Disembodied Entities: Linguistic Factors
Determining Semantic Role Assignment of Target Domain Referents in Metaphoric Duals

Zachary Rosen

University of Colorado at Boulder, zaq.p.rosen@gmail.com

Follow this and additional works at: https://scholar.colorado.edu/ling_gradetds

Part of the Cognitive Psychology Commons, and the Linguistics Commons

Recommended Citation
Rosen, Zachary, "Disembodied Entities: Linguistic Factors Determining Semantic Role Assignment of Target Domain Referents in Metaphoric Duals" (2018). Linguistics Graduate Theses & Dissertations. 73.
https://scholar.colorado.edu/ling_gradetds/73

This Thesis is brought to you for free and open access by Linguistics at CU Scholar. It has been accepted for inclusion in Linguistics Graduate Theses & Dissertations by an authorized administrator of CU Scholar. For more information, please contact cuscholaradmin@colorado.edu.
DISEMBODIED ENTITIES:
Linguistic Factors Determining
Semantic Role Assignment of Target Domain Referents in Metaphoric Duals

by

ZACHARY P ROSEN

B.A., Carroll College, 2013

A thesis submitted to the
Faculty of the Graduate School of the
University of Colorado in partial fulfillment
of the requirement for the degree of
Master’s of Arts
Department of Linguistics
2018
This thesis entitled:
Disembodied Entities: Linguistic Factors Determining
Semantic Role Assignment of Target Domain Referents in Metaphoric Duals
written by Zachary Paul Rosen
has been approved for the Department of Linguistics

________________________________________
(Dr. Bhuvana Narasimhan)

Date: __________

The final copy of this thesis has been examined by the signatories, and we find that both the content and the form meet acceptable presentation standards of scholarly work in the above mentioned discipline.

IRB protocol # 18-0047
Abstract

Rosen, Zachary (M.A., Linguistics - Department of Linguistics)

Disembodied Entities: Linguistic Factors Determining Semantic Role Assignment of Target Domain Referents in Metaphoric Duals

Thesis directed by Associate Professor Bhuvana Narasimhan and Professor Laura Michaelis-Cummings

Though there exists a profound, and constantly evolving literature exploring the nature of English speakers’ alternations of temporal metaphors (Gentner, Imai, & Boroditsky 2002; McGlone & Harding 1998; Matlock, Ramscar, & Boroditsky 2005 as a selection), strikingly little work has been done on extending the research in temporal reasoning to other examples of metaphoric duals (as defined in Lakoff 1993)—alternations in which the target domain referent is either construed as moving object in space, such as in “His sadness is catching up to him”, or as a location to which other entities are oriented to, as in “He fell into a deep sadness”—in other domains. Additionally, to date there has been very little exploration of the factors and motivations that might influence speakers to select one metaphoric dual over another. In the current paper, I look at dualism, constrained to two metaphoric target domains—EMOTION and THOUGHT—in order to analyze both the effects of emotional valence on duals outside of the target domain of TIME, as well as to compare between target domains in order to look at finer-grained differences in dualism—do duals in the domain of EMOTION behave in a similar fashion to those in the domain of THOUGHT? To the best of my knowledge, this question has yet to be explored in the current literature. My results indicate that while emotional valence may not be
a significant factor when deciding on the semantic role assignment of target domain referents outside of the domain of TIME, the full story is intriguingly far more complicated, and incorporates the interaction of additional cognitive phenomenon, such as interactions between target domain behavior, verb frequency, and emotional valence, in tandem.
ACKNOWLEDGEMENTS

I would like to first and foremost thank my advisors, Dr. Bhuvana Narasimhan and Dr. Laura Michaelis-Cummings for their guidance and enthusiasm throughout the process of crafting this thesis. I cannot begin to express my gratitude to the both of them not only for their words of encouragement and necessary criticisms, but for their constant willingness to “nerd out” with me about the data from the studies conducted as the results became clearer throughout the course of this research project.

Dr. Martha Palmer’s willingness to jump onboard this thesis committee has earned my thanks a thousand times over. She has encouraged not only some of my exploration of topics external to this thesis, but has had a strong influence on my interest in semantic roles as a linguistic phenomenon, and I’m beyond grateful for her willingness to invite me to participate in the Computational Semantics group’s weekly meetings even early on in my career at the University of Colorado, Boulder.

And although she is not part of my committee, I feel that I absolutely need to thank Susan Brown for her constant mentorship. I am extremely grateful for her encouragement.

Finally, I would like to thank both my peers in the Linguistics Department at the University of Colorado, Boulder, and my partner Kelly Isaacs, for their continued support. I owe you all back a minimum of two years for having had to listen through my incessant excitement over this project and others. Thank you.

Author

Zachary Paul Rosen
CONTENTS

ABSTRACT ................................................................................................................................. iii

LIST OF TABLES .......................................................................................................................... ix

LIST OF FIGURES ...................................................................................................................... x

DUALISM DU JOUR: A BRIEF INTRODUCTION TO THE STUDY OF DUALISM ....................... 1

1.1 CONCEPTUAL METAPHOR THEORY AND ITS IMPLICATIONS .......................................... 1

1.2 AN INTRODUCTION TO THE NATURE OF DUALITY IN CONCEPTUAL METAPHOR THEORY ........................................................... 3

1.3 PSYCHOLINGUISTIC UNDERPINNINGS OF THE DUALISM PHENOMENON ..................... 5

1.4 THE CURRENT STUDY’S INTENDED CONTRIBUTIONS TO THE LITERATURE .................... 9

2 DUELING ROLES: SEMANTIC ROLES AND THE STUDY OF DUALISM .............................. 10

2.1 SOURCE DOMAINS, FRAMES, & THEMATIC ROLES .......................................................... 11

2.2 DATA USED TO GENERATE THE ANALYSES OF ME AND LE SEMANTIC ROLE-SETS ........ 14

2.3 DUALISM AND ITS ROOTS IN SEMANTIC ROLES ............................................................. 16

2.3.1 The Moving Entity Semantic Role-Set ........................................................................... 16

2.3.2 The Locative Entity Semantic Role-Set ......................................................................... 18

2.4 A NOTE ON DISAMBIGUATING ME FROM LE INSTANCES ............................................... 20

2.5 WHY HOME-IN ON THEMATIC ROLE DIFFERENCES IN DUAL UTTERANCES? .............. 22

3 HYPOTHESES 1 AND 2 .......................................................................................................... 23

4 THEORETICAL UNDERPINNINGS ....................................................................................... 26

4.1 KEEPING POSITIVE: EMOTIONAL VALENCE .................................................................. 26

4.2 SENTIMENT ANALYSIS & THE IDENTIFICATION OF EMOTIONAL VALENCE IN ENGLISH UTTERANCES ................................... 32

4.3 TYING IT ALL TOGETHER ............................................................................................... 39

5 EXPERIMENTS 1 & 2 .......................................................................................................... 40
5.1 EXPERIMENT 1: A CORPUS STUDY ........................................................................................................... 40
  5.1.1 Materials ........................................................................................................................................... 41
  5.1.2 Methods ........................................................................................................................................... 41
  5.1.3 Results .............................................................................................................................................. 42
  5.1.4 Discussion ....................................................................................................................................... 43

5.2 EXPERIMENT 2: A MECHANICAL TURK SURVEY ............................................................................... 44
  5.2.1 Materials .......................................................................................................................................... 44
  5.2.2 Participants ..................................................................................................................................... 45
  5.2.3 Methods ......................................................................................................................................... 45
  5.2.4 Results ........................................................................................................................................... 47
  5.2.5 Discussion ..................................................................................................................................... 52

6 GENERAL DISCUSSION ............................................................................................................................. 53

7 CONCLUSION ........................................................................................................................................... 57

8 BIBLIOGRAPHY ......................................................................................................................................... 58

APPENDIX

A. MTURK QUESTIONNAIRE AND CONSENT FORM ............................................................................. 61

B. APPENDIX B: MIXED-EFFECTS MODEL SUMMARY FROM EXPERIMENT 2 ................................. 83
# TABLES

Table

1. Target domain and polarity ranking for the lexical units collected from EnTenTen13 .................. 42
2. Counts of moving and locative entity instantiations in EnTenTen13 ..................................... 42
3. \(X^2\) statistics relating to the three conditions being tested ................................................. 43
4. Effects from the logistic regression model and their descriptions ............................................. 51
5. ANOVA results indicating significance of contribution of fixed effects to overall model .......... 52
6. Statistical results for the interactions of target domain with other fixed effects .................... 53
FIGURES

Figure

1. An example of one question block as seen by participants .............................................. 45

2. ME versus LE responses by test question ............................................................................. 48

3. ME versus LE selection by emotional valence—negative versus positive. ............................ 49

4. ME versus LE selection by target domain—EMOTION versus THOUGHT ............................... 49
1. Dualism, *Du Jour: A Brief Introduction to the Study of Dualism*

1.1 Conceptual Metaphor Theory and Its Implications

Conceptual Metaphor Theory as conceived of in Lakoff and Johnson’s seminal 1980 work, *Metaphors We Live By*, describes the underlying mechanism behind cognitive processing as fundamentally metaphoric in nature, mapping experiential phenomena to abstractia as a mechanism of structuring both language and thought into a linguistic, conceptual packaging. In this way, salient conceptual schema from real world experience can be used to deepen our understanding of otherwise inaccessible concepts (Lakoff & Johnson 1980). As an example, look at how Lakoff and Johnson spend considerable time and effort in exemplifying the effects of spatial reasoning on our understanding of abstract concepts such as positive emotions—HAPPINESS IS UP: “I’m feeling up today,” “Terry was flying high off of the success of her presentation,” “Hawaii has the highest happiness quotient out of all the States surveyed,”) (Lakoff & Johnson 1980). This structuring of an abstract concept via a concrete system pulled from the real world is also seen in our conceptualizations of quotidian phenomena like time A POINT IN TIME IS A LOCATION—“We can finish the exam on Monday,” “We are swiftly approaching the holiday season,”(Lakoff & Johnson 1980).

Of particular interest to the current study, a single member of what Lakoff and Johnson describe as the target domain—a collection of abstract concepts or ideas—i.e., all references to TIME or GOVERNMENT—being structured via real-world experience—may in fact find itself mapped to several structuring concepts, or source domains\(^1\) (Lakoff & Johnson 1980). For

\(^1\) Lakoff describes the source domain of a conceptual metaphor as being a experientially-based schema that can be used to reason about the abstract concept pulled from the target domain. For example, in the conceptual metaphor COMMUNICATION IS CARRYING A MESSAGE, any sort
example, the target domain of LOVE can be structured via several, possible source domains as seen below.

LOVE IS A PHYSICAL FORCE (ELECTROMAGNETIC, GRAVITATIONAL etc.)

I could feel the electricity between us. There were sparks. I was magnetically drawn to her. They are uncontrollably attracted to each other. They gravitated to each other immediately. His whole life revolves around her. The atmosphere around them is always charged. There is incredible energy in their relationship. They lost their momentum.

LOVE IS MADNESS

I'm crazy about her. She drives me out of my mind. He constantly raves about her. He's gone mad over her. I'm just wild about Harry. I'm insane about her.

LOVE IS A JOURNEY

We're at a crossroads. We'll just have to go our separate ways. I don't think this relationship is going anywhere. It has been a long, bumpy road. Our marriage is on the rocks. This relationship is foundering.

(Lakoff & Johnson 1980)

of speech-act gets construed as a package that is delivered to someone: He relayed his mother’s best wishes to Uncle Jerry.”
This variety of metaphoric mappings available allows speakers to highlight specific facets of a given abstract concept based on the metaphoric mapping being employed (Lakoff & Johnson 1980). But what are the motivations behind selecting one mapping over another? In order to pry deeper into the reasoning employed by speakers in selecting one conceptual metaphor over another, I will be looking at the extreme case of metaphoric dualism in order to better understand just what some of these motivations might look like, and just how they affect speakers’ choices of metaphor. This paper will explore not only metaphoric dualism, but the effects of *emotional valence* on the semantic role assignment of items from the target domain as a possible motivating factor behind metaphor selection in English speakers.

