CYCLIC GESTURES AND MULTIMODAL SYMBOLIC ASSEMBLIES: AN ARGUMENT FOR SYMBOLIC COMPLEXITY IN GESTURE

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CYCLIC GESTURES AND MULTIMODAL SYMBOLIC ASSEMBLIES: AN ARGUMENT FOR SYMBOLIC COMPLEXITY IN GESTURE

by

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B.A., Liberal Studies, California State University San Marcos, 2008
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DISSERTATION

Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
Linguistics

The University of New Mexico
Albuquerque, New Mexico

July 2018
DEDICATION

This work is dedicated to my parents, who taught me to be continuously curious about the world, and to my grandparents, who instilled this value in my parents to later pass on to me.
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ABSTRACT

In this dissertation, I seek to better understand the nature of the relationship between meanings expressed in gesture and those expressed in speech. This research focuses on the use of cyclic gestures in English. Cyclic gestures are manual co-speech gestures that are characterized by a circular movement of the hand or arm. Despite cyclic gestures being commonplace in many types of spoken discourse, no previous studies to date have specifically explored the functions these gestures serve in English.

Broadly, this dissertation addresses two questions: (1) What functions do cyclic gestures serve in interaction in English, and (2) how are cyclic gestures integrated with other meaningful units in multimodal expressions? Using data collected from television talk shows, I examine the functional-semantic properties of spoken language expressions that accompany cyclic gestures and identify properties of meaning that repeatedly align with the expression of the gestures. I also explore relationships between fine-grained formal properties of cyclic gestural expressions and functional-semantic properties of the co-expressed speech. The results of the study find a number of significant relationships between gesture forms and spoken language meanings. For example, when cyclic gestures were expressed with spoken constructions serving an evaluative function, they were significantly associated with bimanual asynchronous rotations and finger spreading ($p < .001$) with a moderately strong effect size ($\phi_c = 0.26$).

Drawing on the patterns identified in the analysis of the data, I analyze cyclic gestures as component symbolic structures that profile schematic processes. I argue that
formal properties that accompany cyclic movement gestures (e.g., handshapes and locations of the hands in space) have the potential to be meaningful. Data from English suggest that cyclic gestures can integrate simultaneously with other symbolic structures in gesture to form complex gestural expressions (i.e., symbolic assemblies). Extending theoretical tools from the framework of Cognitive Grammar (Langacker, 1987, 1991), I explore how the schematic meaning of cyclic gestures is instantiated in specific complex gestural expressions and how those gestural constructions interact with symbolic structures in speech. This work challenges traditional assumptions about the nature of gesture meaning, which treats gestures as simplex, holistic structures. Instead, the findings of this research suggest that gestures are best analyzed as constructions.
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1 Multimodality in Interaction

1.1 Introduction

As I write this introduction, I am sitting in a busy coffee shop that I frequent a couple of times a week. In the afternoons, they often play music too loudly, so I am wearing earplugs. People fill the nearby tables, some working quietly while others are chatting amongst their companions. I can’t make out the words people are saying. The earplugs muffle their voices. The music, which is blaring at a decibel level that exceeds the noise reduction rating of my earplugs, further obscures their speech. As I look around the coffee shop in this transitory state of reduced auditory perceptual abilities, it strikes me that much of the language use happening in the room is unobstructed and available to me. Speakers are moving their hands around them and shifting their bodies in different directions as they talk to one another. What is even more striking to me are the inferences I am making about what is happening in the conversations occurring next to me, using the cues speakers provide in their gestures.¹

A few tables away, a woman sits on the same side of the booth as her companion, who is to her right. As she is talking, she extends her left arm straight out and far to the left of her body. Her palm faces outward, away from her body. Her fingers are spread and curved. As she gestures, she looks right toward her companion. I infer that she might be talking about a distal physical location of some type. Perhaps she is using the gesture in a reference point construction (Langacker, 1995) and directing her interlocutor’s conceptual attention to a particular physical location for the purpose of locating a targeted entity. A hypothetical exchange that might accompany the use of this gesture is provided in (1). Brackets and bolded letters are used to show where the gesture described above might occur in this context.

¹ In this context, I am attending mainly to the manual (hand) gestures speakers are producing. However, gesture as a sociocultural praxis (Streeck, 2009) includes the non-manual bodily modes of expression, such as body positioning, head tilts, shoulder shrugs, facial movements, and eye gaze.
(1) WOMAN; You know that [used bookstore downtown]?
FRIEND; ((nods)) Yeah.
WOMAN; Well apparently there is a new gelato shop that just opened next door. I’ve heard it’s delicious.

At another table in the coffee shop, two university students are talking to each other across their computers. The student who is talking (S1) has the index finger of her right hand extended while the other fingers remain closed. This handshape is familiarly used with manual acts of pointing. SI’s right hand makes small movements of the wrist, pointing to various locations in space (approximately a foot in front of her torso). I assume that she is using the points abstractly, pointing to non-present or abstract referents established in the spoken discourse. Pointing gestures used in conversation are most commonly of the abstract type (McNeill, 1992). The small size of the hand movements toward different locations in space also suggests that the speaker is performing abstract pointing. While this hasn’t yet been examined crosslinguistically, Enfield, Kita, and De Ruiter (2007) found that when Lao speakers produced points in a relatively restricted gesture space and did not gaze in the direction of the point (such as those I observe on this occasion), the served more abstract functions associated with the structuring of information. As the other interlocutor (S2) begins to take a turn, she extends her arm out toward S1 with her palm open and facing up (henceforth this hand configuration is referred to as a PUOH gesture).² I infer that S2 might be using the PUOH gesture with her arm extended toward her interlocutor to express a metaphorical offering (Müller, 2004), possibly indexing the contribution she is making to the previously established discourse topic.

These coffee shop observations are speculative, of course. It is impossible to be certain of the specific meanings these hand gestures are serving in the interactions without having access to the spoken language expressions that accompany them. I only

² Gestures made with a flat open hand facing upwards will be abbreviated as PUOH (palm-up open hand). PUOH hand configurations will be discussed in more detail in §2.5.4. See (Kendon, 2004) and Müller (2004) for a detailed account of PUOH handshape functions.
share this experience to draw attention to the fact that language use in its primary face-to-face setting, the “canonical encounter” (Clark, 1973), is invariably multimodal. Spoken language does not exist in isolation from other symbolic modes of expression, such as facial expressions, hand gestures, and body positioning. It is only one of many semiotic resources speakers use in interaction. The human body is a salient communicative resource, particularly when it is visible to others. People do not take it for granted when their bodies are visually perceptible to their interlocutors. Rather, they capitalize on that experience by using “the public visibility of the body as a dynamically unfolding, interactively organized locus for the production and display of relevant meaning and action” (Goodwin, 2000). Even as computer-mediated interactions have increased, we continue to demonstrate how heavily we rely on the body for the expression of certain types of meaning in language use. In emails, text messages, and on social media, we compensate for the lack of visible bodies present in the exchange by using emoticons and emojis to express our emotional states and our affective stances as they relate to meanings expressed through the written medium (Schnoebelen, 2012).

Importantly, while multimodality is inherent to language, it is not purely epiphenomenonal. Research suggests that speakers are aware of the communicative potential of gesture (Alibali, Heath, & Myers, 2001; Bavelas, Gerwing, Sutton, & Prevost, 2008; Melinger & Levelt, 2004). Likewise, listeners attend to meanings expressed in gesture that are not encoded in the corresponding speech (Goldin-Meadow, Wein, & Chang, 1992; Kelly & Church, 1998). For example, McNeill, Cassell, & McCullough (1994) found that when observers experience an incongruence in the meanings expressed in speech and gesture, they integrate the meanings they observed being expressed in both channels into their own retelling of that experience. What these and other studies tell us is that gesture is meaningful in its own right. Gesture doesn’t merely occur as a consequence of spoken language. Rather gesture and speech co-emerge because each modality contributes meaning and elaborates on the meanings expressed in the other mode. As McNeill (1992) describes it, “at the moment of synthesis, gesture and language are combined into one unified presentation of meaning.”

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3 Thanks to Eve Sweetser for bringing this to my attention during one of our chats at HDLS 12.
In this dissertation, I seek to better understand the nature of the relationship between the meanings expressed in gesture and those expressed in speech. This research examines linguistic expressions in English are produced with circular movement gestures. Co-speech circular movement gestures have not been specifically studied in English, but research on these gesture forms in German suggest that they can share a relationship to aspectual meanings (Ladewig, 2011). As the category of aspect is one that has both fascinated and puzzled linguists for decades (see Binnick 1991), gestures that might interact with this category are especially interesting for studying interactions between gesture and speech. Broadly, this dissertation begins to address two questions: (1) What functions do circular movement gestures serve in interaction in English and (2) how are circular movement gestures integrated with other meaningful units in gesture and speech to provide coherent and unified meanings in multimodal expressions? To begin answering these and other questions, I analyze functional-semantic properties of spoken language constructions with which speakers use circular movement gestures (for which I use the term cyclic gestures). In addition to exploring conceptual similarities across the types of spoken language meanings that occur with cyclic gestures, I explore patterns in the mappings between formal properties of the gesture and specific functional-semantic properties in the co-expressed speech. The findings of this research challenge previous accounts that treat gestures as simplex, holistic structures. Instead, I argue that co-speech hand gestures can be (and often are) symbolically complex expressions that simultaneously incorporate multiple meaningful gestural components for particular communicative purposes. Note that I use the terms symbolic and symbolic structure to refer to any structure that has a form and a meaning. More specifically, a symbolic structures is “a pairing between a semantic structure and a phonological structure” (Langacker, 2008). These concepts will be discussed in more detail in Chapter 5.

In the remainder of the chapter, I situate the perspective taken in this dissertation about the nature of gesture meaning within the context of the traditional treatment of meaning in gesture. I further outline the agenda of the current research project in greater detail. Section 1.2 introduces traditional approaches to the characterization of co-speech gesture meanings. I suggest that these approaches have made it difficult to fully integrate

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4 Cyclic gestures are characterized in further detail in §1.3, §2.5.4, and §3.3.3.
gesture with language in linguistic theoretical frameworks. Section 1.3 provides a more detailed description of the scope and aims of the current project. The final section of this chapter, §1.4, outlines the structure of the dissertation and objectives for each chapter.

1.2 Beliefs about the Symbolic Nature of Gesture

An increasing number of linguists today recognize the expressive potential of gesture in language use. David McNeill’s influential (1992) work, *Hand and mind: What gestures reveal about thought*, is often credited with sparking interest in co-speech gestures among linguists. It was in this work that McNeill first argued that the simultaneous expression of gesture and language reflects both the linguistic and imagistic aspects of thought. Since the time of McNeill’s pioneering work, co-speech gesture research has become a burgeoning interest in the field of linguistics. Yet despite this trend, gesture continues to remain on the periphery of much of linguistic inquiry and theory. For instance, while there is evidence that some degree of conventionalization is present for certain multimodal (gesture-speech) expressions (Andrén, 2010; Zima, 2014), it is unclear how best to include gestures in construction grammar theories of language as they often have stringent requirements pertaining to frequency and conventionalization.

Certain beliefs about the symbolic nature of co-speech gesture have made it difficult to analyze how meanings are integrated across the spoken and gestural channels in multimodal expressions. Gestures are thought to encode meaning in a way that is “fundamentally different from that of language” (McNeill, 1992). Because foundational scholarship on gesture has emphasized that the gesture is radically unique from spoken language, semantic properties in gesture are often characterized using terminology that is distinct from that used for spoken language (see §2.5 and associated subsections for further details). Two specific characterizations that have been made about the expressive behavior of co-speech hand gestures (henceforth, *manual co-speech gestures*) are particularly important to arguments I put forth in this work.

First, manual co-speech gestures have been described as being “noncombinatoric” (McNeill, 1992, p. 21). A single gesture is often studied as a holistic unit that cannot be further broken down into meaningful component units nor integrated with other gestures to form more complex expressions. McNeill does not view this as a limitation of gesture
but rather a resource that allows for the expression of idiosyncratic and imagistic aspects of thought. He describes these facets of thought that are represented in gesture as “analog rather than digital” (p. 11). This characterization contrasts with two properties argued to be fundamental to spoken language: discreteness and productivity (Hockett, 1960). Discrete meaningful units are integrated in spoken language to form more elaborate expressions. A central aim of linguistics is to identify the meaningful constituents in language and to describe patterns in how those constituents can be arranged with respect to one another for the expression of different meanings.

Recently, there have been researchers who have identified multiple meaningful components in a single gesture as well as others who have noted that variations in the form of a gesture can be associated with different functions, thus challenging McNeill’s position that gestures are noncombinatoric. Martinec (2004) has proposed that formal elements in gesture can combine in systematic ways to express meanings about events and their participants. Sweetser (2009) noted that gesture that directly relate to the content of what people are saying can have rhythmic beat gestures superimposed on them (see §2.5.1 for a discussion of beat gestures). Streeck (2009) has analyzed shrugs as “compound” enactments that incorporate raised shoulders, arms and brows as well as particular handshapes and palm orientations. While Streeck suggests that the formal components of shrugs are each “displays of distancing and disengagement” (p. 191), he does not analyze the relationship individual components have to the meaning of the compound shrug expression. Other research has proposed that different formal variants of a gesture type can be associated with distinct meanings (Bressem and Müller, 2014a; Calbris, 2003; Harrison, 2010; Ladewig, 2011; Müller, 2004). These studies will be discussed in further detail in §2.5.4. While research has identified meaningful components in co-speech gesture, there are no studies to my knowledge that examine the relationship between the meaning of symbolically complex gestural expressions (i.e., gestures that incorporate more than one meaningful component) and the meanings of the individual component gestures that comprise them. This current project begins to address this gap in the literature (Chapter 6).

The belief that gestures lack symbolic complexity has likely contributed to the practice of using broad labels to classify the meanings of gestural expressions. For
example, co-speech gestures that evoke participants or properties of events are often classified as *representational gestures*. Gestures that serve higher-level discourse functions, such as those relating to the structuring of information, are grouped under the category of *pragmatic gestures* (see §2.5 for a detailed account of gesture classifications). Of course linguistic research has found that a number of different functional properties apply to the level of information structure. Information structure includes the relational categories of *topic* and *focus*, as well as phenomena relating to cognitive constraints on language comprehension, such as *identifiability* and *accessibility* (Lambrecht, 1996). To categorize the meaning of a gesture as pragmatic is not a particularly informative characterization. This label does not capture fine-grained distinctions between types of interactive and social meanings, which we know to be incredibly diverse at the level of information structure and discourse. Additionally, this label does not highlight similarities across various interactional functions that gestures serve.

Another characterization that has been made about co-speech gestures that is challenged in this work is that they are idiosyncratic and lacking convention (McNeill, 1992, p. 22). Remember that McNeill suggests that gestures are able to represent aspects of thought that speech cannot, specifically “the idiosyncratic imagery of thought” (p. 1). While McNeill and others have argued that there isn’t a conventional mapping between a gesture’s form and a gesture’s function, this view has been softened over the years with the recognition of recurrent co-speech gestures (see §2.5.3 for an overview). Recurrent gestures are manual gesture forms that have form-meaning mappings that are argued to be more conventionalized than other gestures occurring with speech (Ladewig, 2014a). Cyclic gestures, the focus of this dissertation, are considered to be a type of recurrent gesture.

It is important to emphasize that not all gestures have traditionally been analyzed as being idiosyncratic. However, co-speech gestures have been associated with a lower degree of conventionality when compared to culturally conventionalized gestures that are used without speech, such as thumbs up or the middle finger (Kendon, 2004). Linguists are interested in identifying patterns in the way meanings are packaged in language. As such, modes of expression perceived as lacking convention, ones that do not fit neatly
into morphosyntactic (and other) linguistic theories, have not received as much attention historically as more central linguistic phenomena.

In spoken language, ideophones are an example of a phenomenon found in many languages that were historically treated as linguistic outcasts (Childs, 2001). Ideophones are expressive words related to onomatopoeia. Dingemanse (2011) defines them as “marked words that depict sensory imagery.” Interestingly, ideophones and depictive manual gestures are often temporally aligned when co-expressed (Kita, 1993, Dingemanse, 2011, pp. 343-353). An example of a Siwu ideophone that “depicts” a manner of walking is given in (2).

(2) gbadara-gbadara
   ‘be walking unevenly and out of balance’  (Dingemanse, 2011, p. 27)

Ideophones are typically considered peripheral members of a language’s lexicon. This characterization stems from their unique expressive mode of depiction and performance. Because ideophones have marked forms that seem to pattern differently from the rest of grammar they have been analyzed as operating outside of the grammatical and phonological system of language (see Newman, 2001 for a critique of this perspective). Dingemanse notes that even descriptive grammars of languages that make extensive use of ideophones fail to mention them at all, much less try to account for their role in language (p. 73). More recently, research documenting the range of different types of meanings expressed by ideophones in different languages has revealed crosslinguistic patterns in the paths of development of ideophone systems (see Dingemanse, 2012 for a review). Akita (2009) has even proposed an implicational hierarchy based on these patterns.

I bring up the historical treatment of ideophones in linguistics because the situation with co-speech gesture is analogous. Despite the frequency with which gestures are used during talk-in-interaction, spoken language grammars rarely include any description of the ways in which speakers use non-verbal modes of expression alongside language. Co-speech gestures, like ideophones, have been assumed to be extra-grammatical structures. In this dissertation, I show that cyclic co-speech gestures do in fact interact with
grammatical structures in language and that there are significant patterns associated with these interactions. This research and other research on gesture suggest that the field of linguistics would greatly benefit from the inclusion of gestural behaviors in descriptive language work.

So far in this section, I have discussed two properties that have been used to describe the symbolic nature of co-speech gestures that the findings from this dissertation will suggest are misguided. There is a third characteristic associated with the use of manual co-speech gestures, one that is indisputable, that is also important to this work. Manual co-speech gestures are not always present with speech. Based on several discussions I have had with linguists who don’t study gesture, I have come to understand this feature as being an additional barrier to the mainstream inclusion of gestures in linguistic theory. The apparent intermittent appearance of hand gestures in language use might lead one to infer that co-speech gestures are optional. While it is true that manual gestures are not used with every spoken utterance, I take the position that the occurrence or nonoccurrence of gestures with speech is influenced by construal. Construal relates to how a speaker conceptualizes meanings and packages those conceptualizations into language. Meaning in language “consists of both conceptual content and particular ways of construing that content” (Langacker, 2008). If we understand co-speech gestures as a phenomenon of human social behavior that together with language imposes a particular construal on conceptual content, as this study does, it is not a problem that manual gestures are not always present in language use.

Studying usage events in which manual gestures do occur can teach us more about the nature of construal and provides a richer understanding of cognition than spoken language alone. As a caveat, it should be noted that construal is not the only phenomenon determining whether speakers use gestures. The matter is complicated further by other factors that have been found to influence the use of manual gestures. For example, researchers have identified constraints on the working memory that are associated with different rates of manual gesture occurrence (see §2.3 for a review). Construal likely interacts with these cognitive constraints in complex ways. As far as I am aware, there are no studies to date that have explored these interactions and it is beyond the scope of the current study.
Assumptions about the way meaning is expressed in gesture and the stability of gesture meanings across different usage events have contributed to the practice of using different labels to describe categories of meaning in gesture than those used for spoken language. This research seeks to unite the semantic analysis of gesture and language under a commensurable framework that allows for a closer examination of the symbolic relationships that exist across modalities. Drawing upon the findings from a study on cyclic gesture use in English, I will dispute two of the claims that have been made about the symbolic nature of co-speech gesture, specifically (1) that they do not combine to form more complex symbolic units and (2) that they are highly idiosyncratic.

1.3 Current Project: Scope and Objectives

This dissertation research originates in the recognition that language in interaction is inherently multimodal. It is not a coincidence that speech and other symbolic systems produced with the body are simultaneously used in communicative action. Speech and gesture work together “to mutually elaborate each other” to varying degrees throughout an interaction (Goodwin, 2000, p. 1499). While there is strong evidence that language and gesture are joint contributors in a multimodal communication system, it is less clear to what degree cross-modally expressed meanings are integrated in conventional ways. This dissertation explores observable patterns in how speakers in interaction simultaneously recruit semiotic resources across modalities for different communicative functions.

I examine multimodal expressions in English that include the use of cyclic gestures. Cyclic gestures have been characterized by a shared property of movement, specifically, a "continuous circular movement of the hand" (Ladewig, 2011; 2014b) as shown in Figure 1. To better understand the contributions that cyclic gestures make to meaning in multimodal expressions, I closely examine the functional-semantic properties in the spoken language expressions that accompany them.
Cyclic gestures, while categorized under a single label, are not uniform. They are best considered a gesture family (Ladewig, 2011). Gesture families are groupings of gestures that share at least one articulatory feature, such as handshape or similarity in movement and are argued to share a semantically general “theme” that is schematized from use (Kendon, 2004, pp. 225-226). In addition to analyzing the functions for which cyclic gestures are used, I further explore whether differences in the formal expression of the gesture correspond to different meanings. That is, do specific formal properties of the gesture, such as direction of the movement, whether the gesture is performed with one hand or two hands, different hand configurations, and use of gesture space, serve to distinguish different meanings in systematic ways?

The research presented in this dissertation is situated within the broader realm of usage-based linguistic approaches. Linguists who adopt usage-based theoretical frameworks stress that human cognition, including our knowledge about language, is grounded in our perceptual, motoric, and social experiences with the physical world (Beckner et al., 2009; Bergen & Chang, 2005; Bybee, 2006, 2010; Hopper, 1987; Langacker, 1987, 1991, 2008; Tomasello, 2009). Usage-based linguists argue that the study of language is most appropriately situated within the contexts in which language is used. Within this perspective “grammar is the cognitive organization of one’s experience with language” (Bybee, 2006, p. 711). Knowledge that humans have about language emerges from experiences with specific usage events and the categorization of those experiences. Following from this tenet, humans must too have representations for gesture, as gestures undeniably occur as a part of one’s experience with language.⁵

⁵ I recognize that the terms like “representation” and “categorization” (among other “-ation” terms) are problematic because they reify the complex, dynamic social behaviors and neural processes involved in “languaging” (see Kravchenko, 2014; 2016 for further discussion on this topic). As these are the conventional terms used in the framework adopted in the research, they will continue to be used despite being misleading.
In adopting a usage-based, non-modular perspective of linguistic meaning. I do not consider semantics and discourse/pragmatics to be discrete topics of study. Language evokes more than just conceptual (semantic) meanings. Linguistic expressions, which incorporate elements that express conceptual content, are also used to perform information packaging and discourse functions in language use. I understand meaning in language to be encyclopedic and that language users’ knowledge includes semantic representations for lexical units as well as representations for how those units function in context. In this work, I use the terms semantics/semantic and functions/functional when talking about linguistic meaning. I use semantic properties most often to refer to objective content meanings and functional properties most often to refer to higher-level discursive and pragmatic meanings. However, as language expresses both types of meaning simultaneously, I use the compound modifier functional-semantic to capture linguistic meaning more generally; I also use the term meaning for this same purpose.

Specifically, this dissertation follows a cognitive, usage-based approach. In cognitive linguistics, the patterns observed in language use are believed to reflect important aspects of cognition. Cognitive linguists have viewed co-speech gestures as an additional resource for indirectly gaining access to salient properties of human cognition (see Cienki, 2016). In taking a cognitive approach, I include a cognitive-semantic analysis to partially account for patterns in the way speakers use cyclic gestures. This involves applying descriptive tools developed within cognitive linguistics to capture conceptual relationships across the spoken language expressions that accompany cyclic gestures. Importantly, these relationships are understood to emerge from perceptual and motoric mechanisms, so whenever possible, potential experiential motivations for cyclic gesture use will also be discussed.

While the word gesture has been used as an umbrella term for all types of bodily actions in spoken language—including handshapes, hand and arm movements, body positioning, eye gaze, facial expressions, and head movements—this study’s scope is limited to manual co-speech gestures (with the exception of eye gaze). Ideally, a usage-based study of language would want to consider each of these gestural modes of
expression. However, an analysis of all simultaneously occurring gestures becomes difficult to implement in practice. Research has traditionally given more attention to those gestures made with the hands than other types of nonverbal expressions. This is not surprising. Hand gestures, being out in front of the body, are perceptually prominent. The hands in general are especially salient and important to human cognition. We act on and perceive much of the world using our hands. Actions performed with the hands and perceptual experiences realized with our hands contribute to the emergence of embodied conceptual representations (Streeck, 2009, pg. 39).

There are also practical reasons for the manual bias as well. Visual limitations in video data that arise from filming techniques also lead to difficulty in including non-manual gestures in one’s analysis. For example, the talk show data used in this study is not optimal for fine-grained analysis of non-manual gestures. Videographers use different degrees of zooming and camera angle shifts, leading to great variation in the portion of the speakers’ bodies that are visible. Videographers are not thinking about studying gesture when they film talk shows, of course. Filming techniques that are ideal for the study of non-manuals include the use of multiple cameras that remain constant in relation to the speakers’ bodies (see Perniss, 2015 for recommendations on filming techniques for non-manuals in signed language research).

