions are presented in Table 7. Additionally, intercorrelations among the five questions in metaphor and literal condition are presented in Table 8and 9. Separate repeated measures ANOVAs were performed for each of the five questions, with the target language type (metaphor or literal) as the independant variable. The following effects were observed. Participants perceived the characters' experiences as significantly more emotionally intense when those speakers used a metaphorical (M = 3.80, SD = .67) instead of a literal statement (M = 3.63, SD = .60), $F(1,39) = 5.39$, $p = .02$. Moreover, the friends in the story were rated as significantly closer when they used a metaphorical (M = 3.70, SD = .42) compared to a literal statement (M = 3.56, SD = .48), $p = .01$, $F(1,39) = 6.17$, $p = .02$. None of the other contrasts reached significance.

Table 7

Intercorrelations between questions in literal and metaphorical conditions for Study 3

	Literal				
Metaphor	Emotion	Characters relate to	Closeness	Reader Relates to	Like a friend
Emotion	.74*	.40	.52*	.19	.30
Characters relate to	.32	.82*	.20	.46	.37
Closeness	.51*	.19	.70*	.35	.26
Reader Relates to	.40	.34	.15	.62*	.36
Like a friend	.33	.27	.09	.51*	.60*

*Significant at the .002 level using a Bonferroni correction

Table 8

Intercorrelations between questions in the metaphor condition in Study 3

	Text level		Reader level	
Emotion	Characters Relate to	Closeness	Readers Relate to	Like a friend
Emotion	.37**	.54*	.45*	.46*
Characters Relate to		.13	.39**	.34
Closeness			.22	.32
Readers Relate to				.76*

*Significant at the .005 level using a Bonferroni correction

**borderline at <.025

Table 9

Intercorrelations between questions in the literal condition in Study 3

	Text level			Reader level	
	Emotion	Characters Relate to	Closeness	Readers Relate to	Like a friend
Emotion		.46**	.46*	.38**	.32
Characters Relate to			.33	.46*	.33
Closeness				.16	.11
Readers Relate to					.53*

*Significant at the .005 level using a Bonferroni correction

**borderline at <.025

The second set of analyses assesses the correlation between the questions the participants answered and their scores on the Eyes task. Because emotional intensity and closeness ratings were significantly higher for metaphorical than literal conditions, ratings on these scales were correlated with the participants' Eyes score. Higher scores on the Eyes task were significantly correlated with ratings of greater perceived closeness when friends used metaphor, $r(38) = .34$, $p = .03$ but not when the friends spoke literally, $r(38) = .14$, $p = .36$. Given that the metaphorical and literal ratings of closeness were highly correlated, $r(38) = .70$, $p = .001$, the unique contribution of the Eyes score to the closeness ratings was assessed using a partial correlation to control for the variance contributed by literal statements. Closeness ratings significantly correlated with the Eyes scores, in the expected direction $r(37) = .34$, $p = .03$, controlling for the contribution from the literal condition. When the reverse is computed, the correlation of the literal ratings with the Eyes score, controlling for the contribution of metaphorical language, I find no significant relation $r(37) = -.14$, $p = .38$. Emotional intensity ratings did not correlate with the Eyes score in metaphorical, $r(38) = .23$, $p = .14$[7] or literal, $r(38) = .12$, $p = .42$ conditions.

The remaining text-level question did not show a significant difference. One friend did not relate to the other to a greater degree in the metaphor condition ($M = 2.95$, $SD = .59$) relative to the literal condition ($M = 2.95$, $SD = .58$). Similarly, the two reader-level questions did not show differences based on target type. Participants did not relate to the speaker's experience to a greater degree with the metaphorical comments ($M = 3.19$, $SD = .61$) compared to the literal comments ($M = 3.11$, $SD = .57$). Likewise,

[7] Note the correlation in the metaphor condition is in the predicted direction.

participants did not feel as though the interlocutor using metaphor (*M* = 3.48, *SD* = .71) would be more like someone they knew relative to a character who spoke literally (*M* = 3.46, *SD* = .61).

Discussion

This study was run to test readers' social inferences of metaphor in text and how these inferences relate to social intelligence as indexed by the Eyes task. The study also serves as an extension to Horton's (2007) study that showed participants perceived strangers as closer when one interlocutor commented metaphorically on an event. As predicted, the present study showed that, even when participants are told the interlocutors are friends, greater closeness is inferred when an interlocutor uses a metaphor. The present study was run with, arguably, better controlled stimuli than those used in previous studies[8], further validating the social effects of metaphor. In addition to perceived closeness, the study also assessed perceived emotional intensity as well as the reader's own experience with the text (e.g., metacognition). The results show that metaphor was perceived as significantly more emotionally intense than literal language. Taken together, the results suggest the social effects of metaphor include both a greater perceived closeness between interlocutors and greater emotional intensity of the comment compared to a literal equivalent.

After reading the short vignettes and answering the questions, participants also completed the Eyes task. This task was included to determine whether the perception of emotional intensity and closeness in the metaphor condition is associated with general

[8] Neither Gibbs, Leggitt and Turner nor Horton present norms or indicate their stimuli were normed

social intelligence. As predicted, scores on the Eyes task significantly (and uniquely) correlated with ratings of closeness between speakers using metaphor. The correlation suggests that those who infer a close relationship in the characters using metaphor, also show greater social intelligence, as indexed by the ability to identify emotions in sets of eyes. The results are supportive of the idea that metaphor conveys interpersonal information to readers; especially to those who are socially astute.

Outside of the work presented in this dissertation, no research has investigated the relation of first order ToM to metaphor perception in an adult population, underscoring the novel contribution of the correlational findings with the Eyes task. Additionally, the reading comprehension findings shown here can be interpreted in light of research from the first two studies of this dissertation, that show ToM is activated when participants create contexts associated with metaphor. In the present study, readers infer emotional and social content in metaphor use and, arguably, activate social-cognitive processes to do so.

No differences were found with the reader-level questions. These questions, it seemed, did not engage ToM or metacognitive processes as strongly as questions about the personal relationship between the characters. Generally speaking, it is possible that readers do not consciously think about if they can relate to the character or whether the character was like one of their friends. Therefore, unlike the text level questions, these questions may have seemed artificial or even difficult to estimate. Additionally, the comment in the text was not directed at the reader thus slightly reducing their own empathetic engagement. Alternately, it is possible that readers did not feel like they could relate to the content because the texts were not sufficiently elaborate. Although all

questions are used in the next study (to keep the methodology consistent), the analytical emphasis is on text-based questions.

Study 4

To further investigate the nature of interpersonal effects in the perception of metaphor, the same study was run using a between groups design. The motivation to do so comes from the fact that switching between literal and non-literal language may attenuate the effects of non-literal language. A between groups design will provide more straightforward correlations between the Eyes task and the variables of interest. Additionally, between group methodology is more consistent with the design of the first two studies in this dissertation.

Method

Participants

Ninety-two participants (59 females, Mean age: 20.10 *SD*: 5.80) from Western University completed the study (46 in each group). Participants were randomly placed either in a metaphorical or literal group and answered the same questions used in the first study of this chapter. They also completed the Eyes task.

Procedure

Stimuli and methods were the same as Study 3, with the removal of filler items and the use of between groups design. Once again, at the outset of the study participants are not made aware of the nature of the Eyes task. Instead, participants were told they are going to complete a few different tasks and that each will be explained in turn.

Results and Discussion

For intercorrelations among the five questions for each group, see Tables 10 and 11. Once again, metaphorical comments were rated as significantly more emotionally intense (M = 3.79, SD = .44), compared to literal comments (M = 3.43, SD = .43), t(90) 3.88, p = .001. Additionally, interlocutors were rated as interpersonally closer to one another when using metaphor (M = 3.52, SD = .33) compared to literal comments (M = 3.35, SD =.38), t(90) = 2.07, p = .04. These findings replicate the results from the previous study in this chapter and Horton (2007). Participants also indicated that one character could relate to another to a greater degree when the conversation involved metaphorical (M = 2.93, SD = .45) compared to literal dialogue (M= 2.77, SD = .39), although the contrast only approached significance, t(90) = 1.84, p =.06. Scores on the Eyes task correlated moderately with ratings on emotional intensity in the metaphorical group r(44) = .35, p = .02 but not the literal group r(44) = .03, p = .88.

Once again the reader-level contrasts failed to reach significance, but this time were, more obviously, in the predicted direction. The participants tended to indicate that they could relate to the comment to a greater degree with metaphorical (M= 3.30, SD = .52) rather than literal interactions (M = 3.11, SD = .62), t(90) = 1.56, p = .12. Participants tended to think that the interlocutor speaking metaphorically (M = 3.64, SD = .53) would be more like a friend they would have compared to those speaking literally (M = 3.43, SD = .64), t(90) =1.66, p = .10.

A step-wise regression for the metaphor condition was run with the five questions as predictors of the Eyes task. Analysis show that emotion ratings added independent

Table 10

Intercorrelations between questions in the metaphor group in Study 4

	Text level		Reader level	
	Emotion	Characters Relate to	Closeness	Readers Relate to	Like a friend
Emotion		.30	.37**	.35**	.10
Characters Relate to			.35**	.54*	.34**
Closeness				.25	-.07
Readers Relate to					.65*

*Significant at the .005 level using a Bonferroni correction

**borderline at <.025

Table 11

Intercorrelations on between questions in the literal group in Study 4

	Text level		Reader level	
Emotion	Characters Relate to	Closeness	Readers Relate to	Like a friend
Emotion	.25	.41*	.30	.15
Characters Relate to		.26	.19	.08
Closeness			.11	.10
Readers Relate to				.73*

*Significant at the .005 level using a Bonferroni correction

significant predictability to the Eyes task, $R = .35$, $\beta = .35$, $F(1,44)= 6.18$, $p = .02$. These results are congruent with the correlational analyses reported above. The regression model for the literal group showed no significant predictors, $R = .16$ and therefore a stepwise regression was not run.