1.2 An introduction to the nature of duality in Conceptual Metaphor Theory

George Lakoff attributes the initial observation of the duality present to one of his students, Jane Espenson, in his 1993 paper, “The Contemporary Theory of Metaphor”. Metaphoric dualism, according to Lakoff (1993), is defined as the existence of two, complementary source domains that share a single target domain. The two metaphoric source domains are related to one another by their inclusion of two schemata—a location schema, and an object schema. And it is the mapping of a target domain referent to either one of these schemas that powers dualism. In one such mapping, the target domain referent is mapped onto a location in the location schema—in the made-up example of “I went from sadness to *being filled with joy*” the phrase “being filled with joy” is construed as a RESULT or GOAL that one moves towards or into. In contrast, in the object schema the target domain referent instead is mapped onto an object, moving along some axis either towards or away from some other actor
in the sentence. Thus, you find utterances like “His joy was fleeting” where “joy” is construed as an object, moving away from the person referenced by the pronoun in the sentence. It is important to note here that while both the object and location schema are related to the motion-frame, they are both in fact separate encodings of relationships between arguments in a sentence. As Lakoff (Lakoff & Johnson 1980:292) writes, “schemas like these two are primitives that structure rich images.”

I want to stop here for a second to define just what a target domain referent is in the context of this paper. A target domain referent is an argument that occupies a role in the argument structure of a construction, referring to some attribute of the target domain. This allows not only simple nouns like “joy” but entire phrases like “being filled with joy”, to act as a target domain referent, for the target domain of EMOTION. The term is used here to highlight a portion of the target domain that is being referenced in the construction. While it is possible that named entities like people, places, and objects can be plucked from the target domain as well, I want to mention that my use of this word will be restricted to referring to components of the target domain like specific emotions, ideas/thoughts, and temporal referents.

Though Lakoff indicates that duality itself may be a much larger phenomenon than his documentation of it, he argues that the object and location joint mappings are explicitly tied to the Event Structure metaphoric mapping (Lakoff 1993). In his analysis, this allows both mappings for a target referent to occur in the same semantic frame—an abstract description of an event including its participants—namely the motion-frame which has entries for a THEME (moving object) argument, a GOAL (final location) argument, and a LANDMARK (a point of reference along a path) (Lakoff & Johnson 1980). In his analysis, these mappings allow nominal
arguments the wiggle-room necessary to be construed in one of two possible semantic roles within the frame expressed in a metaphoric utterance (Lakoff 1993).

Lakoff posits that there are only a handful of metaphoric mappings, and thus a handful of source domains, that are activated with respect to duality. Though all mappings in duality, according to Lakoff, require some level of dependence on the concept of linear motion, he posits that the POSSESSION source domain in English equally relies on an acquisition—“Paul gave x to Jen”—and loss frame—“Hillary lost x”—both of which are composed of a motion-to and motion-away-from frame respectively (Lakoff 1993). For Lakoff, it is because of the fact that possession is intricately linked to motion that possession is included as a possible frame evoked in dualism. He is not alone in seeing a relationship between possession and motion. Hwang and Palmer (2015) discuss the computational identification of several caused motion constructions, including “change of possession” as describing the relationship of an agentive entity to the motion to a new location of a THEME argument. In sum, though two possible source domains are activated with respect to duality—either the MOTION or POSSESSION domains—their dependence on the motion-frame is what drives the two construals that are possible in duality. Whilst Lakoff describes metaphoric dualism as closely relating to a single semantic frame—that of motion—I will discuss in section 2.1 how several, related semantic frames comprise a source domain, per Karen Sullivan’s work via her concept of identity-links between semantic frames (Sullivan 2013).

1.3 Psycholinguistic Underpinnings of the Dualism Phenomenon
To date, research into duality has been relatively limited to the analysis of differences in construals of temporal event structure, and focuses predominantly on processing differences between moving and locative mappings for temporal lexical units (Gentner, Imai & Boroditsky 2002; McGlone & Harding 1998; Matlock, Ramscar & Boroditsky 2005). Researchers are divided with respect to the motivating factor behind this difference in processing time, with some believing that comprehension of temporal utterances is in fact intricately linked to the frame-semantic differences (Gentner, Imai & Boroditsky 2002; Matlock, Ramscar & Boroditsky 2005), and others pointing to pragmatically based, perspectival differences (McGlone & Harding 1998) encoded between the two dual members. And still others have pointed to differences in psychological reference points with respect to the two, arguing that the primary difference between duals in temporal language lies in whether the point of reference in the sentence is coded as another agentive argument, or the temporal referent itself (Núñez, Motsch, Teuscher 2006). What researchers can agree on is that the perspectival and/or semantic information encoded in “The holidays are approaching” is different from that of “we’re approaching the holidays”. Little-to-no work has been done, however, on how differences in semantic role mappings for the target domain referent—“the holidays” in the last two examples—are selected for in either one of the dual utterances described. The current study hopes to add to the existing literature in that domain by specifically addressing the question of what factors influence the selection of the semantic role mapping for the target domain referent in dual utterances.

Be that as it may, work on duality with respect to temporal events provides an excellent glimpse into some of the psychological undercurrents that underlie the processing of duals in
general. In a series of experiments, Genter, Imai and Boroditsky (2002) found that transitioning between moving-time and moving-ego referential time led participants to process the unprimed dual mapping slower than those who were given consistent examples of only one of the two duals. In other words, according to Gentner, Imai, and Boroditsky (2002), if I commence a conversation with you about temporal relations, and start it off by talking about how “We’re already at three in the afternoon?”, and if I were then to switch between dual members without priming by following that last sentence with “Dinner time is creeping up on us . . .” it should take you increased time to process and make sense of the latter sentence. In the study conducted by Gentner, Imai, and Boroditsky (2002) these processing time increases were statistically significant regardless of what direction the shift in dual usage went—either moving-ego to moving-time, like the example in this paragraph, or from moving-time to moving-ego. Following up on their laboratory results, the researchers ran an experiment at a local airport, where they engaged unwitting participants with a framing example for either of the two duals. For reference, researchers primed participants by either (1) referring to the time difference between two cities, distinct from the city researchers and participants were located, or (2) referred to the time difference between the city participants were in and a distant city (Genter, Imai & Boroditsky 2002). Researchers subsequently asked participants a question with either the same or the alternative temporal frame than the one they had initiated the conversation with—again, if a researcher initiated the conversation with a moving-ego framing of time, they could either continue using the moving-ego framing, or switch to the moving-time framing (Genter, Imai & Boroditsky 2002). The results of this more naturalistic study of temporal framing alternation both affirmed and confounded their previous results from the laboratory
setting in interesting ways. If researchers switched between one metaphoric time-mapping to another, participants’ response time increased (indicating a greater overall processing time). However, a small but statistically significant sub-group of participants spontaneously responded with the ego-moving temporal perspective, irrespective of the temporal metaphor they were primed with, within a window of response time consistent with participants who had received priming and test conditions in the same metaphoric mapping (ego-moving to ego-moving, or time-moving to time-moving) (Gentner, Imai & Boroditsky 2002). Researchers indicated that they were ill-equipped to explain the reason for this phenomenon in the current study, but that one of the duals—ego-moving—correlated with an overall decreased processing time is clear from the naturalistic data collected (Genter, Imai & Boroditsky 2002).

And it is from this point that I start in the current study. As we can see, there is in fact a pre-existing volume of literature dealing explicitly with the phenomenon of dualism (Gentner, Imai & Boroditsky 2002; McGlone & Harding 1998; Matlock, Ramscar & Boroditsky 2005), even if that literature deals almost exclusively with dualism in temporal metaphors. The existing literature leaves open a slew of questions that have yet to be explored, however. For example: how and to what degree is dualism both influenced by, and exerting influence over, semantic role mappings of nominal arguments in dual utterances? And what, if any, other factors influence the selection of one dual over another? In the rest of this paper, I will be looking explicitly at the semantic role mapping of the target domain noun in dual utterances, for reasons which will be explained in section 2. Furthermore, I will be looking at the effects of emotional valence on semantic role selection and preferences for that target domain noun (as explained in sections 3 and 4). Additionally, as I will explain in section 3, the scope of this study
allows me to undertake a task which previous research into dualism, given that it has largely been focused on temporal metaphors, could not—analyzing what the contribution of different target domains are to dualism—i.e., is TIME more likely to be mapped to the location schema, and THOUGHT more likely to be mapped to the object schema? I will then end this survey of dualism, semantic role, and polarity by looking at the results from two novel experiments, designed to explore the impact of polarity on semantic role mappings of target domain nouns in dual utterances (see section 6).

1.4 The Current Study’s Intended Contributions to the Literature

Even beyond expanding my analysis to both metaphoric duals in domains outside of temporal metaphors, and to extending what has been done on duals to include a description of the differences in semantic role assignment between dual members, I want to build on the existing literature in a couple of additional ways. While researchers have shown that there are clear differences in duals with respect to both the kind of information encoded in dual members, and in people’s ability to process duals when speakers switch between them at will (Gentner, Imai & Boroditsky 2002; McGlone & Harding 1998; Matlock, Ramscar & Boroditsky 2005), I am interested in what motivates speakers in deciding to use one dual over another. I propose that there are a couple of possible explanations for these differences.

First, and perhaps the most salient of the possibilities, is whether or not additional cognitive factors like emotional valence might influence speakers’ decisions with respect to which dual is best suited to convey an idea. In this view, one of the two possible dual members
is associated with negative emotional affect, whilst the other is more associated with positive emotional affect. I’ll talk about this hypothesis and its implications in greater depth in section 4.

Second, to what degree is the choice between duals influenced by the target domain itself? From Lakoff and Johnson (1980) onward, the assumption has been that the primary contributor in metaphoric mappings has always been the source domain. So while we know that the differences that have been described in metaphoric duals must arise from the different image schemas instantiated, what hasn’t been explored in great depth is the degree to which the target domain itself contributes to people’s choices of dual members. Thinking of it within the context of this study, do people prefer to use (in Gentner, Imai & Boroditsky (2002)’s words), the EGO-MOVING dual when talking about target domain referents from the domain of “time”, but the [OBJECT]-MOVING dual when talking about target domain referents from “emotion”? Though research directly exploring this possibility appears to be scarce to the best of my knowledge, as I will explain in section 3 the design of the current study will allow me to analyze this question in greater depth.

2. Dueling Roles: Semantic Roles and The Study of Dualism

This paper concerns itself with the effects of two linguistic phenomenon—emotional valence, and the contribution of target domains—on the semantic role assignment of the target domain referencing noun in dual utterances. But before we can discuss the effects of these two on dual selection, it is vitally important that we start by looking at some of the literature that exists on semantic roles before moving on to discuss how other linguistic phenomena might affect them.
In the following sections, I will discuss (1) some of the existing literature on metaphor and its interface/reliance on semantic roles in order to construct metaphoric meaning, (2) a very short, preliminary exploration of the frames that will concern us later in defining dualism as a phenomenon, (3) a possible representation of the collection of semantic roles that comprise what I will define as the Moving Entity and Locative Entity collections of semantic roles in metaphoric duals, as well as describing how arguments in these collections of roles might acquire their semantic meaning via coercion as described in Sign-Based Construction Grammar, before (5) why it is important to focus on semantic role selection as a crucial component to consider with respect to dualism.

2.1 Source Domains, Frames, and Thematic Roles

In her own work on the constructional basis of metaphor, Karen Sullivan posits that source domains are themselves composed of myriad semantic frames which are perceptually similar along some cultural axis (Sullivan 2013). As Sullivan describes, metaphoric source domains do not consist of singular semantic frames, then, but of several, related frames. As an example, the exercise domain as she describes it includes not only semantic frames related to exerciser, type of exercise, etc., but also includes other semantic frames, like the semantic frame for motion, which all work together to describe the sum total of relationships between things that we perceive as associated (Sullivan 2007; 2013). As an example, let’s consider the metaphor THINKING IS EXERCISE. Whilst in this mapping the brain can “flex its intellectual
muscles,”, it can also “work towards strengthening its acuity”, invoking the MOTION_FR\textsuperscript{2} by “work[ing] towards” the fitness related goal of increased acuity, whilst still being part of the EXERCISE source domain (Sullivan 2013).

One important component that I’ll be borrowing from Sullivan’s (2013) work on metaphor is her observation that semantic roles in different semantic frames are in fact related to one another. She calls the relationship between related semantic roles “identity links”. From this perspective, the THEME in one metaphoric utterance is related to semantic roles in other utterances by way of an identity link between the two. A “brain” that works towards the goal of increasing its acuity, can just as easily flex its muscles”, because the THEME from the first example is related to the EXERCISER in the second example via identity link. Furthermore, we can also take for granted that some semantic roles are categorically unrelated to one another. Take for example the THEME in “The holidays are approaching”, which does not share an identity link with thematic roles in other semantic frames—like the LOCATION in “we’re approaching the holidays”. By alternating the assignment of a particular semantic role to a target domain referencing noun, arguments in other semantic roles are assumed to be distinct and unrelated from the target domain noun in all other utterances.