Despite the privileged status of manual gestures, researchers (myself included) do recognize the important contributions that non-manual modes of bodily expression make to meaning in interaction. In recent years, researchers have begun to attend to other parts of the body and have found that non-manual gestures are rich in their expressive potential. For example, studies on pointing gestures have found that points are not restricted to the hands. Some cultures have conventionalized practices for non-manual pointing, such as using the lips (Enfield, 2001) or nose (Cooperrider & Núñez, 2012). Shoulder shrugs have been found to serve stance-marking functions in interaction (Debras & Cienki, 2012). Speakers use head tilts simultaneously with changes in eye gaze and pitch to signal shifts in perspective (Maury-Rouan, 2011). Sweetser & Stec (2016) found that shifts in eye gaze signal shifts in the alignment of viewpoint in different mental spaces established in storytelling. In signed language research, non-manual expressions have long been recognized as serving more grammatical functions,
such as agreement marking (see Sandler & Lillo-Martin, 2006 for a review) and topic marking (Liddell, 1980).

A comprehensive account of multimodality in language should include non-manual gestures because they too are a part of usage events. Furthermore, non-manual gestures likely interact with manual gestures in composite gestural expressions (for an example of this interaction involving shrugs see Streeck, 2009). As this dissertation is about cyclic hand gestures, however, the emphasis will be on manual gestures. For the remainder of this work, the use of the term *gesture*(s), unless otherwise specified, will be used exclusively to refer to the communicative actions performed with the hands while speaking. Including non-manual gestures in this analysis would certainly provide a richer account of how meaning in language is constructed across modalities and should be pursued in future research.

Finally, while I have likely given the impression that cyclic gestures are the topic of this dissertation, it would be more precise to say that this dissertation is about multimodal expressions in which cyclic gestures participate. As previously mentioned, I will argue that cyclic gestures are often symbolically complex gestural constructions (i.e., they incorporate multiple meaningful component structures). Other properties of a gesture’s form that are co-expressed with a cyclic movement gesture (e.g., handshapes, locations of the hands in space, and movement qualities) have the potential to be meaningful. Following this analysis, the gestures shown in Figure 2 (a-c) are not simply cyclic gestures. They are different gestural expressions that incorporate cyclic gestures.

In Figure 2, the bracketed and bolded text show where cyclic gestures align with speech. This convention is used throughout the dissertation. Transcription conventions throughout this dissertation broadly follow Du Bois, Schuetze-Coburn, Cumming, & Paolino (1993). Underneath the transcription for each example there is a broad description of the formal properties of the gestural expression. The white numbers in the images 1 and 2 are used in this dissertation to designate two-handed (bimanual) cyclic gestures that are asynchronously produced. The number 1 is placed next to the first hand to produce a circular rotation and the number 2 is placed next to the hand that follows.

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6 Throughout the dissertation, some examples are shown with more narrow transcription detail than others. This variation depends on the purpose for which an example is being used.
The representations of cyclic stroke movements using arrows are only provided for the first two stills that are shown in figures. These arrows are not intended to show qualitative properties of the circular path along which the hand travels. They merely provide a representation of the direction of the path of movement.

Figure 2: Complex gestural expressions with cyclic gestures

(a) I was a little intimidated by LA. I didn't [quite know how to deal] w- I still [am not sure I] know how to deal with it.  
*Gesture form:* bimanual; asynchronous; small rotations; curved-5 handshape

(b) I didn’t like (0.2) like electrocute him. [He got] electrocuted while I was supposed to be making sure he didn't  
*Gesture form:* bimanual; synchronous; small rotations; L handshape, path movement

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7 There are two cyclic gesture tokens in this example. The second token that is produced (not represented in the figure), interestingly, is also expressed with a negative hedged assertion in speech.
8 The straight arrow in 2b is used to show that the cyclic movements travel along a path (along the transverse-horizontal plane) that starts near the speaker’s body and moves outward.
What would you call what you do now?

Gesture form: single; very small rotations; toward interlocutor; palm-up-open handshape

If one analyzes the gestural expressions shown in Figure 2 (a–c) strictly as different instances of a single gesture (i.e., the cyclic gesture), it would be difficult to identify a unifying function for the circular movement gesture. In these examples, the cyclic gestures are used with spoken language constructions with diverse functional-semantic properties. This includes being used with a negative hedged assessment (Figure 2a), a positive assertion in the Get-Passive Construction (Figure 2b), and an information question (Figure 2c). One might also observe that the forms of the gestures (e.g., hand configurations, locations in space, and movement trajectories) vary greatly across the three tokens. In Figure 2(a), the circular movements are small in size and produced asynchronously across two hands. The speaker’s hands are spread in a 5 handshape with curved fingers. In Figure 2(b), the speaker produces the circular movements on two hands but the rotations are in unison in this case. The palms face the speaker’s body and the hands point at one another with L handshapes in which the index finger and thumb are extended straight (resembling the shape of a pistol) while the other fingers are closed. Additionally, the circular rotations in Figure 2b travel along a path. The rotations are small in size. In Figure 2(c), the speaker produces the circular movement with only one hand (his right hand). The hand performing the cyclic gesture is extended toward the interlocutor. Both hands are oriented up with open handshapes (i.e., PUOH).

If one treats all three examples shown in Figure 2 (a–c) as variants of a single, holistic gesture (i.e., variants of the cyclic), one could identify a high-level similarity in the semantic properties of the speech that could be argued to be important to the meaning of the cyclic gesture. For example, each of the three cyclic gesture tokens are produced

9 Examples of the handshapes that are most frequently used with cyclic gestures in English are provided in §3.3.4.
with events in speech (although the types of events and the packaging of those events are quite distinct). There is a major limitation to this analysis, however. If these examples are taken reflect variants of the cyclic gesture, it would be impossible to get beyond a highly schematic characterization of the function of cyclic gestures because of the diversity of the semantic properties across examples. Alternatively, if we take a homonymist approach (see Haspelmath, 2003) and argue that these examples illustrate three distinct and unrelated gestures that happen to display a circular movement pattern, circular movement gestures would appear to be highly variable and idiosyncratic. Under this approach, it would be analyzed as arbitrary that circular movement are produced in the gestures in each example. This a possibility, of course, but the findings of the research presented in this dissertation will raise doubt that these three examples of cyclic gesture use (and other uses) share no functional-semantic relationships with one another. Instead, this research reveals that cyclic gestures can integrate simultaneously with other meaningful units in gesture to form uniquely meaningful complex structures. For example, I find that finger-spreading, as is present in the example shown in Figure 2(a), is a meaningful component in gestural expressions that include cyclics (see Chapter 4 and 6 for evidence of this).

In §6.3, I argue that Figure 2(a) is an instance of a conventionalized gestural construction in English, which integrates a cyclic movement, asynchronous bimanual rotations, and spread fingers to indicate a specific type of epistemic relationship between the speaker and what they are saying. In Figure 2(b), the cyclic gesture is integrated with a path gesture, which is characterized by a path movement out away from the body (represented with the straight white arrows). While path movements co-expressed with cyclic gestures are not analyzed in detail in this work, path movements have been found to be used to reflect the path of motion and direction of motion in the source domain of metaphorically construed motion events (Stickles, 2016). The particular gesture shown in Figure 2(b) can be analyzed as evoking with the path movement the metaphor CHANGE OF STATE IS CHANGE OF LOCATION. Under the analysis presented in the work, the L handshapes in this example are also meaningful, serving an attention directing function. Finally, the example shown in Figure 2(c) integrates three symbolic structures in the gestural expression: a PUOH handshape, the use of gesture space out toward the
interlocutor, and a cyclic movement. I will analyze this as a type of gestural construction that is used to foreground a specific type of interactional process (discussed in §6.4).

In this dissertation, I show that many of the functions that circular movement gestures serve in English can be traced to a higher-level, schematic meaning. This meaning is specified (or extended) in particular usage events by the integration of cyclic gestures with other meaningful structures in gesture and by meanings expressed in speech. I argue that the productivity of cyclic gestures in English stems from the relationship that the schematic meaning of the gesture has to one of the most basic experiential domains. The high degree of variability in the forms of cyclic gestures and spoken meanings with which they are expressed (as observable in the three examples in Figure 2) is the result of cyclic gestures being used in different gestural and multimodal (gesture-speech) expressions. Ultimately, the findings from this dissertation on cyclic gestures suggest that we should be thinking about gestures as constructions. As such, it becomes necessary to identify the meaningful components in gestural expressions and to examine the semantic relationships between those components and the composite gestural expressions into which they integrate. In order to better understand the functional properties of composite gestural expressions one has to examine them in the context of the multimodal expressions in which they are used. In examining these relationships, one can better understand how meaning is integrated across modalities in language use.

1.4 Structure of the Dissertation

The following chapter discusses existing research on co-speech gestures. It begins by introducing the most prevalent theories that have been proposed (based upon psycholinguistic evidence) to account for why people gesture when they speak. It then presents psycholinguistic research that explores cognitive-functional motivations for the variable frequency with which speakers produce manual gestures with speech. The chapter also discusses research that examines whether co-speech gestures are intended to be communicative. These topics are important to this work because the primary proposition that underlies this research is that gestures contribute to meaning in language. It is therefore necessary to discuss experimental evidence to support this claim. Chapter 2 further provides a review the primary categorization schemes that have been used to
describe gestural meanings and notes some of the limitations to those categories that the current research begins to address. Existing research on cyclic gestures is also discussed in this chapter.

Chapter 3 provides a detailed description of the methods used to study cyclic gestures. This includes a description of the operational procedures used to code formal properties of the gestures. It also describes the categories and operational definitions used to code the functional-semantic properties of spoken language expressions. These methods are presented in detail for the purposes of transparency and replicability.

Chapter 4 presents the study of cyclic gesture use in English. The first part of the study describes semantic-functional properties and specific constructions with which cyclic gestures were found to be repeatedly co-expressed. The second part of the study presents statistically significant patterns found in the mapping between formal properties of the gesture and functional-semantic properties in speech. It also identifies similarities and differences in the distribution of different formal properties across meanings expressed in speech using cluster analysis.

Chapter 5 introduces a cognitive-semantic framework that treats co-speech gestures as having the potential to be symbolically complex expressions. The central tenet of this chapter is that meaningful components in the gestural channel can be simultaneously integrated as complex gestural expressions that interact with meanings in speech in the form of multimodal expressions. These complex gestural and multimodal composite expressions take on new meanings related to but not derivable from the general meanings of the components that comprise them. I posit that different formal parameters (e.g., handshape and movement) in gesture are available for the expression of meaning. Different gestural features or “slots” offer different affordances in terms of the categories of meanings they are best suited to express. I illustrate how this framework can be applied to the study of multimodal expressions using an example of a construction that I describe as the Joint Action Construction in English. 10 This chapter challenges the view that gestures are holistic structures that cannot be broken down into meaningful components.

10 I extend the convention of capitalizing language-specific spoken language constructions to English gestural constructions that I propose in this work.
In Chapter 6, I draw on patterns found in the study on cyclic gesture use in English (Chapter 4) to propose a schematized meaning for cyclic gestures and discuss some of the ways that meaning is extended to different functions. I apply the framework that is described in Chapter 5 to the analysis of two symbolically complex types of gestural expressions that incorporate cyclic movements. In these analyses, I examine relationships between component gestural meanings and the meanings of the composite gestural expressions with which they participate. Drawing upon examples from the data, this chapter demonstrates how cyclic gestures are specifically integrated with other meaningful structures in gesture and how these composite gestural expressions are integrated in multimodal expressions.
2 Why We Gesture, When We Gesture, and How Gestures Mean

2.1 Introduction

Interpreting meaning expressed in language use is a particularly complex process because it not only requires that one take into account the multitude of perspectives a speaker can adopt toward particular states of affairs relevant to the discourse but also how those perspectives interact within a particular context. Language does not merely involve abstract cognitive-psychological phenomenon. Language is inherently a social activity. It involves two or more participants who have particular intentions and communicative goals for the interaction “engaging in a joint action” (Croft, 2009). Interlocutors execute various types of meaningful behaviors (both collaboratively and autonomously) “to accomplish the social processes they have set out to accomplish” (Clark, 1992). As the current research explores interactions between meaningful behaviors expressed gesturally and those expressed through speech, it is necessary to discuss existing research that has examined the role of co-speech gestures in language.

The purpose of this chapter is to situate the study presented in this dissertation within the broader domain of co-speech gesture research. Specifically, this chapter covers existing scholarship on gesture in order to (1) provide empirical evidence to support the claim that gestural expressions are part of utterances and should be studied alongside language, (2) describe approaches that have traditionally been used to study the meaning of gestures, including cyclic gestures, and (3) identify limitations to previous categories used to describe the meaning of gestures.

2.2 Cognitive Motivations for Co-speech Gesture Occurrence

The position taken in this study is that gestures are meaningful expressions that are integrated, often in systematic ways, with the meaningful expressions in spoken language (as multimodal expressions). What evidence is there to suggest that speech and gesture are co-collaborators in the expression of conceptually unified meanings? No one would
argue that gesture and speech co-occur. That fact can be directly observed. However, just because they are simultaneously performed does not necessarily mean that they are both contributing to linguistic meaning. To find support in favor of studying language as a multimodal phenomenon, one can turn to theories and research exploring reasons why speech and gesture are used together in interaction.

A number of theories have proposed cognitive motivations to account for the co-occurrence of gestures with speech (Goldin-Meadow, 2005; Hostetter & Alibali, 2008; Kita & Özyürek, 2003; Krauss et al., 2000; McNeill, 1992; de Ruiter, 2000). These theories have grown out of psychological approaches to the study of cognition and language. Researchers seem to agree that gestures emerge from cognitive representations of spatial information. Theories diverge in the role they posit perception to play in those representations. Some theories propose that the perception of spatial relationships drive the expression of gestures, while others argue that stored simplex spatial images that lack any structured relationships across images are the source of gestures (see Hostetter & Alibali, 2008, pp. 507-508 for a comparison of theories). There is also a lack of agreement concerning whether speech and gesture are understood to form an integrated system or separate systems.

The earliest of the modern theories accounting for the occurrence of gesture with speech is McNeill’s (1992) growth point theory (further developed in McNeill, 2000a; McNeill & Duncan, 2000). McNeill notes that growth point theory is greatly influenced by Vygotsky’s work on consciousness and thought (p. 219). A growth point is considered to be the conceptual origin of an utterance (the minimal unit) “out of which a dynamic process of utterance-level and discourse-level organization emerges” (McNeill, Duncan, Cole, Gallagher, & Bertenthal, 2008). McNeill’s theory posits that growth points include both holistic-imagistic properties as well as discrete-analytic properties (p. 220). McNeill argues that these seemingly conflicting characteristics of thought, holistic-imagistic and analytic-componential, are manifested in utterances as gesture and language, respectively (McNeill, 1992, pp. 219-221). In growth point theory, gesture and language are understood as being unified within the same system of conceptualization. The imagistic conception in the growth point is unique from the analytic componential conception in that it is grounded in visual perception. However, McNeill suggests that the actual
cognitive processes leading to the physical (i.e., gestural) manifestation of those images are the same as the processes leading to the expression of spoken language.

Other frameworks argue that gesture and speech interact with one another, either during conceptualization (Kita & Özyürek, 2003; de Ruiter, 2000) or production (Krauss et al. 2000), but represent separate systems. Indirect evidence of a two-system theory comes from mismatches in gesture and speech. Gesture-speech mismatches refer to cases in which the meanings expressed in gesture are different from those expressed in the co-occurring speech. For example, Kita and Özyürek (2003) examined the gestures speakers of English, Japanese, and Turkish used during the retelling of a cartoon storyline (after watching a video of the cartoon). In construing the same event in the cartoon, speakers of all three languages were found to encode lateral directional event structure information in their gestures that they didn't express in speech. Kita and Özyürek interpret this convergence in gesture use and meaning across typologically distinct languages as support for the argument that the spatial, imagistic source of gestures are driven by mechanisms outside of the domain of language. However, they also observed language-specific variation in the expression of other aspects of event structure in the speakers’ gestures, which were influenced by the way a speaker’s particular language encoded manner and path (p. 21). Kita and Özyürek interpret language-specific variation in participants’ gestures as evidence that the different mechanisms that drive the production of gesture and language closely interact during conceptualization, contributing to conceptually unified multimodal meanings in language use.

Another leading theory that has been proposed to account for the relationship between gesture and speech is called the Gesture as Simulated Action (GSA) framework (Hostetter & Alibali, 2008, 2010). The GSA framework posits a single system for gesture and language and argues that both modes are grounded in perception and action. Hostetter & Alibali argue that speakers simulate the performance and perception of actions as they are using language. This idea of simulation, which is the central to embodied approaches to cognition, is defined as “a re-creation of the neural states involved in performing or witnessing a particular action” (Hostetter & Alibali 2010, p. 245). This contrasts with growth point theory, which suggests that gesture but not language has its source in visual perception. However, growth point theory was
developed nearly two decades before GSA. Much work on embodied cognition, simulation theory, and the neural theory of language has been advanced since McNeill’s growth point theory was introduced (see Gibbs, 2006). Cognitive processes involved in language use (e.g., inferential abilities) are argued to rely on the same neural activations as action and perception (Gallese & Lakoff, 2005). One piece of evidence to support the theory that language involves the simulation of physical actions comes from activation in the motor cortex that is observed when processing language (Gallese, 2007 for a review).

The GSA framework suggests that if simulation activation exceeds a particular threshold, the simulated action will result in an actual action, specifically a hand gesture. Language-specific conventions are argued to impact the simulation and thus the form and meaning of the gesture. For instance, in Kita & Özyürek’s (2003) crosslinguistic study on the multimodal expression of path and manner (described in the previous paragraph), the variation in how participants expressed path and manner information in gesture would be taken as evidence for different simulations of path and manner under the GSA framework. These different simulations are shaped by the way a language conventionally encodes those types of meanings. The GSA model argues in favor of a single system because both gesture and language are considered to emerge from the same simulation (p. 509). Gesture-speech mismatches are not interpreted as indicating separate sources of conceptualization under this approach. Instead the two modalities are viewed as working together to profile different properties of the simulated event, with each modality offering different affordances.

In the current research, the analysis of meanings in multimodal expressions are informed by and most closely align with McNeill and Duncan’s growth point theory and Hostetter & Alibali’s GSA framework (see chapters 3 and 4 for a description of the framework and methods used in this research). Language and gesture are understood to be united within a single (domain general) cognitive system and reflective of a shared conceptualization. This study doesn’t address simulation-based theories of language and cognition but it recognizes that there is a good deal of evidence to suggest that simulated action plays an important role in many areas of cognition that interact with language. Language processing and production involves general cognitive abilities that are important in other domains of knowledge not specific to language, such as memory,
attention, and inference. Gesture, being simultaneously expressed with language as part of a single message, is expected to rely on many of the general cognitive abilities that language does.

One can also look at gesture and speech as different forms of action that we perceive of as being meaningful to particular communicative goals (Holle & Gunter, 2007). As language users, “we effortlessly integrate them (gesture and speech)” and we understand them to be “relating to one overall idea” (Enfield, 2009). Meaning in interaction is created through action (Glenberg, 1997, 2007). These meaningful actions interact with and are simultaneously constrained by the affordances each mode (of action) offers in relation to the interlocutors’ goals and past experiences with those actions (Glenberg, 1997). Glenberg and Kaschak (2002) capture this perspective using the analogy of someone who wants to change a lightbulb (i.e., the person’s goal). The person recognizes the different affordances offered by their body, a chair, and a new lightbulb and the person “meshes” those affordances into action to accomplish their goal. This idea can be extended to account for multimodality in language. People recognize, based on past experiences of perceiving and acting with our body in the physical world, that speech and gesture offer different affordances as distinct symbolic modes. Speech and gesture are integrated into a unified action that aligns with the situational context and a person’s interactional goals.

Some might question that if gesture meanings are integrated with speech in multimodal utterances, as is argued in this dissertation, why are they only present some of the time? Why don’t we always make use of the unique affordances offered by gesture in language use?

2.3 Factors Influencing Co-speech Gesture Rate

As hand gestures are not invariably performed during spoken language use, it is reasonable to question the factors that drive the expression of gestures when they do occur. What determines whether or not people use hand gestures on a given occasion? Research suggests that the expression of gestures is motivated by a number of factors, such as cognitive constraints (both general and specific to individuals), the nature of the content being expressed, and context of the usage event.
Despite requiring greater motoric effort and coordination to produce than speech alone, hand gestures seem to help reduce the cognitive load imposed on the working memory while speaking. Cook, Yip & Goldin-Meadow (2012) performed a study in which participants explained math problems while listening to a list of items being read to them. Participants who were instructed to use gestures in meaningful ways while explaining the problems remembered more items from the list than those participants who were instructed not to gesture or were instructed to make contextually meaningless gestures throughout the task. Rate of gesturing has also been found to increase when people are engaged in cognitively taxing activities (Goldin-Meadow et al., 2001). Morsella & Krauss (2004) found that hand gesture frequency increased when speakers had to describe content that was more difficult to encode in language. When asked to describe a series of images, speakers used significantly fewer gestures in describing shapes that resembled concrete, familiar entities, such as flowers and clocks, than when describing unfamiliar visual-spatial patterns that weren’t associated with specific lexical terms. When the visual stimuli were removed from a speaker’s environment during the description of the shapes, the speaker’s rate of gesturing was higher than when the stimuli were present. These studies suggest that gestures might be more frequent when communicative tasks are cognitively demanding and suggest that gesturing can help to offload some of the demands placed on the working memory during language use.

There is also research to suggest that gestures occur at a relatively frequent rate with certain types of metaphoric linguistic expressions (Stickles, 2016a; Zima, 2014). Similarly to both performing actions and thinking about literal actions, thinking about actions metaphorically activates the neural premotor cortex (Desai, Binder, Conant, Mano, & Seidenberg, 2011). Because metaphorical thinking has the potential to be cognitively more demanding, Stickles notes that it has the potential to increase the “amount of simulated action in our thinking” and suggests that we should expect to see more gestures with metaphorical language (p. 159). This might not be true for all types of metaphors though. Stickles cautions that an increased cognitive load is not expected for highly conventional metaphors because there is less activation in the premotor cortex for these types of metaphors. Conventional metaphors show differences from novel
metaphors in terms of the region of the brain that is activated during processing (Schmidt, DeBuse, & Seger, 2007).

In addition to contextually driven cognitive demands interacting with use of gesture, studies have also examined how individual differences in cognitive skills impact rate of gesturing. Hostetter and Alibali (2007) found that differences in the rate at which speakers produced gestures are correlated with how participants performed on tests measuring spatial and verbal skills. The study specifically examined the rate of hand gestures that encoded meanings related to the substantive content expressed in speech (called representational gestures). Participants with low performance on tests that measured spatial visualization skills gestured at a lower rate than those who had higher scores on the spatial tests. On the other end of the spectrum, the highest rate of gesturing was found in participants with low performance on certain verbal skills tests and high performance on spatial tests. This suggests that individual abilities in different cognitive domains can influence how frequently speakers use representational hand gestures. Hostetter and Alibali (2008) have further suggested that strength of neural connections between different motor regions of the brain, which can be influenced by genetic or experiential factors, could account for individual differences in use of hand gestures (p. 504).

The specific type of content encoded by speech as well as situational context can also influence the rate at which speakers use co-speech gestures. High rates of gesturing have been observed when spatial information is co-expressed in the speech (Morsella and Krauss, 2005; Rauscher, Krauss, & Chen, 1996). Hostetter and Alibali (2010) found that participants in their study gestured at a higher rate when describing shapes they had physically created with wooden pieces than with content they had only perceived visually on a computer monitor. However, participants in both conditions frequently used hand gestures (at a rate higher than was predicted) in their descriptions of the patterns. This study, similar to Hostetter and Alibali’s (2007) experiment (previously discussed), was interested in representational gestures that depicted physical properties of the shapes (as opposed to gestures used for interactional meanings). Hostetter and Alibali’s work suggests that both action involving spatial relationships and perception of spatial
relationships (i.e., actual action and simulated action) can increase the rate at which speakers’ use some types of gestures.

The findings of Kok’s (2017) study also suggests spatial relationships play in the use of gestures with speech. In looking at gesture use in German using data collected from direction-giving experiments, Kok examined the relationship between different lemmas and the likelihood that a hand gesture would co-occur with them (pp. 149-156). Kok was interested in the occurrence of any type of hand gesture, not just those serving representational meanings. The lemmas most likely to co-occur with gestures, what Kok calls “gesture attracting” lemmas, were those serving locational and demonstrative functions. Both of those categories of words are important in expressing spatial information.

Other research suggests that information status can impact the frequency of certain kinds of gestures. In examining one teacher’s use of gesture with their students, Alibali and Nathan (2007) found the instructor used gestures connecting abstract information to the physical world (such as through pointing or representing properties of objects and actions) at a higher rate when presenting new content and when answering student’s questions. This suggests that when speakers believe the information they are expressing is not accessible to the addressee, they use certain types of gestures to supplement content expressed in speech.