Using a between subjects methodology, this study confirms the findings of the first study of this chapter. That is, metaphorical comments are perceived as emotionally intense and that the two speakers are close. Additionally, the results show that use of metaphor is perceived as prompting one character to more strongly relate to another compared to the literal condition (although this result is borderline). Eyes scores correlated with emotional intensity ratings, suggesting that those who show greater social intelligence are more perceptive to the social information conveyed by metaphorical comments. This study furthers the idea that inferences about why someone might use metaphor rely on general social abilities like ToM. The significance of the finding and the difference between the two studies are discussed in the following general discussion.

General Discussion for Studies 3 and 4

Recall the purpose of the two studies presented in this chapter was to assess what readers infer from metaphorical and literal expressions used by friends. The findings from these studies extend the research in the first chapter that assessed what writers included in the creation of a metaphorical context. Results from the two studies in the previous chapter, showed that writers included social elements in the creation of metaphorical context. The findings of those production studies were interpreted in light of an ostensive reader. In the studies presented in this chapter, participants are placed in

the role of the reader. In this case contextual information was matched to isolate the effects of metaphor use between interlocutors in text.

Results of the two studies in this chapter show that the use of metaphor between the two interlocutors was enough to suggest that, generally speaking, the comment itself was emotionally intense, that the two friends were close and that one friend could relate to the other (although this last contrast was only a marginal effect in Study 4). Additionally, participants who perceived greater emotional intensity and closeness were more accurate at identifying emotions in others (as determined by scores on the Eyes task), suggesting that those who show greater social intelligence are more perceptive to the social information conveyed by metaphorical comments. In contrast, literal ratings did not correlate with scores on the Eyes task in either study, suggesting this type of language may not require the same social inferences. The results of both studies suggest that the inferences associated with metaphor generally emerge when the reader is considering a character's perspective and not necessarily their own personal experience with the text. Taken together, these results support the contention that metaphor conveys social and emotional information.

The finding of higher ratings on social variables implies that use of metaphor in text can prompt a social-inferential process on the part of the reader. The correlations between the Eyes task and interpersonal variables suggest these social-inferential processes engage ToM. The correlational findings can be interpreted in light of previous research the shows readers infer pragmatic and social information from even short pieces of text (e.g., Horton, 2007). These inferences help create meaningful construals of what is happening in the story (Gibbs, 2006). Therefore, the relationship between social ratings

and the Eyes tasks in the metaphor condition suggests reading metaphor engages an "as if" simulation wherein interlocutors take others' perspectives to infer intention and emotional closeness (Gibbs & Colston, 2012). Moreover, metaphor uniquely engages this inferential process, given that no relationship was found between ratings and scores on the Eyes task in the literal condition (Study 3) or group (Study 4).

There was one noticeable difference between the findings of the two studies. Two different (but complementary) correlations emerge from Studies 3 and 4. Study 3 demonstrated a strong positive correlation between ratings on how close the friends are perceived and scores on the Eyes task. Study 4 shows a correlation with those same variables in the correct direction, but was not reliable ($r(44) = .14$, $p = .35$). Instead the Eyes scores significantly correlated with ratings of emotional intensity in the Study 4. To investigate the contribution of emotionality ratings to the closeness correlation, a partial correlation was conducted. The partial correlation of closeness and Eyes scores, controlling for the influence of emotional intensity ratings, shows no significant relation ($r(41) = .01$, $p = .99$). Therefore closeness ratings did not contribute to Eyes scores in Study 4.

Given that closeness and emotionality ratings are generally highly correlated with each other in these studies, the different significant correlations in the two studies are best seen as complementary. Research on interpersonal relationships show strong friendships are a combination of emotional intensity and closeness (Marsden & Campbell, 1984). These concepts are separate but interactive. Therefore, closeness and emotionality questions likely tapped into a similar underlying experience. Indeed, the intercorrelation matrices from both studies suggest the three text level questions are highly correlated

with each other. Another possible explanation is based on the observation that closeness ratings by the metaphor group in the second study tended to be lower (M = 3.52) than the ratings in the first study (M = 3.70)[9]. The lower ratings suggest that the between groups design reduced the perceived closeness of the two characters but retained the emotional intensity. The mean for emotional intensity was consistent across the two studies; 3.79 in Study 1 and 3.80 in Study 2.

The findings are congruent with the idea that we simulate emotive and social information when we make inferences about the reason metaphor is used. I do not argue here that literal language is not (or cannot) show an "as if" simulation of others' thoughts. Instead I take a position similar to Gibbs and Colston (2012, p. 217), who suggest that metaphor carries an ostensive message that demands attention in a way that literal language does not. In this case, comprehension "may generally function along the lines suggested by Relevance Theory, but with the addition of embodied simulation processes". According to Relevance Theory, the ostensive message is worthy of the processing efforts on the part of the comprehender. Given its non-literal nature, metaphor comprehension always proceeds with an interpretation of the ostensive message. During the interpretative process, extralinguistic information is rapidly sought and applied (Ritchie, 2006; Katz, 2005). Moreover, Gibbs (2006) indicates that readers may only construct embodied simulation when "those inferences enable them to understand the plot or the writer's rationale for including something in the text" (p. 207). The research presented in this chapter suggests that relevant contextual information includes knowledge of others' cognitive and emotional states. As a consequence, the interpersonal

[9] This contrast is significantly different; $t(84)=2.07$, $p = .04$

inferences associated with metaphor may be more strongly simulated (or embodied) when reading text.

More broadly, the results inform reading studies in general. In order to understand text, readers infer content beyond the words on the page. The correlation between metaphor ratings and scores on the Eyes task suggest these inferences include emotional and social experiences. The findings in the two studies presented here are largely supportive, albeit indirectly, of the idea that we embody emotional and social information in text (see e.g., Zwann, 1999). Likewise, the studies provide some support to the idea that pretense can convey interpersonal information (e.g., Gallese, 2007). Importantly, these embodied experiences of text may be more apparent with metaphorical than literal language.

The two reading studies are a logical extension to the findings of the context production studies of the second chapter. The production studies showed that participants were more conscious of their audience when prompted by metaphorical, but not literal statements. Participants in these first studies included emotional and expressive content in metaphorical contexts in order to make a context meaningful. The reading studies in this chapter show that indeed, closeness and emotionality are inferred when reading metaphor in extended text, even when contexts are written so that they are less imaginatively rich and emotionally powerful.

The next chapter explores reader's inferential judgments using reaction time methodology. To do so, all contextual information is removed and participants are, in essence, forced to rely solely on inferences about the sentences that are reading. The

general research question here is: what are the associated creative and social inferences when doing so?

Chapter Four

The studies presented thus far have assessed the production and perception of metaphor using contextual information. These studies show that the effects of metaphor production and comprehension are emotional and interpersonal in nature. Studies 1 and 2 show participants included social and emotional markers that help express content of thought to others when asked to created context for metaphorical sentences. Studies 3 and 4 show that participants inferred closeness and emotional intensity when metaphor was used between friends in written text. To further the social hypothesis of metaphor, the final study investigates the inferences associated with metaphor by removing contextual information. Specifically, this study assesses Katz's (2005, p. 185) claim "even when presumably out of context, the interpretation of a given statement is inextricably linked to the manner in which it is presented, and when an explicit context is not available, one is constructed during the act of comprehension". To test this premise, metaphor is presented on its own, unconstrained by context. The intention here is to assess the strength and versatility of social effects, under contextually vague circumstances where participants must strongly rely on their own inferences for comprehension. The relevant inferences are predicted to be largely social in nature.

Recall metaphor perception likely involves an inferential process that incorporates a host of factors including knowledge of the speaker's intent and the emotion (e.g., Ortony, 1975). As a consequence, information conveyed by metaphorical language requires social inferences in addition to lexical and semantic knowledge. I posit that the reader may ask, at some level, "why would that be said" or "what is the context" even if a speaker is not present (see e.g., Katz, 2005; Ritchie, 2006) and even if these thoughts are

not conscious. Indeed, Ritchie (2006) provides a theoretical reason why this might occur. He proposed that metaphor comprehension requires introspective knowledge that provides information on emotional valence and social or contextual norms. Indeed, one could argue that important introspective inferences likely include, at a minimum, the intention that motivates use of a given non-literal expression. Gibbs and Colston (2012) expand on Ritchie's (2006) work, suggesting that metaphor generally invites perspective taking in a more significant way than literal language. Consequently, metaphor relies on both imaginative and inferential leaps into other "minds and worlds" (Gibbs & Colston, 2012, p. 218). Even under increasingly vague contexts, participants infer human intention to interpret metaphor (e.g., producing more interpretations when a metaphor is associated with a poet as opposed to a computer program; Gibbs, Kushner & Mills, 1991).

As a result of these imaginal and inferential processes, it is possible to look at the consequences of reading metaphors by once again using other, ostensibly unrelated, cognitive and emotional tasks. Recall, the basic premise of embodied cognition assumes whatever relevant information is simulated in one task can implicitly influence other tasks. The study in this chapter was designed to address the social consequences of reading metaphors without an elaborative context and is meant as a final extension of the other studies of this dissertation. The previous studies had participants either create context for metaphor or read metaphor with contextualizing information and answer questions on this information. The study in this chapter removes context and questions that orient the reader to relevant social information (as in studies 3 and 4). This last study is meant to examine whether social inferences are involved in interpretation even when reading metaphor out of context.

The first prediction is that reading metaphor outside of contextualizing information will still prompt an orientation to social information. This premise is tested in several different ways. The first way is the inclusion of the Reading the Mind in the Eyes task. Recall that the Eyes task requires one to identify the relevant mental/emotional states depicted in pictures of Eyes (what is called first order Theory of mind; Baron-Cohen et al., 2001). Studies in this dissertation show that metaphor processing activates first order ToM (as assessed with the Eyes task). I examine here whether the effects of reading a metaphor *without context* "spills over" to other social tasks, indexed by performance on the Eyes task that follows the metaphor reading task. Specifically, I predict participants will show higher scores on the Eyes task even in the absence of elaborative context (a prediction that would complement group differences findings in Study 2 of this dissertation that showed participants scored higher on the Eyes task following production of contextual information associated with metaphor).