Frames that are related might instantiate slightly different semantic roles, but the roles instantiated are still related via identity link (Sullivan 2013). The frames BRINGING_FR and MOTION_DIRECTIONAL_FR are different frames as classified in FrameNet (Fillmore et al. 2001; Fillmore, Johnson & Petruck 2002), but they both belong to the source domain of MOTION in

\textsuperscript{2} The capital letters and underscore in this example are exemplary of FrameNet’s conventions for indicating semantic frames—BRINGING indicates the semantic frame listed in FrameNet, and “_FR” are an abbreviated indication of the “frame” (see Fillmore et al. 2001; Fillmore, Johnson & Petruck 2002).
English. The BRINGING_FR frame includes the following core thematic roles: Agent, Theme, and Goal. The MOTION_DIRECTIONAL_FR includes both Theme and Goal, but additionally instantiates Source more than in the BRINGING_FR, and also excludes AGENT as a possible semantic role. However, an argument mapped to the THEME role in the BRINGING_FR can be mapped to the THEME or COTHEME role in the MOTION_DIRECTIONAL_FR without a hitch, and the GOAL of one frame can easily become the SOURCE of another frame as is often the case in continuous discourse (Ferreti, Rohde, Kehler, and Crutchley 2009).

Additionally, mapping a target domain referent from different target domains to the same semantic role in the source domain should trigger the same type of entity reading for the different lexical units, regardless of the fact that the lexical units are from separate target domains. Indeed, we see exactly that in the following two examples from the THOUGHT and EMOTION target domains below

(1) Our thoughts arise from our desires

THEME

SOURCE

*FrameNet Frame: MOTION_DIRECTIONAL_FR*

(2) . . . His wild emotions had never been widely accepted.

THEME

TIME

MANNER

*FrameNet Frame: RECEIVING_FR*
In both cases, the thematic role, THEME, cues for precisely the same sort of argument—some entity that is semantically construed as moving from one place to another—regardless of the difference in both (A) the frame and frame elements that are instantiated, and (B) the target domains that the lexical units are pulled from.

Let’s return for a second to our definition of duality—two complementary source domains, sharing the same target domain. If we apply everything we’ve just discussed from Sullivan’s work, we see that duality can be described as being driven by a difference in whether an argument is assigned to a semantic role that shares an identity link with all other arguments for the object schema—be it the THEME, COTHEME, or even AGENT in a large number of cases— or to a semantic role sharing an identity with all other arguments that invoke the location schema—GOAL, SOURCE, LANDMARK, RECIPIENT, and others. Let’s call any semantic role invoking the object schema a Moving Entity (or ME), and any semantic role that invokes the location schema a Locative Entity (LE).

### 2.2 Data Used to Generate the Analyses of ME and LE Semantic Role-sets

The data used in the following section of this paper was collected via the online corpus building tool, *Sketch Engine* (Kilgarriff et al. 2014; Kilgarriff, Rychly, Smrž & Tugwell 2004; Jakubíček, Kilgarriff, McCarthy & Rychly 2010), an internet based tool that is licensed through the University of Colorado, Boulder, which allows users to swiftly compile, search, analyze, and even download relevant examples from their hosted corpora.

Though Sketch Engine allows users to search through a collection of major, curated corpora including the British National Corpus (BNC), I decided initially to generate my own
corpus from which to pull data from internet sources found freely on the web (later, I will switch to the more structured EnTenTen13 corpus, but for now let’s look at some real-life, examples from current English as found on the world-wide web). My motivation for this was two-fold: (1) I wanted to collect data specific to a select few target domains in which I was interested, and (2) I wanted data that most fully represented the current, synchronic, syntactic and constructional trends in English.

There potentially exists an infinite number of possible duals in the wide, wild and varied, universe of English, but I am of course limited in space and time in my capacity to analyze the phenomenon. I have thus restricted my analysis to the following two dual systems:

1. **EMOTIONS ARE MOVING ENTITIES, and AN EMOTIONAL STATE IS A LOCATION**
2. **THOUGHTS ARE MOVING ENTITIES, and IDEAS ARE A PLACE IN COGNITIVE SPACE**

This initial dataset will be used solely to construct a semantic profile for the ME and LE categories of semantic roles, and I needed to restrict the data I looked at in order to even approach completing this study.

In collecting these duals, I leaned heavily on Sullivan’s (2013) definition of autonomy—that nominal arguments tend to be the target domain referring items in any given construction, because of the fact that their meaning is independent from all other sentence constituents, including the verb—and crafted a WebBootCat query on Sketch Engine, where data was pooled by finding the following set of lemmas: “idea”, “thought”, “theory”, “feeling”, “anger”, and “depression” These terms were selected in order to give us examples from both the target
domains of THOUGHT ("idea" and "thought", "theory") and EMOTION ("feeling" "anger", and "depression"). WebBootCat functionally will search for documents that contain as many of those terms in combination as possible. The list I’ve compiled is far from exhaustive of all the possible duals that exist, even under Lakoff’s restriction to those involving the *motion-frame*. But in order to describe what the semantics of the ME and LE categories of semantic roles might actually look like, this provides an excellent starting point from which to build my subsequent descriptions.

2.3 Dualism and its Roots in Semantic Roles

2.3.1 The Moving Entity Semantic Role-Set

We’ll start by first reconstructing just what should go into the semantics of an ME role-set. Before we flesh out the feature sets associated with MEs, let’s look at some examples in which the target domain referent is interpreted as an ME.

(3) *Complicated emotions* may arise from feeling . . .

\[
\begin{array}{ll}
\text{THEME} & \text{SOURCE} \\
\end{array}
\]

*FrameNet frame*: MOTION_DIRECTIONAL_FR

(4) *Anger* may also arise, not due to a present situation, but because . . .

\[
\begin{array}{ll}
\text{THEME} & \text{CIRCUMSTANCES} \\
\end{array}
\]

*FrameNet Frame*: MOTION_DIRECTIONAL_FR
(5) The man who strikes first admits that his ideas have run out.

AGENT

RESOURCE

FrameNet Frame: EXPENDRESOURCE_FR

(6) . . . so ideas may be transferred as you imagine them.

THEME

TIME

FrameNet Frame: TRANSFER_FR

What is perhaps the most striking characteristic of each of the above examples is that in each and every one of them the target domain referent is assigned to a semantic role in the frame indicating that, with respect to the other arguments in the sentence, it is the target domain referent that is undergoing a change of location. In examples (3) and (4), the target domain referent is the subject of an otherwise intransitive verb of motion (instantiating the MOTION_DIRECTIONAL_FR as would be described by Sullivan 2013). In example (6), the target domain referent “ideas” is realized as the nominal subject of a passive construction in which the TRANSFER_FR is instantiated (in this instance, this allows only for it to be construed as a moving object). Example (3) is interesting—the lexical unit “run out” in fact evokes the EXPENDRESOURCE_FR frame, but the expenditure of a RESOURCE (in this case, “ideas”) in that frame is a linear progression, away from the owner of that resource. Thus, we can see that there is an identity link between RESOURCE and THEME between the two frames—they’re both part of the source domain of MOTION by participating in linear movement to and away from some other, animate point of reference. The RESOURCE in one frame could be just as easily realized as the THEME in another semantic frame. In all of these instances, the semantic frame
as conjured by the verb is one of motion or forced change of location, of a specific emotion or thought.

### 2.3.2 The Locative Entity Semantic Role-Set

In order for us to specify the difference between the ME and LE thematic role-sets, it is necessary to also define what the arguments subsumed in the LE thematic role must look like. Following the methodological example of 2.3.1, we’ll begin first by taking a look at some of the examples in which an LE argument is present.

*(7)* If you go into a blind rage when anger arises it is because . . .

<table>
<thead>
<tr>
<th>THEME</th>
<th>GOAL</th>
<th>TIME</th>
<th>CIRCUMSTANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*FrameNet Frame: MOTION_DIRECTIONAL_FR*

*(8)* . . . physical symptoms are merely tangible evidence of what is going on

<table>
<thead>
<tr>
<th>EVENT</th>
<th>MANNER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*in your unconscious mind . . .*

<table>
<thead>
<tr>
<th>PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

*FrameNet Frame: EVENT_FR*

*(9)* It is founded on our thoughts.

<table>
<thead>
<tr>
<th>CREATED_ENTITY</th>
<th>PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*FrameNet Frame: INTENTIONALLY_CREATE_FR*
It is worth noting here that though it is feasible that an LE argument might in fact occur in the first nominal position in a ditransitive utterance, this was rarely represented in the data collected (approximately three examples in total out of 62 examples of ditransitive utterances, and out of 3682 examples used for this portion of the study). Instead, cueing for the LE semantic role set was accomplished primarily through the use of an oblique argument, in the spray-alternation arrangement, consistent with the analysis of duality posited by David (2016). Furthermore, when the ditransitive was invoked, the nominal argument positioned immediately following the verb was nearly always animate and in reference to a human being, or assumed animate qualia as in the following example:

(10) Give the feeling a name.

RECIP THEME

_FrameNet Frame:_ GIVING_FR

Where the target domain referent, feeling”, is construed as an entity which accepts the nominal argument “name”. Per Lakoff’s (1993) analysis, of the sub frame associated with giving—the motion-to frame—this allows us to link the RECIPIENT role to the landmark or GOAL role in the motion-frame, since the giving-frame is linked to the motion-away-from frame.

Syntactic features aside, what was static across all examples was the mapping of LE examples to positions in the argument structure of motion-frame-invoking verbs that clearly cued for a locative relationship of the target domain referent (invoking the location schema) to the event being described. Most if not all examples were preceded by a spatial preposition, like those seen in examples (7), (8), and (9).
2.4 A note on disambiguating ME from LE instances

How is it that speakers and listeners are able to disambiguate LE and ME mappings in not just metaphoric utterances, but any discrete chunk of sinusoidal pressure hitting their eardrums? The answer may lie in the way in which the two are profiled in a given utterance in which they are contained. The spray-load alternation construction\(^3\), for example, is characterized by (a) the presence of three nominal arguments in the ARGUMENT-STRUCTURE of the verb, often overriding the verb’s local, lexical semantics, and (b) with the LE nominal argument following the ME argument. Though some researchers like Sag (2012) attribute both the *spray* and *load* alternations to the inclusion of two, completely underspecified listemes for both the profiled roles of direct and indirect object, the two are semantically divergent along the fault-line of what people interpret those arguments as, according to their order of appearance. Reisinger et al. (2015), while testing the associations of Dowty’s 1991 semantic proto-role features in a variety of different experimental set-ups, discovered that there are clear associations of agentive and patientive characteristics with syntactic roles in a sentence, giving pretty clear evidence that linear order does indeed affect people’s semantic understanding of nominal arguments (Resinger et al. 2015). The implication of this is that one can disambiguate the two on the basis of word order in English. Thus, the difference between the ME and LE thematic role-sets is not specified lexically, but rather by the mother-tree from which they spring. In layman’s terms, what we’re left with after the dust has settled is a series

\(^3\) Rappaport & Levin (1985, 1988) define the difference between the spray- and load-alternatives of the spray-load alternation as differing in whether the locative argument immediately follows the verb, or in the transferable object in the semantic frame immediately following the verb. Think of it like the following:

Load-Alternation: “Hilda loads *the wagon* with hay”
Spray-Alternation: “Hilda loads *hay* into the wagon”
of about three constructions that via linear order are able to be easily interpreted with respect to their semantic roles:

(11) *My sadness* is overflowing into my work

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>VERB&lt;sub&gt;motion&lt;/sub&gt;</th>
<th>OBLIQUE&lt;sub&gt;LOCATION&lt;/sub&gt;</th>
<th>THEME(ME)</th>
</tr>
</thead>
</table>

Intransitive, motion construction, with an non-obligatory oblique argument indicating location.

(12) *I shot* Carol *my latest idea*

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>VERB</th>
<th>INDIRECT OBJECT</th>
<th>DIRECT OBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT</td>
<td>RECIP/GOAL(LE)</td>
<td>THEME(ME)</td>
<td>ME</td>
</tr>
</tbody>
</table>

Caused-motion construction, indicating change of location of THEME, or transfer of possession.

(13) *Harold pitched* *his crack-pot theory* to the executives

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>VERB</th>
<th>DIRECT OBJECT</th>
<th>to/from INDIRECT OBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT</td>
<td>THEME(ME)</td>
<td>GOAL/SOURCE(LE)</td>
<td>ME</td>
</tr>
</tbody>
</table>

Caused-motion construction, indicating change of location of THEME, or transfer of possession.
The beauty of this approach is that the three do not require the predication of additional rules in the grammar \textit{a priori}. Rather, the difference in alternations is an assumed part of the way that their arguments are ordered, and predetermined, cultural associations of the construction to a salient understanding of the event being described (Goldberg 2006; Sullivan 2013), with occasionally an argument having its role made overt by means of preposition.