Whether or not a speaker uses gesture with speech and the rate at which a speaker gestures are influenced by a variety of factors, such as cognitive constraints on memory, an individual’s neural architecture, linguistic content, and interactional factors. The current study does not include a measurement of cyclic gesture rate across speakers nor does it look at how different variables might impact the frequency with which speakers use cyclic gestures. It does, however, complement existing research by identifying functional-semantic linguistic variables that are associated with the use of gestures (specifically, cyclic gestures) in conversational data. Based on the research described in this section, it could be predicted that if cyclic gestures are used for representational functions that depict properties of events, they will frequently be co-expressed with the description of motion events (particularly motion events that the speaker has performed or observed). However, this study uses talk show data, while previous research studies
exploring variables correlated with the use of gesture have been performed in highly controlled experimental settings or in specialized contexts of language use (e.g., classroom learning). Because the type of talk and interactional goals in talk shows is different from those in classroom and experimental settings, the linguistic and situational variables interacting with the occurrence of gestures are expected to vary.

The dissertation aims to gain a better understanding of the role cyclic gestures contribute to linguistic meaning. It is assumed that whenever cyclics are used in language use, they are there, in part, because they are participating in the construal of meaning within a particular context for a particular purpose (see §3.3.). This doesn’t preclude cyclic gesture use from interacting with other aspects of cognition that aren't specific to language, such as the working memory. From a usage-based perspective, language use is always interacting with and constrained by domain-general cognitive processes. Still, some have argued that gestures primarily function for language planning and production and that the communicative functions are secondary or absent much of the time (Krauss et al., 2000, p. 274). If gestures are a part of linguistic meaning, then we should expect to find evidence that speakers design their gestures for addressees.

2.4 Do Co-speech Gestures Benefit Speakers or Addressees?

There is disagreement among researchers as to whether gestures occurring with speech primarily benefit speakers or to the addressees. As suggested by research discussed in the previous section, the use of hand gestures does benefit speakers by aiding in the cognitive load demanded by the working memory during language use and might assist in lexical retrieval. Further evidence that gestures fundamentally benefit speakers comes from the fact that people gesture even when they can’t see their interlocutor, such as when they are on the telephone (Bavelas et al., 2008). However, de Ruiter (1998) argues that just because people gesture when their bodies are not visible to their interlocutor doesn’t conflict with the claim that gestures are communicative and meaningful. De Ruiter suggests that perhaps gesture is so integrated into language use that people “simply cannot suppress it” (p. 18). Still, congenitally blind people who have never visually observed the gestures of others, use gestures while speaking (Iverson and
Goldin-Meadow, 1998), which can be interpreted as supporting a speaker-oriented view of the reason gestures are used with speech.

Gestures have been found to benefit speakers by facilitating learning. Research suggests that when children use gestures in the context of learning, it can help them to access tacit knowledge that can assist them in developing new understandings about abstract concepts (Broaders, Cook, Mitchell, & Goldin-Meadow, 2007). Cartmill, Hunsicker & Goldin-Meadow (2014) found that the age at which children first acquired determiner-noun constructions in English was predicted by the age that children began using multimodal expressions that include a pointing gesture to a physically present object followed by a verbalized nominal in speech. As children began using determiner-noun constructions in speech, their point-noun constructions decreased. Cartmill et al. suggest that children are not expressing redundant meanings when they both point to objects using gesture and then name the objects in speech. The pointing gesture is argued instead to function as a gestural determiner, which might help children to develop a richer understanding of the functions of determiners before they use them in speech.

Other research emphasizes the benefit that gesturing has for the addressee. Valenzeno, Alibali, and Klatzky (2003) found that children who received instruction using resources from both gesture and speech (co-expressed) performed better on post-tests than students who were instructed with speech alone. Speakers also seem to recognize that gestures benefit addressees, as speakers’ gestural behavior changes according to variables in the situational context. For example, speakers have been found to use more gestures when talking to attentive listeners than to distracted listeners (Jacobs and Garnham, 2007). Even though people use gestures when they are not visible to their addressees, the forms and functions of the gestures vary from those speakers use during face-to-face interactions. For instance, gestures have been found to be larger in size, more likely to communicate content not included in speech and communicate meanings that index the interaction when speakers are communicating face-to-face (Bavelas et al, 2008). Research has also shown that speakers of English change their use of gesture space when representing the starting and endpoints of motion events depending on where their interlocutors are sitting in relation to them (Lewis & Stickles, 2017; Özyürek, 2002).
In addition to the evidence that speakers recognize that their gestures benefit addressees and adapt their gesture behavior accordingly, there is lots of evidence to suggest that addressees assign meaning to gestures, regardless of whether the gestures were intended to be communicative. Evidence of this can be observed in the fact that recurrently used co-speech gesture forms serve similar functions across usage events within a speech community (discussed in §2.5.3), pointing to processes in interaction that lead to conventionalization. Furthermore, co-speech gestures used by hearing people are argued to be one of the direct sources for signs (both lexical and grammatical) in signed languages (Wilcox, 2004a). This suggests that there must be patterns to the communicative contexts in which speakers use gestures that deaf people have interpreted as being meaningful. Of course in signed languages, these gestural sources lexicalize and grammaticalize into fully conventionalized signs and grammatical markers that function in ways that are distinct from the gestural source.

In the current study, co-speech gestures are recognized as being multifunctional in that they benefit both speakers in planning and producing meaningful utterances and addressees in processing and assigning meaning to (or categorizing) speakers’ messages. What is important to this study is not whether gestures are always intended to be communicative but that people use gestures in patterned ways with speech. This indicates that addressees make inferences about the gestures other speakers use, assign meanings to them, and adopt similar practices in the way they use gestures in their own production. Before discussing some of the patterns that have been identified in how speakers use particular gesture forms across usage events, I first describe the categories that linguists have developed to classify different properties of co-speech gestures.

2.5 Classification of Co-speech Gestures

Co-speech gestures have traditionally been broadly categorized into typologies based upon various formal and functional properties that span across several dimensions. Table 1 illustrates the criteria most frequently used to group co-speech manual gestures into types. Most commonly, gesture classifications are based upon how a gesture relates to different dimensions of meaning. Gestures can evoke meanings related to an utterance’s conceptual content (i.e., substantive meanings associated with traditional parts of speech).
Gestures can also serve discourse-interactional functions, such as marking salient roles in discourse structure (e.g., topic or focus) or signaling speech act or stance-related meanings that are not lexically expressed in the spoken utterance. For gestures that evoke conceptual content, further distinctions have been proposed to identify different strategies used for representation of that content (e.g., depictive strategies).

Another way that gestures are categorized into types is based upon the recurrence of a particular formal property that is used in broadly similar contexts. Gesture forms with form-function mappings that are more conventional are given a label, usually based upon the form of the gesture. The cyclic gesture is an example of a grouping based on form-function recurrence. However, how best to determine the degree of conventionalization in co-speech gestures is an area that has not been well explored (Kok & Cienki, 2016).

Table 1: Criteria used in gesture typologies

<table>
<thead>
<tr>
<th>Dimension of meaning</th>
<th>Conventionality/Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the gesture express meanings related to conceptual content, the structuring of information, or to interactional functions (e.g., turn-taking)?</td>
<td>Mode of representation&lt;br&gt;IF a gesture’s meaning relates to conceptual content, how is that meaning represented in the gesture?&lt;br&gt;To what degree is a gesture conventional within a speech community?&lt;br&gt;Symmetric relationship&lt;br&gt;This criterion identifies more specific classifications of gestures that are associated with a higher degree of conventionalization (called “gesture families”).</td>
</tr>
</tbody>
</table>

Kendon (2004) stresses that a single typology for gestures is neither practical nor possible given the multidimensional nature of gesture meaning and the multidisciplinary tendency of gesture research (p. 107). In the following section, I review a few of the most frequently used classifications schemes for gesture, which will be referenced throughout this dissertation (for a comprehensive description of gesture typologies see Kendon, 2004, pp. 88-104).
2.5.1 Dimensions of gesture meaning

One classification that has frequently been adopted for co-speech gesture research was first introduced in McNeill (1992, pp. 12-18). Within this grouping, McNeill distinguishes four primary categories of co-speech gestures: *iconic*, *metaphoric*, *beat*, and *deictic* gestures. Table 2 shows the relationship these four gesture types have to two other functional distinctions that McNeill proposes (discussed in more detail below). The columns in the table are organized by the relationship each type has to the conceptual or propositional content expressed in the speech. The rows are organized according to whether the gesture’s referent is something that is tangible and visually perceptible or whether it corresponds to abstract ideas or meanings. McNeill (2008) notes that he first presented the gesture typology as categorical groupings but later reformed this view, instead suggesting that the groupings (iconic, metaphoric, beat, deictic) are reflective of different dimensions of meaning (drawing on ideas originally discussed in Duncan, McNeill, & McCullough, 1995). Arguments that symbolic properties of gestures are multidimensional rather than discrete and categorical come from the fact that a single gesture often corresponds to multiple groupings: deictic, iconic, metaphoric, and beat (p. 41).

Table 2: McNeill (1992) gesture classifications

<table>
<thead>
<tr>
<th></th>
<th>imagistic (representational)</th>
<th>non-imagistic (non-representational)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>concrete</strong></td>
<td>iconics</td>
<td>deictics-prototypical pointing (pointing to something physically present)</td>
</tr>
<tr>
<td>(iconic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>abstract</strong></td>
<td>metaphors</td>
<td>deictics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>beats</td>
</tr>
</tbody>
</table>

Iconic and metaphoric gestures are subsumed under a broader grouping called *imagistic* gestures. Imagistic gestures depict, represent, or display characteristics of objects, actions, or movement patterns (McNeill, 1992, pp. 78). Iconic and metaphoric
gestures differ as to whether the domain in which the conceptual content that the gestures represent serves a literal purpose or is used to access another (target) domain through metaphor. Iconic gestures depict or represent properties of concrete objects or physical properties of events expressed in the spoken language. There is a “degree of isomorphism” between the form of the iconic gesture and the semantic content that it is used to represent (Kita, 2000, p. 162). A constructed example of an iconic gesture would be someone talking about chopping vegetables while repeatedly making small up and down movements with a flat open hand that has a palm orientation positioned toward the body. This example would be considered iconic because the flat handshape with a vertical palm represents properties of the cutting instrument and the movement represents properties of the act of chopping vegetables.

McNeill makes a distinction between metaphoric gestures and iconic gestures on the basis of concreteness. Iconic gestures depict tangible entities while metaphoric gestures represent abstract meanings, such as ideas and mental processes (p. 14). Others have clarified that metaphoric gestures display iconicity in their forms, as they represent actual properties of tangible entities or actions (Stickles, 2016; Sweetser, 1998). A gesture is metaphoric if the real-world physical properties (i.e., the image-schematic properties) that are represented iconically in the gesture’s form “refer to elements in the source domain of a conceptual metaphor” (Stickles, 2016, p. 16). In these cases, a gesture’s meaning is extended to a more abstract target domain. An example of a metaphoric gesture involving the cyclic gesture, which is taken from the data collected for this dissertation, is shown in Figure 3. Note that the spoken expression is not metaphoric.

Figure 3: Metaphorical use of a cyclic gesture

It [IS a proc]ess.
In this example, Whoopi Goldberg is pointing out some of the furniture upgrades that have been done to the set of the talk show she co-hosts (The View). Goldberg characterizes the changes being made to the set as being “a process” while performing a cyclic movement gesture. In an earlier turn Goldberg remarks that the set “is better than in was” but “not yet where it will be,” suggesting that she views the ongoing (physical) cosmetic changes to the set as a sign of continuous progress. The cyclic gesture in this multimodal expression can be seen as evoking the metaphor CONTINUOUS PROGRESS IS CONTINUOUS MOTION (see Stickles, 2016 pp. 145-152 for further details on the gestural use of this metaphor). The continuous (repeated) circular movement displayed in the form of the gesture iconically represents components in the source domain of motion while the meaning of the gesture involves a metaphorical extension of motion to the more abstract domain of progress.

Unlike imagistic gestures, gestures of the non-imagistic type do not represent conceptual content, rather they index conceptual or discursive meanings indirectly. Beat gestures and decitic gestures are grouped as non-imagistic. Beats interact with temporal, prosodic structures in the corresponding spoken language, acting as a gestural “highlighter” to mark saliency in speech (McNeill, 1992, p. 169). Unlike iconic and metaphoric type gestures, which are grouped exclusively by (broadly) shared functional properties, beats are further characterized by a shared property of form, specifically, an up and down manner of movement.

Deictic gestures index objects, actions or locations that are either physically present in the interactional setting or non-present, abstract entities and events. Deictic gestures that direct attention to physically present entities are typically called ‘points.’ Points are not limited to a specific form, such as handshape (e.g., the canonical extended index finger used in pointing) and can be expressed non-manually (as noted in Chapter 1). Adding further complexity to these gesture types, deictic gestures that index non-present entities (or those meanings construed as entities) as well as beat gestures are included in a

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11 In the turn that immediately precedes Goldberg’s utterance, co-host, Rosie O’Donnell, who is not visible due to the angle of the camera, initially describes the physical changes to the set as “a process,” Goldberg is then agreeing with O’Donnell’s observation. This is why the contrastive stress (denoted by the capitalized letters) occurs on the BE verb.
more general group called abstract gestures (McNeill, 1992, pp. 168-171). Abstract gestures are those that express meanings related to intangible concepts and experiences. Metaphoric gestures are also part of the abstract grouping of gestures. Contrastively, iconic gestures and prototypical pointing gestures (indexing physically present entities) are classified as concrete and iconic. McNeill describes the inclusion of prototypical deictic points in the broader classification of iconic gestures because they make iconic use of space (p. 173).

Cohesive gestures are another category of gestures that McNeill proposed. Cohesive gestures coordinate with discourse structure, connecting “thematicallly related but temporally separated parts of the discourse” (McNeill, 1992, p. 16). These gestures were later renamed catchments (McNeill, 2000a; McNeill et al., 2001). Any of the four gesture categories described above can serve cohesive function. The central formal characteristic of catchments is the repetition of some component of the gesture’s form (e.g., repeated movement). McNeill argues that repetition iconically reflects continuity in the discourse. Iterated beat gestures would typically be categorized as catchments as they add emphasis to schematic semantic roles across utterances (such as highlighting different types of topic and focus roles) that share functional relationships with one another. Cohesion can also be signaled with a gesture hold, which is a static phase in the gestural performance. McNeill provides an example of a gesture hold serving a cohesive function (pp. 177-178).

In McNeill’s example, a speaker is retelling the series of events he observed in a scene of a video. Throughout the entire scene in the video the speaker watched, one of the characters is holding a newspaper. When the speaker is retelling events from the video scene, he makes a handshape that resembles someone holding a newspaper with his right hand. The speaker holds the handshape over a sequence of topically related clauses. As the right hand maintains the gesture hold, the other hand is dynamic, continually moving to produce different imagistic gestures that relate to the propositional meanings expressed in speech. McNeill analyzes the gesture hold as functioning to show discourse cohesion across different subevents that are revealed across successive clauses in the retelling of the video.
While McNeill makes a two-way distinction to reflect the relationship a gesture has to different dimensions of linguistic meaning (i.e., imagistic and non-imagistic), Müller (1998) makes a three-way distinction. The three categories Müller describes are *referential gestures*, *discourse gestures*, and *performative gestures* (as cited in Cienki, 2008). These groupings roughly correspond to distinctions regarding whether the gesture meanings are most closely tied to propositional content, information structure, or speech act functions. Müller’s referential category is comparable to McNeill’s imagistic grouping except that it also includes deictic gestures. Referential gestures represent, depict, or index conceptual content. Discourse gestures include beats and other gestures that express meanings that interact with information structure. Performative gestures are associated with meanings related to speech act functions (e.g., requesting a response from an interlocutor) and turn-taking. The Palm-Up-Open-Hand gesture (PUOH) when the arm is extended out in front of the speaker (toward the addressee) is used for the performative function of making requests (Müller, 2004). Kendon (2004) combines Müller’s performative and discourse gestures groupings under a broader category of *pragmatic* gestures to reflect that gestures that fall within these types convey meanings outside of the ideational content evoke by the speech (pp. 158-159). Table 3 shows the co-speech gesture classifications adopted by Kendon (2004) and Müller (1998).

<table>
<thead>
<tr>
<th>Kendon (2004)</th>
<th>referential</th>
<th>pragmatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Müller (1998)</td>
<td>referential</td>
<td>discourse</td>
</tr>
<tr>
<td>gestures that represent, depict, or indexes conceptual content</td>
<td>gestures that mark elements of information structure</td>
<td>gestures that serve speech act functions</td>
</tr>
</tbody>
</table>

There is a general trend across gesture groupings to separate gestures that represent substantive lexical content from those that serve more schematic, discursive functions. As noted at the start of this section, McNeill and other researchers recognize that a single gesture can simultaneously express meanings that fall into different groupings. Kendon
(2004, p. 224) also notes that a particular gesture can fall into any of these categories depending on how it is used in context. This is, of course not unlike the rest of language. A linguistic unit can encode propositional content as well as index higher-level interactional meanings depending on the context in which it is used. For example, a preposed use of I think can function in English to profile a literal thinking event or to signal that what follows is an assessment made by the speaker (Aijmer, 1997). A gesture might encode a more specific, word or phrase-like meaning related to the content of the speech (e.g., representing an action) while at the same time serving an interactional function (e.g., marking cohesion or speaker stance). If different meanings are co-expressed (e.g., iconic gesture with a beat), the dimensions are not expected to be equally as salient (McNeill, 2008). While McNeill recognizes that there can be multiple meanings expressed in a single gesture, he does not see gestures as being symbolically compositional. That is, he doesn’t view gestures as incorporating conventional (or at least conventional to some degree) component structures that contribute to the holistic meaning of the gestural construction.

2.5.2 Mode of representation

Special sub-category groupings have been proposed for representational-imagistic gestures based upon how a gesture depicts or represents conceptual meanings (Müller, 1998, 2004; Streeck, 2008). Müller (2014a) calls these groupings modes of representation. These include the categories of acting, molding, tracing, and representing. In this section, I use examples that I have collected from talk show data to show specific instances of these categories with the hope of reifying them for the reader. While I do include some contextual information in order to illustrate how each example represents a different mode of representation, the examples are not intended to be analyzed in great detail in this chapter. There is further discussion about the modes of representation as they relate to cyclic gestures in §6.3.

In the acting mode, gestures made with the hands reflect actual actions of the hands, as shown in Figure 4. This example shows actor Thomas Haden Church describing how he trained in order to learn to ride a bull for a movie. Someone would yank ropes attached to a tire while he tried to stay balanced on the tire. In gesture, the movement depicts the
action of yanking ropes while the handshapes iconically represent hands holding ropes. In this enactment, Church’s gesture represents an actual physical activity that he had performed using the hands (and arms).

Figure 4: Acting mode of representation

they start you off (0.5) on TIRES (0.25) [that they YANK with ropes, and that k]ind of [acting mode] gives you the rudimentary (H) I’m really going to bust my ass

In the molding representational mode, the hands depict the act of touching or grasping an entity (Muller, 1998 p. 140 via Streeck, 2008, p. 294). In Figure 5, actor Ryan Gosling performs a molding gesture. His depiction resembles the grasping or holding of an entity. The specific entity the molding gesture represents is specified by the co-occurring spoken language construction (i.e., the guy that wrapped Gosling in towels). The molding handshape is used during both static (holds) and dynamic (cyclic movement) gesture strokes. This example will be discussed in further detail in Chapter 6.

Figure 5: Molding mode of representation

I turn around and [the guy that (0.2) um (0.25) y’know wrapped me in all |the towels,] *hold* | *cyclic stroke* | *hold* [molding mode] goes ((gestural mimicry))
The *tracing* mode of representation is just as it sounds, it involves tracing paths and outlining the boundaries or shapes of real or imagined entities. In Figure 6, actor Salma Hayek traces a circular region in space with an open hand facing downward to outline an imagined boundary construed as being occupied by a snake that she encountered during an outdoor interview. It is worth mentioning that after the tracing gesture, Hayek then points to a location in the physical environment (denoted with brackets without bolding in Figure 4). She performs a pointing gesture and then a hold with her arm extended outward after the movement phase and uses a construction in speech that calls for her interlocutor to jointly attend to the same location in the ground (“where *that* is”). Interestingly, this example shows two consecutively produced gestural expressions, one representational (i.e., tracing) and one deictic (i.e., point), contribute to the construal of the snake’s location.

![Figure 6: Tracing mode of representation](image)

In the *representing* mode, the hands serve the role of entities. This includes both concrete and abstract entities. In Figure 7, actor Ali Wentworth describes a car accident she experienced earlier in the day. In the gestural expression shown, her hands are used to represent concrete entities, specifically, the car she was driving (right hand) and the car she hit (left hand). Interestingly, the gesture occurs during a break in speech before the spoken construction that predicates that Wentworth (*I*) “got into a car accident.” The preposed gestural expression is possibly used to emphasize the causal link between the
events expressed in the two spoken clauses that immediately precede and follow the gesture (i.e., not knowing where to turn caused me to crash).

Figure 7: Representing mode of representation

I had my rental car, and I was very confused as to where to turn, [representing mode] anyway, I got into a car accident.

In addition to the four modes of representation discussed above, Streeck (2008a) makes further distinctions. He calls this classification scheme “modes of depiction.” Some of Streeck’s categories align with Müller (1998). In other cases, a mode proposed by Streeck divides a mode proposed by Müller into multiple modes. Streeck also identifies depictive modes that Müller does not discuss. Streeck’s identification of additional modes of depiction is likely influenced his microethnographic research on language and gesture use. His research has explored diverse and highly specialized interactional settings, such as communication among auto shop workers (Streeck, 2009). Table 4 describes Streeck’s categories of gesture modes and shows how they compare to Müller’s four groupings.
Table 4: Comparison of Streeck (2008) and Müller (1998) gestural modes

<table>
<thead>
<tr>
<th>Streeck’s categories</th>
<th>Definition of Streeck’s categories</th>
<th>Relationship to Müller’s categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling</td>
<td>“a body part (usually the hand) is used as a token for an object” (p. 292)</td>
<td>Representation</td>
</tr>
<tr>
<td>Bounding</td>
<td>depiction of “extent (size)… literally or figuratively” using “relative positioning of fingers” or hands (p. 292)</td>
<td>not addressed (possibly grouped with molding)</td>
</tr>
<tr>
<td>Scaping</td>
<td>depiction of “domains and terrains” (p. 293)</td>
<td>not addressed</td>
</tr>
<tr>
<td>Making</td>
<td>the hands are molded to bring construed entities “into existence” or depict the shape of an entity “through prehensile positions” (p. 293)</td>
<td>Molding</td>
</tr>
<tr>
<td>Handling and Acting</td>
<td>handling is depiction of a “practical action of a hand” using an instrument (p. 293); acting is depiction of hand actions performed without an instrument (p. 295)</td>
<td>Acting</td>
</tr>
<tr>
<td>Pantomime</td>
<td>imitation of movements made by animate beings (p. 295)</td>
<td>Acting</td>
</tr>
<tr>
<td>Drawing</td>
<td>outlining boundaries and tracing paths in space (p. 293)</td>
<td>Tracing</td>
</tr>
<tr>
<td>Marking</td>
<td>tracing in space for the purpose of modifying properties of virtual objects (p. 294)</td>
<td>Tracing</td>
</tr>
<tr>
<td>Self-Marking</td>
<td>depictions “performed on the surface of the gesturer’s body” (p. 294)</td>
<td>Acting and Tracing</td>
</tr>
<tr>
<td>Abstract Motion</td>
<td>gesture’s motion depicts movement of “entity previously introduced in the discourse” but the hands do not serve to represent the entity (p. 295)</td>
<td>not addressed</td>
</tr>
<tr>
<td>Model-world making</td>
<td>“the building of a model-world through a succession of gestural acts” (p. 294)</td>
<td>Combination of modes(^\text{12})</td>
</tr>
</tbody>
</table>

\(^{12}\text{Streeck notes that while model-world making incorporates other modes, it should be considered a higher-level type of depiction because it develops over time to create a cohesive topography (p. 294).}\)
Depictive modes have been useful in identifying patterns in the ways representational-imagistic gestures are used in microanalytic studies. There is a gap in the literature, however, in exploring how depictive modes interact with specific types of representational gestures, such as the cyclic gesture. For example, what functional differences exist in cyclic gestures used in acting modes of representation versus tracing modes or when compared with cyclic gestures that combine with molding modes? Do they act similarly to distinct construction types in spoken language, packaging particular form-meaning pairings in gesture for particular functions? Are modes of depiction analogous to strategies as understood in typological studies of language? A study included in Kok’s (2016) dissertation suggests this could be the case. Kok found that in German, the tracing representational mode to be used with attributive constructions (pp. 176-182) and property predication (pp. 182-185). There is much work to be done in discovering whether languages use different modes as distinct constructions and whether there are similarities in the functions different modes serve across languages.