A secondary way of examining whether metaphor induces orientation to social information is to examine the content of the responses on a different, non-social task. A noun generation task is used in this study. In this task, participants are presented with verbs (e.g. "running") and are asked to write the first noun that comes to mind (e.g., "person" or "legs"). Responses to the noun generation task will thus be analyzed using Linguistic Inquiry and Word Count (LIWC, Pennebaker, Francis & Booth, 2001). Responses are predicted to vary depending on the perspectives of the respondent. The critical contrast is whether the mere act of reading a metaphor induces a social orientation, as seen by the generation of words that focus on a human agent as opposed

to, say, an object or body part. This orientation is captured by the "social" category of LIWC, which includes words like "mother", "father", "doctor" etc.

Recall from earlier discussion that LIWC's social category shows mixed results in the literature when used in extended discourse contexts (e.g., Pressman & Cohen, 2006). Indeed, the first study of this dissertation shows that the literal group tended to use more words from the social category when describing actions in a short discourse context. In the final study of this dissertation, the social category may actually inform the nature of metaphorical thought because of the constrained methodology. Unlike Studies 1 and 2 of this dissertation, participants in the present study are not creating discourse contexts, but simply providing "the first noun that comes to mind" in response to verb prompts. The first thing that comes to mind upon reading metaphor is, arguably, human intention. This embodied experience of human intention is predicted to "spill over" to the noun generation[10]. Under the constrained methodology of the noun-generation task, I predict participants in the metaphor group will respond with more social words than those in the literal group.

Another potential effect of metaphor will also be assessed. Some researchers have suggested that metaphor has "creative" effects. Creativity here is the cognitive process that involves "forming […] elements into new combinations which either meet specific requirements or are somehow useful" (Mednick, 1962, p. 221). Creativity is therefore relevant to metaphor comprehension because metaphor requires the "construction of novel, non-salient connections or associations between words in order to integrate

[10] Other LIWC categories are not predicted to be relevant in this type of study. For instance, in response to the word "hugging", it is unlikely that participants will use an affect word (happy) or a cognitive word (think) because these words violate subject-verb agreement rules of the English language.

meaning and create plausible expressions" (Gold, Faust & Ben-Artzi, 2011, p. 604). The act of understanding metaphor may encourage participants to deploy attention widely to access remote lexical and conceptual cognition (see e.g., Katz & Pestell, 1989). For instance, researchers suggest that those sensitive to metaphorical meaning will be better at connecting semantically distant objects (via a task like the remote associates test). In fact participants with higher remote associates' scores are significantly faster at identifying the meaning of novel metaphors (Gold, Faust & Ben-Artzi, 2011).The creative effects of metaphor, however, are largely understudied.

The noun generation task can also be used as a proxy for creativity. Semantic distance between verb and noun will be calculated using latent semantic analysis (LSA, Landauer & Dumais, 1997). This methodology is considered a sensitive test of the type of creativity defined above (e.g., Prabhakaren, Green, & Gray, 2011). Latent semantic analysis calculates the frequency of co-occurrence of terms using corpora data and produces a cosine of the words of comparison. The word-word distances produced by LSA tend to correlate with word-word priming effects (e.g., Landauer & Dumais, 1997) and are therefore a good approximation of semantic association. Distance between a noun and a verb can be a sign of creativity because greater semantic distances suggest more remote association. For instance, one study had participants produce a verb under a condition in which they were prompted to "be creative" or not prompted (Prabhakaren, Green, & Gray, 2011). Participants in the "creative" condition produced noun-verb pairs with distances were significantly further away than participants who were not prompted. Latent semantic analysis is therefore an appropriate test of creativity prompted by metaphorical thought.

The general procedure for this experiment is as follows. Following the format of many studies in this dissertation, participants in Study 5 were placed randomly in two groups and either read short metaphorical or short literal sentences (taken from Cardillo et al., 2010 norms). They occasionally answered "yes" or "no" questions to ensure they were paying attention. In the stimuli used here, the single word that drove metaphorical or literal interpretation always came at the end of the sentence (e.g., The skater's fall was a *stumble* vs. The first date was a *stumble*). These stimuli were, of course, matched on relevant LIWC variables (discussed in greater detail in the methods section). Unlike the other studies in this dissertation, this reading task requires participants to read each sentence word-by-word via a moving windows procedure. The procedure permits the analysis of "wrap up effects" (Pexman, Ferretti, & Katz, 2000) or the time spent synthesizing the information in the sentence. Wrap up effects are indexed by time spent on the last word of the sentence. Longer wrap up times suggest integration of lexical and pragmatic information. Research has consistently shown that metaphor out of context takes significantly longer when compared to literal statements out of context or metaphor within context (e.g., Inhoff, Lima & Carroll, 1984; Ortony, Schallert & Reynolds, 1978; Kemper, 1981). Following word-by-word reading, participants completed the noun-generation task and the Eyes task (counterbalanced).

Summary and Predictions

Based on the embodied view of metaphor comprehension, I predict participants will do better on the Eyes task after reading metaphorical sentences compared to those who read literal sentences. Likewise, the metaphor group will use more social words in their responses to the noun generation task compared to the literal group. Finally, the

semantic distances of verb-noun generation will be assessed, with the prediction that metaphor should prompt broad attentional deployment to remote concepts.

Method

Participants

Thirty-nine undergraduate students (25 Females) from Western University with English as a first language (Mean Age = 18.56, *SD* = 1.80) were tested. Two participants were removed from the study, one for showing reaction times longer than 2 standard deviations above the mean and one for failing to complete all parts of the study. Participants received 1 research credit for completing the study. Participants were randomly placed in a metaphor (n = 20) or literal group (n = 19). Ethical approval is presented in Appendix H.

Materials and Procedure

At the outset of the study participants were not made aware of the nature of the Eyes task or the noun generation task. Instead participants were told they will be completing a few different tasks and each will be explained in turn. The methodology is congruent with much of the work on embodied cognition wherein participants complete ostensibly unrelated tasks.

Materials were 58 metaphorical and literal statements taken from the Cardillo et al's (2010) norms (see Appendix I for examples). Items were chosen so that the last word of the sentences was the same between the two groups (e.g., metaphorical: "The contract was legal zigzag"; literal: "The mountain road was a zigzag"). These items were matched

on emotional valence as determined by the proportion of people who rated the comment as positive (Metaphor M = .27 SD = .31; Literal M = .26, SD =.28 $t(114)$ = .10, p =.91). Additionally, sentences were analyzed with LIWC and matched on pronouns, affect, social, motion and cognitive mechanism words (see Table 12). These short sentences were presented on a computer screen using E-prime (Schneider, Eschmann, & Zuccolotto, 2002). Participants read the sentences word-by-word and occasionally answered some comprehension questions (14 in total) about the sentences they had read to ensure they were paying attention.

Following the reading task, participants completed the "Reading the Mind in the Eyes task" (Baron-Cohen et al. 2001) and the noun generation task (counterbalanced across participants). The noun generation task, akin to verb generation tasks (e.g., Holland et al., 2001), requires participants to produce a noun for a give action (e.g., hugging). Participants are asked to provide the first noun that comes to mind for 30 verbs presented one at a time on the computer screen. Half of the verbs were taken from the sentences the participants read and half were new verbs. Old and new verbs were used so participants would not consciously recognize the words or develop strategies when responding. Furthermore, the use of old and new verbs permits an analysis of where social and creative effects might occur (e.g., if effects are seen with old items or if they transfer to new items). These different types of verbs are therefore included in the reported analyses.

Table 12

LIWC norms for stimuli used in Study 5

	Metaphor	Literal
All Pronouns	2.80 (6.26)	2.50 (6.71)
Personal Pronoun	2.80 (6.26)	2.25 (5.70)
She/He pronouns	2.30 (6.26)	2.25 (5.70)
Adverbs	0.24 (1.89)	1.40 (4.73)
Affect	5.73 (9.16)	6.79 (9.27)
Cognitive mechanisms	2.88 (7.05)	1.13 (5.23)
Motion	2.46 (5.64)	4.45 (8.39)
Social	5.91 (7.93)	4.26 (9.08)

Results

Manipulation Check

Two sentences with reaction times two standard deviations longer than the average were removed from the analysis. Sentences to which participants provided incorrect answers were removed from the analysis (less than 1% of the data). Confirming past research involving the reading of metaphors out-of-context (e.g., Inhoff, Lima, & Carroll, 1984; Ortony, Shallert & Reynolds, 1978), participants tended to spend longer at the last word of the metaphorical sentences. This was found across items (*M*met = 900.00 ms, *SD* = 128.30; *M*lit= 767.01 ms, *SD* = 102.48, $t(110) = 6.08$, $p = .001$) and participants (*M*met= 900.30 ms, *SD* = 199.27; *M*lit= 767.01 ms, *SD* = 228.31, $t(37) = 1.94$, $p < .06$).

Eyes Task

As predicted, and supporting the group differences findings in Study 2 of this dissertation, participants in the metaphor group did significantly better on the Eyes task (*M* = 29.60, *SD* = 2.16) than those in the literal group (*M* = 25.80, *SD* = 3.50), $t(37) = 4.04$, $p = .001$. Performance on the Eyes task did not correlate with average RTs to the last word with either the metaphorical $r(18) = .16$, $p = .48$ or literal sentences, $r(17) = .10$, $p = .66$.

Noun-generation Task

The nouns generated for each of 30 verbs were analyzed with the Linguistic Inquiry and Word count program (LIWC; Pennebaker, Francis, & Booth, 2001), which

provides counts on a variety of categories of words. The data presented here are average word counts with a maximum of about 30 responses per participant. Analysis focused on the production of words from the "social" category, though for completeness a range of categories was assessed. The group who had read the metaphors prior to doing the noun generation task produced significantly more social words (e.g., "friend", "mother", when given a verb such as "hugging"), $M = 7.25$ ($SD = 4.00$), than the group who read the literal sentences prior to the task, $M = 4.62$ ($SD = 2.60$), $t(37) = 2.41$, $p = .02$. For the social nouns produced in the metaphor group, paired t-tests show responses did not differ when participants were prompted with old verbs ($M = 3.55$, $SD = 1.90$) or new verbs ($M = 3.70$, $SD = 2.45$), $t(19) = -.36$, $p = .72$. For social nouns produced by the literal group, paired t-tests showed no differences when participants were prompted with old ($M = 2.57$, $SD = 1.38$) or new ($M = 2.05$, $SD = 1.47$) verbs, $t(19) = -1.94$, $p = .07$.