2.5 Why Home In on Thematic Role Differences in Dual Utterances?

Though perspectival differences have been explored in several studies (Gentner, Imai & Boroditsky 2002; McGlone & Harding 1998; Matlock, Ramscar & Boroditsky 2005; Lakoff 1993), much of the alternation between the dual systems revolves around the lexical semantics of the target domain referring noun. For example, though the source domain MOTION is constant between the two mappings of time in the following example note that the precise metaphoric mapping between either one of the two duals appears to be contingent on the thematic role of the target domain referent:

\begin{align*}
(14) & \text { We} \quad \text {are approaching} \quad \text {the holiday season.} \\
& \text {THEME} \quad \text {VP} \quad \text {GOAL}
\end{align*}

\begin{align*}
(15) & \text {The holiday season} \quad \text {is approaching} \quad [\text{us}] \\
& \text {THEME} \quad \text {VP} \quad [\text{GOAL}]
\end{align*}

It is worth noting in (15) that although the GOAL argument is omitted, it is assumed that the GOAL is in fact the speaker and those whom the speaker is addressing. Thus, though there is
indeed a perspectival difference in what is moving and what is acting as the locative entity in these examples and others, the difference in perspective arises from the difference in thematic role mapping of target domain referent. Lakoff himself appears to be largely agnostic with respect to the relationship between thematic role mappings and perspectival differences in dual systems (1993). He defines the alternation in the following terms:

“In the location system, change is the motion of the thing-changing to a new location or from an old one.

In the object system, the thing-changing doesn’t necessarily move. Change is instead the motion of an object to, or away from, the thing changing.” (Lakoff 1993:225)

Notably absent in his definition however is the mechanism by which this system is established. Though it is assumed that something is clearly undergoing some change in state, structured by our conceptual understanding of motion, it is unclear how we might come to understand which entity has undergone a change in location, and which entity is acting as a location in kind. Bolstering our understanding by focusing on the thematic role mapping alternations that characterize dual utterances vitally gives us access to answering these two questions, by both (a) describing the underlying mechanism at the heart of dual alternations, and (b) simultaneously granting us access to analyzing people’s understanding of a target domain referent in context.

3. Hypotheses 1 and 2
Now that we’ve dug a little deeper into the kinds of semantic role alternations that seem to contribute to the differences in dual utterances, we can start to look at the major questions I hope to answer, as alluded to in section 1.4—what factors influence English speakers when deciding to use one dual over another? For review, here are the possibilities I’ll be looking at in this study:

1. For English speakers, is the selection between the ME or LE construal of a target domain referent influenced by cognitive factors like emotional affect?
2. Is the selection between the ME or LE construal of a target domain referent influenced by the target domain in English speakers?

Given the ambiguity of the motivation for speakers’ preferences, and given that I will be looking at two previously unexplored target domains that participate in duals (metaphors for EMOTION and THOUGHT), it’s worth testing not just one, but two hypotheses. I’ve laid them out below.

**Hypothesis 1:** English speakers will exhibit polarity specific restrictions on semantic roles for positive and negative polarity sensitive items with respect to metaphoric dualism, such that either positive polarity items will be more strongly associated with either the LE or ME set of semantic roles, and negative polarity items will be more strongly associated with the opposite.

**Hypothesis 2:** English speakers will exhibit target domain specific restrictions on semantic roles with respect to metaphoric dualism, such that the assignment of ME
versus LE semantic roles in the target domain of emotion will differ from assignment of ME versus LE semantic roles in the target domain of thought.

If hypothesis 1 proves true, it would effectively open the floodgate with regards to what cognitive factors influence peoples’ metaphor usage. Testing if emotional affect changes people’s choice of metaphoric mapping in an extreme case like metaphoric duality, where the target domain can be mapped onto two closely related image-schema at will, would tell us quite a deal about how much information about the speaker’s feelings and stance towards the target domain referent evoked is encoded in the choice between the use of one dual or another, and via the framework I’ve outlined give us a means of model of how speakers extract such information efficiently from the semantic roles presented in an utterance.

Hypothesis 2 is informed largely from gaps alluded to in previous work. The results of the Gentner, Imai and Boroditsky study appear to show there are not only real consequences for changing metaphors mid-conversation without warning, but that there is at a minimum a hierarchy of ways to talk about abstract concepts in everyday speech. It is no accident that people preferred the LE version of the temporal duals, and the fact that this behavior arose in an emotionally agnostic domain like time might mean that looking at emotional valence as the source of this behavior might be to a small degree misguided. A simpler explanation, given the evidence from the prior work on temporal metaphor alternation, might be that even though there exists a multitude of ways to talk about a target domain referent, there are some ways of talking about it that are more acceptable than others. For example, given the results from the Gentner, Imai & Boroditsky study referenced above it might just be that for target domain
referents from the target domain of TIME, that people prefer an LE construal. This hypothesis would predict that while this may be the case for TIME, it may be that other target domains like EMOTION would exhibit different preferences, say, for an ME construal.

The following section will work to stitch together a narrative that lays the groundwork for hypothesis one by looking at work on emotional valence and temporal metaphors, and then tying that together with the syntactic and lexical predictions one would make from sentiment analysis with respect to the contexts in which emotional affects rears its head. In section 5, I will describe the two experiments that were run in the course of this study, before bringing it all together in a general discussion of the results in section 6.

4 Theoretical Underpinnings

4.1 Keeping Positive: Emotional Valence

Though there is little to no research on the effects of emotional or affective valence on dualism writ-large, there does exist a deep body of work analyzing its effect on one dual-exhibiting metaphoric target domain: TIME. Though the current study is engaged in analyzing dualism outside of just temporal metaphors, as previously mentioned, it is worth taking a second (all pun intended) to look at some of the literature on affect and temporal event framing.

In order to correlate these past studies with the current one, I will swap the terms “ego-moving” and “time-moving” for the terms LE and ME respectively. My justification in this is this: in ego-moving conditions, the temporal event described is by necessity mapped onto the LOCATION or GOAL semantic roles and is thus an LE example, whereas for the time-moving
perspective the temporal referent is mapped onto the THEME semantic role, making it an ME example under the definitions established at the beginning of this paper.

Margolies and Crawford’s investigation into the effects of emotional affect on temporal reasoning appear to indicate that speakers have a preference for associating negative events with an ME construal of the temporal referent (Margolies & Crawford 2008). Researchers conducted two experiments to test this hypothesis. In the first, participants were split into one of two groups and asked to think of a possible, future event that they associated with either dread or enthusiasm, and then told that said event would be occurring next Wednesday (Margolies & Crawford 2008). Besides giving the dread group a rather undeserved heart-attack, participants were then asked to respond to a trio of questions in order to discern their affective stance to that event now that it had been scheduled so close in the future, including “Which statement best expresses how you feel? (a. I am approaching this event; b. The event is approaching me.)” in order to test what temporal metaphor they were using in reasoning about the event now (Margolies & Crawford 2008). For the positive event group, 61% of the participants selected choice (a) (the LE option), whilst in the negative event condition 64.1% chose option (b) (the ME choice) (Margolies & Crawford 2008). Experiment 2 borrowed the same format as experiment 1, but crucially provided participants with events to imagine—“on Wednesday next week you are going to your favorite place” for the positive event condition, and “on Wednesday next week you are going to the dentist for a wisdom tooth extraction” for the negative event condition (Margolies & Crawford 2008). Predictably, participants’ responses were similar to those in experiment 1. For the positive condition, 69.2% selected the LE option, whilst in the negative condition the ME was the more popular choice (52.7%) (Margolies &
Crawford 2008). In every condition, participants appeared to associate the LE option—“I am approaching this event”—with positive valence, and the ME option with negative valence.

The effects of emotional valence and temporal metaphor selection are non-trivial. Research by Ruscher (2011) indicates that the choice between an LE mapping of the temporal noun and an ME mapping can affect speakers’ judgements about the durative length of emotionally charged events like grieving. In her results, she noted that people primed with the LE mapping of temporal referents indicated that passage of grief would occur within 5 months, whereas the ME mapping exposed participants expressed that their grief would continue for 10 months or beyond (Ruscher 2011). In lay-man’s terms, the choice between LE and ME construals of temporal events at a minimum effects people’s judgements of events’ durations, and in the worst case scenario may exacerbate emotional trauma.

Most recently, researchers Lee and Ji of Queen’s University conducted three experiments analyzing the effects of emotional valence on participants’ responses to a variety of different tasks. In their first experiment, researchers asked participants to write short descriptions of a time in which they felt either “embraced” or “rejected” as priming, before asking participants to respond to the question “The meeting originally scheduled for next Wednesday has been moved forward two days. Which day has the meeting been rescheduled for?” (Lee & Ji 2014). Researchers predicted that participants describing an event in which they had felt embraced would likely place the meeting on Monday, whilst in the “rejected” condition they would place the meeting on Friday, consistent with prior research on emotional valence and temporal event framing (Lee & Ji 2014). Participants verified researchers’ hypothesis, with “rejected” participants selecting Friday (the LE choice, as Friday was more distant from
participants) statistically more often than Monday (60.7% of the time), whilst “embraced” participants exhibited the opposite selection pattern (selecting Monday—the ME option—76.2% of the time). As Lee and Ji explain, “recalling a bad past—one that makes people move away—prompted the ego-moving perspective as it renders active and faster psychological distancing,” (Lee & Ji 2014). In their second experiment, researchers were curious about the effect of temporal distance between the present and a future, happy event. To access speakers’ representations of that future event, participants were asked to write a different short response, this time describing an impending event that would cause them happiness or unhappiness, and its temporal proximity to the present (Lee & Ji 2014). For the test condition, participants were then asked to unscramble a collection of words in which “we are approaching the deadline” and “the deadline is approaching us” were both possible, final responses to the puzzle (Lee & Ji 2014). Interestingly, in this experiment the results were switched, such that the LE option of “we are approaching the deadline” was more common amongst “happy” participants in this instance. And in the final experiment, researchers asked participants to recall a time in which they felt either “proud” or “ashamed” and then asked them the same question as in experiment 1. The results largely replicated those from the first experiment as well—participants who indicated that they felt ashamed were more likely to indicate that the meeting had been moved to Friday as opposed to Monday. In sum, when an event was marked in some way for negative emotional affect, participants did everything they could to linguistically place temporal distance between themselves and the negative event, often relying on the LE construal to indicate said distance.
What of these behavioral differences, though? What does it ultimately mean for participants to exhibit preferences for one dual or another based on emotional valence? Recent research by Padrao et al. (2016) attempted to analyze Event Related Potential (ERP) effects of agency in participants in two conditions: in one experiment participants’ brain waves were analyzed whilst they controlled a digital avatar on a screen—participants were immersed in a 3D, digital rendering of the testing environment using an NVIS nVisor SX111 head-mounted display, and were asked to control a digitized representation of the avatar’s arm to point at a screen displaying a series of arrows in an (Padrao et al. 2016). Participants were asked to quickly point in the direction of one of three arrows on a screen, where sometimes the three arrows were all pointing in the same direction, and in others the arrows contradicted the direction of the arrow which participants were asked to point in the direction of—an Eriksen flanker task, which is specifically designed to be error prone (Padrao et al. 2016). To get a grasp on how participants constructed a sense of agency in these tasks, researchers then manipulated the avatar on the screen to select/point in the wrong direction against the (Padrao et al. 2016). Their results indicate that when researchers acted in such a way as to impinge on the agency of the participants (i.e. changing the position of the mouse on the screen in order to cause the participant to point incorrectly, in spite of having accurately pointed in the correct place), they elicited a higher N400 effect. This adds depth to the current study in an interesting way—if participants are indeed selecting LE and ME choices according to associations of the two with emotional valence, and if the two vary crucially with respect to construed aspects of agency of the target domain referent, then we would expect a stronger aversion to mismatched agency-valence examples. In essence, we should find strong evidence in the data for participants’
preference for LE examples when a target domain referent has negative emotional affect, and the opposite when the target domain referent is marked for positive emotional affect.