### 2.5.3 Conventionality

Another way gestures get classified is based upon how stable to form to meaning mapping is across usage events. Researchers have recognized that gestures that occur with speech behave differently from other types of communicative bodily actions that people use without speech. McNeill (1992) has emphasized that co-speech gestures, gesticulations, are “not fixed” and that they “reveal the idiosyncratic imagery of thought” (p. 1). Kendon (1982) developed a continuum to capture some of the behavioral properties that distinguish co-speech gestures from other types of gestures and from the highly conventionalized signed languages that rely on the gestural modality. The Gesture Continuum, which McNeill originally called “Kendon’s Continuum,” has been revised a number of times (Ladewig, 2014a; McNeill, 1992, 2000b). Table 5 displays an updated version of the continuum and properties associated with each gesture type. This typology of gesture types is based on various broad distributional properties rather than on specific

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Strategies are formal patterns for how certain meanings are conveyed within a language and sometimes across languages.
semantic properties. As you move right across the continuum, the gestures types are considered to share more properties in common with language until you reach signed languages, which are fully expressive linguistic systems.

Table 5: Gesture continuum (expanded from McNeill, 1992)

<table>
<thead>
<tr>
<th></th>
<th>Gesticulation</th>
<th>Pantomime</th>
<th>Emblems</th>
<th>Signed Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech present?</td>
<td>obligatory</td>
<td>never</td>
<td>optional</td>
<td>never</td>
</tr>
<tr>
<td>Phonotactic constraints?</td>
<td>no</td>
<td>no</td>
<td>some</td>
<td>yes</td>
</tr>
<tr>
<td>Conventional?</td>
<td>no</td>
<td>no</td>
<td>to a degree</td>
<td>yes</td>
</tr>
<tr>
<td>Discreteness?</td>
<td>global/synthetic</td>
<td>global/analytic</td>
<td>segmental/synthetic</td>
<td>segmental/analytic</td>
</tr>
</tbody>
</table>

Recurrent Gestures

speech present, recurrent form, conventional to a degree, can be segmental and synthetic

(Ladewig, 2014a, p. 1570)

Gesticulations are co-speech gestures created in-situ and are considered to be highly dependent on meanings expressed in speech. In particular, their forms are not considered to be conventionally associated with particular functions. Pantomime is the gestural mimicry that is meaningful in its own right without the accompaniment of speech. Pantomime is used in theatrical performances, by mimes, and often by stand-up comedians for comedic functions. Emblems (like the ‘okay’ sign or ‘peace sign’) are culturally conventional signs that can replace spoken words, phrases and even clauses depending on the contexts in which they are used. For instance an English speaker could make eye contact with a co-worker across the office and make a thumbs up sign while raising their eyebrows to ask non-verbally, “Is everything okay?”

Recently researchers have suggested that co-speech gestures are often not as idiosyncratic as has been previously argued. That is, McNeill’s characterization of gesticulation as idiosyncratic did not cover all types of co-speech gestures. The term
**recurrent gesture** has been used to describe co-speech gestures that have a relatively fixed relationship between form and meaning (for an overview see Ladewig 2014a). Recurrent gestures are used within speech communities to serve broadly similar communicative functions across tokens of use (Bressem and Müller, 2014a; Ladewig, 2011, 2014b; Müller, 2004). In other words, they have a higher degree of conventionalization in the mapping between form and function. Cyclic gestures, the object of this research, are considered to be a type of recurrent gesture (Ladewig, 2011). Because of the stability in the form-meaning mapping of recurrent gestures, Ladewig (2014a) suggests that a modification should be made to the Gesture Continuum. At the bottom of Table 5, the change is reflected. Recurrent gestures are placed further to the right of the continuum than gesticulation, suggesting they are more conventional and have the potential to combine with other gestures.

Ladewig and Müller use the term *singular gestures* for the gesticulation category of gestures explored by McNeill (1992). Singular gestures are distinguished from recurrent gestures in that they are analyzed as being ad hoc and created on the spot. They are further distinguished from recurrent gestures by the level of meaning with which they interact. Singular gestures have been described as spontaneous creations, which are used co-expressively with a certain speech segment and, as such, are part of the propositional content of an utterance. Recurrent gestures often fulfill performative functions and modify the spoken meanings with which they occur in different ways (Ladewig, 2014a, p. 1562)

This distinction made between singular and recurrent gestures suggests that, for gesture, idiosyncrasies are associated with the expression of semantic content (in the traditional sense of “semantic”) and convention is associated with higher-level discursive functions. This is an unusual observation, given that conventionalization in language doesn’t pertain to particular dimensions of meaning. Conventionalized units at the word level can evoke conceptual content (e.g., ‘dog’). Symbolically more complex and schematic constructions are also conventional. For example, consider the *be like QUOTATIVE* construction. It can express conceptual content (a speaking event) and interactional meanings (e.g., display of speaker’s epistemic stance). Emblems also pose a problem for the proposal that less conventional gestures express substantive semantic
content. Emblems are highly conventional gestures (more conventional than recurrent gestures) and they can express substantive, propositional content (e.g., the ‘thumbs up’ emblem used in response to the question, How have you been?).

I suggest that co-speech gestures are never fully idiosyncratic. If we examine a gesture as a (potentially) symbolically complex expression, we have the possibility of identifying more fixed and variable elements in the expression. Gestural expressions, like linguistic constructions can vary in their degree of schematicity (as I will show in Chapter 6). Apparent idiosyncrasies in gesture are likely the result of the variable nature of construal and not a specific property associated with the gestural modality.

2.5.4 Gesture Families

More conventionalized co-speech gestures, recurrent gestures, are often described in terms of gesture families. Gesture families are groupings of gestures that share at least one articulatory feature, such as handshape, movement or palm orientation that remains stable across contexts of use (Kendon, 2004). Ladewig (2014a) calls the defining articulatory property of recurrent gestures “the formational core.” Gestures included within the same family are analyzed as sharing a "semantic theme" (Kendon, 2004, p. 227) or "semantic core" (Ladewig, 2011) that can be abstracted from different uses. The forms of gestures are understood to come from actual actions in the physical world and those actions are thought to motivate the semantic core of the family. Aside from the property associated with the formational core of a gesture family, other formal characteristics of recurrent gestures vary. Gestures within the same family that are associated with some differences in form and that correspond to distinct contexts of use are treated as different variants of the same gesture family.

One of the gesture families that has received the most attention in research is the Open Hand Supine or Palm Up Open Hand (PUOH) family of gestures (Kendon, 2004, pp. 264-280; Müller, 2004). This gesture family is formally characterized by a particular handshape, one in which the hand is open and facing upwards. The broadly shared semantic theme across this family of gestures is suggested to involve a meaning of transfer (of something), which can be construed either as some type of “offering” or “receiving” (Müller, 2004, pp. 236-238). Müller analyzes the functions of PUOHs as
having a source in physical actions of object transfer, specifically, actions of giving, receiving or requesting concrete objects (p. 236). Two of the variants that have been described for the PUOH are Palm Addressed and Palm Presentation and are shown in Figure 8 (a&amp;b).

In Palm Addressed (PA), the open hand(s) is directed toward the interlocutor in gesture space. In other words, the PA is a PUOH gesture used for pointing (Kendon, 2004, p. 271). It is often used when the speaker is acknowledging or agreeing with something their interlocutor has said (p. 272). Alternatively, it can be used to request information from the interlocutor. Figure 8 (b) provides an example of a PA. The PUOH performed on talk show host, David Letterman’s right hand is directed toward the show’s guest, Michelle Obama. In this example, Letterman is offering his support to Michelle Obama after she has stated that her children were raised normally despite growing up as the President’s kids in the White House. He performs a PA while saying “Well, that’s great credit to you” recognizing the role Obama played in raising her kids normally.

Palm Presentation (PP) variants are formally characterized by a PUOH handshape held in space near the speaker’s body. Kendon describes PP variants of PUOH as occurring in clauses that “serve as an introduction to something the speaker is about to say, or serve as an explanation, comment or clarification of something the speaker has just said” (p. 266). In Figure 8 (b) actor, Bradley Cooper displays a (PP) PUOH gesture. Cooper has just explained that his publicist recommends that her clients (i.e., actors) keep their political views private. He then performs the PP gesture while making a meta-comment related to his publicist’s viewpoint, aligning with her position in saying, “I think she’s right.”

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14 In the utterances that follow the one used with the PP gesture, we find out that Cooper does not in fact align with the perspective of his publicist. At the moment of the PP performance he is pretending to align with his publicist’s stance.
Figure 8: Two variants of the PUOH family

(a) Palm Addressed (PA)  
(b) Palm Presentation (PP)

These examples are described as variants of the PUOH family. Questions arise, however, when one considers that Figure 8 (a) includes a pointing gesture and a PUOH. Why should one consider it a variant of a PUOH and not a variant of a point? It seems more accurate to say that this is an example of complex gestural expression. If one calls it a variant of a PUOH, one would be defining an entire construction in terms of only one of the constituents. Instead we might look at how the point and PUOH are symbolically integrated with one in another in relationship to the spoken language construction and surrounding discourse context with which it co-occurs. In fact, (Ruth-Hirrel & Wilcox, in press) analyze this type of point-PUOH expression as a gestural construction that can function to show a speaker’s alignment with an interlocutor’s evaluation.

Interestingly, both examples in Figure 8 share the function of relating to stance evaluation and alignment. In (a) the speaker is aligning with the addressee while in (b) the speaker is making an evaluation associated with a non-present participant. I would argue that the formal and functional differences in the two examples that incorporate PUOH are the result of the PUOHs occurring in different gestural and multimodal expressions and not the result of the PUOH inherently having different variants. This is the general position that is put forth in this dissertation and applied to gestural expressions that include cyclic gestures.

Cyclic gestures are another type of gesture that is considered to be a gesture family (Ladewig, 2011, 2014b). Ladewig describes the formal property that unites the cyclic family of gestures as a “continuous rotational movement, performed away from the body.” The semantic core or theme that broadly characterizes cyclic functions has been
called “cyclic continuity” (Ladewig, 2014b). Previous research on cyclic gestures is described in the next section.

2.5.5 Cyclic gestures

There is very little research on cyclic gestures despite them being relatively frequent in conversational interactions. Ladewig (2011, 2014b) is the only other researcher who has specifically examined the forms and meanings of cyclics. Ladewig (2011) examined the formal variants and broad contexts of use for 56 tokens of cyclic gestures collected from casual interactions (i.e., conversations and game-playing) among speakers of German. Speakers were repeatedly found to use cyclic gestures during word searches, when describing ongoing events, and when performing requests (see Table 6 for examples with Ladewig’s English translations). These different contexts of use are considered to reflect distinct variants of cyclics because they are functionally distinct and display variation in formal properties of the gesture (properties other than the family defining movement property).

Table 6: Contexts of use for cyclic gestures in German (Ladewig, 2011)

<table>
<thead>
<tr>
<th>Context of Use</th>
<th>Examples (cyclic gesture use corresponds to underlined segment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>word search</td>
<td>during different phases of “non-fluent” speech (before, during or after) associated with a word search</td>
</tr>
</tbody>
</table>
| descriptions  | *I became aware* of how emotionally bitter I was*  
                *she was trying endlessly*  
                *intellectually I want to continue on this level* |
| requests      | *You can sleep on it. It is* *(0.3 sec pause) How is* this thing called?*  
                Note: all request functions occurred while playing a game of Tabu (Taboo), which is a game in which one player can’t say the word on the card drawn but tries to get other team members to guess the word by evoking frames of reference. |
| enumerations  | only one token found and no example provided |
When cyclic gestures occurred during word searches, Ladewig observed that the rotation tended to be performed in central gesture space (directly in front of the torso). Ladewig noted that cyclics used with the category of descriptions were performed far to the right side of the body (Note: Ladewig doesn’t identify which hand is dominant for participants). When cyclics were used with descriptions, they occurred with abstract events construed as ongoing. The request context refers to situations in which speakers encouraged an interlocutor to continue giving verbal guesses in the context of playing parlor games (as described in Table 5). Requests occurred with and without speech and were associated with a larger gesture size, rotation at the elbow (rather than the wrist), and extended toward the addressee in gesture space.

Ladewig’s study categorized cyclic gesture meanings in terms of contexts of use rather than based upon specific constructional semantic properties. As one can see from the examples shown in Table 6 for the variant of cyclic gestures used with descriptions, there are a variety of different construction types, event types, and aspectual properties represented in the three examples alone. Ladewig does include more detailed analyses of some of the semantic properties in specific examples but those microanalytic observations cannot be generalized beyond each particular example.

Based upon patterns found in cyclic gesture use in the German, Ladewig (with insight from Johnson, 1987) suggests that the forms and meanings of cyclic gestures are driven by schematized imagistic representations that emerge from human experience with cycles, such as breathing and circling actions (e.g., cranking). Ladewig suggests that specific uses of the cyclic gestures in language arise through metaphorical extension, specifically involving the metaphors TIME IS MOTION THROUGH SPACE, BODY IS A MACHINE and MIND IS A MACHINE.

Cyclic gesture functions have also been described in research that does not explicitly seek them out as a topic of study. In other research, cyclics have been characterized as metaphorical representations of processes or transitions (McNeill, 1992) and as signifiers that the corresponding discourse is redundant or unnecessary (Sweetser, 1998). Müller observed circular movements expressed with the PUOH hand configuration and analyzed them as contributing a meaning of discourse continuity across spoken language arguments that are metaphorically offered (Müller, 2004, pp. 245-246). Duncan (2002)
found speakers of Mandarin to use circular movement gestures to encode manner of movement in motion events (e.g., rolling). When a linguistic expression included manner and path of motion (e.g., rolling down a hill) speakers performed cyclic rotations that traveled along a path-like motion in space (p. 199). Furthermore, Duncan observed that progressive aspect is associated with representational gestures that display repetition or more extended movements. Cyclic gestures that display multiple rotations and that are used to visually represent manner of motion might also encode information about aspect. This suggests that a cyclic gesture’s meaning has the potential to be multidimensional and serve more than one function.

There is also evidence to suggest that cyclic gestures are used recurrently with specific instantiations of spoken language constructions (Zima, 2014). Zima, who was not specifically studying cyclic gestures, examined the types of hand gestures used with specific motion constructions in English. For example, cyclic gestures were found to occur in 60% of a total 202 tokens of the construction [V(motion) in circles] and in 72% of a total 152 tokens of the [N spin around] motion construction. Zima notes that the constructions differ as to whether the circular motion relates only to the path of motion (as in [V(motion) in circles]) or both path and manner of motion (as in [N spin around]). For both construction types, cyclic gestures were proportionally more frequent when the constructions involved meanings of physical motion than when they were used for metaphorical motion meanings. Zima’s research aligns with studies that suggest action and simulations of action events can lead to an increase in representational gesture use (discussed in §2.3). Zima suggests that construction grammarians should explore the frequency with which specific gestural forms occur with particular constructions to identify whether gestures can be conventionally integrated with spoken language constructions.

In sum, research mentioning the use of circular movement gestures in English suggests they can be used to convey substantive content, such as manner and path of motion and aspeクトual properties of events, specifically continuous aspeクトual meanings. Cyclics also have the potential to serve interactional functions, such as marking discourse cohesion and making requests. In German, different uses of cyclic gestures have been argued to share a broad semantic theme of “continuity.”
2.6 Limitations to Gesture Classifications

The gesture typologies discussed in the subsections of §2.5 have helped to capture general properties related to how co-speech gestures express meaning. While the classifications can be useful descriptive tools that capture important characteristics recurrent in gestural expressions, researchers have cautioned that gestural groupings should not be interpreted in a discrete, categorical sense. Gesture meanings are multidimensional (i.e., they correspond to various qualitative dimensions of meaning). Different functional dimensions might be evoked simultaneously in a single gesture (Kok et al., 2016). For instance, beat movements can be superimposed on iconic, metaphoric, and pointing gestures (McNeill, Levy, & Duncan, 2015). Representational gestures often have a deictic component to them. How much can one learn simply by describing a gesture as an iconic gesture that includes a beat? Do all iconic-beat gestures serve similar functions? That seems unlikely, as iconic gestures alone don’t comprise a semantically cohesive grouping. The representational gesture types, iconic and metaphoric, only tell one that the relationship between the form of the gesture and the meaning of the gesture is motivated in some way by iconicity and whether or not the depicted meaning is concrete or abstract. The representational types don’t characterize gestures by any specific semantic properties.

Iconic and metaphoric gestures can represent meanings associated with different semantic classes. They can represent substantive content pertaining to objects, events, properties of objects (e.g., size or shape), properties of events (e.g., manner, path, aspect), or locations. The label “iconic” lumps representations/descriptions of objects, events, properties, and locations into a single grouping as long as the representations correspond to the material world. The iconic label can be motivated by an iconic use of a handshape, movement, both handshape and movement, or by a spatial relationship involving the hands. For example, the hands often iconically represent tangible entities, as we saw in Figure 7 with the hands representing cars. A gestural movement can represent properties of a motion event, such as a path movement, a manner of movement, or both path and manner. Movements can be iconically represented in gesture without the hands functioning representationally at all. Alternatively, both the hands and the movement of a gesture can simultaneously represent properties and participants of events. This is also
seen in Figure 7. The hands and properties of the gestural movement represented the complex car crash event. Figure 4 similarly represented participants in an event iconically using the hands and properties of an event iconically through movement. The agent (rope yanker) semantic role and the rope instrument role were represented metonymically through the handshape. The path and manner of the rope yanking event were represented in the movement.

The groupings iconic and metaphoric don’t actually tell you anything about the semantic category of meaning that the gesture is representing. Furthermore, the representational labels do not indicate what function the representation serves in the discourse. A representational gesture can be used for object reference, as was shown in Figure 5 with the use of the molding representational gesture co-expressed during a referring construction (“that guy”). It also seems possible that a representational gesture could also serve a predating function, as someone might argue the rope yanking gesture in Figure 4 does. Gesture research could benefit from the regular practice of distinguishing functionally more specific types of representational gestures. Some researchers have begun to do this (Kok 2016, pp. 76-99; Kok et al. 2016).

Kok et al. (2016) performed a large perceptual study that examined the multifunctionality of gestures during a direction-giving task. In the study, Kok and colleagues selected clips of gestures from a task in which the “route giver” participants had watched a video that took them on a tour through an animated town. The town tours were organized by landmarks. The route givers were instructed to tell an addressee the exact path through town the video had shown. The researchers then used crowdsourcing to find participants to watch the selected gesture clips (with speech) from the task and assign Likert-scale judgments regarding the meanings of the gestures. The study found that three broad functional dimensions of meaning were important to the meanings of gestures in the direction-giving context: object representation and reference, movement and location (i.e., spatial relationships), and “metacommunicative signaling.” Kok and colleagues found that meanings across these dimensions could be co-expressed in a single

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15 Kok uses multifunctionality to describe a gesture serving multiple functions in a single usage event. I call this multidimensionality so as not to confuse it with the way multifunctionality is discussed for spoken language. In spoken language, multifunctionality has been used when a single form performs different functions in different constructions (see Haspelmath, 2003).
gesture. Participant perceived meanings in certain dimensions as being more prominent in a given gesture, typically only assigning each gesture one primary meaning.

Kok’s (2016) dissertation expands on these findings by identifying formal correlates for different functions identified in the Kok et al. perceptual study. For example, handshapes and hand positions were found to be the most salient formal dimensions contributing to object reference constructions (pp. 125-126). Kok also identified formal correlates in the expression of gestures associated with other types of functions, such as shape depiction, place reference, and process depiction (pp. 121-140). These findings are discussed in greater detail in Chapter 5. The findings from these two studies suggest that speakers distinguish different functional types of gestural expressions and different meaningful components in those expressions.

Unlike representational types of gestures, each non-representational grouping (i.e., beats and points) is united by both formal and functional characteristics. Beats share a similar up and down movement property and are characterized broadly as functioning for emphasis (Cassell et al., 1999). Pointing involves a handshape (or body part) that does the pointing, what (2016) term a “pointing device.” Pointing also involves a movement toward a spatial location, one that is established as meaningful, for the function of directing attention. In a sense, McNeill’s non-representational types are more similar to gesture families, as gestures associated with each grouping share formal and functional properties.

Both non-representational gestures and gesture families are characterized by abstract meanings. While schematic characterizations of expressions are important in capturing similarities across functionally diverse expressions that are semantically related, “a single abstract meaning does not fully describe…the established semantic value” for a symbolic structure (Langacker, 2008, p. 38). We need to examine semantic properties within specific usage events in which gestures are used and look for associations between those properties and the formal properties of gestures in order to identify more specific types of gestures and have a finer grained understanding of the meanings they carry. Furthermore, crosslinguistic data on particular gesture forms that have been identified as gesture families need to be analyzed. Currently, it is unclear whether gesture families should be understood as language-specific or crosslinguistic groupings. Because the semantic core
of gesture families are believed to be iconically motivated, emerging from bodily actions and perceptual experiences in the physical world, the notion of gesture family suggests that these motivated forms might behave similarly across languages. However, crosslinguistic evidence is needed to corroborate that theory.

Another problem that needs to be addressed in research on gesture families is the idea of gesture family variants. A form associated with a particular family, such as a cyclic, can combine with other meaningful structures, such as a beat, in a single gesture (as discussed in 2.2.5). Returning to an example previously shown in Figure 2(c) in Chapter 1 (shown again below), we see an information question construction (Croft, 2017) expressed in the spoken language that is co-expressed with a PUOH handshape, a point toward the addressee, and a cyclic movement. Based on current practices, it is unclear whether one should call this gestural expression a point, a Palm-Addressed (PP) variant of the PUOH family of gesture, or a variant of the cyclic gesture. Under previous approaches the decision would be made opportunistically depending on which gesture family or gesture type the researcher was most interested in studying.

Figure 2(c): Point, PUOH, Cyclic Gesture

What would you call what you do now?

In selecting one meaningful component as representative for the entire construction, you are possibly arbitrarily privileging one meaningful component over the others. Of course, it could be the case that there is a reason to emphasize one of the symbolic components, such as if one component is more salient to the meaning of the whole gestural expression in relationship to the speech. But our current understanding of gesture meaning doesn’t allow us to do that yet. We first need to identify all of the meaningful
component units in a “gesture” and analyze how they contribute to the meaning of the whole gestural expression and to the more complex multimodal expression that includes speech. This is not to suggest that the meaning of the gesture as a whole can be predicted by identifying meanings of each component. However, each component is expected to serve a symbolic relationship in how it is integrated with the forms and meanings of other gestures and with the forms and meanings in speech to express a unified complex expression.

2.6.1 Addressing limitations in the current study

People have long recognized that a single gesture can convey complex meanings corresponding to different functional dimensions, from the more substantive to the more interactional. However, few studies have examined functional motivations for why and how multiple meanings get co-expressed in gesture or have explored the specific processes by which gesture meanings integrate with meanings in spoken language. Two exceptions can be found in recently completed dissertations (Kok, 2017; Stickles, 2016) and in a recent article by Kok and Cienki (2016), which will be discussed in further detail in Chapter 5. The current study makes an additional contribution to the understanding of multimodal integration of meaning in spoken language.

In this dissertation, I argue that gestures used with speech are often complex expressions. To say it another way, a single gesture might incorporate multiple meaningful components to form the meaningful whole. I suggest that recognizing that a single gesture has the potential to be symbolically complex is the key to solving many of the challenges that researchers have faced in characterizing meaning in gesture. Figure 2(c) shows a symbolically complex gestural expression that includes three familiar symbolic units: point, PUOH, and cyclic. In analyzing gestures as complex expressions, one doesn’t need to describe the gestural expression as a variant of any particular component structure. It is a specific multimodal expression—a more conventional one at that (as I will discuss in Chapter 6). The point, PUOH, and cyclic gestures all participate in this expression. Other non-manual meaningful structures also typically occur with this construction, such as eye gaze toward the addressee. Importantly, the meaningful components in the gesture shown in
Figure 2(c) don’t exclusively occur together and are not always expressed with information questions. They occur in other expressions as well as previous research has discussed.
3 Data and Coding Procedures

3.1 Introduction

The purpose of this chapter is to (1) introduce the type of data used in the study of cyclic gestures and (2) provide descriptions of the procedures used to code both the gestural and spoken language expressions. As discussed in the previous chapter, the meanings of gestures are often characterized based upon observations about the general functional properties surrounding their context of use. This current research on cyclic gestures diverges from this tradition by examining specific semantic properties encoded in the spoken language expressions that accompany the gestures. Through this examination, this study seeks to identify whether cyclic gestures are repeatedly used with particular types of meanings expressed in speech. Additionally, this research explores whether variable properties in the form of the gesture share significant relationships to particular meanings expressed in speech.

This chapter includes a detailed description of the coding practices used in the studies presented in Chapters 4 and 7. It is designed to be a resource for other researchers who are interested in cyclic gestures as well as for those who are more generally interested in examining the relationship between co-speech gestures and constructions in spoken language. Data used to explore the functions of cyclic gestures in English come from American English talk show episodes or segments of episodes that are publicly available online. Clips of the tokens used in this research will be made publically available on my website, lauraruthhirrel.com, starting in January of 2019.