The literal group produced significantly more biological words (e.g., "hand", to the same verbs), $M = 3.90$, $SD = 1.50$, compared to the metaphorical group, $M = 2.40$, $SD = 1.60$, $t(37) = -2.64$, $p = .02$. There were no reliable differences in the generation of biological nouns when prompted with old (1.89, $SD = 1.04$) or new ($M = 2.05$, $SD = 1.26$) verbs, $t(18) = -.38$, p = .70. Likewise, the metaphor group did not differ on the production of biological related word in the old ($M = .95$, $SD = .82$) or new ($M = 1.45$, $SD = 1.14$) conditions, although the effect approached significance; $t(18) = 1.95$, $p = .07$.

Creativity Effects

Average distance between noun and verb was computed for each participant using LSA cosines. Numbers closer to 1 indicate close semantic relations between words. Recall that, if metaphor prompts a creative thought process, the average distance should

be significantly further away from 1 compared to a literal group. The average semantic distance between metaphor and literal groups did not differ; metaphor (*M* = .24, *SD* = .04), literal (*M* = .25, *SD* = .03), *t*(37) = -.83, *p* = .41. The average semantic distance did not differ between old and in verbs in either the metaphor or the literal group. For the metaphor group, the average distance for old verbs was .23 (*SD*= .05) and .25 (*SD*= .05) for new verbs, *t*(38) = 1.04, *p* =.31. For the literal group, the average distance for old verbs was .25 (*SD*= .04) and .26 (*SD*= .05) for new verbs, *t*(36) = .84, *p* =.40. Reading metaphor did not result in the greater deployment of attention reflected in more remote associates.

To be complete, I investigated the relationship between creativity (as indexed by LSA) and scores on the Eyes task. Semantic distances did not correlate with scores on the Eyes task in either the metaphor *r* (18)= .11, *p* = .64 or literal condition *r* (17) = .24, *p* =.30.

Discussion

Study 5 was run to test the implicit impact of reading metaphors without specific contextual information. Specifically, Study 5 tested the idea that even out of context, metaphor comprehension is accomplished through inferences about intentional agents. The study served as a logical comparison to the other studies in this dissertation that rely on varying degrees of contextual information to convey metaphorical content. Results in this final study showed that participants tended to spend longer at the last word of the metaphorical sentence (compared to the matched literal item). This finding generally replicates many studies that show metaphor takes longer to read than literal sentences when not accompanied by contextual information (e.g., Inhoff, Lima & Carroll, 1984;

Ortony, Shallert & Reyonlds, 1978). Longer wrap up effects suggest the integration of pragmatic information (Pexman, Ferretti, & Katz, 2000). It is therefore possible that longer reaction times in the present study suggest participants were integrating inferential information (although this claim is highly speculative).

Results also showed that participants in the metaphor group scored significantly higher on the Eyes task compared to the literal group. Additionally, and as predicted, participants who read metaphorical sentences subsequently provided more social nouns in response to verb prompts. In contrast, the literal group used more biological words in response to these same nouns. The findings did not differ based on old or new nouns. In addition to the content of the responses in the noun generation task, semantic distance was analyzed using LSA. Past research suggests larger distances are indicative of "creative" processes (e.g., Prabhakaren, Green & Gray, 2011). Results of the present study showed average semantic distance between the two groups were not significantly different, suggesting that reading metaphorical sentences did not prompt a deployment to remote associates.

The results show that the mere act of reading metaphors, out of context, still led to an orientation towards social information. This finding was demonstrated implicitly by superior recognition of emotional states on the Eyes task, and by a reliable increase in the use of words with social import when cued by a verb. Importantly, the study shows that these social effects can occur without an elaborative text in which a speaker utters the metaphor or, indeed, on a non-social task (like the noun-generation task). The findings also show that it is likely the act of reading and interpreting metaphor that drives the Eyes effects (and not merely context, as suggested by an alternate interpretation to the results

of Studies 1 and 2). These findings can be interpreted in light of an "as if" simulation process wherein participants seek relevant social and emotional information when reading metaphorical sentences (e.g., Ritchie, 2006; Gibbs & Colston, 2012). Congruent with findings in embodied cognition, this "as if" simulation transferred to other tasks.

The metaphor group performed better, over all, on the Eyes task, demonstrating that they were more accurate at identifying emotions in sets of Eyes. This finding is congruent with Study 2 of this dissertation that shows the metaphor production task also prompted higher scores on the Eyes task. Why might metaphor prompt this particular effect? Reading metaphor likely results in a simulation of social information, which includes inferences about intention and emotional intensity (e.g., Ritchie, 2006). The results of Study 5 suggest an agent and intention is likely inferred in metaphor comprehension. That is, at some level, readers activated knowledge associated with an intentional agent when comprehending metaphor- especially when additional context is lacking. The findings of Study 5 are largely supportive of Katz's (2005) claims that, even out of context, metaphor comprehension relies on contextual information. The inferential information associated with metaphor may be best considered social and interpersonal in nature. That is, because of the lack of context, participants were forced to process metaphorical sentences using an "as if" simulation of the kind proposed by Gibbs and Colston (2012). The result of this simulation was a stronger orientation to the social information conveyed by metaphor and thus higher scores on the Eyes task. Likewise, this orientation is demonstrated in social words used in a non-social, noun generation task.

Participants in this study not only strongly embodied an implicit intention of metaphor but also used more social category words in the noun generation task. In contrast, the literal group used words from LIWC's biological category. One could argue that both findings suggest an embodied simulation of "humans", the difference instead is that embodiment occurs at different levels (e.g., socially versus with body parts). Although both findings might be generally congruent with an embodied cognition approach, greater use of words from the social category suggests the embodied nature of metaphor is strongly interpersonal. That is, reading metaphor prompted a broader deployment of attention to social categories (i.e., people). These results are a unique addition to the literature and show the social inferences associated with metaphor comprehension also transfer to ostensibly non-social tasks.

In contrast to the social effects, participants in the metaphor group did not produce more "creative" responses to the noun generation task. Metaphor did not prompt a deployment of attention to remote associates. Although, some studies have shown creative effects associated with metaphor (see e.g., Gold, Faust & Ben-Artzi, 2001), creativity has been understudied in this area. The findings of this study show that the more obvious effects may come from social knowledge and related ToM ability. Indeed, use of metaphor in everyday conversation may not necessarily be motivated by creative effects, but instead by interpersonal closeness. Nonetheless, the relation between creativity, social knowledge and metaphor use, remains an empirical question for future work.

This final study suggests that, even out of context, readers search for the intentional and emotional information associated with metaphor to reach a coherent

understanding. This interpretation results in social effects. To date, little research has assessed the effects of metaphor comprehension or the role of social knowledge. In fact much of the work has been speculative (e.g., Ritchie, 2006). Study 5 suggests that activation of introspective qualities is important to metaphor interpretation and we seek intention in comments that lack additional contextual information. These findings complement other studies in this dissertation that use varying degrees of contextual information. Moreover, the social effects of metaphor may be a more interesting avenue to pursue than creative effects. The significance of these results and proposed mechanisms are further discussed in the final chapter.

Chapter 5 General Discussion

The operational goal of this dissertation was to address the gap in the literature that has overlooked the social effects of metaphor production and comprehension. This dissertation investigates the result of attending to, and elaborating on, a metaphorical message. Gibbs (1994) suggests that the social function of metaphor is twofold: metaphor allows the speaker to express his or her attitude (or, presumably, intention) and allows the target of the statement to understand this attitude (or intention). Therefore, the studies in this dissertation explore the expression of intention in context production studies and resulting social effects such as perceived interpersonal closeness or emotional intensity. The working hypothesis for the studies presented in this dissertation is that introspective qualities like emotion and intention are simulated in both the person who produces the metaphorical expression and the person who comprehends the meaning of this expression. The simulation was investigated in this dissertation by analyzing the context in which metaphor is used and by examining the effect of reading metaphor on other, ostensibly unrelated, tasks. This chapter begins with a review of the studies comprising this dissertation followed by a discussion of the implications and future directions.

Review of studies

In Studies 1 and 2, participants wrote a discourse context to make metaphorical or literal sentences meaningful. Previous research suggests metaphor is used to express a vivid emotional sentiment and to express abstract thought to others (Ortony, 1975). As a test of Ortony's (1975) hypotheses, Study 1 and 2 were run with normed stimuli to

investigate the nature of the content that participants include in metaphorical and literal contexts. A computerized text analysis program (LIWC) was used to analyze this content.

The first two studies demonstrated that participants providing context for metaphorical prompts used more idiomatic emotional expressions, cognitive mechanism words (e.g., "think" and "intend"), adverbs and first person pronouns. Those responding to the literal prompts used simple, physical descriptions. The use of adverbs and idiomatic language can be interpreted in light of past research that shows that these markers of speech are used to express emotional intensity and to insert personality in writing (e.g, Hopper, Knapp & Scott, 1981). Additionally, past research suggests that use of cognitive mechanism words reflects a desire to express what one is thinking (e.g, Pennebaker, 2012). The use of the "I" pronoun in the metaphor context allowed the writers to insert themselves into what they were writing (e.g, Kuo, 1999). In contrast, use of "motion" words by the literal group suggests these contexts included physical descriptions of what was occurring instead of emotional and cognitive elements (Pennebaker et al., 2007). The findings of Studies 1 and 2 demonstrated that participants included different types of content when creating either metaphorical or literal contexts. Specifically, the findings support the idea that metaphorical contexts include markers of intention and emotion whereas literal contexts are simply physically descriptive.