Agency and emotional affect—and thus the predictions made at the bottom of the prior paragraph—are far from removed from one another. Research by McGlone and Pfiester (2009) indicates that there is a strong association of agency mapping in temporal metaphor mappings and emotional valence. Researchers conducted three studies to explore the associations between these two linguistic phenomena. In the first, researchers collected 2,069 temporal expressions from five different corpora of American English, and then had two judges classify these examples according to their emotional valence (McGlone & Pfiester 2009). As an example, judges were presented with a sentence such as “yes tough to travel and to do things when you get there too but we just decided you know that we’re coming up on our tenth anniversary and by god we are going to have us some fun on our own” and then asked to indicate whether the connotation of the sentence was either positive or negative. They found only one statistically significant variable in their analyses that contributed to the emotional valence rating in the judges’ judgements—whether the agents in the sentences surveyed were human or non-human (McGlone & Pfiester 2009). Confirming researchers’ hypotheses, utterances with a human agent were more often classified as having positive valence, and non-human agents were more often seen as having negative valence (McGlone & Pfiester 2009). In their second study, researchers conducted an experiment in which participants were asked to select from a list of events, one that had happened to them in the last 90 days and that they found to be pleasant, unpleasant, or netural, and then asked to write a short description of the event on a single page (McGlone & Pfiester 2009). Again, the use of human-agents in positive
events was higher than in negative and neutral ones (McGlone & Pfiester 2009). As the coup de grace, McGlone and Pfiester tested whether usage of LE and ME temporal metaphors would influence participants’ feelings of emotional valence with respect to a short, journal-like narrative (McGlone & Pfiester 2009). Consistent with experiments 1 and 2, when the journal-like narrative was written with human-agent, temporal metaphors (LE), participants rated the narrators’ excitement for events described in the journal entries as higher (McGlone & Pfiester 2009). Simply put, it is not just what sorts of modifiers or lexical entailments accompany a target domain referent but whether or not it is construed as agentive or not that affects speakers’ judgements of emotional affect, per McGlone and Pfiester.

In the next section I’ll talk more about the state of the art in sentiment analysis—a field of linguistic inquiry that specializes in attempting to extract emotional affect from cues in the speech stream—but we’ll be returning to this last point at the end of the following sub-section. It is in this assignment of agentive or patientive role that I feel there may be an interaction of semantic role assignment and emotional affect.

4.2 Sentiment Analysis & The Identification of Emotional Valence in English Utterances

Though we can take for granted from the previous literature the existence of emotional valence as a psycholinguistic phenomenon, this leaves open the question of how to identify it in English utterances. This section in particular will look to some of the work that has been done with sentiment analysis in English in order to develop a link between emotional valence and semantic roles.
Fair warning: Throughout the rest of this section I will be using the terms sentiment, polarity, and emotional valence interchangeably. Conventionally, they refer to the same thing in this computationally heavy context—the emotional response of the speaker to the topic being discussed. In any case, if we’re to find some mechanism by which to analyze the syntactic effects of emotional valence on semantic role realization, then we ought to start by looking at some of the existing strategies to exploit linguistic cues to infer sentiment. At the end of this section, I will attempt to reverse engineer the effects of sentiment on semantic role assignment from how sentiment is inferred from test documents.

Most approaches to sentiment extraction and analysis to date have focused on lexically focused sentiment associations. Taboada et al. (2011) are in good company in that regard. First, Taboada et al. define sentiment analysis in terms of semantic orientation in a text—the combinative measure of not only polarity (either positive or negative, consistent with emotional valence in the previous descriptions), but also the subjectivity of an utterance. Their approach to sentiment analysis disregards syntactic (Duric & Song 2012; Polanyi & Zaenen 2006; Read & Carroll 2012) or discourse defined criterion (Polanyi & Zaenen 2006), and instead focuses on the construction of dictionaries of lexical items with associated sentiment ratings (Taboada et al. 2011). Whilst their approach is lexically based, they do however appear to at least nod to some syntactic information, understanding that sentiment triggering lexical units occur in a variety of functional classes in English (they collect lexical examples for their dictionary from nouns, verbs, adjectives, and adverbs) (Taboada et al. 2011). The emphasis of their research is largely uninterested in syntax, however, and thus we part ways from their specific research foci here. In the conclusion of their study, they do point out one important
draw-back with respect to sentiment analysis to date: the minute you leave the domain (here referring not to metaphor source or target domains, but the domain of the documents they collected their lexical entries from—think: scientific texts, or technical papers) of the training data, accuracy drops “precipitously close to chance” (Taboada et al. 2011). Should sentiment be tied reliably to syntactic or semantic role variation, however, we may be able to extend far beyond the domain restrictions imposed by current methods of sentiment analysis. If it proves true in the current study that emotional valence is highly associated with semantic role variability, then it would add a new factor to consider when looking at sentiment in a text.

The computational approach to sentiment-mining and analysis as proposed by Duric and Song (2012) is interesting for a couple of reasons. The a priori assumptions informing their approach are based largely on an understanding of sentiment as being realized through the modification of the entities—the various topics discussed, including people and events (Duric & Song 2012). Thus, while the entities in the document can be widespread across an entire document, sentiment is a short-range, “syntactic relationship” of the sentiment carrying modifier to the entity it is modifying. Think of it like this: when I talk about “my thesis”, throughout this document it can be realized in a myriad of forms, repeated throughout the document. In this way it is a topic, or entity. But the way I talk about it—the sentiment expressed about “my thesis”—can clearly change from its “idyllic” beginning to the very “stressful” end. This syntactic restriction is what characterizes sentiment in Duric and Song’s approach, but the syntactic effects of sentiment effectively end there for them—how the entity modified by sentiment is realized in context is not explored in their research at all.
Read and Carroll (2012) borrow heavily from previous work on Appraisal from Systemic Functional Linguistics, as initially described by Martin and White (2005). As Read and Carroll describe,

“Appraisal . . . is a Systemic Functional Linguistic theory of evaluation in text (Martin and White 2005). It consists of three subsystems that operate interactively: Attitude is concerned with one's personal feelings (emotional reactions, judgements of people and appreciations of objects); Engagement considers the positioning of oneself with respect to the opinions of others (heterogloss) and with respect to one's own opinions (monogloss); while Graduation addresses how language functions to amplify or diminish the attitude and engagement conveyed by a text,” (Read & Carroll 2012:423).

Additionally, Read and Carroll indicate that the system should be robust enough that it not only covers emotions and opinions, but also the manner in which the authors “engage with their audience and other authors,” as well as the strength with which authors present their opinions (Read & Carroll 2012). Whilst emotional valence is roughly equivalent with their variable of attitude—the feelings of the speaker as codified in the language, and varying dialogically according to “positive” or “negative” polarity, the real item of interest here is what Read and Carroll define as engagement, or “the linguistic phenomena by which authors construe their point of view and the resources used to adopt stances towards other authors' perspective,” (Read & Carroll 2012). Whilst Read and Carroll spend a solid chunk of their time and analysis on the identification of lexical items that cue for the three systems that compose appraisal, they
allude to several, grammatical and higher-level linguistic structures that can be used to infer sentiment. These include nominal domains like emotion (which I am directly looking at in this study), adjectival modification (similar to the dependence-autonomous element as seen in Sullivan (2013)), specific verb and auxiliary usage patterns, and a smattering of grammatical strategies including hedging and negation strategies, amongst others (Read & Carroll 2012). Disappointingly the most complex unit analyzed in their analysis are multi-word expressions—a strategy which, while far more complex than many of the lexeme-specific strategies that exist, falls short of describing the relationship between the sentiment of a single unit and the sentence as a whole. It rather identifies a set of grammatical function words that cue for the semantic relationships described in the above block quote. Though the dictionary is built of lexical units that cue for grammatical relationships, it is still very much a lexical approach to sentiment analysis.

In spite of this, Read and Carroll’s use of appraisal theory has made great bounds in allowing researchers to model sentiment in a variety of domains, where-as lexically based approaches had tended to be domain specific. Korenek and Šimko (2014) were able to successfully classify documents compiled from twitter data and so-called microblogs for sentiment. Whilst the brunt of their analyses were computed using the appraisal based lexical dictionary compiled by Read and Carroll (2012), they interestingly identified a series of microblog specific constructional patterns in order to constrain the contexts in which the appraisal indicating terms occurred according to the topics indicated in those constructions (Korenek & Šimko 2014). Though, again, the brunt of the work is computed via the lexical database composed by Read and Carroll, their attention to constructional patterns should not
be overlooked here. Whether intentional or not, their pre-processing created a construction-informed environment with which one could identify the semantic role of not only the entity being modified, but begin to compile a list of semantic roles that were filled by entities of differing emotional affects—if you have a construction, even if you lexically derive what the emotional valence is, you have relied to some degree on syntactic constraints in order to extract a sentiment rating from the utterance.

Work done by Polanyi and Zaenen (2006) may in fact come closest to the analysis I’m seeking to make in the pre-existing literature. Polanyi and Zaenen incorporate not only lexical units into their model of sentiment extraction, but incorporate a smattering of syntactic cues, and a dollop of discourse-pragmatic ones which they dub Contextual Valence Shifters (CVS). Important for my analysis, they identify several contexts in which sentiment is realized, such as in the case of combination with negatives and intensifiers (reversing the polarity of a term while simultaneously conveying emotional affect), modal usage and modification of the clause overall (as in “He would give her everything”), and in irony (Polanyi & Zaenen 2006). Though on first glance irony should appear difficult to identify, it is worth noting that in the example they provide it is the mismatch of extremely positive sentiment attached to the agentive entity in a sentence, in conjunction with the negative connotation of the verb that triggers an ironic reading at all—in “The very brilliant organizer failed to solve the problem,” it is the fact that the positively charge appraisal of the “brilliant organizer” is mismatched with what the verb “failed” entails with respect to its first argument that causes us to read the sentence as being ironic.

Whilst they dub the combination of positive affect in the subject in conjunction with the negative entailments of the verb CVS, we get a first glimpse into how semantic roles and
emotional valence might interact from this very same example. The emotional affect associated with a lexical item can change polarity according to the entailments of the semantic role it is prescribed to.

Kennedy and Inkpen extend three syntactic contexts described as CVSs in Polanyi and Zaenen to their classification of documents for sentiment. By focusing on instances of intensifier, negation, and diminisher usage in sentences, they effectively take into account a very select few syntactic environments known to affect polarity judgements and achieved an accuracy of approximately 86% in when identifying textual sentiment (Kennedy and Inkpen 2006). Their results seemingly indicate that there is a clear and intriguing relationship of syntax to sentiment.

We’ll end this overview of sentiment analysis methods with work done by Vilares, Gómez-Rodríguez, and Alonso (2016) derive a series of “universal operations” from syntactic dependencies that heavily imply specific sentiment relationships. Whilst previous models focused on lexical semantics as cues for sentiment, the model proposed by Vilares, Gómez-Rodríguez & Alonso (2016) takes as an input the dependency tree of a sentence, and incrementally associates a sentiment rating to each node in a grammatical tree using a set of “compositional operations”, and then calculates a sentence’s polarity using the polarity calculated for each of the head-phrases in a grammatical tree (Vilares, Gómez-Rodríguez & Alonso 2016). Think of it like this: given the sentence, “The Black Friday sale was horrific,” they first calculate the polarity for each head-phrase attached to the grammatical tree of the sentence—“The Black Friday sale,” “horrific”—and then calculate the polarity of the sentence overall using the polarity ratings for all of the head-phrases. Their method requires little to no
additional supervision, and importantly takes into account the effects of syntax on sentiment calculation. Whilst their system is phenomenally accurate in comparison to other methods (and largely due to their incorporation of universal dependencies as inputs, in their own estimation), the syntactic relationships that they define are constrained to the “intensification”, but-clauses”, “negation”, and “irrealis” (Vilares, Gómez-Rodríguez & Alonso 2016).

4.3 Tying it all Together

The fact of the matter is that there are myriad ways of deriving the sentiment of an expression from the lexical units in a construction. Common amongst all of the surveyed authors however is the understanding that emotional affect is achieved through the modification of the topic of conversation. Secondarily, it is interesting to note that whilst most of the authors surveyed have opted to focus their research and analysis methods on lexical sentiment, there are a couple (Polanyi & Zaenen 2006; Duric & Song 2012) who point to impact of syntactic structures on the realization of polarity, though largely through the usage of modal verbs and negation. Though these do not directly relate to the semantic roles of arguments per se, they do set a precedent in establishing the linkage between syntactic form and sentiment.

Almost all of the authors surveyed noted that nouns could act as sentiment bearing devices as well. If this is the case, and understanding that syntax does in fact interact with sentential polarity, this leads us to one of the main questions we would like to look at in the course of this study—are polarly charged nouns more likely to be realized in a particular semantic role? This intuition comes from the combination of my understanding of sentiment as a syntactic phenomenon, in conjunction with the prior research cited on emotional valence and
temporal metaphors—if time-moving (ME) construals are seen as more negatively charged than ego-moving (LE, because the temporal referent is rendered locative), and knowing that there are syntactic effects on the sentiment reading of sentences, is it that target domain referents are more likely to be realized in LE constructions if they are negatively charged, and ME constructions if they are positive? If this were to be true, it would add additional insight not only to our understanding of metaphor comprehension, but also extend the study of sentiment beyond lexical phenomena and more solidly into the domain of the interface of syntax and semantics. It would mean that constructions carry sentiment associations to some degree in their argument-structure.