3.2 Discourse genre selection

Language use is embedded within social activities (Fairclough, 1993). Social activities that are routinized and familiar within a culture are considered to be genres or “socially recognizable ways of using language” (Hyland, 2002). Talk shows are one type of genre. The talk show genre includes more specific subgenres, which vary cross-
culturally, such as the Chinese therapy talk show genre (Yan, 2008). The English cyclic gesture data were collected from morning, afternoon, and late night talk shows that share similar themes across the topics that are discussed. The most frequent discourse topics discussed in these types of programs are politics, celebrity gossip, television and film, and sports. The shows vary in the role comedy plays in the program. Late night shows are hosted by comedians and emphasize humor.

The talk show genre (broadly construed) was selected for several practical reasons. When first considering this topic of research, I examined several talk show episodes to get an estimate of how difficult it would be to collect a large number of cyclic gesture tokens (i.e., relative to the number of tokens typically included in research on gesture). I found that cyclic gestures occurred frequently enough in talk shows to make the task of collecting hundreds of tokens manageable. Additionally, the format of talk shows allows for the collection of cyclic gesture tokens across several speakers in a single episode. In the U.S., talk shows invariably include a segment in which invited guests come on the show to chat with the host(s). They often feature multiple guests each episode. Some talk shows, particularly the morning shows, have multiple hosts.

Talk shows are a unique type of broadcasting because they feature characteristics of both casual conversation as well as more institutionalized discourse. In institutional discourses, participants have particular goals and identities that are motivated by the institutional context of the interaction (Ilie, 2001). A host of a talk show has a certain institutional role in the domain of talk shows (i.e., host). Their identity as host motivates the type of talk they engage in. At the same time, the institutional setting of talk shows is somewhat flexible, allowing the hosts (and guests) to emphasize their institutional identities to variable degrees through talk. For instance, the host might be personal friends with one of the guests and the discourse, at times, might resemble a conversation between friends as opposed to an interview.

Because talk shows represent a relatively fluid discourse genre, I considered that there might be a greater variety of different uses of the cyclic gesture represented than one would find in a more rigid genre (e.g., classroom talk). As the primary goal of this research was to learn more about the functions that cyclic gestures serve in interaction in American English, the accessibility of talk show data, the degree to which cyclic gestures
were used across many speakers, and the tendency toward conversational language use within the genre made it an appropriate data source.

3.3 Coding Gesture Forms

A number of coding guidelines have been proposed for the annotation of gesture form (Bressem, 2013; Bressem, Ladewig, S.H., & Müller, 2013; Duncan, 2008). The level of detail a researcher decides to record about a gesture’s form will depend on the research questions and the data source. Stickles (2016) notes that annotation practices for gesture form are comparable to those for phonetic transcriptions, ranging from fine-grained to very broad. The type and quality of the data greatly influences a researcher’s coding decisions.

In spoken language research, narrow phonetic analyses cannot be performed on low quality recordings that include a lot of noise. That is one of the benefits to laboratory phonetic research. Laboratory research allows a researcher to control the environment in which the data is collected so that detailed transcriptions are possible. Similarly, characterizations of gesture form cannot be performed on certain types of video data. In the case of gesture, one can use a motion capture system to capture precise bodily movements, but in doing so, one sacrifices a natural context of language use. As the data used in this research come from pre-recorded talk shows, I (the researcher) had no control over the filming process. The type of data selected for this research meant it was impossible with the naked eye to reliably code fine-grained differences in certain properties of gesture form, such as the use of gesture space. For the formal variables that were difficult to code because of the data source, I developed rather crude (yet operationalized) methods for distinguishing different categorical types with those variables. I discuss these methods as they apply to particular formal properties.

Many of the decisions I made regarding the coding of the gestures forms arose from observations made during the pilot study, which I performed in 2012-2013. In the pilot study, I examined the formal properties of 111 tokens of cyclic and curvilinear arc gestures (also collected from talk shows) as well as their broad context of use. The pilot study gave me the opportunity to annotate a wide range of formal properties associated with gestural expressions that incorporate cyclic and curvilinear movements. Variable
formal properties across tokens of cyclic gestures that were perceptually salient to me as a critical observer (and that were able to be systematically coded) were all incorporated into the coding scheme. The pilot study also allowed me to identify challenges in coding particular variables. For example, the initial coding scheme had to be modified after recognizing that a speaker’s palm orientation during the performance of a cyclic or curvilinear movement can change because of the fact that cyclic gestures are movements. The pilot study, which allowed for a first pass at a subset of the data collected for this research, played a critical role in refining and expanding the coding scheme.

3.3.1 Gesture phrases and the stroke phase

Because this research seeks to identify relationships between gestural forms and meanings expressed in the spoken language, it was important to determine which temporal phases of manual gestural movements would be included in the gestural analysis. A manual gesture, a “movement excursion,” can be segmented into different movement phases that are characterized by particular formal characteristics (Kendon, 2004). Gesture phrases are the typical units by which gestures are analyzed. A gesture phrase minimally requires the inclusion of a particular segment, the stroke phase. A stroke is the primary movement phase that characterizes a gesture. However, there can be static gestures in which the stroke is analyzed as a period of stasis as opposed to a movement (Duncan, 2013). If a gestural excursion includes any preparatory movements or holds between the resting position of the articulators and the performance of the stroke, this phase is also considered to be a part of the gesture phrase. The other phase that is included in the gesture phrase is called a post-stroke hold. Post-stroke holds are static periods that sometimes follow gestural strokes in which an articulator (hand) is held still at the endpoint location of the stroke. The phases and characteristics of gesture phrases are outlined in Table 7. Non-obligatory phases are denoted with parentheses.
Table 7: Phases included in a gesture phrase

<table>
<thead>
<tr>
<th>Manual gesture phases</th>
<th>Formal characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>(preparation)</td>
<td>The articulator is moved away from a position of rest to the spatial location where the stroke is to be performed (Kendon, 1980); The preparation phase can also include a static period, called a pre-stroke hold, in which the articulator is held in position before the performance of the stroke (Kita, 1990).</td>
</tr>
<tr>
<td>stroke</td>
<td>This is the period of accented movement of the articulator or peak in articulatory effort (Kendon, 1980, p. 212).</td>
</tr>
<tr>
<td>(post-stroke hold)</td>
<td>The articulator is held static in the location associated with the end of the gesture stroke (Kendon, 1980, p. 213).</td>
</tr>
</tbody>
</table>

In this research, gesture annotation was limited to the stroke phase. This decision was made because the stroke phase of a gesture has been found to carry the most meaning (Kendon, 2004, pp. 113-121), and the primary goal of the research on cyclic gestures presented in the upcoming chapters was to learn more about the meaning of cyclic gestures. The stroke is the segment of the gesture in which the gestural meaning relates to the main “idea unit” co-expressed in the spoken language (McNeill, 1992, pp. 25-29). Furthermore, cyclic gestures, being particular types of movement, always coincide with stroke phases. Specifically, the stroke phases are the movement phases in which at least one articulator is rotating along a circular path.

3.3.2 Segmentation of the stroke phase

All talk show episodes or segments of talk shows collected were exhaustively examined for instances of cyclic gestures. Cyclic stroke phases were identified using a method developed by Seyfeddinipur (2006). Each gesture token was examined frame-by-frame using ELAN software. ELAN is an audio and video annotation tool that has been developed by researchers associated with The Language Archive at the Max Planck
Institute for Psycholinguistics, The Netherlands. A specific tier was created in ELAN to show the beginning and endpoint of each stroke. The first frame in which the hand became blurred in the performance of the cyclic movement was considered to be the beginning of the stroke phase. The first frame in which the hand or hands were no longer blurred after the cyclic movement was considered to mark the end boundary of the stroke phase. An example of this process for a cyclic gesture is shown in Figure 9.

Figure 9: Coding stroke phase boundary

This procedure was straightforward in many cases, but there were exceptions. Cyclic gesture strokes have the possibility of being performed with both hands moving asynchronously along circular paths. This situation occurred when one hand would begin the onset of the stroke phase before the other, leading to the hands being involved in the expression of different portions of the circular movements at the same time. Bimanual asynchronous cyclic gestures were analyzed as part of a single gesture stroke that was distributed across two hands rather than as two distinct strokes participating in different

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16 ELAN is free to download. The latest version of the software is available at http://tla.mpi.nl/tools/tla-tools/elan.
gesture phrases. This annotation decision was made for two reasons: (1) there was always some temporal overlap in the timing of the strokes across the hands (i.e., both hands were making circular movements for a portion of the time) and (2) the stroke movements on each hand were qualitatively alike (i.e., they both performed a cyclic movement). For asynchronously timed, bimanual gestures, the first frame in which either hand was blurred was considered to be the beginning of the stroke phase. The first frame in which neither hand showed blurring was marked as the end of the gesture stroke.

Another challenge to coding gesture strokes occurred when a cyclic gesture was immediately preceded by or followed by another gesture stroke without a hold or transitional phase (i.e., preparation or retraction). In these situations, stroke phases were approximated using visual cues. If another gesture preceded the cyclic without a phase of stasis, the start of the stroke was identified as the first frame in which there was a noticeable increase in degree of blurriness from the previous frame. If another gesture followed the gesture stroke without a post stroke hold, the frame that occurred directly before the frame showing an increase in blurriness was accepted as the end of the cyclic stroke.

The final issue that sometimes would interfere with the coding practices was when a cyclic gesture was performed at a slow speed. This was unusual but there were situations where the motion was performed slow enough that there was not a very high degree of blurriness during the stroke phase. In these cases, the stroke phase was approximated looking frame-by-frame at the shape of the movement and by using other visual cues that might be co-present at the beginning and ends of the stroke, such as holds, changes in direction, handshape changes, and changes in body positioning.

### 3.3.3 Defining cyclic gestures

A gesture was formally categorized as a cyclic if it included at least one full circular rotation. The rotation could occur at the elbow, wrist, finger (in rare cases), or at multiple sites simultaneously. It should be noted that this formal characterization differs from the way cyclic gestures have previously been classified. Ladewig (2011; 2014b) used a narrower definition of cyclic gestures. In order to be classified as cyclic, Ladewig (2014b) required that a gesture be performed (1) with a “continuous [uninterrupted]
rotational movement” of at least two rotations (2) with rotations moving outward away from the body (on the upper portion of the rotation), and (3) with the hand held in a constant position in gesture space. This stricter set of formal criteria reflects Ladewig’s interest in exploring whether these specific, recurrent properties in gesture are associated with related meanings in language use.

For this project, the gestural form in which I was interested was more loosely construed as any rotational movement along a circular path that included at least one full rotation. The reason for keeping the criteria that determined which gestures would be included in the research broad was to allow language use to determine how and if these movements are related. I expected that patterns and variation in usage would provide evidence to support lumping formal variants of circular movement gestures into the same functional-semantic groupings or splitting them into distinct types.

3.3.4 Formal coding of gestures

The coding scheme took into consideration a number of variable formal properties associated with cyclic movements. Formal variants in gesture that were not specifically dependent on cyclic movements but that were co-expressed with them were also coded (e.g., configurations of the hand). The stroke phases of gestures incorporating cyclic movements were coded for the following features: handedness, number of rotations, synchronization of hands, hand distance (for bimanual cyclics), handshape, finger spreading status, finger curvature and bending status, palm orientation, location in gesture space, gesture size, site of primary rotation, and direction of movement. The location of the eye gaze of the speaker, whenever available, was also included in the coding scheme. A further movement property, path movement (i.e., circular rotations that travel along a path), was also coded. Table 8 shows the categories included under each of these formal variables. Visual examples that illustrate different values within each coding category are shown in throughout the rest of this section.
Table 8: Coding categories for formal properties of gestures

<table>
<thead>
<tr>
<th>Components of form (manual gestures)</th>
<th>Coding categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>handedness</td>
<td>unimanual, bimanual</td>
</tr>
<tr>
<td>for bimanual gestures</td>
<td></td>
</tr>
<tr>
<td>• stroke synchronization</td>
<td>asynchronous, synchronous</td>
</tr>
<tr>
<td>• hand distance</td>
<td>near, wide, neutral</td>
</tr>
<tr>
<td>handshape</td>
<td>e.g., fist (S), one, five, B, B-lax, dynamic, mixed</td>
</tr>
<tr>
<td>• finger-spreading status</td>
<td>spread, closed, lax, NA</td>
</tr>
<tr>
<td>• finger-bending status</td>
<td>bent, curved, straight, NA</td>
</tr>
<tr>
<td>palm orientation (stroke)</td>
<td>up, down, out, speaker-in, center-in, mix</td>
</tr>
<tr>
<td>palm orientation (end)</td>
<td>endup, other</td>
</tr>
<tr>
<td>location in gesture space</td>
<td>lateral: side (right or left), midline</td>
</tr>
<tr>
<td></td>
<td>vertical: upper, lower, central</td>
</tr>
<tr>
<td></td>
<td>sagittal (distance in front of Ego): away, unmarked</td>
</tr>
<tr>
<td>• size of circle(s)</td>
<td>large, standard, reduced</td>
</tr>
<tr>
<td>Movement properties:</td>
<td></td>
</tr>
<tr>
<td>• site of rotation</td>
<td>elbow, wrist, finger, mixed</td>
</tr>
<tr>
<td>• rotation direction</td>
<td>inward, outward</td>
</tr>
<tr>
<td>• number of rotations</td>
<td>single (1 rotation), multiple (&gt;1 full rotation)</td>
</tr>
<tr>
<td>• path movement</td>
<td>path, nonpath</td>
</tr>
<tr>
<td>Components of form (non-manual gestures)</td>
<td></td>
</tr>
<tr>
<td>eye gaze</td>
<td>toward (interlocutor), hands, away (from interlocutor), mixed, unavailable</td>
</tr>
</tbody>
</table>
These categories of gesture form were not arbitrarily selected. Gesture research has a tradition of using many of the descriptive practices used by sign language researchers to characterize formal properties of the gesture. Minimally, an analysis of manual gesture form always includes some characterization of handshape, palm orientation, movement, and location. These were the four formal parameters of signs first described by Stokoe (1960). These formal features have been recognized as being important to sign languages because they can be used to establish minimal pairs. For example, a change in location, with the other three parameters remaining identical can be used to distinguish different signs. The same situation applies to the other parameters of handshape, palm orientation, and movement (all other forms being equal). These aspects of form have also been found to be meaningful in research on gesture, as I will be discussed throughout this section of the chapter. Other categories in the coding scheme emerged because they are elaborations of the primary parameters. For instance, finger-spreading and finger-bending are specifications of handshape and the category for gesture size is a characterization of the use of gesture space during the dynamic stroke phase. In the remainder of this section, I provide more detail about each the coding categories for each component of form.

**Handedness and bimanual gestures.** Coding included recording whether the circular movement was performed with a single hand (unimanual) or both hands (bimanual). If the movement was performed with both hands, the gesture was classified as either synchronous or asynchronous, depending on whether the hands performed the stroke simultaneously or not.

For bimanual gestures the relative distance between the hands was coded. If the hands were further apart than the width of the shoulders on the median plane (right to left), the bimanual gestures were coded as wide for this variable. If the hands were nearly touching or touching, the hands were coded as near. Hand distances in between wide and near were coded as neutral. Unimanual gestures were given a label of other for these variables.

**Handshape.** Figure 10 includes examples of different static handshapes used with cyclic movements in the data. Not every handshapes found in the study is included but
the handshapes shown represent those found in the majority of the data. Not pictured are *dynamic* handshapes (Brentari, 1998), which are those that change throughout the course of the gesture stroke. It was possible for each hand to have a different handshape during the performance of bimanual strokes. These cases were coded as *mixed* handshapes. The labels given to the handshapes shown below are drawn from research on American Sign Language (ASL) and are based upon the alphabet and numeral signs. A full list of handshapes can be found in Tennant and Brown’s (1998) handshape dictionary (many on pp. 28-29). Throughout this dissertation, I will refer back to these handshapes using the conventional labels used in ASL research with the exception being the “S” label. I will use the more descriptive label of “fist” to characterize these handshapes.

Figure 10: Examples of handshapes used with cyclic gestures

5
5 lax
B (open)
S (fist)
L
1
G

**Finger-spreading.** A separate variable was created to record whether a speaker’s fingers were *spread, closed, or lax* during the performance of the stroke phase. This category did not apply to all handshapes and was only used for 5 and B types of handshapes. For instance, a 1 handshape was not classified as either spread or closed. When this category did not apply (i.e., the handshape was not of the 5 or B type), the
gesture was coded as other for this category. Examples of the spread and lax categories are shown in Figure 11. They are also shown in Figure 10, specifically, the 5 handshape is spread and 5 lax is lax. An example of the closed finger-spreading value is shown in the image of the B(open) handshape in Figure 10. While spreading can be determined from the handshape to some degree (e.g., a non-lax 5 is always spread to some degree and a B is always closed) a separate category was created to capture these properties as a distinct variable.

The 5 and B handshapes are often considered to be unmarked, neutral handshapes, both in gesture (Stickles, 2016) and ASL (Battison, 1974), due to the frequency with which are used (and their distribution in ASL). Both spread and closed handshapes require more tension of the hand to maintain (this is also noted by Bressem, 2013, p. 1086). A benefit to coding finger-spreading under a separate variable is that it underscores the potential saliency and symbolic potential of this difference in both effort and formal appearance of the fingers. Differences in positioning of the fingers have been found to be important for both signed language and gesture research.

Takkinen (2005) found that deaf children acquiring Finnish Sign Language (FinSL) showed differences in degree of finger spreading and finger closure when compared with the same sign forms produced by deaf adult FinSL users. Occhino (2016) identified formal properties of signs and analyzed them as evoking a complex image schema called the emergence schema (p. 168). One of the ways this schema can be instantiated in certain constructions in ASL is through dynamic finger spreading (p. 171). Müller (2014b), in reviewing Quintilian’s writings about the use of the ring gesture in ancient Roman rhetoric, describes the discourse-functional differences between ring gestures in which the non-ring fingers are spread and those non-spread variants (p. 566). These studies are suggestive of the potential for spread fingers (and non-spread fingers) to be used meaningfully in gesture and signed languages.

The coding procedures for the finger-spreading variable included specifications for resolving cases where spreading or closure occurred for a portion of the stroke (with dynamic handshapes) as well cases in which one hand was spread or closed while the

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17 Ring gestures are characterized by either the fingertip of the index finger or the middle finger touching the fingertip of the thumb (forming a ring shape).
other hand displayed a different hand configuration (with mixed handshape). A handshape was categorized as spread if there was a large amount of space between the fingers at any point during the stroke phase. If space between the fingers was minimal, the gesture was coded as lax for this variable. For bimanual gestures, there were cases in which one hand was either spread or closed and the other hand was lax or in a handshape that could not be classified as open or spread (e.g., 1). For bimanual gestures, only one hand needed to be spread in order for it to be classified as such. Importantly, not all non-lax 5 handshapes (i.e., straight fingers with spaces between each finger) were coded as spread. In order for a 5 handshape to be coded as spread, there had to be a perceivable tension. This visible tension was the result of a higher degree of spreading. The same criterion was applied to the closed finger category. If at any point during the performance of a cyclic the fingers on at least one hand performing a cyclic were pressed together (touching), the gesture was coded as closed. All four fingers had to be spread or touching for the gesture to be coded as spread or closed. There were no cases in the data in which one hand was spread and one was closed during the bimanual expression of the strokes.

Figure 11: Examples of lax and spread fingers

![lax example](image1.png)  ![spread example](image2.png)

It should be noted that spreading is a difficult property to code because the boundaries between spread and lax finger-spread-finger spreading likely vary from speaker to speaker. That is, it is expected that some people will show a higher degree of spreading in spread-finger handshapes. Since there was no way to precisely control for within-speaker variation for this formal property (as one could do if using motion capture data), additional annotation procedures aimed at promoting reliability were performed. If there was any question as to whether a gesture should be categorized as spread or lax, a
minimum of two annotation passes were performed before assigning the gesture to a particular category. On the first pass, the finger-spread variable for the gesture was coded as “spread-ish.” Once coding was completed for the entire episode in which a token had been noted as spread-ish, a second pass was performed. In the second annotation pass, finger-spread for the questionable token(s) was compared across other gesture tokens produced by the same speaker. Most speakers produced multiple tokens of cyclic and gestures. If there was no data from the same speaker available for this comparison, the speaker’s handshapes outside of the context of cyclic gestures were examined to see whether a perceptible lax baseline could be established for that particular speaker. Other co-expressed elaborations of handshape could also be used as evidence for or against the categorization of a particular gesture as “spread.” For instance, in the cases where finger-spread status was difficult to determine, finger-bending might also help with the annotation decision. If the speaker’s fingers showed a slight natural curvature (as can be seen in the curved example in Figure 12 below), it was taken as support that the finger-spread variable for that gesture should be categorized as lax (because other components of the handshape were in a relaxed position). Contrastively, straight fingers or bent fingers were taken as support that the “spread-ish” gesture should be categorized as spread (because it takes additional effort to straighten and bend hands).

**Finger-bending.** Another variable associated with handshape, finger-bending, was also included in the formal analysis. This variable was motivated by research on signed languages and on gesture that have found finger-bending (and lack of) to be important in the characterization of meanings of signs and gestures. For example, bent fingers in ASL can be used with classifiers to express that something is broken or wrecked (Supalla, 1986). Certain metaphors in ASL are also mapped onto signs through the use of straight and bent fingers. Wilcox (2000) identified signs made with bent fingers that instantiate the metaphor **IDEAS NOT FULLY IN EXISTENCE ARE BENT** and contrasted them with certain signs made with straight fingers that instantiate the metaphor **IDEAS IN EXISTENCE ARE STRAIGHT** (p. 130-138). ASL specifically has minimal pairs that illustrate these distinct metaphorical mappings. In gesture, the ring gesture, in addition to having a variant with
spread fingers that gets used for a particular function also has a bent finger variant that serves a different function (Müller, 2014b).

Handshapes were classified as *straight, curved, bent, or other*. Handshapes to which this category wasn’t relevant, such as the fist handshape, were coded as *other*. Curved handshapes were distinguished from bent handshapes by observing whether or not there was curvature at the distal inter-phalangeal joint (DIP), the most distal finger joint from the body of the hand. Handshapes in which curvature was visible at the DIP joint, were coded as bent. This decision was made because if a high enough degree of bending was present at the proximal inter-phalangeal joint (PIP), the knuckle, then the DIP would also show bending. If bending at the DIP could not be visually observed and bending was only present at the PIP, then the handshape was classified as curved. At least three fingers on one hand had to show DIP curvature for the handshape to be classified as bent (exceptions being if a handshape involved fewer than three activated fingers). Figure 12 shows examples of bent and curved finger handshapes. Straight finger handshapes can be observed in Figure 10 in the image with the 5 handshape and in Figure 11 in the image with spread fingers.

Figure 12: Examples of *bent* and *curved* fingers

Palm orientation. There were six labels used to code the category of palm orientation. The palm was coded as being oriented *up, down, out, speaker-in, or center-in* (the final two labels were adopted from Stickles, 2016). Because cyclic gestures involve movement, it was possible for the palm orientation to change throughout the performance of the stroke. In these cases, the palm orientation was coded as *mixed*. Figure 13 shows examples from the data of each of the possible orientations, except the mixed orientation.
During the pilot study, I observed that many examples of cyclic gestures would end in a palm up orientation, even when the stroke was performed with a different orientation. The palm up orientation is known to be a salient feature in gesture (Kendon, 2004, p. 271; Müller, 2004), particularly when used with certain handshapes (e.g., B-open). A separate variable was created to record any strokes that ended in with an upward facing palm orientation. The categories associated with this variable were endup (when the palm was facing up), or other (when the palm was not facing up).

**Location in gesture space.** McNeill (1992, p. 89) outlined a comprehensive coding scheme for the use of gesture space (Figure 14). During the pilot study for this project, this coding scheme was difficult to implement with precision with talk show data, particularly because of the shifts in camera angles and variations in the degree of zoom used in filming. Instead, a simplified scheme for the location of the hands during the performance of the stroke was used to capture major divisions in gesture space (shown in
Hand location was categorized across three variables. These variables are each associated with a different anatomical plane: lateral (right and left), vertical (upper and lower axis), and sagittal (distance out in front of the body).

The lateral plane was divided into two categories. A label of side was assigned for any token that was performed outside of the boundaries of either shoulder on the median (right-left) plane (Figure 16). For bimanual gestures, the gesture was categorized as side
if one of the strokes was performed outside of the shoulder boundary (to either the left or right side). Notes were taken in a separate column in Excel to record which side a cyclic was performed. If the stroke occurred inside the width of the shoulders on the lateral plane, it was categorized as *midline*. For the vertical plane (upper-lower), strokes performed at the shoulders (lower neck) or higher, were categorized as *upper* (see image to the right in Figure 17. Those performed at the waist or lower were labeled as *lower* (see image to left in Figure 17). Gestures performed in between the shoulders (neck) and waist on the vertical plane were labeled as *central*. The final variable for spatial location categorized the use of space in front of the body. Strokes performed away from the body on the sagittal plane were categorized as *away* (from Ego). Those closer to the body were categorized as *unmarked*. Gestures were coded as away if there was at least a 90 degree bend at the elbow when the elbows were at the sides of the body. Tokens were also categorized as away if the elbows were pulled out in front of body (not in line with the hips) while the hands were extended out (see Figure 18 for two examples of away gestures). Any gesture made closer to the body was coded as *unmarked* for the sagittal plane variable.