To supplement Study 1, Study 2 tested the writer's social motivation to include certain types of content in metaphorical contexts and how this might differ from literal contexts. To do so, I examined correlations between the use of affect words by participants in the metaphor condition and their scores on the Eyes task. This analysis was motivated by the idea that the written content participants include in metaphor

contexts was socially expressive and used to inspire reactions in others. Socially expressive content was hypothesized to activate social processes. This prediction was assessed in Study 2 with the inclusion of the Eyes task. Confirming predictions, Study 2 showed that participants' use of affective words in the metaphor context production condition was positively correlated with their scores on the Reading the Mind in the Eyes task (Baron-Cohen et al., 2001). Participants who included a greater amount of emotional content in the metaphor condition were more accurate at identifying emotions in eyes. In contrast, this correlation was not found with the literal group. Study 2 also showed that the metaphor group scored higher, overall, on the Eyes task than the literal group. Taken together, the findings suggest that writers simulated an ostensive reader (mechanisms discussed in the next section). More broadly, the results of the first two studies support the contention that contexts produced in the metaphor condition convey a vivid, emotional message which is social in nature.

Studies 3 and 4 assessed what readers infer when reading metaphor. These studies employed reading tasks wherein the information conveyed by contextual content was more constrained than the first two studies in order to exert tighter experimental control. Following methodology typically used in non-literal language research, participants in Studies 3 and 4 read short scenarios that ended with metaphorical or literal statements and answered questions assessing social and emotional inferences (on likert type scales). They also completed the Reading the Mind in the Eyes task to assess if social inferences required in metaphor interpretation are related to general social abilities (like ToM). As predicted, use of metaphor by characters in a story was perceived as suggesting greater emotional intensity and interpersonal closeness. Scores on the Eyes task positively and

uniquely correlated with relevant social variables (closeness and emotional intensity) in the metaphor condition. This correlation shows that those who perceived greater emotional intensity and closeness when metaphor is used, are generally more accurate at identifying the emotional experience of others. Once again, the results are supportive of the idea that metaphor conveys interpersonal information to readers; especially those who score high on a measure of social intelligence. These perception findings complement the context production findings of the first two studies.

Study 5 tested the idea that, even out of context, metaphor comprehension proceeds through the reader's inferences of relevant contextual and interpersonal information (e.g., Katz, 2005; Ritchie, 2006). In this final study, metaphor was presented without contextual and extralinguistic information and was read word-by-word on a computer screen. The motivation to present metaphor without context was to further assess the strength and versatility of the social effects found in the other studies of this dissertation. After reading metaphorical or literal sentences, the participants also completed a social task (the Reading the Mind in the Eyes task) and a non-social, creativity task (noun-generation task, where participants provided nouns in response to verb prompts). These tasks assessed, in different ways, when social inferences from reading metaphor spill over to other tasks. Indeed, results show that participants in the metaphor group did better on the Eyes task than the literal group, supporting the claim that, even out of context, metaphor conveys an interpersonal intention. This information is thought to be implicit in the metaphors used in this study. Additionally, compared to the literal group, participants in the metaphor group provided more "social" words in response to verb prompts. Participants, however, were not more creative with their

responses in the noun generation task, suggesting the relevant effects might be primarily social.

Taken together, the results of the studies in this dissertation show metaphor has social effects. Metaphor prompts an orientation to others' emotional experience and requires a consciousness of the intention of the message. These experiences of metaphor result in social effects such as interpersonal closeness and emotional intensity. The five studies represent one of the first attempts to explore metaphor's social effects experimentally. Generally speaking, the results support the premise that metaphor is used because it expresses an interpersonal perspective more strongly than literal language and may serve to build relationships. The representation of intention and the emotional inferences are true for both the writer (or creator) of the metaphor (as in Studies 1 and 2) and the reader of metaphor (in Studies 3, 4 and 5). The studies in this dissertation thus provide a general explanation for why we might use metaphorical rather than literal language at certain points in conversation and with certain people.

Review of Theory

The current state of the metaphor research is a mix of comprehension theories, each of which can, at best, only explain some of the requisite psychological processes involved in interpretation. For instance, early models identify some of the relevant features (or constraints) involved in inferences associated with metaphor comprehension (e.g., familiarity or aesthetic judgment; Katz et al., 1988). Context and pragmatic models broaden the research scope and incorporate extralinguistic knowledge such as the role of gender and friendship status into the inferences required in metaphor comprehension

(Katz, 2005). Similarly, research shows that metaphor comprehension relies, in part, on common ground or the shared knowledge on which the interaction rests (Clark, 1996). However, a recent review of non-literal language research (Gibbs & Colston, 2012) suggests that the current models are unable to fully demonstrate what people infer from figurative language or the role of pragmatic effects. At best, each model can only explain one aspect of comprehension and no single model can provide a complete account of how metaphorical meaning is reached.

The research presented in this dissertation emphasizes the powerful social effects of metaphor and may serve to extend much of the current theorizing about figurative language. The motivation to use metaphor comes from a desire to engage others emotionally and cognitively. Early work by Ortony (1975) suggests that metaphor has unique interpersonal effects like expressing abstract thought or making topics more vivid. Recent theorizing connects Ortony's (1975) hypotheses to the ability to take others' perspective (e.g., Gibbs, Leggitt & Turner, 2002). That is, metaphor is used to effectively communicate with or inspire emotional reactions in other individuals. The research in this dissertation suggests that inferences associated with metaphor can result in powerful social effects (like interpersonal closeness). Metaphor's effects might be best explained with an embodied cognition approach.

Proponents of embodied cognition indicate that language conveys more than static, specific meanings and that interlocutors' experience of language is perceptually and emotionally embodied (Barsalou, 2008). According to embodied cognition, the brain coordinates multimodal information (e.g., emotion) not captured by amodal accounts in order to compute meaning out of raw data and to ground experience in embodied

simulation (Barsalou, 2008). Comprehension via simulation involves the reliving or reimagining of the pertinent information associated with the stimulus. Researchers propose that the embodied information associated with metaphor comprehension includes introspective qualities such as emotion and the intention of the comment (see e.g., Ritchie, 2006). Related to these qualities is the idea that metaphor interpretation prompts an "as if" simulation of others' thoughts and feelings (Gibbs & Colston, 2012). This "as if" simulation involves taking another's perspective in communication. Although not explicitly stated in their work, this "as if" simulation likely requires social abilities like ToM. Therefore, we activate emotional and social knowledge as a part of the embodied comprehension of metaphor in order to understand what is being communicated.

Based on embodied cognition, a likely process of understanding metaphor is simulation whereby we infer other's intentions and emotions (e.g., "as if" simulation of Gibbs and Colston, 2012). Throughout this dissertation, I connect this process with introspective simulation proposed by Barsalou (1998, connected to metaphor by Ritchie, 2006). In inferring intention we activate introspective simulators. A basic example of how introspective simulation might operate can be illustrated with abstract words. In comprehending the word "love", we simulate basic emotions as well as contextual information and intention associated with an agent (see, e.g., Barsalou & Wiemer-Hastings, 2005). The ability to introspect in this manner also covers higher cognitive abilities like truth, negation, intention and pretense. Moreover, Barsalou (1998) seems to suggest that without the ability to introspect, we would not be able to use ToM processes. Barsalou (1998) prefers a non-modular, domain general approach, whereby attention directs the nature of introspection (e.g., to emotional content) and these qualities are

stored as perceptual symbols (i.e., “associative patterns of neurons” that represent the cognitive activity p. 583) for future cognitive work. The relevant cognition work in comprehending metaphor (and therefore the activation of perceptual symbols) varies with context and effort. In sum, I believe introspective qualities are fundamental to processing metaphor. Whether this type of mechanism is fully congruent with ToM or whether alternate accounts are needed, remains to be seen.

There are a number of ways that the studies in this dissertation are consistent with an embodied perspective of metaphorical language. In Studies 1 and 2, participants used vivid, emotional language to create meaningful metaphorical contexts. The vivid experience of metaphor is tied, in part, to embodying (or re-living) cognitive and emotional experiences associated with the stimuli. Additionally, Study 2 showed that writers in the metaphor group were more accurate at recognizing others’ emotions after creating metaphorical contexts. This finding can be interpreted in light of the general embodied cognition methodology that suggests whatever relevant information is strongly simulated in one task (e.g., the content of metaphorical contexts) can influence another, ostensibly unrelated task. Therefore, in Study 2, writers were simulating another’s perspective when they included emotional content. Studies 3 and 4 provide indirect support of embodied cognition and metaphor. Past research shows that readers simulate emotions and intentions of characters in text (Zwann, 1999). The findings of Studies 3 and 4 showed that readers infer emotional intensity and closeness when characters used metaphorical comments. Additionally, those who were more accurate at identifying emotions in others (as measure by the Eyes task) perceived greater emotional intensity and closeness between speakers using metaphor. Participants demonstrated this pattern of

results because they were able to embody others' perspectives and this skill is related to metaphor comprehension. These correlational findings thus suggest metaphor interpretation involves general social ability. Finally, Study 5 shows, even out of context, participants embodied intention when they read metaphorical comments. This embodiment was shown implicitly by higher scores on the Eyes task and use of social nouns in a noun generation task after participants had read metaphorical statements. Once again, what is embodied in one task, transfers to another. In sum, the results of the five studies suggest an embodied experience of metaphor.

Related to embodied cognition, the results of this dissertation are broadly suggestive of an "as if" (Gibbs & Colston, 2012) simulation. This "as if" simulation is an embodied interpretation of what a speaker expresses and, one could speculate, likely operates via ToM processes. Ritchie (2006) posits that metaphor comprehension incorporates introspective qualities like emotion and inferences about intention. These factors are, arguably, the core elements of an "as if" simulation. The result of such simulations are the "social effects" of metaphor detailed in this dissertation. As Gibbs and Colston (2012) suggest, metaphorical language is a social invitation to infer the thoughts and feelings of the speaker. The target of the metaphor "projects" themselves into the mind of someone else, to infer thought and experience strong emotional closeness. Furthermore, as the results of Study 5 show, the "as if" simulation may occur even out of an explicit conversational context.

The findings speak to a recent theory proposed by Ritchie (2006). Context limited simulation theory incorporates the roles of context, embodied simulation, common ground and relevance in the comprehension of metaphor (e.g., Ritchie, 2006). The

proposed theory is largely untested and hypothetical. Applying embodied cognition, Context limited simulation provides a theoretical basis for the importance of context and extralinguistic knowledge in understanding what is said. Ritchie (2006) claims that metaphor has its origins in social interactions and non-literal interpretation relies on an explicit or implicit context. Relevant features are activated through an embodied experience of the topics of communication. Importantly, interpretation relies heavily on the conversational context, introspective qualities like emotion and, I argue, interpersonal intention. As this dissertation suggests, it is possible that, at some level, the introspective qualities he proposes include intention of the speaker. In fact, Ritchie (2006) suggests that even without an explicit speaker, contextual information is still inferred. Although his theory has not been widely tested, the results presented in this dissertation should be considered in light of this framework. The results of the work in this dissertation show interpersonal expression is likely simulated when both understanding and using metaphor. The findings in this study extend Ritchie's (2006) theory by suggesting the result of introspective simulation is powerful social and emotional effects.