Again, this is not the only hypothesis being put under the microscope in this paper—alongside of sentiment, I’m intrigued by the possibility of semantic role assignment being decided at the level of the target domain. But if this hypothesis does hold true, it certainly does carry some promise to innovate domains outside of psycholinguistics, including in computational sentiment analysis.

5 Experiments 1 & 2

5.1 Experiment 1: A Corpus Study

In this first experiment, I asked whether it was possible to discern an effect of polarity on the distribution of positive and negative affect sensitive items in a large corpus of contemporary English data, with respect to the mapping of a metaphoric target domain referencing noun either what I have described as the ME or LE semantic role groupings. Though I remain agnostic prima facie as to whether we ought to see more negatively or positively
charged target domain referents construed as either LE or ME, if emotional affect does in fact affect the distribution of ME and LE semantics, we ought to find the following trend in the data: That the count of ME and LE contexts will vary according to whether the target domain referent is positively charged or negatively charged.

5.1.1 Materials

I opted to use the English Web 2013 Web Corpus (EnTenTen13) for the purposes of testing distributional differences in semantic role assignments. The decision to use this particular corpus was made in order to better align the results pooled from the corpus with the conditions of later psycholinguistic experiments. I wanted to pull from examples that were closer to natural, contemporary language usage. Though other corpora were available, including both COCA and the BNC corpus, which include spoken language sub-corpora, EnTenTen13 was the most contemporary corpus available at the time, which made it more desirable for use in this instance.

5.1.2 Methods

In order to test the distributional differences between polarity sensitive nouns in each dual alternation, I selected a small number of nouns from both the target domain of THOUGHT and EMOTION, and then using SketchEngine’s word-sketch generator, compiled a list of environments in which the noun could be construed as either an ME or LE instance for comparison. Table 1 below shows the nominal arguments used, their domain, as well as their associated polarity:
### Table 1: Target domain and polarity ranking for the lexical units collected from EnTenTen13.

<table>
<thead>
<tr>
<th>Lexical Unit</th>
<th>Target Domain</th>
<th>Rating from Taboada et al.’s (2011) Lexical-Item Dictionary</th>
<th>Polarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>EMOTION</td>
<td>2</td>
<td>Positive</td>
</tr>
<tr>
<td>Anger</td>
<td>EMOTION</td>
<td>-2</td>
<td>Negative</td>
</tr>
<tr>
<td>Depression</td>
<td>EMOTION</td>
<td>-2</td>
<td>Negative</td>
</tr>
<tr>
<td>Joy</td>
<td>EMOTION</td>
<td>3</td>
<td>Positive</td>
</tr>
<tr>
<td>Bad Idea</td>
<td>THOUGHT</td>
<td>-3 (for “bad”)</td>
<td>Negative</td>
</tr>
<tr>
<td>Great Idea</td>
<td>THOUGHT</td>
<td>4 (for “great”)</td>
<td>Positive</td>
</tr>
</tbody>
</table>

Polarity in this instance was coded according to a binary-value: positive or negative. The values in the third column represent the rating for emotional affect given by Taboada et al. (2011) in their lexical dictionary of sentiment bearing words, though for simplicity in my calculations in the following results I have assigned the referents a binary value of either positive or negative. Note that in the Taboada et al. ratings, negative affect continues from a value of “0” or neutral to “-5” indicating maximum negative affect, and up to “5” for a maximum rating of positive emotional affect. The results from the examples collected corpus—including both the counts of ME and LE contexts, and chi-square testing of the effects of target domain, emotional valence (positive or negative), and lexical unit—are shown in the next section.

### 5.1.3 Results

The following counts were obtained for the lexical units described in Table 2 from my preliminary analysis of EnTenTen13:

<table>
<thead>
<tr>
<th>Target Domain Noun</th>
<th>ME</th>
<th>LE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>18523</td>
<td>21857</td>
</tr>
<tr>
<td>Anger</td>
<td>11538</td>
<td>26907</td>
</tr>
<tr>
<td>Depression</td>
<td>2925</td>
<td>5287</td>
</tr>
<tr>
<td>Joy</td>
<td>73161</td>
<td>36027</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Great Idea</td>
<td>7126</td>
<td>1583</td>
</tr>
<tr>
<td>Bad Idea</td>
<td>112</td>
<td>303</td>
</tr>
</tbody>
</table>

*Table 2: Counts of Moving and Locative Entity instantiations in EnTenTen13*

I tested the distributions shown for the small collection of lexical units above for statistical significance in three different areas of analysis (1) differences caused by polarity ranking as either positive or negative (testing the primary hypothesis, (2) differences related to the two target domains—thought and emotion (testing hypothesis 2—and (3) differences resulting from the lexical unit being used (testing the null hypothesis). Table 3 below shows the chi-squared statistics being reported for the three areas of analysis being tested.

<table>
<thead>
<tr>
<th>Condition</th>
<th>$X^2$ statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences stemming from polarity</td>
<td>$X^2(1, N = 205349) = 14527$, p-value &lt; 2.2e-16</td>
</tr>
<tr>
<td>Differences stemming from target domain</td>
<td>$X^2(1, N = 205349) = 2245.2$, p-value &lt; 2.2e-16</td>
</tr>
<tr>
<td>Differences stemming from lexical unit</td>
<td>$X^2(51, N = 205349) = 22501$, p-value &lt; 2.2e-16</td>
</tr>
</tbody>
</table>

*Table 3: $X^2$ statistics relating to the three conditions being tested*

In all three of the conditions, we can reject the null-hypothesis that the data has been randomly distributed across all groups, but we cannot reject any one of the three possible hypotheses we tested for. Thus, it is unclear if the distributional differences are being caused by polarity differences, target domain specific differences, or differences arising solely from the lexical units themselves.

### 5.1.4 Discussion

In all three analyses the distributions are statistically significant. We cannot rule out any of the hypotheses that we initially started with, then—our primary hypothesis appears to have been validated, due to the statistical significance of the differences between the two polarity
conditions being tested. But simultaneously, the differences between target domains validates our hypothesis 2, and the differences stemming from the lexical units equally validates the null hypothesis—that there is no systematic influence of either polarity or the target domain over semantic role assignment in dual utterances. We have insufficient evidence to assume primacy of any one of the possible, competing hypotheses.

5.2 Experiment 2: A Mechanical Turk Survey

The results from the corpus study in experiment 1 indicate that polarity is in fact a strong factor in deciding the semantic role assignment of nominal arguments from the target domain. Two questions remain, however: (1) to what degree does polarity influence the online, semantic role assignment in speakers of English? and (2) considering that polarity, target domain, and lexical unit all appeared to contribute to the semantic role assignment of nominal arguments in the corpus examples, what is the contribution of polarity specifically to semantic role assignment in metaphoric dualism? To test the interactions of polarity with other factors such as target domain and lexical units, I created the following survey.

5.2.1 Materials

The survey\(^4\) was created via Qualtrics’ online survey development platform. Distribution of the survey was done exclusively through Amazon’s Mechanical Turk (MTURK) human information task service.

\(^4\) The survey in its entirety is included in the appendix at the end of this document.
5.2.2 Participants

A total of approximately 58 participants responded to the survey via MTURK. Of the 58, 12 participants were not included from the total number of participants due to incomplete survey responses, and one participant was removed on the basis of the participant’s completion time (approximately 2.47 minutes) which was deemed far too low to have been able to complete the survey while reading the questions provided. Participants were paid $3.00 upon completion of the survey.

5.2.3 Methods

Each question in the survey was presented individually on the screen for participants to respond to. For each question, participants were asked to select one of two provided sentences that would best be completed by a noun-phrase displayed at the top of the screen. For each question, the two sentences were constructed such that one sentence in which a noun-phrase could be inserted would be construed as a Moving Entity, and in the other the noun-phrase would be construed as a Locative Entity. An example of one of the test question screens can be seen in figure 1 below:

QP8:
Select one of the following two sentences that you feel is best completed by the following phrase:

“horrendous idea”

o I shared the _____ I had with my colleagues.
  o We revisited the _____ over coffee the next day.

Figure 1: An example of one question block as seen by participants
The examples, and sentence choices that participants were asked to select between, were coded as having the following categorical features, which were then used in the multiple linear logistic regression analysis described in the results section in order to ascertain which variables were linked to the distribution of Moving and Locative Entity choices for each question. Those features are as follows: (1) Polarity rating of the target domain noun-phrase as either positive or negative, (2) the target domain of the noun-phrase, (3) the head lexical unit of the target domain noun-phrase provided, (4) the verbs used in the Moving and Locative Entity choice sentences provided, (5) the syntactic role—as defined as subject, direct object, or oblique—that the target domain noun phrase provided would fill in either the Moving or Locative Entity sentence.

In the corpus study above, lexical units from within the target domain were used, i.e., for the domain of emotions I looked at items like “anger” and “happiness”—unique lexical units that are inherently positive or negative. For the experimental study, I wanted to control for any effects arising from lexical form\(^5\), so I used the following four lexical items in the survey, from the target domains of THOUGHT and EMOTION respectively, and modified them via a polarity sensitive adjective: (1) thought, (2) idea, (3) feeling, and (4) emotion. Thus, to generate a negative polarity noun-phrase, modifying “thought” with “terrifying” yielded the target domain referent, “terrifying thought” modified for negative emotional affect, and conversely modifying thought with the adjective “interesting” yielded the positively charged target domain referent

\(^5\) In experiment 1 (section 5.1) target domain, emotional valence, and lexical form all appeared to be correlated with ME versus LE realization. In order to control for lexical form, I decided it was best to limit the number of lexical units used in experiment 2 (section 5.2).
“interesting thought”. In order to control for the six features described in the previous paragraph for both positive and negative emotional affect test conditions, I then paired one positive and one negative polarity example by using the same multiple-choice sentences for the participant to select between. This allowed me to directly compare the differences in behavior between positive and negative conditions. The paired positive and negative test questions were then split into separate question blocks in the survey flow.

Test and filler examples were presented in five blocks, and divided into 4 test and 7 filler examples per block of questions. The order of the two sentences that participants were asked to choose from for each question, examples in the block of questions, and the blocks themselves were all randomized.

5.2.4 Results

The following are the counts for the number of times that participants selected either the ME or LE option for each of the test questions. For clarity, the test questions are labeled according to the following schema: Q [N/P: Positive or Negative polarity] [1-10: ME and LE example set 1 through 10]. Thus, QN1 and QP1 share the same head noun as well as the same options for either the ME or LE sentences to choose between, but vary with respect to the modifier attached to the head noun and thus vary with respect to polarity.
Comparing the counts for ME versus LE sentence selection for the two test-conditions—nominal phrase with positive polarity and nominal phrase with negative polarity, we find the following distribution of examples:
Figure 3: Total of ME versus LE choices by emotional valence—negative versus positive.

Figure 4: ME versus LE selection by target domain—EMOTION versus THOUGHT
The data appears to indicate that whilst there are general differences in the selection of ME versus LE sentences for the two conditions, the difference observed appears to be rather slight. Additional testing is needed in order to discern whether or not this difference is in fact significant.

In order to ascertain the effects of emotional affect and the target domain—and to settle once and for all the degree to which the two influenced semantic role selection for our participants—we need to use an inferential model in order to examine the effects of each factor in the experiment. The following mixed-effects logistic regression model incorporated the following fixed effects—those features that I was interested in examining at the onset of the study, and codified in the two hypotheses I established in section 3—and the following two random effects:

<table>
<thead>
<tr>
<th>Effect Type</th>
<th>Effect Name</th>
<th>Effect Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Effects</td>
<td>Emotional Valence of the stimulus noun-phrase (VAL)</td>
<td>Coded here as either 0 for negative, or 1 for positive.</td>
</tr>
<tr>
<td></td>
<td>Target domain of the stimulus noun-phrase (DOM)</td>
<td>Coded here as either 0 for thought, or 1 for emotion.</td>
</tr>
<tr>
<td></td>
<td>Syntactic role of the stimulus noun phrase in the ME sentence (SR.ME)</td>
<td>A bucket-column for the three syntactic roles available {0:Subject; 1:Direct Object; 2:Oblique}</td>
</tr>
<tr>
<td></td>
<td>Syntactic role of the stimulus noun phrase in the LE sentence (SR.LE)</td>
<td>A bucket-column for the</td>
</tr>
</tbody>
</table>
three syntactic roles available
{0:Subject; 1:Direct Object; 2:Oblique}

<table>
<thead>
<tr>
<th>Participant</th>
<th>The identifier for the participant, thus controlling for participant specific effects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>This was used in order to control for the idiosyncracies arising from the questions themselves.</td>
</tr>
</tbody>
</table>

**Table 4:** Effects from the logistic regression model and their descriptions.

The model summary indicates that the following were statistically significant: target domain (alpha-level: .05, \( p < 0.001 \)) and intriguingly the syntactic role of the ME sentence (\( p < 0.001 \)). Neither emotional valence (alpha-level: .05, \( p = .885 \)) nor the syntactic role of the LE sentence (alpha-level: .05, \( p = .648 \)) were statistically significant in the initial model’s estimations. The model summary, including all p-values, can be seen in appendix B, attached at the end of this paper.