Figure 16: Example of *side* location on lateral plane
It should be noted that the majority of gesturing is done directly in front of a speaker’s torso in “central gesture space” (McNeill, 1992, p. 83). Sweetser and Sizemore (2008) call this “personal gesture space.” Speakers gesture in central or personal gesture space for different purposes than when they gesture in “interpersonal gesture space,” which is the space between the speaker and interlocutor’s personal gesture spaces (ibid, pp. 25-26). And speakers use “extrapersonal gesture space” in distinct ways from the other two spaces. Extrapersonal gesture space is all areas of gesture space outside of the personal and interpersonal spaces. The functions of these gesture spaces will be discussed in more detail in chapters 4-6 as they relate to findings for the use of cyclic gestures in English. In the coding scheme, central gesture space corresponds to the center-center and center regions in Figure 14. In the categorization scheme used in this study,
central/personal gesture space roughly corresponds to the categories *midline* (for the lateral plane), *central* (for the vertical plane), and *unmarked* (for the sagittal plane). In some cases, *upper* gesture space on the vertical plane might be included in central/personal gesture space (if the gesturing is done near the body on the sagittal plane). The *away* value for the sagittal plane when it is extended in the direction of the interlocutor corresponds to interpersonal space. Because this research only coded formal properties of the gestural expression, there was not a coding variable that included the three functional divisions of gesture space (i.e., personal, interpersonal, and extrapersonal). Other researchers studying meaning in gesture might want to include these divisions in their coding scheme.

**Stroke size.** The relative size of the movement during the stroke was also coded with one of three values: *reduced*, *standard*, and *large*. Gestures that were reduced in size were those in which the circular motion path was made within a very restricted region of gesture space and the hand remained in that location during the performance of the stroke. Often times reduced strokes required a frame-by-frame check to confirm that the movement was a cyclic and not some other type of movement. Gesture strokes that passed through more than one region of gesture space within the same plane (according the divisions shown in Figure 15) were categorized as large cyclics. All movements that displayed a movement size between the small and large categories were coded as standard sized. Examples of standard and large sized cyclic gesture strokes are shown in Figure 19. It is difficult to illustrate the movement of reduced size cyclics in still images so they are not shown.

Figure 19: Examples of *standard* and *large* cyclics
Site of primary rotation. The site of primary rotation refers to the joint where the movement was most pronounced: wrist, elbow, or finger. The movements were closely observed frame-by-frame to make a judgment for this category. If it was unclear whether the primary movement occurred at the wrist or elbow, the gesture was coded as mixed for this category.

Direction of rotation and number of rotations. The direction of rotation of the cyclic was recorded as inward moving, if on the upper arc of the circular movement, the hand was moving toward the body. Direction was coded as outward moving, if on the upper arc, the hand was moving away from the body. Cyclic gesture strokes were also coded to note whether they included a single rotation or multiple rotations.

Path movement. Other characteristics of movement could be co-expressed with the cyclic strokes. For strokes that involved multiple circular rotations, each rotation could be performed in the same location(s) or the rotations could move along a trajectory on any of the spatial planes. An additional variable categorized cyclic gestures that traveled along a path under the label of path. If the cyclic stroke didn’t incorporate a path movement, the gesture was labeled nopath.

Eye gaze. The only non-manual variable that was included in this study was eye gaze. In many but not all cases, it was possible to code for this category. In situations where the camera angles prevented the annotation of this category, eye gaze was categorized as unavailable. Eye gaze was also coded as unavailable if the speaker was
talking out toward the audience (because it was unclear whether eye gaze was being maintained with audience members). Other categories associated with eye gaze during the performance of the stroke were toward (interlocutor), hands, away (from interlocutor), and mixed.

Eye gaze was coded as toward interlocutor if during the entire performance of the gesture stroke, the speaker was looking at one of the immediate interlocutors in the conversation (audience members excluded). If the speaker looked at the hands while performing the stroke, the eye gaze was coded as hands. If the speaker was clearly looking away from the interlocutor(s) while performing the stroke (and was not talking directly to the audience), the token was coded as away. If the speaker looked in multiple directions throughout the stroke performance, such as toward and away from the interlocutor, the gesture was coded as mixed.

**Note on manner of movement.** It should be noted that cyclic gestures have to potential to be performed different manners of movement (e.g., different speeds or different rates of change in acceleration). For example a beat gesture can be co-expressed with a cyclic gesture. Although beats expressed on the hands are typically described as biphasic up and down movements, researchers have recognized that beats can actually be “overlaid” more generally on other gestures (McNeill et al., 2015). Beat manner of movement was a category that initially was included in the coding scheme but it proved difficult to operationalize and reliably code. Ultimately, it was left out of the analysis but there are plans to explore this formal property in a future study that includes multiple coders (for inter-rater reliability).

### 3.4 Spoken Language Constructions

One of the primary goals of the current research project is to gain new insight into the meanings of cyclic gestures by studying their relationship to semantic-functional properties expressed in spoken language. Spoken language constructions were primarily coded for functional-semantic criteria rather than structural. The benefit to coding speech for functional-semantic properties is that patterns to the use of cyclic gestures can be compared across languages. Taking a usage-based perspective, however, I recognize that
language structure is symbolic (meaningful) and there were cases when a variable was coded based upon structural criteria as will be explained in more detail below.

The coding scheme for the spoken language evolved over multiple passes of the data. In order to make coding more consistent and efficient all tokens were coded for the same variable in the same pass. The pilot study initially helped to identify areas of interest based upon patterns observed and recorded in notes. Additional passes helped to pinpoint further variables that should be considered, even though not every one of them turned out to be statistically fruitful. Unlike research exploring particular spoken language constructions, many of which have the advantage of having existing literature to guide and motivate a coding scheme, it wasn’t clear from the onset of the study which properties of the spoken expressions were relevant. As the coming chapter will show, cyclic gestures are not bound to a particular related network or type of construction. This coding scheme was thus exploratory but informed by existing literature.

3.4.1 Determining the scope of spoken language constructions

For the spoken language coding, it was necessary to determine which components of the spoken expressions should be included in the analysis. Gesture strokes have been analyzed as occurring during the portion of speech to which the gesture’s meaning pertains (McNeill, 1992, p. 27) or slightly preceding it (Schegloff, 1984). This doesn’t mean that the gestures serve the same meaning as the spoken expression that accompanies it. It means that the meaning of the gesture relates in some way to the meanings co-expressed in speech.

In the initial pass at coding the data (after the pilot study), the scope of the spoken language construction was limited to expressions that coincided with the stroke phase of the gesture. This also included words, phrases, and clauses in which the elements included in the constituent were at least partially expressed during the stroke. This practice proved problematic as gestures strokes don’t always align with constituents in speech. A limitation to only coding the functional-semantic properties of the speech coinciding with the stroke phase is that it fails to include meanings that interact with the meanings expressed during the stroke. For some tokens it was apparent that the meanings in speech that were not expressed during the scope of the stroke boundary were relevant
to the meaning of the gestural expression. As an example, actor Anna Gunn expressed the spoken expression that is in bold in Figure 20 as she performed asynchronous circular rotations with two hands at each side. During this circular movement gesture stroke, Gunn’s hands were held in fist handshapes depicting the movement of the arms during running or jogging (in an exaggerated manner). At least part of the meaning evoked by the gesture relates to the meaning of jog, which isn’t expressed in speech until after the end of the stroke.

Figure 20: Misalignment between stroke phase and related spoken meaning

[And I was practically having to] jog to catch up with them.

After the initial pass of the data, exceptions were made for coding semantic information outside of the stroke boundary. These exceptions were motivated by observations made during the pilot study and the initial pass such as the observation made in relation to 0. Other exceptions were motivated by conceptual relationships between symbolic elements in constructions. Specific exceptions and justifications for inclusion of spoken language meanings that occurred outside of the stroke boundary are outlined in I-III.

I. During the pilot study and first pass of coding, particular semantic classes of words were found to be repeatedly co-expressed with cyclics. Sometimes the only spoken language structure that aligned with a cyclic gesture stroke would be a word from a particular semantic class or functionally similar word. This recurrent alignment of cyclic strokes with particular categories of meanings suggested that certain semantic types of words might be important to the meaning of cyclics. As
such, it was determined that these recurrent semantic classes should be included in the coding anytime they occurred temporally near a cyclic gesture. The recurrent semantic classes were quantifiers (e.g., all, many), downtoners (e.g., kinda, sort of), and linkers/connectives (e.g., subordinators and coordinators). Cyclics also frequently aligned with various types of discourse markers (e.g., like, just, yknow). If these semantic classes of words or word types came immediately before the word on which the stroke began, they were also included in the analysis. It was not common in the data for these words to occur directly after the cyclic gesture stroke and so only those that occurred directly before were included in the coding.

II. If a cyclic stroke was co-expressed with any event-related element (i.e., content verbs, auxillaries, modals, polarity markers, adverbs) used in predication, all variables associated with event structure were coded for that token. That is, a cyclic stroke did need to extend across a full clause for the semantic properties of the event to be included in the analysis.

III. If a cyclic stroke occurred during the expression of event-related meanings in speech, semantic properties expressed in the subject argument phrase were also included in the analysis. The reason for this decision was based upon the fact that an event is relational and “conceptually dependent; it cannot be conceptualized without conceptualizing the participants who interact to constitute it” (Langacker, 2008 p. 104). Participants are always a part of the scope of predication and participants in the subject position in English are particularly salient, often encoding agent or experiencer semantic roles.

3.4.2 Transcription of spoken language

A tier was created in ELAN for the transcription of the speech that aligned with cyclic gesture strokes. A separate tier was created for the transcription of the broader context of speech surrounding the stroke. Minimally, the broader context transcription included one intonation unit preceding the stroke and one following. Pauses and pause
lengths (in milliseconds) for pauses longer than 0.20 ms were included in the transcription.

### 3.4.3 Semantic class and Information Packaging Function

Each spoken language expression that was co-expressed with a cyclic stroke was coded for semantic class. Because cyclic gesture strokes were rarely isolated to a specific word, the semantic class was taken as the head of the spoken expression that co-occurred with the gesture. A strictly semantic definition of head was adopted for this study. The head of a construction was defined as “the primary information-bearing unit” or “the most contentful item (in the construction) that most closely profiles the same kind of thing that the whole constituent profiles” (Croft, 2001, p. 259). If a cyclic aligned with spoken content that could not be identified as a unified constituent, then that token was assigned a value of other for the variable of semantic class.

Information packaging function was coded whenever possible. The three primary information packaging functions are reference, modification and predication (Croft, 2001) but there are others, such as presentational and equational. Complex predication was included with predication in the coding scheme. Some information packaging functions were ad hoc based upon the data. For instance, an information packaging function of list was assigned for cyclic gesture strokes that occurred across several coordinated elements (phrasal or clausal). An information packaging function of planning was assigned to cyclic gesture that only occurred with filler words and pauses. Information packaging function could not be determined for every token because strokes did not always align with spoken expressions that coherently fit into a single information packaging function. In these cases, the information packaging function was coded as other. Examples of semantic class and information packaging function coding from the English data collected for this research are shown in (1)-(7). The left side of the forward slash shows semantic class coding and the right side shows information packaging coding.

Decisions had to be made about what was salient about the specific portion of the spoken expression with which the cyclic stroke aligned. For example, the semantic class variable for (4) could have been classified as predicate because the stroke begins on a
verbal element. However, it was more significant that the cyclic stroke aligned primarily with coordinated phrases serving a listing function. Thus, the decision was made to emphasize the coordination (listing) of objects in the coding for these variables rather than the predicated event. An additional discursive information packaging function related to subordination that was coded under a separate variable is described in 3.4.7.

(1) And they [get in an adventure] every episode (event/predication)
(2) He's like an alien [that hasn't read the entire] manual. (event/modification)
(3) [Does that affect the] kind of decisions you make and what kind of movies you want to do? (event/question)
(4) We’re not taking care of our own roads, our own bridges, our own schools, our own people. (object/list-phrasal coordination).
(5) And we [have a vague memory] that there’s an oak tree somewhere on this hill. (object/predication)
(6) [They’re amazing! (property/predication)]
(7) [I think] people are really concerned to see what’s in those tax returns. (other/other)

3.4.4 Properties of phrasal constructions (argument phrases).

When a cyclic stroke coincided with phrasal constructions (i.e., constructions performing the functions of reference or modification of referents), a number of properties were coded. There were differences, however, in the coding scheme used for argument phrases functioning as the subject from those functioning as the object or serving oblique roles. There were more coding variables for subject roles because that is typically where the most focally prominent referent is expressed (Langacker, 2008, p. 365). In describing the properties of phrasal constructions that were included in the coding scheme below, I clarify the specific types of argument phrases (subject, object, oblique) to which the variables apply.

**Animacy.** Subject phrase referents were coded as either human or other. They had to be overtly expressed to be coded as human.
**Person.** If a pronoun (excluding indefinite pronouns) was used to express a subject referent, the pronoun was coded for person. The categories included first, addressee, second generic (when the second-person pronoun was used for generic reference), third (excluding dummy subjects), and dummy subjects (e.g., *It has finally stopped raining*). Non-pronominal referents and pronominal referents not occurring in subject phrases were coded as other.

**Number.** Referents in subject phrases were coded for number, singular or plural. Second-person pronominals used for generic function and dummy subjects were coded as other for this variable along with referents outside of subject argument phrases.

**Identifiability.** This semantic category relates to whether an addressee(s) can identify a referent “from among all those which can be designated with a particular linguistic expression and identify is as the one the speaker has in mind” (Lambrecht 1994, p. 77). Coding for this category was performed on referents in subject phrases. The coding categories associated with this variable were definite, specific indefinite, non-specific indefinite, and generic. Definite referents are those that are identifiable to both the speaker and hearer. Pronouns (when referring to animate entities) excluding indefinite pronouns and proper nouns were coded as definite. For common noun phrases, the modification of a referent with the definite article (*the*) or demonstrative in some cases (*e.g., That guy was there again today*) also signaled that a referent was definite.

*Specific indefinite* referents are those that have an actual identity in the real world but are not construed as being identifiable to the addressee. *Non-specific indefinite* referents are those object concepts for which there is no specifically identifiable referent in the real world. Both *specific* and *non-specific* indefinites are signaled with the indefinite determiner (*a/an*) in common noun phrases. One piece of criteria that helps to distinguish these two types of indefinites (noted in Croft, in prep, Chapter 2) is that non-specific indefinites cannot occur in events that have actually occurred. Non-specific indefinite referents (in common noun phrases) only occur with situation types have not occurred but are desired or attempted. For example, one cannot be referring to a specific identifiable
goat when one says *I want go to online and see if someone is selling a goat nearby*. The speaker has not yet identified a specific goat they would like to purchase. Alternatively, if one were to say *I bought a goat last weekend*, it would refer to a specific goat (as a specific goat has already been identified and purchased). *Generic reference*, similar to indefinites, does not identify a particular referent. Instead, a generic referent is only identifiable only in terms of its type (e.g., *Goats destroy gardens*).

**Indefinite pronouns.** The presence of an indefinite pronoun was recorded for any type of phrasal construction (subject, object, oblique) co-expressed with a cyclic stroke. Indefinite pronouns were further coded as *specific* or *nonspecific* indefinite Haspelmath (see Haspelmath, 1997). *Specific* indefinite pronouns are used when it is presupposed that a referent is uniquely identifiable (e.g., *I have to go to my office to meet somebody in an hour*). *Nonspecific* indefinite pronouns are used when the referent does not have a uniquely identifiable identity or their identity has not been established (i.e., *I don’t know anyone in the physics department*).

**Quantifier and numeral constructions.** If a word associated with the semantic class of numerals and quantifiers was present in any phrasal construction co-expressed with a cyclic stroke, the specific semantic type of numeral or quantifier was recorded. It is worth noting there are a number of terms that linguists use to classify different types of quantifiers. Part of the issue is that many terms come from formal logic that don’t translate or capture the complex distinctions found in human languages. Another problem is that the criteria used to differentiate quantifiers fall across different dimensions: for example they might be classified based upon whether the entity they modify is countable or not, whether the quantity is precisely or imprecisely indicated, or how the groups of entities are construed. The types of quantifiers and numerals coded within this variable came from Langacker (1991) and Croft (in prep, Chapter 3). These include the major divisions between *absolute* and *relative* quantifiers and the more specific distinctions among *cardinal numerals*, *vague numerals*, *ordinal numerals*, *amounts*, *proportional* and *distributive quantifiers*, and *set-member modifiers*. These categories will be discussed in further detail as they are relevant to the findings on cyclic gesture use in Chapter 4. Also
included were related constructions like measure classifiers (glass of water), which are used for mass nouns, and group classifiers, which are used for sets of count nouns (pack of matches) (Croft, 2001, p. 119).

**Location arguments.** Cyclic gestures that were expressed with oblique argument phrases that expressed meanings about the location of an event as well as location predication constructions (e.g., I am in Los Angeles) were coded as location. This coding variable arose from observations made in the pilot study.

Both literal and metaphoric location meanings were included for this coding variable. Coding did not specify the exact nature of the place related (locational) meanings (see Biber et al., 1999 for semantic subcategories of place and time).

### 3.4.5 Properties of clauses

A token was coded for the following properties whenever at least some portion of the stroke coincided with the expression of any of the following verbal elements in speech (e.g., copula, lexical verb, auxiliary, negative marker). Not every predicate-related variable was relevant to every token. If it was not relevant, the token was coded as other. The use of N/A as a variable value was avoided because the software used for statistical analysis treats N/A as missing values.

**Tense.** Clausal constructions occurring with cyclics were coded for tense: past, present, future, and future-relative (relative to the time in which the construed event is situated).

**Lexical aspect.** Verbal aspect was also recorded. Verbal aspect relates to the “inherent temporal structure of a situation” (Croft, 2012). The aspectual properties used to differentiate traditional categories (i.e., activities, states, accomplishments, and achievements) outlined by Vendler (1967) were as for values for the aspectual variables. These properties are dynamic/static; durative/punctual; and atelic/telic. Notes were also taken regarding how a construed event fit into more specific aspectual subtypes proposed
by Croft (2009). This was not a separate coding variable but the observations made in the notes will be discussed in more detail in Chapter 4.

**English-specific aspectual constructions.** A variable was created to record cases in which a cyclic token was co-expressed with the English Perfect construction. Another variable coded cases in which a cyclic was used with the English Progressive construction.

**Polarity.** If a negative marker was used in the clause with which the cyclic stroke was performed it was recorded as *negative*.

**Presence of modal marker.** If any type of marker of modality (deontic or epistemic) was used in the clause with which the cyclic stroke was performed it was recorded as *modal*.

**Semantic verb type.** During the pilot study all semantic verb types were coded based upon classifications described in Levin (1993). It became apparent that there were only a few classes of verbs that were recurrently used and that closely aligned with cyclic gestures. As such, coding for semantic verb type was limited to aspectual (phasal) verbs and motion verbs. Aspectual verbs are complement-taking predicates that express the inception, continuation, or completion of an event (pp. 274-275).

**Agentive semantic role of subject participant in event.** When a cyclic gesture was use with a predicate construction in which the participant in the subject argument phrase served the semantic (thematic) role of *agent*, it was coded.

**Event frequency and iteration.** A variable was created to code all events expressed with cyclic gestures that included meanings related to event frequency and iteration. The variable values were *frequency* and *iterative*. Construals that expressed meanings about the rate of occurrence of an event over different occasions as well as habitual readings were coded as *frequency*. Construals that expressed meanings about event repetition
within a single occasion were coded as *iterative*. These aspectual meanings can be expressed both lexically and morphosyntactically in English. This variable was strictly based on semantic reading rather than a particular strategy.

**Adverbs (modifiers of events).** Lexical event modifiers (adverbs) that occurred with cyclic gestures were coded for semantic type using categories described in (Biber et al., 1999). These categories include *place, time, manner, degree, additive, restrictive, stance,* and *linking*. Table 9 shows the definitions for each category.

Table 9: Semantic categories of adverbs (based upon Biber et al., 1999)

<table>
<thead>
<tr>
<th>Semantic types of adverbs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>place</td>
<td>shows “position, direction, or distance” (p. 552)</td>
</tr>
<tr>
<td>time</td>
<td>shows “position, frequency, duration, and temporal relationship” (p. 552)</td>
</tr>
<tr>
<td>manner</td>
<td>expresses “information about how an action is performed” (p. 553)</td>
</tr>
<tr>
<td>degree</td>
<td>describes “the extent to which a characteristic holds” (p. 554); can scale up or scale down the extent</td>
</tr>
<tr>
<td>additive</td>
<td>shows “that one item is being added to another” (p. 556)</td>
</tr>
<tr>
<td>restrictive</td>
<td>serve “to emphasize the importance of one part of a proposition” (p. 556)</td>
</tr>
<tr>
<td>stance</td>
<td>express epistemic or attitudinal stance (p. 557)</td>
</tr>
<tr>
<td>linking</td>
<td>shows semantic relationship and cohesion between elements in discourse (p. 558)</td>
</tr>
</tbody>
</table>
Discourse markers

Discourse markers that occurred with cyclic gestures were coded for particular functions: focus, hedge, elaboration, and filler or other. Table 10 shows the operational definitions for each category.

Table 10: Discourse marker types and definitions

<table>
<thead>
<tr>
<th>Discourse marker type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>focus</td>
<td>draws special attention to or emphasizes the new information that follows the discourse marker (see Underhill, 1988)</td>
</tr>
<tr>
<td>hedge</td>
<td>expresses imprecision or serves a downtoning function (see Biber et al., 1999)</td>
</tr>
<tr>
<td>elaboration</td>
<td>signals that what follows is an elaboration of something previously stated or provides an example related to something previously stated (see Fraser, 1988)</td>
</tr>
<tr>
<td>filler</td>
<td>short words like um and uh which fill pauses and are relate to speech management</td>
</tr>
<tr>
<td>other</td>
<td>used for cases in which a primary function could not be determined or did not seem to fit appropriately in the other categories</td>
</tr>
</tbody>
</table>

3.4.7 Properties of Complex sentences

A token was coded for the following properties whenever at least some portion of the stroke coincided with the expression of verbal elements that were a part of a complex sentence.

Complex sentence type. Tokens were coded for whether they occurred with clausal coordination or subordination. A separate variable identified the particular type of coordination and subordination. Semantic types of coordination were identified using the descriptions given by Haspelmath (2004), including disjunctive (or), conjunctive (and),
and adversative (*but*). Categories for subordination included relative clause, complement clause, protasis (of conditional), apodosis (of conditional), and adverbial.

**Assertion.** Cristofaro (2003) observed that subordinate clauses are pragmatically non-asserted. Pragmatic assertion roughly corresponds to the new information expressed by a sentence. Non-assertion refers to the information expressed by a sentence that is presupposed. Pragmatic presupposition is defined as "The set of propositions lexicogrammatically evoked in a sentence which the speaker assumes the hearer already knows or is ready to take for granted at the time the sentence is uttered" (Lambrecht, 1994, p. 52). Cristofaro’s work suggests that a subordinate clause depends on and presupposes information about the event expressed in the main clause in order to establish the meaning that is in focus in the entire complex sentence (pp. 29-35). Non-assertion can be further characterized as being “presented in the perspective of the information encoded by another clause.” Cyclic strokes that only aligned with the subordinate clause in a complex sentence were coded as *non-asserted*.

**Linker alignment.** While not a semantic variable, a variable was created to record when the onset of a cyclic stroke aligned with a coordinator or subordinator in a complex sentence construction. This variable was included to see if cyclic gestures repeatedly aligned with clause boundaries across semantically related clauses.
4 Cyclic Gesture Use in American English

4.1 Introduction

Speakers of English use circular movement gestures when they talk. While no study to date has examined the relative frequency of these gestures (for which I use the term cyclic gestures) across different discourse genres and modes, it is not unusual to see English speakers repeatedly produce cyclic gestures in conversational interactions. As someone who pays special attention to these types of gestures, I also regularly observe speakers using cyclic gestures in classroom lectures and during academic conference presentations. Despite cyclic gestures being commonplace in many types of spoken discourse, very little is known about why speakers are using these particular gestures with speech (see §2.5.5 for a summary of the existing literature). This chapter addresses this gap by examining functional-semantic properties of spoken language constructions with which speakers of English use cyclic gestures. It further examines whether there are significant relationships between formal properties of the manual gestures that include a circular movement and functional-semantic properties in the spoken expressions.