Another perspective should also be considered in addition to the "as if" simulation and context limited simulation. Recall, that use of metaphor is essentially an act of pretense: saying one thing but intending something else. Mar and others (2006; Oately, 1999; Oately 2011) characterize acts of pretense as informative ways to simulate social knowledge about other people, including emotional experience and intentions of characters in fiction. Pretense allows us to simulate a wider range of experience than literal perspectives. The results of the studies in this dissertation suggest metaphor may act as a point in conversation or reading to reflect on the motivation of the characters or

to discuss one's own intention. Extended processing of metaphor, as in fictitious narratives, may prompt a mode of thought that is different from more literal modes (e.g., a narrative mode; see: Bruner, 1986; Gerrig 1993). This mode allows the writer or reader to strongly simulate interpersonal knowledge or consider others' perspective more broadly (e.g, Gibbs & Colston, 2012). Therefore, in addition to an "as if" simulation and the role of contextual information, a metaphorical mode of thought induced in the participants may help explain the group differences found in this dissertation. That is, it is possible that reading and writing about metaphor prompted a unique mode of thought that spilled over to other tasks like the Reading the Mind in the Eyes task. Therefore, participants were not only embodying another's perspective, but doing so quite differently than a literal group.

A question arising from the data presented here is whether or not there are individual differences in embodied simulation related to metaphor comprehension (for discussion on individual differences and metaphor comprehension see Blasko, 1999). Barsalou (2008) suggests that people can show individual variability in simulation when, for instance, those people are experts in a certain field. As an example, compared to non-experts, expert ballerinas more strongly simulate movements produced by other ballerinas (Calvo-Merino et al., 2005). Extending these expertise findings to the present study, it is possible that individual differences in ToM ability can result in different patterns of use of metaphor and different levels of processing and comprehension. One could predict that English majors might be experts in non-literal language and pretense because their field of expertise requires them to notice this type of language. These groups may show higher Eyes scores and greater patterns of metaphor use. Additionally,

they may be more prone to perceive metaphor as relevant and, consequently, process it deeply. In the present research, the correlational findings between closeness ratings and the Eyes scores (e.g, Study 3), suggest there are individual differences in embodied experience of communication in normal populations.

The research presented in this dissertation more broadly speaks to the "special" nature of metaphorical language. Early theories (e.g., Ortony, 1975) of metaphor suggested comprehension and use involved extra or "special" cognitive work. Additionally, proponents of these theories suggest that metaphor is special in that it allows the speaker to express what is not easily expressed with literal language (Ortony, 1975; Gibbs & Colston, 2012). In contrast, other researchers suggested that metaphor is not a remarkable aspect of language and it does not require work that is much different from literal language (Giora, 2008). However, the social nature of this cognitive work has, up until, not been investigated. The studies presented in this dissertation suggest this extra cognitive work may be, in part, interpersonal in nature. Ortony's (1975) vividness and expressibility effects are best understood in light of a reader or writer's desire to express an intention. Metaphor is "special" because it can engage introspective and interpersonal simulation more strongly than literal language.

The results of this dissertation prompt larger questions related to embodied cognition and social effects. There are, of course, many actions that are considered "social". Rorty (1989, p 220) suggests "tossing a metaphor into a conversation is like suddenly breaking off the conversation long enough to make a face, or pulling a photograph out of your pocket and displaying it, or pointing at a feature in your surroundings, or slapping your interlocutor's face or kissing him". His position implies

social effects such as the ones described in this dissertation can result from any anomalous or attention grabbing action. My research, of course, does not test the relation of these actions to social tests like the Eyes task. Although showing a photograph or kissing or slapping someone may indeed prompt an "as if" simulation, we are not always able to express ourselves in this way. My position is that metaphor is readily accessible and can be widely used to produce a social response from an interlocutor. Metaphor additionally allows the speaker to produce subtle, socially acceptable effects and may be just one of the tools we use to inspire closeness and emotional response in others.

Another question arising from the data presented in this dissertation is, can other types of language prompt an "as if" simulation and result in similar social effects? Although I argue that metaphor is a unique method of communication, I do not argue that other types of language do not require ToM or cannot result in social effects. As Gibbs (2006) indicates, embodied cognition may be more strongly required when the reader or interpreter is trying to make sense of events or why something was said. Therefore, one could imagine a literal context where one might want to infer some motivation or intention. For instance, imagine you are standing in line at a coffee shop and a stranger says "nice day today". Depending on the gender of the person you may wonder if he or she is simply being friendly or interested in having a coffee with you. The point of the studies presented in this dissertation is to show that metaphor is a unique form of interpersonal expression that draws attention to itself because it is non-literal pretense. It is equally possible that literal language, at times, can result in social effects.

Limitations and future research

Even though the research in this dissertation provides a cohesive picture of metaphor's social effects, there are a few limitations to consider. Gibbs and Colston (2012, p.5) suggest "researchers tacitly assume that any figurative statement can be paraphrased [literally]". Indeed, this assumption is widely held in order to experimentally investigate many different types of non-literal language. These authors suggest the categorical literal/non-literal distinction is a crude method of investigation that is too simplistic to truly capture the nature of metaphor comprehension. The research presented in this dissertation does indeed use a binary literal/non-literal distinction for experimental purposes. Given experimental constraints, it would be very difficult not to use a binary distinction. However, in truth, a graded view between literal and non-literal language may be equally appropriate. Future research can test the social effects of metaphor using this graded approach. One way to do so would be to correlate social ratings (emotionality and closeness) with metaphoricity ratings (i.e., the degree to which the statement is metaphorically true, see e.g., Katz et al., 1988).

Another possible avenue for research is to examine the effects in more interactive, face to face communication. In their review, Gibbs and Colston (2012) suggest that presenting tropes in isolation is a constraining and even unnatural approach. Instead, they suggest researchers should consider the effects of non-literal language across different contexts. Additionally, they suggest researchers might want to consider complex, interactive communication with numerous instances of figurative language (as in extended text or discourse). Again, for the sake of experimental control, the research presented in this dissertation constrains the type and amount of figurative language that is

presented to participants. However, a logical next step would be to determine if these social effects emerge in an interactive framework by perhaps using computer mediated communication or a face to face discourse methodology. For instance, use of metaphor in interactive communication may result in higher scores on a measure of social sensitivity like the Eyes task. Additionally, pairing conversation partners who have high Eyes scores and having them discuss certain topics may result in greater use of metaphor and other types of non-literal language. More broadly, the work presented in this dissertation can even be extended to explore how the social effects of metaphor can create and maintain social in-groups and out-groups.

These social effects can also be examined using different types of figurative language (e.g., sarcasm and irony). Sarcasm and irony require that participants recognize that the interlocutor is intending the *opposite* of what he or she is saying (see, e.g, Bowes & Katz, 2012). Because of the contradictory nature of sarcastic comments, Gibbs and Colston (2012) propose that sarcasm may activate ToM more strongly than metaphor. Therefore, studies similar to the ones in this dissertation could be run using sarcasm as the target non-literal language type. One could predict that participants would score higher on measures of social sensitivity (like the Eyes task) after reading sarcastic comments (compared to non-sarcastic equivalents).

In the background of much of the work presented in this dissertation is the embodied experience of both reading metaphor and interpreting it in light of an ostensive reader/writer. Embodied experience is thought to be the best explanation for some of the effects shown in this dissertation. Future work can test embodied cognition and metaphor interpretation in a number of ways. For instance, much of work on embodied cognition

involves the participant imagining themselves physically, in a certain context. For instance, one study (Zhong & Leonardilli, 2008) had participants imagine a time when they felt either socially excluded or included. These participants then rated the temperature of the room; an ostensibly unrelated task. Researchers found that those recalling a time of social exclusion rated the temperature of the room as significantly colder. The findings suggest that social isolation is bodily connected to coldness. Future research can assess the embodied social effects of metaphor using tasks similar to that of Zhong and Leonardelli (2008). For instance, interpersonal closeness in metaphor may suggest that two speakers are standing closer to one another or perhaps that the room feels warmer. Another way to test an embodied approach is to investigate how metaphor influences one's own emotional experience. For instance, use of metaphor may make other speakers seem happier. Indeed, the studies presented in this dissertation provide a wealth of possible research avenues.

Neuroscientific studies could also be brought to bear on the role of social effects of metaphor. The studies in this dissertation show ToM activation in metaphor comprehension. Neuroscientific evidence shows a diffuse network is involved in taking others' perspectives and empathetic response. This network includes the medial prefrontal cortex and superior temporal sulcus (Vollm et al., 2006). Likewise, research suggests emotional regions like the amygdala are involved in empathy, ToM and performance on the Reading the Mind in the Eyes task (Adolphs, Tranel & Damasio, 1994). Imaging research will further identify the relative activation of these networks in metaphor processing and the circumstances under which this activation occurs. For

instance, imaging studies could be run to test the idea that metaphor activates an "as if" network in the brain that involves recognition of intention and emotion.

A final possible avenue for research is testing metaphor's social effects across different populations (children or individuals with Asperger syndrome). Children, for instance, must develop the ability to accurately identify thoughts and feelings in others (e.g., Vosniadu, 1987). It is therefore possible to examine children's perception or production of metaphor at different developmental stages, when ToM ability is concurrently developing. One could predict that children without ToM ability do not use metaphor and have trouble interpreting intention. This research would further support social effects in metaphor comprehension and production. Social interpretations of metaphor might even inform the extent of abilities in those with Asperger syndrome or even those with Alzheimer's disease where perception of this type of language is compromised to some degree (Amanzio, Geminiani, Leotta & Cappa, 2008).