I examined whether target domain and emotional valence contributed significantly to the overall model by comparing nested models that included or omitted the relevant variable. Likelihood ratio tests were used to compare the goodness of fit of the original model and revised models that excluded each of the following in turn: (1) emotional valence, (2) target domain, and (3) the syntactic role of the moving entity.
Table 5: ANOVA results indicating significance of contribution of fixed effects to overall model.

The results (summarized in Table 5) indicate that the contribution of emotional valence was not statistically significant, though the contributions of the target domain and, perplexingly, the syntactic role of the moving entity sentence were.

5.2.5 Discussion

All the careful planning in the world will not save a theory. The results here indicate that our first hypothesis—that sentiment will have an effect on semantic role assignment, did not stand the test of the logistic regression model, and we can thus officially disprove hypothesis 1. However, hypothesis 2 did in fact come out a winner in this instance.

I wanted to test whether or not target domain was truly independent, or whether it interacted with one of the remaining three factors in the analysis. So I ran the logistic regression three more times, looking specifically at the interactions of target domain with the other variables. I have used the abbreviated names for the variables as described in the first column of table 4 above in order to save space.

<table>
<thead>
<tr>
<th>Interaction</th>
<th>Statistical Significance of Interaction in Model Summary</th>
<th>Statistical Significance of Random Variation (ANOVA) of Model Subtracting the Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOM*VAL</td>
<td>.979</td>
<td>.979</td>
</tr>
<tr>
<td>DOM*SR.LE</td>
<td>.0696</td>
<td>.0831</td>
</tr>
<tr>
<td>DOM*SR.ME</td>
<td>.912</td>
<td>.9123</td>
</tr>
</tbody>
</table>
Table 6: Statistical results for the interactions of Target domain with other fixed effects. Column two values indicate the p-values of the interactions in the model summary, whereas column 3 indicates the p-values for differences in goodness of fit between nested models constructed with and without the interactions indicated.

Target domain did not interact with any of the additional variables. The results indicate that the effect of the target domain is not modulated by the ME and LE syntactic role assignments in metaphoric duals. In the following, general discussion, I’ll dig more into the details of this intriguing development.

6. General Discussion

So what should we make of the results from the two experiments? Experiment one failed to give evidence in favor of either one of our initial hypotheses, but appeared to validate both of them equally. Experiment two, which controlled much more heavily for lexical form of the target domain referents, only validated hypothesis 2, but failed to dredge up any evidence in favor of hypothesis one—that sentiment would have an effect on the semantic role assignment. Does this mean that emotional affect is done-for as a semantic role deciding factor? It is important to remember that when dealing with language, we’re dealing with people. And people, to their immense credit, are far more complicated that what I have captured in my humble study.

Let’s look at some of the implications of the effects of the target domain on the data. What this means, is that for each metaphoric target domain, there are definitely domain specific semantic role assignment behaviors in metaphoric duals, such that between the target domains of EMOTION and THOUGHT, the assignment of ME and LE status will be different.
This observation in particular may usefully expand on the observations made by Gentner, Imai, and Boroditsky (2002) in their third, naturalistic experiment on temporal reasoning. Of the observations made by researchers who interviewed travelers, there was a slight decrease in reaction time (though not statistically significant) when travelers were presented with a framing statement and question that were both in the LE construal of time, but perhaps even more interestingly, in the cases in which travelers were presented with the ME construal of time, a fraction of the time participants responded to researchers’ question with an LE framing (Gentner, Imai & Boroditsky 2002). Perhaps even more interestingly, when participants did this, their reaction times were lower than those who responded with the normal ME response overall (Gentner, Imai & Boroditsky 2002). Researchers did not, however, comment on why this difference persisted in the data—at the time of their experiment, there was not sufficient data hinting at a possible cause for this difference in reaction time (Gentner, Imai & Boroditsky 2002). The current experiment however may provide somewhat of an explanation for this behavior. If target domain specific preferences for ME versus LE do exist, then we would predict that temporal duals would be biased towards the usage of one construal or another—exactly as we see in Gentner, Imai, and Boroditsky’s third experiment.

And whilst it is certain from the data that there are differences between target domains in metaphoric dualism, what this implies additionally is that there may be target domain specific behaviors when mapping onto any source domain. If this is the case, we should expect to see differences in the semantic role assignments in metaphors per each target domain, as opposed to those differences being determined by the source domain. Knowing this, it might indicate that the stability in metaphoric mappings arises from target domain behavior, as
opposed to the source domain. And this may have some profound implications with respect to metaphor studies, and especially computational metaphor identification and interpretation (see: Mohler et al. 2014; Shutova 2010; Bollegala & Shutova 2013; Hong 2016; Su et al. 2017).

For starters, it might actually explain why inter-annotator agreement can be so fickle in some of the metaphor corpora that exist to date. Take the Language Computer Corporation’s Conceptual Metaphor Dataset (Mohler et al. 2016). Whilst they have collected a corpus of nearly 16,265 examples of governmental metaphors, of which 3,535 are annotated for conceptual metaphor source domains, the inter-annotator agreement on source domain annotations is a mere 54.4%. What could have happened here? Whilst traditionally, it has been assumed that the assignment of target domain referents to semantic roles in metaphoric source domains has been idiosyncratic (Sullivan 2013), whilst the source domain has been the structuring element (Lakoff & Johnson 1980; Lakoff 1993; Sullivan 2013). If it is the other way around, and the target domain is the thing that decides what the semantic role for the target domain referent is, then this would subtly invert Lakoff’s invariance principle:

“Metaphorical mappings preserve the cognitive topology (that is, the image- schema structure) of the source domain, in a way consistent with the inherent structure of the target domain.” (Lakoff 1993: 215)

What it would mean is that the emphasis would shift from the preservation of the cognitive, image-schema structure of the source domain, and onto the necessity for consistency with the target domain. It is the target domain that drives metaphoric mappings, not the source domain.
So where does this leave our first hypothesis about emotional valence? The answer in that domain is less clear. Whilst experiment two did not validate hypothesis one, the corpus experiment did. What should we make of this? For starters, the difference in results may in fact be due to two distinct factors, one of which was actively controlled for in experiment 2, and the other which was not. The first possible reason for the difference might actually be the difference in lexical forms in the target domain referents in the first experiment—whilst experiment 2 shows that there are target domain specific restrictions on ME versus LE assignment, I actively controlled for lexical form, limiting the lexical form to only two, emotional valence-neutral terms from both target domains. The reality is terms like “happiness” and “sadness” are both far more emotionally charged, and simultaneously may in fact exhibit lexeme specific behaviors within domain, as shown in the results in experiment 1 as well. We see a small mirror to this visibly in the graphed results in experiment two (note that in figure 8, whilst emotion tended to have a higher proportion of ME instantiations overall, in both domains there was a subtle effect of emotional valence, such that there were slightly more ME responses for positive than negative emotional affect), but not enough as to repeat the significance in the first study. Ultimately, what we can conclude is that modifying a target domain referent for emotional valence is not sufficient enough a factor to force a significant difference in ME versus LE selection. This is by no means the end of sentiment, but it does indeed show that in order for sentiment to be a factor, there clearly has to be more noise in the form of a greater variety of lexical units before it can begin to act with sufficient force on selection behavior.

7. Conclusion
Explorer Wade Davis once wrote, “Language is an old-growth forest of the mind,” metaphorically describing language as the accumulation of thousands of years of human innovation, sentiment, beliefs, inherited problem-solving skills—a truly human inheritance—handed down to us across the generations that border and bisect the years between us and our ancestors. And whilst the contents of this study are far less poetic than the grandiose descriptions of authors and explorers, I hope it at least describes a small subsection of that ecosystem.

Human beings and the views that we encode and carry with us are dizzyingly complex. In the course of this study, I have described not only the effects of polarity on how we perceive and assign specific attributes and types of entity-hood to abstract concepts in every-day communication, but attempted a first step at unravelling how polarity and several other cognitive phenomena work together to establish the motivations behind why we as speakers of English describe things the way we do. So many questions remain, but I present here a start.
8. Bibliography


Lakoff, George & Mark Johnson. 1980. Metaphors We Live By.


Appendix A: MTURK Questionnaire and Consent Form

Start of Block: CONSENT FORM

CD You are invited to participate in a web-based online survey for the purpose of looking at the preferences of English speakers with respect to framing events—in sum, when it is possible to talk about an event in multiple ways, how do people prefer to talk about it? In what ways do people prefer to organize their thoughts? This research project is being conducted by Zachary Rosen, a graduate student at the University of Colorado, Boulder. It should take approximately 15-20 minutes to complete.

CD1 PARTICIPATION Your participation in this survey is voluntary. You may refuse to take part in the research or exit the survey at any time without penalty. You are free to decline to answer any particular question you do not wish to answer for any reason.

CD2 BENEFITS You will receive no direct benefits from participating in this research study. However, your responses may help us learn more about the interaction of language, cognition, and event comprehension.

CD3 RISKS There are no foreseeable risks involved in participating in this study other than those encountered in day-to-day life.

CD4 CONFIDENTIALITY Your survey answers will be sent to a link at qualtrics.com where data will be stored in a password protected electronic format. Qualtrics does not collect identifying information such as your name, email address, or IP address. Therefore, your responses will remain anonymous. No one will be able to identify you or your answers, and no one will know whether or not you participated in the study.
CD5 CONTACT If you have questions at any time about the study or the procedures, you may contact either the principal investigator, Zachary Rosen, directly at zachary.p.rosen@colorado.edu, or the study's research supervisor, Professor Narasimhan via email at bhuvana.narasimhan@colorado.edu. If you feel you have not been treated according to the descriptions in this form, or that your rights as a participant in research have not been honored during the course of this project, or you have any questions, concerns, or complaints that you wish to address to someone other than the investigator, you may contact the University of Colorado, Boulder Institutional Review Board by post at The University of Colorado, Boulder, Institutional Review Board 563 UCB Boulder, CO 80309-0563 Or by email at irbadmin@colorado.edu.

CQ ELECTRONIC CONSENT: Please select your choice below. You may print a copy of this consent form for your records. Clicking on the “Agree” button indicates that

- You have read the above information
- You voluntarily agree to participate
- You are 18 years of age or older

☐ I consent to allow the Primary Investigator to use the data I provide in their final analysis. (1)

End of Block: CONSENT FORM

Start of Block: Completion Motivation

Motive Are you taking this as part of Amazon Mechanical Turk or for extra credit in a class?

☐ With Amazon Mechanical Turk (1)

☐ For Extra Credit (2)

☐ Neither (3)

End of Block: Completion Motivation

Start of Block: QN1
QN1 Select one of the following two sentences that you feel is best completed by the following phrase:

"a terrifying thought"

- I kept coming back to _____ I had in my head. (1)
- _____ kept running around in my head. (2)

End of Block: QN1

Start of Block: QP3

QP3 Select one of the following two sentences that you feel is best completed by the following phrase:

"feeling of absolute fascination"

- I shared my _____ about the upcoming party with the therapist at our last meeting. (1)
- I circled back to this ____ about the upcoming party with my therapist at our last meeting. (2)

End of Block: QP3

Start of Block: QP7

QP7 Select one of the following two sentences that you feel is best completed by the following phrase:

"good feeling"

- I got a _____ about this proposal (1)
- I re-focused on the _____ I had about the proposal. (2)

End of Block: QP7

Start of Block: QN8
QN8 Select one of the following two sentences that you feel is best completed by the following phrase:

"horrendous idea"

○ I shared the _____ I had with my colleagues. (1)

○ We revisited my _____ over coffee the next day. (2)

End of Block: QN8

Start of Block: Q11

Q11 Select one of the following two sentences that you feel is best completed by the following phrase:

"the Holidays"

○ _____ are approaching. (1)

○ We're approaching ____. (2)

End of Block: Q11

Start of Block: Q17

Q17 Select one of the following two sentences that you feel is best completed by the following phrase:

"our line of sight"

○ The enemy jet crossed our _____ for only a moment before dashing off. (1)

○ Our _____ crossed the enemy jet for only a moment before it dashed off. (2)

End of Block: Q17
Q24 Select one of the following two sentences that you feel is best completed by the following phrase:

"the Canadian border"

- The car crept slowly towards the _____.
- The _____ slowly crept towards the front of the car.