The study presented in this chapter seeks to answer two primary research questions about cyclic gesture use: (1) With what functional-semantic properties in speech are cyclic gestures in English repeatedly expressed? (2) Are variable properties in the formal expression of the gesture (i.e., formal features outside of the circular motion) associated with distinct functional-semantic properties expressed in speech?18 The first research question is addressed in §4.3. Specifically, §4.3 describes the functional-semantic properties of the spoken language constructions that are used with cyclic gestures in English (see §3.4 for coding procedures). The second part of the study (presented in §4.4) uses quantitative methods to identify statistically significant patterns between formal properties of the gesture and functional-semantic properties expressed in the speech.

18 Remember from the definitions provided in Chapter 1 (§1.3) that functional-semantic refers to both overtly expressed meanings that are lexically evoked and interactional-pragmatic meanings.
Findings show that cyclic gestures in English are repeatedly used with a limited range of functional-semantic properties in speech and that many of the meanings with which cyclic gestures are expressed share conceptual relationships with one another. Furthermore, formal properties in the gestural expressions that include cyclic movements show interactions with meanings expressed in speech. Before discussing the findings of the study on cyclic gestures in English, I describe the data used in the analyses in more detail.

4.2 Data

A total of 501 tokens of cyclic gestures were collected for this study. Data come from segments of 95 different American English talk show episodes and approximately 12 hours of video total. Complete episodes were not usually freely available online, but clipped segments of episode were exhaustively examined for cyclic gestures. For criteria used to determine whether a gesture was considered to be a cyclic see §3.3.3. Every gesture identified in the clip that met the established criteria was included in the analysis. Eleven different talk show programs served as sources for the data. The 501 tokens were produced by 96 speakers across the programs.

While there were typically multiple tokens produced by each of the 96 speakers represented in the data, the number of tokens per speaker was not evenly distributed ($Mdn = 3$, $M = 5.27$, $SD = 5.93$). Two speakers were major outliers in terms of the number of cyclic gestures tokens that they produced that are included in this study. The major outliers are talk show hosts Steven Colbert and David Letterman. Colbert produced 40 tokens and Letterman produced 29 tokens included in the study. A large portion of the data collected for this study come from talk show programs that these speakers host (or hosted). This likely contributed to their gestures being overrepresented in the data. As the primary goal of this study was to learn more about the relationships cyclic gestures have to meanings expressed in speech, an uneven distribution of tokens across speakers is not in conflict with this aim. Nevertheless, it was important to ensure that patterns found between functional-semantic properties in speech and cyclic gesture use was represented by multiple speakers to prevent the results from being biased by usage patterns of a single
speaker. This concern was taken into account as I examined patterns in the data. Any finding that was greatly influenced by the behavior of a specific speaker is noted in the presentation of the results of the study.

4.3 Cyclic Gestures and Functional-Semantic Properties in Speech

This section describes the findings in answer to the first research question: With what functional-semantic properties in speech are cyclic gestures in English repeatedly expressed? Of course it would be impractical and uninteresting to discuss every functional-semantic property that occurred multiple times with cyclic gestures. Certain variables, such as those relating to the expression of the subject referent (e.g., number and person), are going to have high rates of co-occurrence with cyclic gestures because they are obligatory elements of phrases and clauses in English. A set of criteria was established to determine whether a recurrent property would be discussed in the findings.

For lexically expressed semantic properties, they had to meet two criteria to be discussed in the remainder of this section. First, a cyclic had to repeatedly align temporally and specifically with the lexical unit evoking the semantic property. Temporal alignment was characterized by (1) alignment between the onset of a cyclic stroke and the expression of a particular semantic word class in speech or (2) alignment between the full expression of the cyclic stroke and a particular semantic unit (e.g., quantifier construction). A semantic class did not have to align specifically and exclusively with the cyclic stroke for every token with which it was co-expressed in the data. To be included in the description of the findings, lexically expressed semantic categories had to have close temporal alignment (as defined above) with a minimum of four cyclic tokens across more than one speaker. If cyclic gestures aligned temporally with expressions designating specific meanings repeatedly and exclusively, it is inferred that cyclic gestures functions share a relationship to those meanings. This is predicted by the finding that the gesture stroke closely aligns (though sometimes imperfectly) with the spoken language expressions it most closely relates to in meaning. The second criterion for a lexically

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19 This isn’t to say that entrenched patterns of gesture use (i.e., within a single speaker) are uninteresting; however, this study was most interested in identifying the more conventionalized patterns of cyclic gesture use in English (i.e., usage practices shared by a speech community).
expressed semantic property to be included in the discussion was that it had to occur with at least 30 cyclic gesture tokens (approximately 6% of the data).

Specific morphosyntactic constructions recurrently used with cyclic gestures are discussed in the findings if they occurred with at least 5% of the data (25 tokens). Semantic properties that are inherently tied to semantic classes, such as a particular category of lexical aspect (in the case of cyclices expressed with events), are discussed if the category occurred with over 50% of the tokens in the data.

Findings for lexically expressed semantic classes are organized by the prototypical information packaging function of the class, specifically reference, modification, and predication. This organization of the findings doesn’t necessarily mean that a semantic property was used for its prototypical function when it occurred with a cyclic. The relationship between information packaging function and semantic class will be discussed in each section as it relates to the findings.

4.3.1 Semantic properties of reference

Cyclic gesture strokes aligned exclusively with referring expressions for 90 tokens (18% of the data). However, this number is misleading based up how the data was coded. For 20 of the tokens, the referring expression was expressed in a Predicate Nominal construction. In each of these cases the be verb was not expressed during the cyclic stroke. So while the tokens were coded as functioning for reference (because the strokes did not align with the verbal elements), the referring expressions were a part of higher-level predicational or presentational information packaging functions. Furthermore, for 19 tokens in which cyclices were aligned exclusively with referring expressions, the cyclic stroke corresponded to multiple coordinated conjuncts. These cases were coded under the information packaging function list rather than reference. The list function is described in §3.4.7. For seven of the tokens in which cyclic gestures aligned with referring expressions, the gestures began directly following a pause of more than 0.25 ms. For these seven tokens, it might be the case that the continuation of speech after a pause is more relevant to the expression of the cyclic than the semantic properties of the referring expression.
Semantic variables associated with referents in referring expressions (e.g., animacy, person, identifiability) will not be discussed here. As mentioned earlier, these are obligatory properties of most types of clauses in English. Furthermore, there were no cases in which cyclic gestures solely aligned with the subject referent so these categories fail to meet the temporal alignment criteria for this portion of the study. However, these properties are included in the discussion of the findings from the quantitative component of this study (§4.4).

**Locations.** Cyclic gestures occurred with expressions used to convey meanings about location in 7% of the data (37 tokens) across 26 speakers. Cyclic strokes did sometimes closely align with phrases expressing location. Example (8) shows this to be the case with a literal locational meaning and (9) shows alignment with a metaphorical locational meaning. The majority, however, did not align exclusively with the oblique phrase. More often (with 28 tokens), the stroke was expressed with a spoken expression that conveyed information about location as well as with additional elements of phrases and clauses that expressed other types of meanings. In these cases, it isn’t clear that the cyclic gesture use was related to the expression of the locational meaning. Example (10) shows a cyclic that was used not in a referring expression but in the locational predication construction *be out of the country*. The onset of the cyclic stroke in (10) aligns with the coordinator and, which conveys information about the temporal ordering of events in juxtaposed clauses and was also found to interact with cyclic gestures (as discussed later in §4.3.5).

(8) Well they put a pig I [in the ground with some] banana leaves.

(9) You're telling me the secret to crossing over [into the Latino] market is to wear your clothes four sizes too big.

(10) [And then I was gonna be out of the country]
4.3.2 Semantic properties of modification

This section discusses semantic classes recurrently used with cyclic gestures that are prototypically associated with modification functions. This includes those expressions that typically serve modifying functions in referring expressions as well as those that modify events.

Quantities and numerical amounts. Cyclic gesture strokes were used with quantifier and numeral expressions in 71 tokens (14% of data) across 47 speakers. Quantifiers and numerals are prototypically used for modification functions in referring expressions, indicating information about amounts and number for object concepts. These related semantic classes were initially identified as interesting to the study of cyclic gestures in English because there were multiple tokens (13 tokens) in which the cyclic stroke aligned exclusively with a quantifier or numeral term (sometimes also including the quantified referent). In other cases (19 tokens), the onset of the stroke phase aligned with the expression of the quantifier or numeral term. This served as another indication that these meanings interact with the meanings of cyclic gestures. After observing these temporal alignment patterns in the data all quantifier and numeral terms that were expressed at any point during a cyclic gesture stroke were included in the analysis.

Note that quantifier and numeral terms do not form a unified semantic class. These expressions are discussed together because they have semantic properties relating to the same conceptual domain and have been described as being associated with same type of information packaging within modification. Specifically, quantifiers and numerals have been described as serving the more specific modification function of selecting (Croft, 2007, p. 358; Croft, in prep, Chapter 3), which involves the selection of a more specific category from a more general category (in this case through quantifying in identifying the specific amount of an entity).

In speech, the quantifier and numeral expressions co-expressed with cyclics were used in variety of different constructions that served diverse functions. Sometimes these expressions were used in referring expressions for the general modification function of “enriching a referent’s identity” (Croft, 2001). Other times they were used in referring expressions that themselves serve as modifiers of events, such as in oblique phrases used
to express information about event frequency. Because cyclic gestures were not
associated with a single quantifier or numeral construction, the description of these two
semantic classes as they relate to the data is organized by semantic subtype. Information
packaging function is discussed only as it relates to specific examples.

**Absolute quantifiers and numerals.** Cyclics were expressed with quantifiers and
numerals that are prototypically associated with absolute quantification. Absolute
quantifiers and numerals provide a direct description of an entity’s magnitude without
reference to all instances of entities of the same type (definition adapted from Langacker,
1991, p. 86). I use the term *entity* as it is used in Cognitive Grammar. Langacker
describes it as a “maximally general term” that “applies to anything that might be
conceived of or referred to in describing conceptual structure: things, relations, quantities,
sensations, changes, locations, dimensions, and so on” (2008, p. 98). Absolute quantifiers
are contrasted with relative quantifiers, which select some amount of an entity relative to
to all instances of the type (e.g., *most children* makes reference to all instances of children).

Cyclics were found to be used with absolute quantifiers that specify vague amounts
of non-countable entities, as shown in (11) and (12). In (11), the referent is uniquely
identifiable, referring to the speaker’s life. Example (12) makes use of the same
quantifier as (11), but the object concept that the quantifier serves to modify is
unexpressed. The unexpressed referent can be inferred to be a non-countable and generic
noun (e.g., *stuff*) that is vaguely quantified by *much*.

(11) ALBA; As an actress:,
i:n movies,
I was never in control of the distribution,
the marketing,
(0.3)
(H) uh: the final cut,
the edit.
(0.2)
And so I w–
[so much of] my life w–
really was in someone else's hands.
(12) JONES; and it was f–fascinating. There's so much that we uncovered in telling that story.

Cyclics were also used with absolute quantifiers that modify countable entities. In (13) and (14) the quantifiers (many and lots of) vaguely characterize the amount for the countable entities points of view and people. It was sometimes the case that multiple types of quantifiers and numerals would be used during the performance of the same cyclic token. In (14) we see that the vague absolute quantifier directly precedes the set-member quantifier (Croft, 2007), other. Set member quantifiers are discussed later in this section.

(13) ROSS; And our show is multigenerational. Like we go from the kids to the grandparents, so there's so many different points of view I think it's really identifiable.

(14) KNDR; Well it's very exclusive, it's just me and my best friend. And, (0.2) lots of other people want to come, but it's just, we thought that we should keep it really exclusive.

Cardinal numerals, which indicate the specific number for a countable entity, were also co-expressed with cyclic gestures. The numerals that were used with cyclic gestures were found in a variety types of constructions serving different functions. In (15), the numeral two designates the specific number associated with the new participant or topic (i.e., “options”), which is introduced with the existential construction. Note, however, that the use of the stance adverb basically that aligns with the onset of the cyclic stroke lends a meaning of approximation and generality to the quantity (Biber & Finegan, 1988).
This was a general pattern with cyclic gestures used with numerals. The specificity of prototypical numeral expressions occurring with cyclic gestures were always qualified using stance markers or hedges (e.g., And it\'s like fifteen hundred people in here looking at me) or through combined strategies of hedging and disjunctive coordination (e.g., this increases I guess by a multiple of about ten or a hundred thousand the amount of radiation we get in our lives every day). While cardinal numeral expressions prototypically specify an exact number of an entity, functional-semantic properties expression in the larger construction in which numerals accompanying cyclics were embedded indicated that the number of selected entities was approximated and not specific.

(15) PENN; it\'s [basically there are two] options, either you can decide to
(0.3)
d–
(0.2)
divorce yourself from loving your children

Example (16) illustrates a cyclic gesture that is used with a numeral in a very different construction than the examples discussed in the previous paragraph. In this case, the numeral expression twenty-five is part of an oblique argument phrase that is used to express duration. Specifically, it is used to designate the length of time in which the referents described in the clause (Lee Young Sr. and Nat King Cole\'s band director) were co-referential.

(16) GARF; Lee Young senior,
Lee a: uh uh d–
Young Senior was Nat King Cole's band director,
(H) [for twenty-five] plus years.
**Universal quantifiers.** Cyclic gestures were also used with universal proportional quantifiers. These are quantifiers that treat all members of a type collectively as a single group. Out of all of the quantifier types found to be co-expressed with cyclic gestures, universal quantifiers accounted for the greatest proportion (31/71 tokens). In example (17) the cyclic is used with a collective universal quantifier (*all*). *All* was one of the more frequent quantifiers used with cyclic gestures, occurring with 14 tokens. Some cases in which *all* appeared with cyclics did not function for quantification. *All* can also be used for intensification. These cases were not included with quantifiers. When *all* was used for quantification, it was either used hyperbolically to mean that *generally* all members of the type were included or it was used in cases when the type itself was not clearly identifiable. Example (18) shows an instance of the latter. The expression *we’re all* is used generically and can be inferred to mean “members of society in general.”

(17) MADD; And he was in the process of doing his due diligence to figure out it's real.  
(H) Because:,  
[obviously all of us] in this business are worried that like somebody's gonna slip us a forged document, or something fake,

(18) MADD; so,  
it's not just a comedy based on,  
like,  
a silly thing happening,  
or a funny thing happening.  
It's like really grounded in,  
who this family is,  
and things that [we're all (0.2)]  
sorta of dealing with right now.

Cyclics were also used with distributive universal quantifiers. Distributive universal quantifiers select all of the members of a category but individuate *each* member. Example (19) shows a cyclic that is used with the distributive quantifier *every.*
Examples (20) and (21) below do not include the use of quantifiers in the traditional sense. The modifiers whole and entire are not used in the same constructions as quantifiers and can be used for distinct functions. For instance, these expression can indicate that that an entity’s magnitude is unexpected (FrameNet). Athanasiadou (2007) notes that these words can function as intensifiers. However, these expressions also share semantic properties related to quantification. They can be used to select the full portion of an entity that is in construed as a whole (having all of its parts). In (20), the entirety (whole) of the entity world is selected. Note that it is used metonymically to stand for the people of the world. Contrastively, the negative construction shown in (21) specifies that the complete (entire) entity manual is not selected. The presupposition is that only part of the manual has been read. In this study, examples such as these were categorized as universal quantifiers.

(19) BAIL; If you feel confident in yourself, the things that other people say, [every little thing] won't upset you and make you be like, cursing people out like, (0.3) it won't bother you.

(20) BRAND; Or as Rocky IV said, if I can change and you can change, [maybe the whole goddamn] world can change.

(21) RWILL; Mitt reminds me of Jeff Bridges in Star Man. He's l-like an alien [that hasn't read the entire] manual.

Sets. Set-member modifiers were also used with cyclic gestures (e.g., first, second, next, other, another). These expressions specify that an entity is “a member of a contextually specified set” (Croft, 2007, p. 358; Croft, in prep, Chapter 3). These sets can be ordered, as can be seen in (22). The set-member modifier next is used to position the entity, one-man show, in relationship to one-man shows that have already happened. Set-member ordinal numeral expressions like this one are ordered. Cyclic gestures also
occurred with unordered set-member expressions, as can be seen with the use of other in (14) above and (26) below (the third cyclic stroke in the example).

(22) LEGUIZ; but my [next one-man show, I just started already], it's Latin history for dummies

Part-whole relations. Cyclic gestures were used with English Partitive constructions. Partitives specify a part-whole or an instance of a type relationship with a specific strategy that involves using a partitive noun (e.g., kind, type, part) in the initial noun phrase followed by of before the NP that specifies the type (i.e., [N_{part} of N_{type}]). In examples (23) and (24), the cyclic stroke coincides with both the expression introducing the part or instance (member and type) as well the whole or type (the Starfleet team and moment).

(23) TAKAY; Their bodies are green. And so th-therefore they were supposed to be aliens. But we also had, [as a member of the Starflee]t team, an a-a person that was half alien.

(24) YEE; It was a Love and Hip Hop moment. Unfortunately.
LONI; Oh was that?
YEE Yeah, it was a Love and [Hip Hop cameras rolling type of mo]ment.

Quantification and events. In addition to quantifiers being used to modify objects in referring expressions, referring expressions that incorporate quantifiers can function to express information about the frequency of an event’s occurrence. Examples (25) and (26) show examples of quantifier expressions a lot of and every functioning in referring
expressions that express event frequency. Note that example (26) includes two additional cyclic strokes that align with constructions that include quantifiers but that do not express information about event frequency. As will be discussed in §4.3.3, cyclic gestures were repeatedly used with spoken language expressions (representing a variety of different constructions) that evoked information about event frequency.

(25) PALMER; It was the first time, one of the first times we hung out. Because yknow it's hard when you're traveling, with your job and stuff like that, [a lot of times you become friends] with people, over text messages.

(26) PATINK; The writers and Claire and myself go, [every] year in January, and we sit [with all the heads] of National Security, CIA, [other security forces].

Adverbs. Cyclic gestures were expressed with constructions that included adverbs in 94 tokens (approximately 18% of data). The categories used to distinguish different types of adverbs (see §3.4.5) were difficult to implement because, often times, the expression fit into more than one semantic type.

In 32 of the tokens that included an adverb, cyclics were used with modifiers expressing degree. Degree adverbs modify the scalar semantics of a properties and events. Bolinger (1972, p. 17) uses the term intensifier to describe these degree expressions. Bollinger defines an intensifier as ‘any device that scales a quality.” Qualities can be scaled either upward or downward. Amplifiers “scale upwards from an assumed norm” while downtoners scale “downwards from an assumed norm” (Quirk, Greenbaum, Leech, & Svartvik, 1985, p. 590).

A few examples of cyclic gestures that closely aligned with amplifiers (very and really) in the data are provided in (27)-(29). Two more instances of amplifiers co-expressed with cyclic gestures are shown in (11)-(12); in these earlier examples the
amplifier so modifies the vague quantifier much, showing an increase in the scale of an amount.

(27) MYERS; There is a
(0.2)
[a very] unique way that uh-
Shoshana talks on the show.

(28) THERO; And then if they said oh we can't,
[we'd really (0.5)]
(0.3)
put more pressure on them to be at the birthday.

(29) MOBAMA; He's [really into goss]ip. So you can get him
(0.5)
real foc-
Because he doesn't have a life.

Cyclics were also used with amplifiers in constructions, not to scale a quality upwards, but to emphasize that an event was unexpected or that it deviated from the expect norm. Two examples are show in (30) and (31). In (30) actor Zosia Marmet is talking about being approached by fans who relate to a character she plays on a television show. The modifier literally is used in this construction not as a scalar intensifier but to draw attention to the contrast between an speaker’s perception of her fans in the real world (i.e., that when they approach her they closely resemble a bouncing manner of motion) and the expected norm (i.e., that people do not actually bounce). Similarly, in (31), comedian Samantha Bee’s use of the amplifier really in the negative construction serves multiple functions. It can be analyzed as a downtoner that scales down or hedges her assertion about her children’s food preferences. It also serves the function of emphasizing that her children’s lack of interest in desserts is not expected (i.e., children usually like sweets). 20

20 Thanks to Logan Sutton for discussing this example with me and bringing to my attention the latter function of (31).
Examples (32) and (33) show cyclics used with downtoners (less and quite). It was difficult to determine whether a token occurring with a downtoner should be counted as a degree adverb or a hedge type of discourse marker. Almost all of the downtoner adverbs were also coded as hedges for the discourse marker variable. This isn’t a problem because a new variable for hedging, which incorporates different formal strategies for hedging (lexical and paraphrastic), is used in the quantitative analysis.

(32) ALBA; but like [it's less]
         (0.2)
         [it's less]dramatic.

(33) NOTH; I was a little intimidated by LA.
         Uh,
         I didn't [quite know how to deal] w-
         I still am not sure I know how to deal with it.
         And I still am not sure I know how to deal with it.
         My son goes to school there.

Adverbs expressing temporal meanings were the most frequent type of adverb expressed with cyclics, occurring with 39 tokens. Examples of tokens that occurred with
adverbs expressing frequency or iteration of an event will be discussed in §4.3.3 in the section that describes event frequency and iteration.

There are many different types of temporal meanings that can be expressed using adverbs in English. Example (34) includes the temporal adverbs then and later on, which express information about the temporal ordering of events, specifically that the event that follows is later in relative time than the event expressed in the preceding clause. These can also be coded as linking adverbs, as they contribute to discourse cohesion. In example (35), the adverb still expresses that a state of affairs (i.e., the need to write more words) persists until a particular time.

(34) KEKE; [and then later on] in the day
(0.3)
Tia Mowry addressed

(35) ELLEN; you [still have seven thousand words] to go

Finally, the adverb just was expressed with cyclic gestures in 19 tokens in the data. This word has many different functions in conversation. When it occurred with cyclics, it served as a marker of stance with a meaning similar to merely or simply. It often simultaneously served a hedging function. Some examples are shown in (36)-(39). Another example of a stance adverb used with cyclic gestures is shown in (15) with the use of the stance adverb basically. Other stance adverbs repeatedly occurring with cyclic gestures were obviously (see (17) above), and even, which was also used to express an element of unexpectedness, as shown in (40) and (41).

(36) HART; [It's just a whole little] friendship thing we got going on man.

(37) BRAND; we all have the capacity to be a bit selfish and egotistical.
I know I do.
[So I just] try and tend toward the best part of myself,
4.3.3 Semantic properties of predication

Cyclic gestures were co-expressed with constructions profiling events with 280 tokens (56% of the data). Not all of these events were packaged as predication. Cyclics occurred with event predication with 172 tokens in the data. Events also often functioned for modification (i.e., relative clauses) and reference (complement clauses), which will be discussed in §4.3.5.

Lexical aspect. Cyclic gestures were only used with events construed as durative, except for in one case. The only punctual event that a cyclic was co-expressed with is shown in Figure 2(b) (got electrocuted). In addition to being expressed with event types that were inherently durative, cyclic gestures were also expressed with temporal modification clauses (adverbials) that expressed durativity in positioning the occurrence of an event in time. Examples are shown in (42)a-c.

(42)  
a. I know you was talking shit about me [during this elec]tion, but I'm gonna let this slide give you a job.
b. [during Christmas time] we like to play games,

c. And [during the interview] he explained to him that he's been meeting
with his,
uh,
legal team,
and he has finally decided that he's sorry.

Cyclics were used with constructions profiling both states (89 tokens) and processes (175 tokens). It was not possible to code for lexical aspect for every cyclic token co-expressed with an event. Again, cyclic gesture strokes sometimes spanned across larger segments of speech that encoded information about more than one event that were construed with different aspectual properties.

Croft (2012, p. 58), drawing on the work of Carlson (1979), Comrie (1976), and others, further divides the aspectual class of states into three subcategories: transitory, permanent, and point (momentary states). In the data, cyclic gestures were used with both transitory and permanent states. An example of each type found in the data is shown in (43)a-b. A transitory state of “staying focused” is expressed in a. The acquired permanent state of having a British accent is shown in b (i.e., under normal circumstances the state is expected to continue throughout the lifetime of the person).

(43)

a. [I'm just staying focused, yknow what I mean.] (transitory state)
b. surpri[se I have a Briti]sh accent. (permanent state)

Building on the work of Hay, Kennedy & Levin (1999) and Dowty (1979; 1991), Croft (2012) distinguishes two types of activities, undirected and directed. Undirected activities represent the traditional sense of the aspectual category, as introduced by Vendler (1967). Directed activities include a gradual qualitative change of state but the event is not construed as having an endpoint or result state. Cyclics were used with spoken language constructions that expressed both types of activities. Example (44)a involves two separate cyclic strokes that are expressed with the undirected activities of mingling and talking (to or with people). In (44)b, the event expressed with the cyclic
involves a series of directed activities. The use of the aspectual verb “keep” evokes a continuous state or process (in this case a process). The character’s role in the Iron Man movie franchise is construed as becoming continually more significant over multiple iterations (i.e., over the course of developing multiple movies).