Conclusions

The production and perception of metaphor requires activation of social knowledge. This activation results in social effects. Participants produced social content like emotional intensity or expression of abstract thought when prompted by metaphorical stimuli (Studies 1 and 2). Metaphor in text suggested the interlocutors were interpersonally close and that an utterance was more emotionally intense than a literal equivalent (Studies 3 and 4). Finally, comprehension of metaphor out-of-context, still exerted some effect, such that participants reading metaphor tended to do better on a ToM task (Study 5). The research presented in this dissertation suggests intention and

social factors should be included in current theorizing to explain why one might use metaphorical as opposed to literal language.

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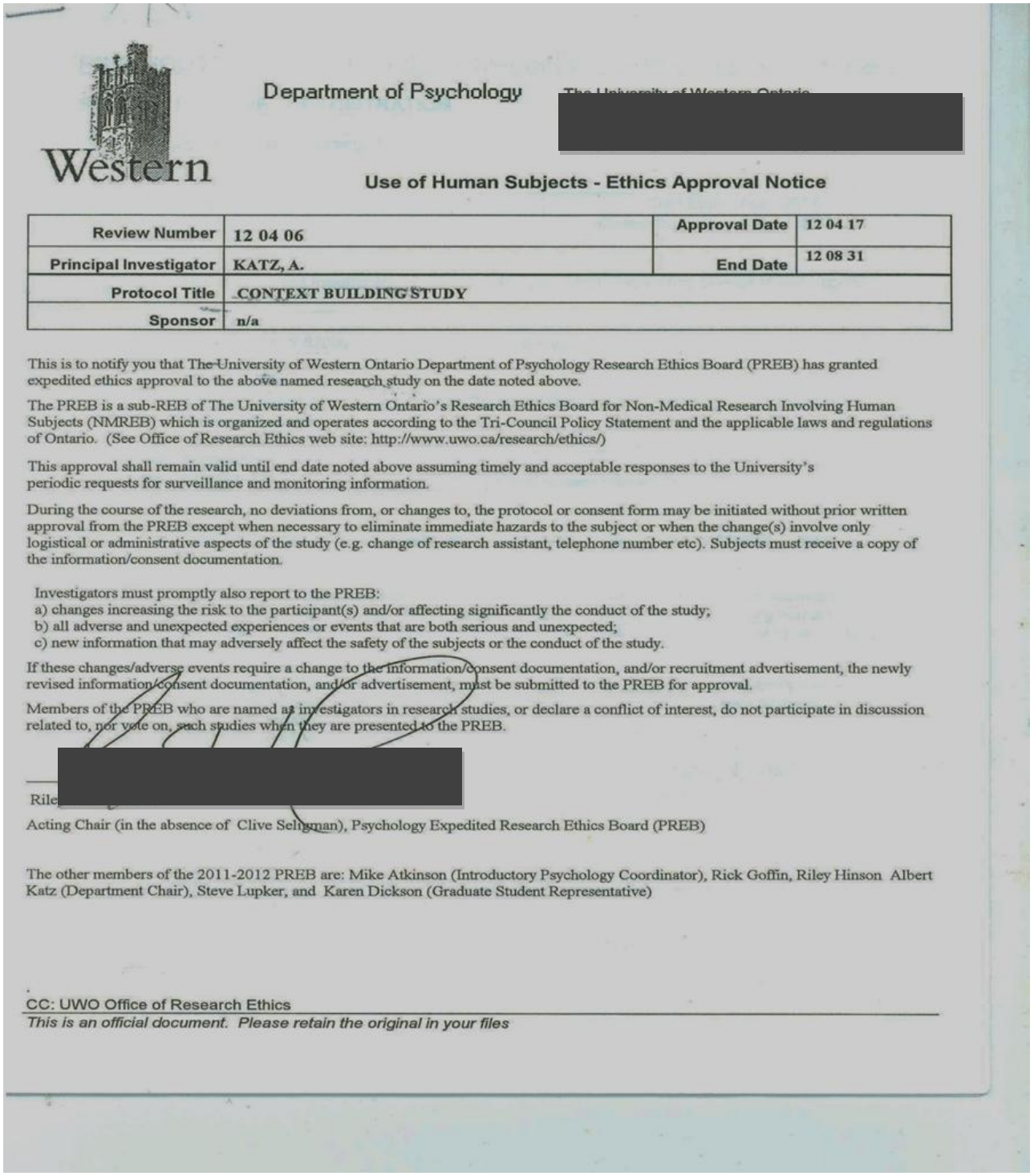
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Appendix A

Ethics Approval for Study 1



Western

Department of Psychology [redacted]

Use of Human Subjects - Ethics Approval Notice

Review Number	**12 04 06**	**Approval Date**	**12 04 17**
Principal Investigator	**KATZ, A.**	**End Date**	**12 08 31**
Protocol Title	**CONTEXT BUILDING STUDY**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

This approval shall remain valid until end date noted above assuming timely and acceptable responses to the University's periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the PREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of research assistant, telephone number etc). Subjects must receive a copy of the information/consent documentation.

Investigators must promptly also report to the PREB:
a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to the PREB for approval.

Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

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Rile

Acting Chair (in the absence of Clive Seligman), Psychology Expedited Research Ethics Board (PREB)

The other members of the 2011-2012 PREB are: Mike Atkinson (Introductory Psychology Coordinator), Rick Goffin, Riley Hinson Albert Katz (Department Chair), Steve Lupker, and Karen Dickson (Graduate Student Representative)

CC: UWO Office of Research Ethics

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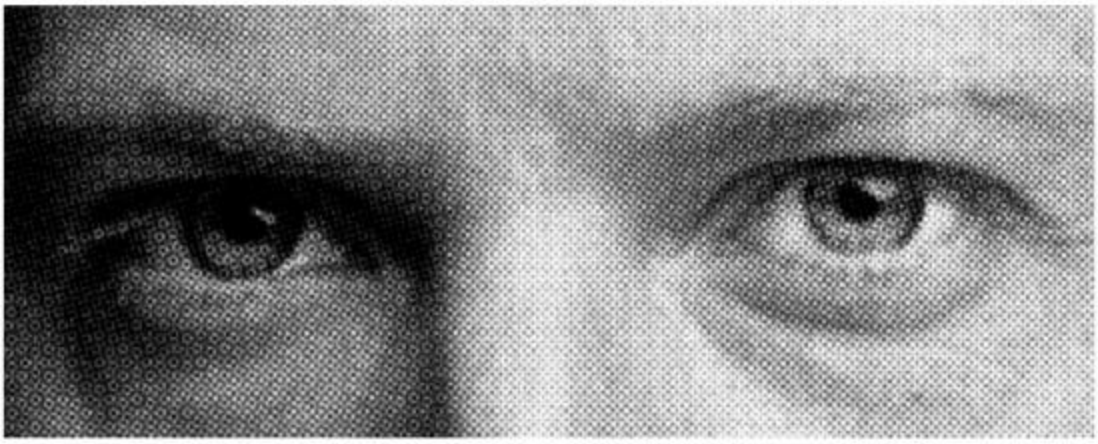
Appendix B

Example of stimuli used in Studies 1 and 2

Metaphor
The minister stirred the audience.
The reader raced through the novel.
The news story was babble.
The haircut was a good chuckle.
The woman dove into her knitting.
The first date was a stumble.
His poetry was a cathartic moan.
Her uncle is an irrepressible belch.
The case worker trudged through the files.
The clever detective jumped at the clue.
The celebrity leapt at the book deal.
His lawyer pressed for a new trial.
Her rejection letter was a slap.
The accountant snuck through the loophole.
The reception was a snore.
The lies snaked through the story.

Literal
The cook stirred the stew.
The man raced past the empty lot.
The baby talk was babble.
Her aside was a rude chuckle.
The woman dove into the pool
The skater's mistake was a stumble.
His only communication was a moan.
His blunder was a loud belch.
The park guide trudged through the swamp.
The performer jumped on the platform.
The happy fan leapt during the goal.
The heavy box pressed against his side.
The punishment was a strong slap.
The teenager snuck out the beer.
The funny thing was his snore.
The python snaked around the victim.

Appendix C



1) Irritated

2) Disappointed

3) Depressed

4) Accusing



1) Arrogant

2) Grateful

3) Sarcastic

4)Tentative

Appendix D

Emotional Self Disclosure Scales

Listed below are 10 emotions that we experience in our lives. In this survey we want you to indicate on a scale from 1-5, how willing you are to talk about these experiences with your same sex friends. **1** means not at all willing to talk about this, **2** means slightly willing, **3** mean moderately willing **4** means almost totally willing **5** means totally willing to talk.

Times when you felt happy

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt angry

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt cheerful

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt infuriated

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt joyous

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt irritated

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt delighted

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt hostile

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt pleased

1	2	3	4	5
Not at all		moderately		Totally willing

Times when you felt enraged

1	2	3	4	5
Not at all		moderately		Totally willing

Appendix E

Ethics approval for Study 2

Western

Department of Psychology The [redacted]

Use of Human Subjects - Ethics Approval Notice

Review Number	**12 10 31**	**Approval Date**	**12 10 24**
Principal Investigator	**Albert Katz/Andrea Bowes**	**End Date**	**13 08 31**
Protocol Title	**A study of writing and cognition**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

This approval shall remain valid until end date noted above assuming timely and acceptable responses to the University's periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the PREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of research assistant, telephone number etc). Subjects must receive a copy of the information/consent documentation.

Investigators must promptly also report to the PREB:
a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to the PREB for approval.

Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

[redacted]

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

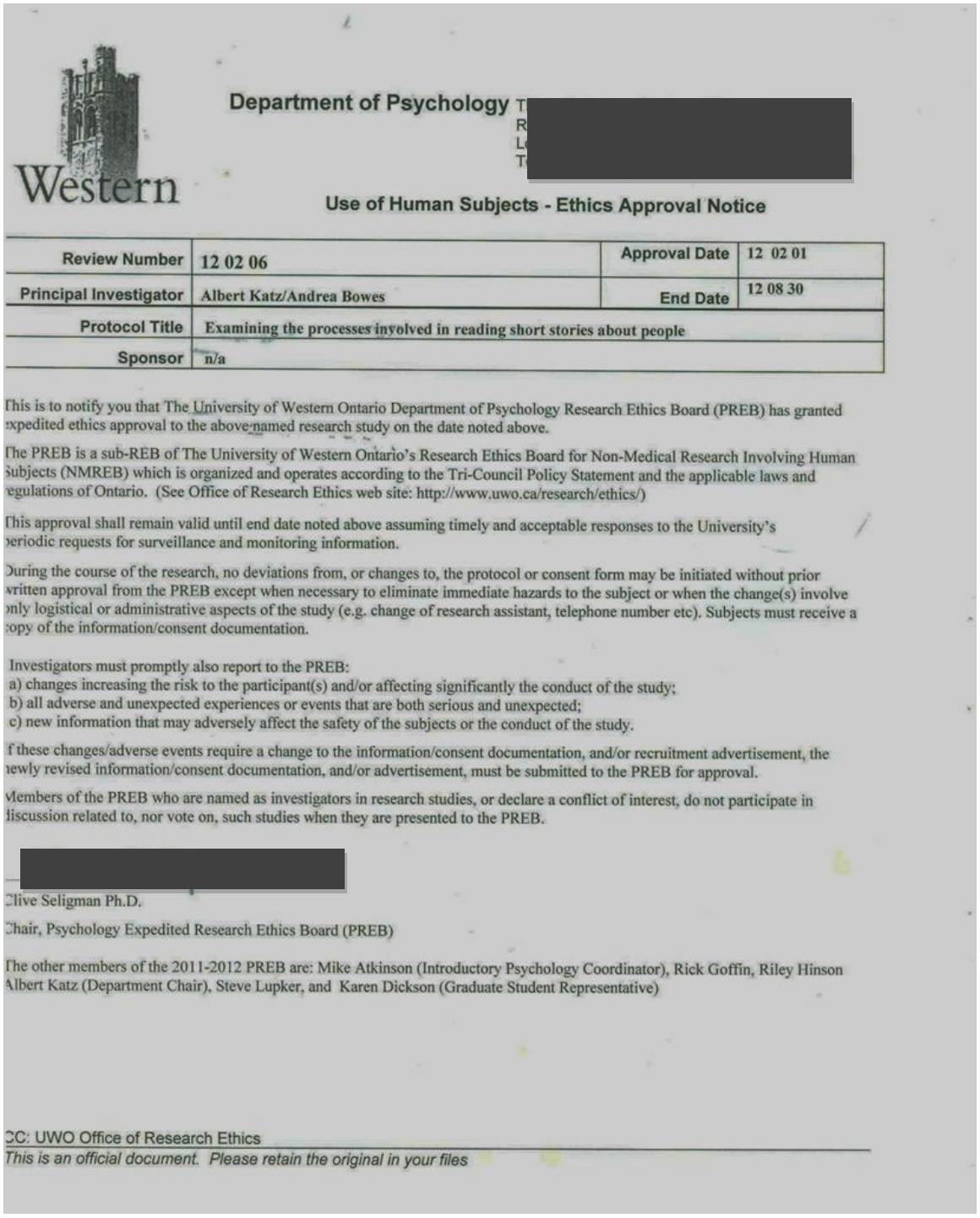
The other members of the 2012-2013 PREB are: Mike Atkinson (Introductory Psychology Coordinator), Rick Goffin, Riley Hinson Albert Katz (Department Chair), Steve Lupker, and TBA (Graduate Student Representative)

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Appendix F

Ethics for studies 3 and 4



Western

Department of Psychology [redacted]

Use of Human Subjects - Ethics Approval Notice

Review Number	12 02 06	Approval Date	12 02 01
Principal Investigator	Albert Katz/Andrea Bowes	End Date	12 08 30
Protocol Title	Examining the processes involved in reading short stories about people		
Sponsor	n/a		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above-named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

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[redacted]

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2011-2012 PREB are: Mike Atkinson (Introductory Psychology Coordinator), Rick Goffin, Riley Hinson Albert Katz (Department Chair), Steve Lupker, and Karen Dickson (Graduate Student Representative)

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Appendix G

Example of Stimuli for Studies 3 and 4

Frank knew that Edward wasn't reliable. Frank had told him some personal information and Edward told the rest of their friends about it. Edward suggested that Frank was prone to problems. Frank warned Kyle: "be careful what you say to him". (Metaphorical: "watch your back around him")

Maria had just completed a nursing course and graduated with honors. She thought that she would be able to get a good job. She was ready to celebrate her hard work. Julia saw Maria later that day and suggested they go out for dinner. Maria responded , "what a very good idea". (Metaphorical: "what a gem of an idea").

Appendix H

Ethical Approval for Study 5

Western

Department of Psychology [redacted]

Use of Human Subjects - Ethics Approval Notice

Review Number	**11 09 22**	**Approval Date**	**11 09 15**
Principal Investigator	**Albert Katz/Andrea Bowles**	**End Date**	**12 06 30**
Protocol Title	**A study on social interactions between friends**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

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Investigators must promptly also report to the PREB:
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[redacted]

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2011-2012 PREB are: Mike Atkinson (Introductory Psychology Coordinator), Rick Goffin, Riley Hinson Albert Katz (Department Chair), Steve Lupker, and TBA (Graduate Student Representative)

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Appendix I

Example of stimuli used in Study 5

Metaphor
Her stare was a bull charge.
His illness was a slow drift.
His job was an endless groan.
His novel was a perspective flip.
His work experience was a clumsy clamber.
His yacht was a rich swagger.
His youth was a happy canter.
The anthology was a literary wander.
The art major was a glide.
The assignment was an easy sail.
The card was a sympathetic hug.
The cash was a steady flow.
The ceremony was a swamp trudge.
The coast was a beckoning voice.
The contract was a legal zigzag.
The court case was a stroll.
The criticisms were a stampede.
The date was a successful launch.
The day's events were a whir.
The declined invitation was a stab.
The divorce was a hard fall.
The dress was a revealing sizzle.
The editorial was a brass-knuckle punch.
The editorial was a middle class whine.
The email was a desperate cry.
The eviction was a mean sweep.
The film was a laugh.
The home purchase was a skydive.
The interview was a painful crawl.
The last month was a sprint.
The letter was a goodbye wave.
The letter was a lonely sigh.
The letter was a polite grumble.
The lie was an integrity collapse.
The man's tattoo was a rebel yell.
The marriage was a forced march.
The new roommate was a dice roll.
The newspaper stories were a trickle.
The numbers were a brain swarm.
The pamphlet was a rant.

The partnership was a financial tailspin.
Her career was a rough climb.
Her inquiries were a nervous scamper.
Her orders were a sharp bark.
The petition was a mad dash.
The price change was a major drop.
The prize money was a lift.
The puzzle was a logic cartwheel.
The reception was a real snore.
The reception was an icy swim.
The review was a karate chop.
The road was an irresistible pull.
The secretary's promotion was a leap.
The taxes were a steady creep.
The test review was a quick jog.
The exhibition was a smash.
The therapy was an archeological dig.
The writer's job is a lonely drive.

Literal
Her exit was a nervous scamper.
Her only comment was a sigh.
Her reply was a mean laugh.
His gait was a confident swagger.
His gesture was a quick chop.
His lawyers interjection was an angry yell.
His trick was a back flip.
The approach was a stampede.
The bacon's cooking was a sizzle.
The battle plan was a charge.
The bay was a difficult sail.
The bed was a heavy lift.
The bees were a black swarm.
The blow was a single punch.
The bowler's throw was a straight roll.
The bungee jump was a scary drop.
The chase was a fast dash.
The child's request was a whine.
The chore was a quick sweep.
The competitive relay was a swim.
The creek was a small leap.
The current was a fast drift.
The disturbance was a smash.
The engine was a low whir.
The excursion was an afternoon wander.
The expedition was a desert dig.

The faucet leak was a trickle.
The final ascent was an exhausting clamber.
The final competition was a sprint.
The flood was a rapid flow.
The friend's greeting was a hug.
The funny thing was his snore.
The grandfather's accident was a fall.
The gymnastics stunt was a cartwheel.
The hallucination was a ghostly voice.
The hike was a leisurely stroll.
The horse's trot was a canter.
The injury was a knife stab.
The magnet was a weak pull.
The man's retort was a grumble.
The motion was a swimmer's crawl.
The mountain road was a zigzag.
The mountain was an easy climb.
The news was a rocket launch.
The panther's approach was a creep.
The parade was a military march.
The patient's reply was a groan.
The plane's trajectory was a tailspin.
The prize was a free skydive.
The race course was an easy jog.
The skater’s entrance was a glide.
The sound was a dog's bark.
The speech was a rant.
The surprise was a hawk's cry.
The tragedy was a building collapse.
The tsunami was a giant wave.
The vacation was a cross country drive.
The way back was a trudge.

Curriculum Vita

Education

PhD., Psychology — 2013 anticipated
Cognition and Perception
University of Western Ontario

MSc., Psychology — Sept 2007-July 2009
Cognition and Perception
University of Western Ontario, London, ON

Bachelor of Arts, Hons. Psychology — Sept 2004- May 2007
University of New Brunswick, Fredericton, NB

Honours and Graduate Awards

NSERC Canadian Graduate Scholarship — Sept 2009-August 2012
$100,000 over three years

Ontario Graduate Scholarship: Science and Technology — Sept 2008-June 2008
$10,000

SSHRC Master's Scholarship — Sept 2007-August 2008
$17,000

Courses taught

Psychology 2135a (Distance) Introduction to Cognition — May-August 2012
May-August 2013

Research Interests

Non-literal language (sarcasm and metaphor)
Gender Differences
Theory of Mind
Bilingualism

Publications (Peer Reviewed)

Bowes, A.E., & Katz, A.N. (2011). When sarcasm stings. *Discourse Processes, 48 (4),* 215-236.

Voyer, D., **Bowes, A.**, & Soraggi, M. (2009). Response procedure and laterality effects in dichotic emotion recognition. *Neuropsychologia, 47,* 23-29.

Voyer, D., **Bowes, A.**, & Techentin, C. (2008). On the perception of sarcasm in dichotic listening. *Neuropsychology, 22 (3),* 390-399.