Q28 Select one of the following two sentences that you feel is best completed by the following phrase:

"the mountain lion"

- Johnny tip-toed his way past the sleeping _____.
- ____ tip-toed its way past the sleeping camper.

Q32 Select one of the following two sentences that you feel is best completed by the following phrase:

"the salad"

- Isau and Eriana put the dressing next to _____.
- Isau and Eriana put _____ next to the dressing.
Q38 Select one of the following two sentences that you feel is best completed by the following phrase:

"the wine"

- Gerardo bought _____ before buying the radishes. (1)
- Gerardo bought _____ prior to buying the radishes. (2)

Q41 Select one of the following two sentences that you feel is best completed by the following phrase:

"Turok, the videogame"

- _____ was the center of Americans' love of dinosaurs for many years before Jurassic Park. (1)
- _____ came out before Jurassic Park Re-invigorated Americans' love of dinosaurs. (2)
"interesting ideas"

- They exchanged some _____ at the meeting yesterday. (1)
- They arrived at some _____ at the meeting yesterday. (2)

End of Block: QP2

Start of Block: QN4

QN4 Select one of the following two sentences that you feel is best completed by the following phrase:

"a god-awful idea"

- while eating breakfast, Benoit stumbled upon _____ for a play. (1)
- while eating breakfast, _____ for a play came to Benoit. (2)

End of Block: QN4

Start of Block: QP8

QP8 Select one of the following two sentences that you feel is best completed by the following phrase:

"terrific idea"

- I shared the _____ I had with my colleagues. (1)
- We revisited my _____ over coffee the next day. (2)

End of Block: QP8

Start of Block: QN9
QN9 Select one of the following two sentences that you feel is best completed by the following phrase:

"negative feelings"

- Heraldo felt his _____ flowing forth from his half-sleeping mind. (1)
- Heraldo felt himself returning to _____ in his half-sleeping mind. (2)

End of Block: QN9

Start of Block: Q12

Q12 Select one of the following two sentences that you feel is best completed by the following phrase:

"the airport terminal"

- We're coming up to ____, now (1)
- ____ is coming up, now (2)

End of Block: Q12

Start of Block: Q19

Q19 Select one of the following two sentences that you feel is best completed by the following phrase:

"Christmas"

- _____ came and went without a hitch. (1)
- We got through _____ without a hitch. (2)

End of Block: Q19

Start of Block: Q23
Q23 Select one of the following two sentences that you feel is best completed by the following phrase:

"the street lights of San Francisco"

- _____ slowly shrank into the distance behind us. (1)
- We slowly left _____ far behind us. (2)

End of Block: Q23

Start of Block: Q29

Q29 Select one of the following two sentences that you feel is best completed by the following phrase:

"the big fluffy dog"

- The kids ran past _____ on the way to the park! (1)
- _____ ran past the kids on the way to the park! (2)

End of Block: Q29

Start of Block: Q33

Q33 Select one of the following two sentences that you feel is best completed by the following phrase:

"my birthday"

- We'll be getting close to _____ in a month! (1)
- _____ will be here in a month! (2)

End of Block: Q33
Q40 Select one of the following two sentences that you feel is best completed by the following phrase:

"New York"

- Hey! Are we ahead or behind _____, time-wise? (1)
- Hey! Is _____ ahead or behind Paris, time-wise? (2)

Q45 Select one of the following two sentences that you feel is best completed by the following phrase:

"the holiday spirit"

- Kuan-Yin fell into _____ with gusto. (1)
- _____ overtook Kuan-Yin. (2)

QN3 Select one of the following two sentences that you feel is best completed by the following phrase:

"feeling of utter dread"

- I shared my _____ about the upcoming party with the therapist at our last meeting. (1)
- I circled back to this ____ about the upcoming party with my therapist at our last meeting. (2)
QP6 Select one of the following two sentences that you feel is best completed by the following phrase:

"innovative idea"

- I kept coming back to the same, ______. (1)
- The same, ______ kept coming back. (2)

QN7 Select one of the following two sentences that you feel is best completed by the following phrase:

"bad feeling"

- I got a _____ about this proposal (1)
- I re-focused on the _____ I had about the proposal. (2)
QP9 Select one of the following two sentences that you feel is best completed by the following phrase:

"positive feelings"

- Heraldo felt his ______ flowing forth from his half-sleeping mind. (1)
- Heraldo felt himself returning to ______ in his half-sleeping mind. (2)

End of Block: QP9

Start of Block: Q14

Q14 Select one of the following two sentences that you feel is best completed by the following phrase:

"the ranch house"

- We knew that we'd be getting close to ______ on the northern end of the lot. (1)
- We knew that ______ would cross our property lines on the northern end of the lot. (2)

End of Block: Q14

Start of Block: Q18

Q18 Select one of the following two sentences that you feel is best completed by the following phrase:

"May"

- Hopefully everything will be taken care of by time we get to ______. (1)
- By time ______ gets here, hopefully everything will be taken care of. (2)

End of Block: Q18

Start of Block: Q21
Q21 Select one of the following two sentences that you feel is best completed by the following phrase:

"Heather"

- _____ passed the hot dog vendor every day on her way to school. (1)
- The hot dog vendor passed _____ every day on her way to school. (2)

End of Block: Q21

Start of Block: Q26

Q26 Select one of the following two sentences that you feel is best completed by the following phrase:

"Tokyo"

- _____ seemed to be covered suddenly by the heavy clouds. (1)
- _____ seemed to appear suddenly out of the heavy clouds. (2)

End of Block: Q26

Start of Block: Q34

Q34 Select one of the following two sentences that you feel is best completed by the following phrase:

"Union Station"

- We'll be passing _____ on the right, shortly. (1)
- We'll be passed by _____ on the right, shortly. (2)

End of Block: Q34
Q39 Select one of the following two sentences that you feel is best completed by the following phrase:

"precious seconds"

- Rafael tried to situate himself in the center of his _____. (1)
- Rafael felt _____ slipping away. (2)

Q42 Select one of the following two sentences that you feel is best completed by the following phrase:

"tour bus"

- Faruk's family took a trip to California in a _____. (1)
- Faruk's family took a trip to California by _____. (2)

QN2 Select one of the following two sentences that you feel is best completed by the following phrase:

"tedious ideas"

- They exchanged some _____ at the meeting yesterday. (1)
- They arrived at some ____ at the meeting yesterday. (2)
QP5 Select one of the following two sentences that you feel is best completed by the following phrase:

"pretty-good feeling"

- I have a _____ about Dave's presentation tomorrow. (1)
- I keep coming back to the ____ I have about Dave's presentation tomorrow. (2)

QN6 Select one of the following two sentences that you feel is best completed by the following phrase:

"tiresome idea"

- I kept coming back to the same, _____. (1)
- The same, _____ kept coming back. (2)

QN10 Select one of the following two sentences that you feel is best completed by the following phrase:

"profoundly awful emotions"

- She had all these _____ rolling around her mind. (1)
- She had all these _____ that she kept returning to in her mind. (2)
Q13 Select one of the following two sentences that you feel is best completed by the following phrase:

"the truck"

○ _____ flew past us on the freeway. (1)

○ We flew past _____ on the freeway. (2)

Q16 Select one of the following two sentences that you feel is best completed by the following phrase:

"the line of trees"

○ Aminou quietly and quickly crossed _____ that circled his family's manor. (1)

○ _____ crossed the property boundaries of Aminou's family's manor. (2)
Q20 Select one of the following two sentences that you feel is best completed by the following phrase:

"the first half of my Spring Break"

○ _____ was spent kicking my assignments down the road. (1)

○ I went about _____ kicking my assignments down the road. (2)

End of Block: Q20

Start of Block: Q27

Q27 Select one of the following two sentences that you feel is best completed by the following phrase:

"the mountain-side"

○ The road carved its way through ____. (1)

○ The road was crossed on either side by ____. (2)

End of Block: Q27

Start of Block: Q30

Q30 Select one of the following two sentences that you feel is best completed by the following phrase:

"a pod of wild orcas"

○ They came across ____. (1)

○ They were approached by ____. (2)

End of Block: Q30

Start of Block: Q36
Q36 Select one of the following two sentences that you feel is best completed by the following phrase:

"Paris"

- The Seine's mighty waters cross _____ on either side. (1)
- The Seine's mighty waters are crossed by _____ on either side. (2)

End of Block: Q36

Q44 Select one of the following two sentences that you feel is best completed by the following phrase:

"Jerusalem"

- _____ was left behind us, out of the view of the rearview mirror. (1)
- _____ crept its way out of view of the rearview mirror, behind us. (2)

End of Block: Q44

QP1 Select one of the following two sentences that you feel is best completed by the following phrase:

"an inspiring thought"

- I kept coming back to _____ I had in my head. (1)
- _____ kept running around in my head. (2)

End of Block: QP1
QP4 Select one of the following two sentences that you feel is best completed by the following phrase:

"a truly inspired idea"

○ while eating breakfast, Benoit stumbled upon _____ for a play. (1)

○ while eating breakfast, _____ for a play came to Benoit. (2)

End of Block: QP4

QN5 Select one of the following two sentences that you feel is best completed by the following phrase:

"less-than-great feeling"

○ I have a _____ about Dave's presentation tomorrow. (1)

○ I keep coming back to the _____ I have about Dave's presentation tomorrow. (2)

End of Block: QN5

QP10 Select one of the following two sentences that you feel is best completed by the following phrase:

"wonderfully positive emotions"

○ She had all these _____ rolling around her mind. (1)

○ She had all these _____ that she kept returning to in her mind. (2)

End of Block: QP10
Q15 Select one of the following two sentences that you feel is best completed by the following phrase:

"his time"

- Alexander spent most of ______ playing video games rather than studying. (1)
- Alexander passed most of ______ playing video games rather than studying. (2)

Q25 Select one of the following two sentences that you feel is best completed by the following phrase:

"the sunrise"

- The party didn't end until _____. (1)
- ______ ended the party. (2)

Q31 Select one of the following two sentences that you feel is best completed by the following phrase:

"the free beers"

- _____ were leapt upon by the marketing department after the office closed. (1)
- _____ were given to the marketing department after the office closed. (2)
Q35 Select one of the following two sentences that you feel is best completed by the following phrase:

"the autumn months"

- Yesenia felt herself meander through _____. (1)
- Yesenia felt herself passed by _____. (2)

Q37 Select one of the following two sentences that you feel is best completed by the following phrase:

"their 20th wedding anniversary"

- When Anna makes it to _____ we'll make sure to uncork a bottle of wine or two. (1)
- When _____ gets here we'll make sure to uncork a bottle of wine or two. (2)
Q43 Select one of the following two sentences that you feel is best completed by the following phrase:

"coffee mug"

- The _____ was located carefully adjacent to the cookie tray. (1)
- The _____ was placed carefully adjacent to the cookie tray. (2)

End of Block: Q43

---

Start of Block: Q22

Q22 Select one of the following two sentences that you feel is best completed by the following phrase:

"the legislation"

- Despite its many flaws, _____ kept coming back to legislators' desks. (1)
- Despite its many flaws, legislators just couldn't get past _____.(2)

End of Block: Q22
Appendix B: Mixed-Effects Model Summary from Experiment 2

**Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) [glmerMod]**

*Family: binomial (logit)*

*Formula: CHOICE ~ VAL + DOM + SR.LE + SR.ME + (1 | PARTICIPANT) + (1 | Q.)*

*Control: glmerControl(optimizer = "bobyqa")*

**Random effects:**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>Std.Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICIPANT</td>
<td>(Intercept)</td>
<td>0.2979</td>
<td>0.5458</td>
</tr>
<tr>
<td>Q.</td>
<td>(Intercept)</td>
<td>0.1978</td>
<td>0.4447</td>
</tr>
</tbody>
</table>

*Number of obs: 914, groups: PARTICIPANT, 46; Q., 20*

**Fixed effects:**

|            | Estimate | Std. Error | z value | Pr(>|z|) |
|------------|----------|------------|---------|----------|
| (Intercept)| -0.22601 | 0.49487    | -0.457  | 0.647886 |
| VAL       | 0.03669  | 0.25269    | 0.145   | 0.884544 |
| DOM       | -0.85647 | 0.27573    | -3.106  | 0.001895 ** |
| SR.LE     | 0.13029  | 0.28508    | 0.457   | 0.647658 |
| SR.ME     | -0.73276 | 0.19718    | -3.716  | 0.000202 *** |

---

*Signif. codes: 0 ‘****’ 0.001 ‘***’ 0.01 ‘**’ 0.05 ‘.’ 0.1 ‘ ’ 1*