(44)
  a. I was with my mo[m and he was sort of mingling],
     and [talking to every]body. (undirected activity)
  b. it was a small small character in Iron Man One,
     and uh,
     they [just kind of kept expanding the r]ole. (directed activity)

Cyclics were also co-expressed with events reflecting both types of accomplishments described by Croft (2012): (directed) accomplishments and nonincremental accomplishments. Directed accomplishments are incremental or continuous, durative processes that are bounded (ibid, p. 26). Nonincremental accomplishments are durative and bounded but involve undirected processes. Example (45)a shows a directed accomplishment that was used with a cyclic gesture. The participant in the event rotates their body in a way that results in the participant facing a different direction. The fact that this particular bounded motion event involves a partial rotational movement around an axis is likely relevant to the use of the cyclic gesture.

In (45)b, author George RR. Martin discusses a practice he would engage in at sci-fi conventions in which he would imitate the act of knighting people. After doing it at enough conventions, it became a tradition and people expected him to do it. This construal is a durative as traditions are established over time. The result state is one in which mock knighting rituals are a tradition. This result state is not accomplished through an incremental process. It is realized through a series of undirected activities. Because of this, the event expressed in (45)b is best categorized as a non-incremental accomplishment.

(45)
  a. [and he turned] around and he was wearing chaps with nothing else un
derneath
b. [it became a tradition]

**Event frequency and event iteration.** With 78 tokens (16% of the data), cyclic gestures were used with spoken language constructions that expressed meanings about event frequency and repetition. The information packaging strategies used to construe meanings about iteration, frequency, and habitualness were diverse. Sometimes these aspectual construals could be attributed to specific lexical units (e.g., as was discussed earlier for quantifiers used to modify events). Other times, these meanings were evoked by the use of a certain event types in the present tense. Example (46)a-g shows several tokens that were expressed with adverbs that encoded information about frequency and repetition of events (*usually, regularly, always, more and more, time and again, another*).

(46)

a. You know how [girls usually sit] around beading and making necklaces?

b. They say people over fifty-five who regularly um (1.0) do the mattress dance have better memory.

c. This guy would [always kind of get] your attention.

d. Yknow [as a kid I always drea]med about being an all American athlete.

e. My kids the older they get they [make you laugh more and more.]

f. [And yet we have time and again] proven immigrants and refugees have proven that when given the chance we contribute to this country.

g. then I [got another call the day before] the script came

**Aspectual verbs.** Cyclic gestures were produced during the expression of complement-taking aspectual verbs with 35 tokens across 29 different speakers. This represents 12.5% of the total cyclic tokens that occurred with event-related constructions in speech and 7% of all tokens collected. For 16 of the 35 tokens, the onset of the cyclic stroke aligned temporally with the expression of the aspectual verb in speech.
Cyclics were used with aspectual verbs that prototypically profile the inception or continuation phases of an event. There was one cyclic token that occurred with the verb *stop*, which at the lexical level profiles the terminative phase of an event. This verb, however, occurred in the Negative Polarity-Interrogative construction “*You haven’t stopped even* through shooting the movies?” In this case, the speaker is showing surprise toward what the addressee previously revealed (i.e., he has always been a member of a rock band). Despite the use of the terminative phasal verb, its integration with the negated Present Perfect and interrogative construction expresses that the undirected activity has persisted through time and has not been reached a phase of termination.

The inceptive aspectual verb *start* occurred with the largest ratio of tokens for those tokens occurring with aspectual verbs (12 tokens). The continuous aspectual verb *keep* had the second highest ratio (9 tokens). Other aspectual verbs used with cyclics were *begin, continue, and try*. Examples from the data are provided in (47)a-e. More specific tense-aspect constructions that interact with the use of these verbs are discussed in §4.3.5.

(47)

a. over the years,  
   [it's starting] to  
   (0.4)  
   be something we're seeing a lot of.

b. I was on my sister's couch for a while to [start building a business].

c. He's the one that everybody keeps trying to overturn

d. And I'm [trying to get you know better at that].  
   Because I've only done really kid comedies.

e. [Let's keep talking.  
   Let's keep talking]ing.

*(Circular) motion events: manner and path.* The co-expression of cyclic gestures and circular path and manner of motion meanings did not meet the criteria discussed in §4.3. However, because these meanings were emphasized in existing research on cyclic gestures, they are briefly discussed here. As previously discussed, Zima (2014) found circular movement gestures frequently occurring with constructions in which the
predicated motion event included a circular path or manner of movement. In this study, only 13 cyclic gesture tokens (4% of the data) were co-expressed with events that were construed as having a circular manner or path of motion. It might have been the case that these types of events were generally rare in the data. As this research was not based upon corpus data, there is no way to determine the absolute frequency of these events types in the data.

A few constructions co-expressed with cyclic gestures that involve circular manner of motion verbs are provided in (48)a-c. In (48)a, the manner of motion in this case is literal. Actor Cameron Diaz jokingly suggests that she has wheels (i.e., rims) on her car that spin while driving. In (48)b, musician Art Garfunkel uses the manner verb roll metaphorically when he discusses the process of settling into a comfortable place when performing live shows. In (48)c, the manner verb roll in rolled up is construed as a result state rather than a process. Talk show host, Stephen Colbert is asking about whether a particular piece of mail (the current discourse topic) came rolled up in a catalog. At some earlier time, it is presupposed that an agent performed the rolling event that led to the state of the mail being rolled up. However, the construction co-expressed with the cyclic construes it as a resulting state.

(48)

a. I got [spinners. They just keep spinning and spinning and spin]ning.

b. The first line makes you settle into the second line [and then you roll] from line to line.

c. [Was it rolled up in a L]LBean JCre with like a rubber band?

In (49)a-d all the cyclic gesture tokens use the spatial oblique marker around. The preposition can be used to express circular path of motion (e.g., The car raced around the track.). In (49)a-d, however, there is no literal circular path of motion expressed in any of the constructions. Example (49)a can apply to any path along which the plane travels that is near the coast. It does not clearly mean the plane is traveling along a circular path. In (49)b, the path movement around can apply to any path that traverses regions contained within the boundaries of Disneyland. It doesn't actually mean that the movement along a
path is around the perimeter of Disneyland (nor that Disneyland’s perimeter forms a circle). In (49)c, *around* is not used to express a path motion but the distributed position of people in a bounded location (a nightclub). Finally, example (49)d actually does suggest a circular path interpretation of *around* because of its use with the circular manner of movement verb *circle*. However, the circular manner and path is used for a metaphorical motion event rather than literal one.

(49)

a. [I fly around] the coast and there's sharks everywhere.
b. I'll take [you around Disneyworld.]
c. it was like fifteen hundred [people around] the place.
d. Am [I circling around your question?]

There were cases where a circular manner or path of a motion was expressed in gesture but was not overtly encoded with a manner verb or oblique path construction in speech. This occurred in depictive gestural expressions in which the gesture was used to enact a literal motion event. During the expression of the speech bolded in (50)a, the speaker simultaneously depicts the action of pulling ropes along a circular path of motion (in order to make tires swing wildly to mimic bull riding). There is nothing in the event encoded in the speech (“yank with ropes”) that evokes this circular movement. The circular path is only encoded in the gesture. In (50)b, the speaker extends her arm out and rotates her hand in circular motion to depict the repeated action of tossing gelatin dessert powder into a boxing ring. Similarly to (50)a, there in nothing in the co-expressed spoken expression to suggest that the event “put Jello in it (the boxing ring)” includes a circular movement, yet a circular motion construal is included in the gestural depiction.

(50)

a. First they start you off on [TIRES, that they YANK with ropes].
b. if there were ever really a fight a catfight on the show you'd know about it cause I get like a ring and [I'd put Jello] in it.
4.3.4 Discursive meanings

This section describes the most frequent functions of discourse markers found to be co-expressed with cyclic gestures. Cyclics were expressed with discourse markers in 121 tokens. This is not particularly interesting as discourse markers are frequently used in conversation. That being the case, this section only discusses those functions that met the count and alignment criteria described in §4.3.

_Hedges and epistemic stance markers._ Cyclic gestures were recurrently co-expressed with lexical and paraphrastic expressions serving functions related to hedging (79 tokens). Lexical hedges are words or fixed multiword expressions that “signal that the speaker of the sentence wishes to be careful about asserting” an idea (FrameNet). There are many reasons a speaker might use hedges. For example, hedges can signal a speaker’s uncertainty about the accuracy of a hedged proposition. Alternatively, a speaker might use a hedge when they are talking about topics that are taboo or when speaking on topics about which they have little knowledge. Downtoners, which were discussed in §4.3.2, can also be used for the function of hedging. Words that express speaker stance, particularly those that are associated with a lowering of epistemic stance, are also included in this grouping. Epistemic stance markers and hedges and are not mutually exclusive functional groupings. The category of epistemic stance has been analyzed to include expressions that make assessments about the reliability of what is being said (Kärkkäinen, 2003).

It was evident that hedge and epistemic stance markers were important to cyclic gesture use because the start of cyclic strokes aligned with these words in 35 tokens (beginning on the hedge or stance marker). Two specific lexical hedges that were recurrently co-expressed with cyclics were _kind of/kinda_ (n=12) _sort of/sorta_ (n=8), shown in (51)a-b. It should be noted that neither of these expressions were used with the partitive construction for the tokens collected. A few additional tokens used with these specific hedges are shown in (44)a-b and (46)c. In those examples the hedges interact with other modifiers that are associated with cyclic gesture use. Other expressions that were used for hedging functions and expressed with cyclics were _I mean, yknow, and like._
Other instances of these forms that were expressed with cyclics were used for other functions, such as focusing (discussed below).

(51)

a. COLBERT;  Do you mind playing somebody, who's not likeable?  Do you mind the blowback that you get for that?  Or do you get blowback?

I certainly got blowback for, for Skylar.

GUNN;  And there was that whole [sort of you know, Skylar ha]te.

As they called it on the internet.
And that was a really tough thing to deal with.

b. LETTER;  I-

is it Schenectady nice?

Is it pretty up there?

MENDE;  It's: beautiful.

It’s [kind of got this old (0.3)
that’s a ghost town] vibe to it

Cyclics were also expressed with epistemic stance markers that mitigated assertions and behaved similarly to hedges. The lexicalized stance expressions that occurred most frequently with cyclic gestures were the pre-posed pragmatic marker I think, shown in (52)a-d and just.\(^{21}\) The pre-posed I think is often associated with the expression of epistemic stance (Aijmer, 1997; Baumgarten & House, 2010); however it is also frequently used in conversation to mitigate or hedge an assertion (Scheibman, 2001, p. 70-71).

\(^{21}\) Examples of just used as a marker of stance are shown in (36)-(39) and (44)b.
Focusers. With 30 tokens, cyclic gestures closely aligned with discourse markers that functioned primarily to direct special attention to the content that follows it. The most frequent expressions serving these functions in the data were *like* and *y’know (you know)*. A couple of examples are shown in (53)a-b.

(53)

a. JLO; Y’know th-
it's the whole premise of [like women,] at a certain a:ge,
if they haven't found,
the right guy,
A note on word searches. Word searches are a function that Ladewig (2011) discussed cyclics being used for in German. English speakers use cyclic gestures for word searches as well. In this data, cyclic gestures were used during word searches (during pauses or disfluent speech) in seven tokens. There were eight tokens in which the cyclic began directly after a long pause (> 0.50 ms) and seemed to function (at least in part) to signal a continuation after a word search (i.e., speech planning). Finally, there was one token that occurred during a pause not as a word search but to hold the floor while the addressee was laughing.

4.3.5 Morphosyntactic Constructions

This section discusses specific constructions that were frequently used with cyclic gestures. The semantic properties of these constructions will be discussed in Chapter 6.

Progressive. Cyclic gestures were used with the English Progressive in 54 tokens. This represents approximately 12% of the data and 31% of predication constructions. Many of the previously discussed examples in the data have shown this alignment with the Progressive. Additional examples are shown in (54)a-c.

(54)

a. That car [**is getting dus**]t on it.

b. I was [**doing another**] talk show,

c. I mean I know you're full of energy, [**but how are you juggling all of this?**]
**Complex sentences.** Cyclic gestures also frequently occurred with complex sentences. They often closely aligned with the boundaries of the conjoined clauses (either through coordination or subordination). Other times they were expressed solely on the coordinator or subordinator. With 88 tokens, the onset of the cyclic stroke aligned with the expression of an overt coordinator or subordinator term. With 18 tokens, the cyclic gesture exclusively aligned with the coordinator or subordinator (sometimes including a juxtaposed discourse marker).

Cyclic gestures were expressed across clause boundaries in coordinated complex sentences with 78 tokens, beginning on the coordinator with 33 of those tokens. All three types of coordination were observed in the data: adversative, conjunctive and disjunctive. For subordination, cyclic gestures were used across clause boundaries in 109 tokens. For 47 of those tokens, the onset of the cyclic gesture coincided with the expression of the subordinator. Cyclic gestures were used in the following clause types for subordination: conditionals, relative clauses, complement clauses, and adverbial clauses.

With 50 tokens, the cyclic gesture exclusively aligned with the subordinate clause, beginning either on the subordinator or on the first word of the subordinate clause. These tokens were coded as non-asserted as described under the assertion variable in §3.4.7.

**Questions.** Cyclic gestures were expressed with questions with 38 tokens (approximately 8% of the data). With 16 of those tokens, the onset of the cyclic gesture coincided with the start of the question. Cyclics were used both with polarity questions (26 tokens) and information questions (11 tokens). Examples (48)c, (49)d, and (54)c show instances in which cyclic gestures are used with questions.

### 4.3.6 Summary and discussion of findings

In this study cyclic gestures were recurrently used with a variety of different types of expressions. A summary of the most frequent types of expressions found to be used with cyclic gestures and the general function of those expressions are shown in Table 11.

One of the semantic classes of words that was repeatedly co-expressed with cyclic gestures were quantifiers. There were many types of quantifiers and types of quantifier and numeral expressions that were used with cyclic gestures. Quantifiers and numerals
serve different functions in language (beyond the prototypical function of designating an amount of something). A general pattern for the quantifiers used with cyclic gestures is that they often vaguely quantified or estimated the amount of an entity. Numerals, which prototypically specify the precise number of an entity, were used in constructions that estimated the number of something (with the help of hedging) when they occurred with cyclic gestures.

Table 11: Summary types of expressions and meanings used with cyclic gestures

<table>
<thead>
<tr>
<th>General meanings</th>
<th>Specific types of meanings</th>
</tr>
</thead>
<tbody>
<tr>
<td>stance</td>
<td>evaluations/assessments</td>
</tr>
<tr>
<td>scalar semantics</td>
<td>degree expressions</td>
</tr>
<tr>
<td>vagueness, uncertainty, and estimations</td>
<td>hedges, certain quantifiers, certain degree expressions</td>
</tr>
<tr>
<td>event-related</td>
<td>durativity, frequent or repeated events, English Progressive, inception and continuation phases of events, manner/path of motion</td>
</tr>
<tr>
<td>discourse coherence/information structure</td>
<td>used broadly with all complex sentence types which show relationships between events expressed across clauses, focusers</td>
</tr>
<tr>
<td>interactional</td>
<td>questions, word searches, hedges</td>
</tr>
</tbody>
</table>

Cyclic gestures were frequently used with degree expressions that modified scalar properties and events. This includes intensifiers and downtoners, including those used for hedging. There were a number of examples in which cyclic gestures were used with degree expressions that signaled that the content in the predicated expression was unexpected or contrasted what was expected. Cyclic gestures were also used with epistemic and attitudinal stance marking expressions.

In addition to recurrently being used with modifiers of referring expressions, cyclic gestures were repeatedly used with specific types of event-related properties. They were used with expressions encoding information about event frequency and repetition. Cyclic gestures occurred with many types of aspectual construals. In particular, cyclic gestures
were closely tied to durative aspect. This was the lexical aspectual category that was present with in all but one of the tokens of cyclic gestures that occurred with event-related constructions. Perhaps this relationship to durative aspect also motivates the recurrent alignment of cyclic gestures with the progressive construction. It is worth noting that in the one example in which a cyclic was used with a punctual event (see Figure 2b), the fact that the event was punctual was not particularly salient. What was most salient in the construction (as it was used in the interaction) was that the speaker construed the punctual event (*he got electrocuted*) as being in contrast to a previous construal of the same event. This semantic property of contrast that is retrievable from the discourse might be what is salient to the use of the cyclic in this case (as we saw contrast to be relevant to some uses of cyclic gestures with quantifiers).

Cyclic gestures were also associated with phasal verbs, specifically those marking the inception and continuation phases of events. Although not frequent in the data, there were clear cases in which cyclic gestures were clearly used to express literal or metaphorical circular manner or path of motion.

Cyclic gestures also interacted with higher-level constructions related to information structure. They were used with complex sentences that signal different types of relationships between events. They were not tied to any one type of complex sentence, which suggests that the functions of cyclic gestures in these constructions might relate more generally to discourse coherence. The onset of cyclic gestures also frequently aligned with linkers (connectives), which serve the more general function of marking discourse cohesion. There were also lexical expressions with which cyclic gestures were used that relate to information structure. They were used with discourse markers that serve a primarily function as focusers, which direct attention to the speech that follows them.

Finally, cyclic gestures occurred in contexts in which interactional meanings were in especially in focus. They were repeatedly used with both polarity and information questions. Note that these questions also embedded events with durative aspect, which might be relevant to the occurrence of the cyclic gesture. There were a few cases in which cyclic gestures did not occur with speech and clearly functioned for speech management functions (word searches and floor-holding).
This component of the study provided a purely descriptive set of observations about the types of expressions with which cyclic gestures repeatedly aligned in the data. The raw frequencies of cyclic gesture use with particular expressions, as presented here, cannot tell us which meanings are most important to the use of the cyclic gesture. A corpus study on cyclic gestures using this same approach and targeting the specific types of expressions identified here would be able to provide normalized type frequencies. A corpus study would allow for the ranking of different functional-semantic types in relation to their co-occurrence with cyclic gestures. It is hypothesized that if more of the meanings identified above are expressed together in the same utterance or juxtaposed across neighboring utterances, the greater the likelihood that a cyclic gesture will be used. This hypothesis will be tested in future research.

To better understand whether these meanings and other functional-semantic variables that were included in the coding scheme are interact with variations in the form of cyclic gestural expressions, the next section examines statistical relationships between cyclic gesture forms and spoken language meanings.

### 4.4 Relationship between Gesture Forms and Meaning

The first part of this study identified and described functional-semantic properties and specific constructions with which speakers of English repeatedly use cyclic gestures. This section describes patterns in the mapping between formal properties in the gesture and functional-semantic properties in speech. Specifically, it addresses the following question: Do different variants in the formal expression of the gesture correspond to distinct functional-semantic properties expressed in speech? The purpose of this component of the study is to make a first attempt at identifying whether there are symbolically distinct types of cyclic gestural expressions used in English.

#### 4.4.1 General description of procedures

In order to determine if there were significant relationships between formal components of the gesture and meanings expressed in speech, each formal variable was tested for independence against each functional-semantic variable. For significant
associations found across variables, effect size was measured. Standardized residuals were also calculated to determine which, if any, cells contributed significantly to the $p$-value.

Each variable associated with gesture form was also tested for independence against the other variables associated with gesture form. Significant relationships found across different formal variables were used to create new variables that combined multiple categories. Two variables that were created combined finger-bending status and finger-spreading status (henceforth, *combined finger configuration status*). One of these variables was a binary variable. The other variable for combined finger configuration was complex and included more categorical distinctions. Table 12 below includes a description of the categories within these variables.

Cluster analysis was performed on combined variables that were found to be associated with several different functional-semantic properties in speech. This was done to determine similarities and differences across cell values (objects) within combined variables based upon their distribution with spoken language meanings. The strength of the clusters were validated using a bootstrapping technique described in §4.5.

All tests were performed using the R software environment. The code for the analyses closely followed that described by Levshina (2015). More specific details about the statistical tests are described below.

### 4.4.2 Creation of evaluation variable

The variables used in the quantitative analyses are described in Chapter 3. One additional variable was created based upon observations made during the first part of the study. It was noted that many of the constructions with which cyclic gestures were co-expressed served an evaluative function. Data was revisited and a variable was created that coded instances in which cyclic gestures were used with evaluations.

Evaluations share a relationship to stancetaking. As Du Bois (2007) put it, “the act of taking a stance necessarily invokes an evaluation at one level or another, whether by assertion or inference.” Evaluations were defined as expressions “whereby a stancetaker orients to an object of stance and characterizes it as having some specific quality or value” (Du Bois, 2007). In order for a token to be categorized as an evaluation,
there had to be a *stancetaker* and an *object of stance* (target of the evaluation). These functional roles could either be overtly expressed or able to be inferred from the discourse. Furthermore, tokens coded as evaluations had to have an overtly expressed evaluation and the cyclic stroke had to at least partially coincide with the evaluative elements in the expression. There were 73 tokens in the data that were coded as evaluations (approximately 15% of the data).

### 4.4.3 Results for independence tests and effect size

Chi-square ($\chi^2$) tests were used to test for independence across each categorical variable related to gesture form and each categorical variable related to functional-semantic properties in the speech that accompanied the gestures. The null hypothesis for each of these tests of independence is that there is no relationship between formal properties of the gesture and functional-semantic properties in speech.

The $\chi^2$–test compares the observed frequencies across two variables in a contingency table with the frequencies that are expected if the two variables are not associated with one another. Specifically, the $\chi^2$–test tells you whether or not observed frequencies across two variables differ significantly from the expected frequencies. There are cases in which the $\chi^2$–test was inappropriate for certain variables in the data. As Gorman and Johnson (2013) write, “The chi-square test is not very appropriate for small amounts of data, since it is based on an approximation that is exactly true under the obviously false assumption that the data set is infinitely large; the accuracy of this test is worse as the sample grows smaller.” If an individual cell (a value across two variables) had an observed frequency of less than five (i.e., cell size <5) or when there was a one degree of freedom and an observed cell had a value of less than 10, Fisher’s exact test was used as an alternative. Fisher’s exact test is able to calculate an exact $p$-value and can handle small frequencies within cells. For variables that were found to be associated with one another, effect size was measured with Cramer’s V. Cramer’s V measures the strength of association between two variables as a percentage of the total possible variation between them.

Pearson’s residuals were calculated for each pair of variables that returned significant $p$-values in the $\chi^2$-test or Fisher’s exact test (i.e., $p < .05$). A residual is the
difference between the observed frequency and the expected frequency for each cell (Agresti, 1996). Residuals were identified in order to determine which specific cells contributed significantly to the $\chi^2$ statistic. Standardized residual values greater than 1.96 or smaller than $-1.96$, make significant contributions to the $\chi^2$-statistic at a 0.05 significance level. The standardized residual values of 2.58 and $-2.58$ are significant at a 0.01 significance level. These measures helped to identify the structure of the dependent relationship between variables.

In addition to examining relationships between gesture variables and spoken language variables, the $\chi^2$ (or Fisher’s exact) tests and residuals were also calculated across each of the gesture form variables. This was done in order to establish whether certain properties in the form of the gesture were associated with one another. This was not performed on variables in the gesture form that were known to be dependent on each other. For instance, relationships between handedness (unimanual or bimanual) and timing of circles (synchronous, asynchronous, unimanual) were not compared because the values associated with the timing of circles variable are partially dependent on whether the cyclic stroke is performed with one hand or across two hands. Contrastively, handedness is not expected a priori to have a relationship with a particular finger-spread status (closed, spread, neutral, or other) and so formal variables were compared with one another to identify significant relationships. The results of these tests were used to create new variables that incorporated multiple formal properties that shared significant relationships with one another. Variables that combined different categories were then tested for independence against the functional-semantic variables of speech.

**Results for properties of phrasal constructions.** This section presents findings for the variables that are prototypically associated with phrasal constructions (referring expressions). Further details on the coding requirements for these variables are discussed in §3.3.4. Results are organized by the variables associated with speech.

*Animacy:*

Animacy (human, non-human) was found to have a highly significant relationship with number of rotations (single, multiple) of the cyclic gesture ($X^2 = 6.88$, $df = 1$, $p <$
No specific cell contributed significantly to the $X^2$-statistic; however, human subject referents occurred with cyclic gestures with multiple rotations at a frequency greater than expected (Pearson residual = 1.214) and with cyclic gestures with single rotations at a frequency less than expected (Pearson residual = -1.702). The opposite was true for non-human subject referents (multiple = -1.010; single = 1.416).

Animacy was found to have a highly significant relationship with finger-spreading status ($spread, closed, lax, other$) during the production of a cyclic gesture ($X^2 = 21.27, df = 3, p < .001$). The effect size was moderate (Cramer’s $V = 0.26$). Closed fingers during the expression of a cyclic gesture occurred with human subject referents at a frequency significantly higher than expected (Pearson residual = 2.49). Contrastively, closed fingers during the expression of a cyclic gesture occurred with speech that didn’t include a human subject referent at a frequency significantly less than expected (Pearson residual = -2.08).

Animacy was also found to have a highly significant relationship with combined finger configuration status (see Table 12 for a description) during the production of a cyclic gesture ($p < .001$ using Fisher’s exact test). The effect size was moderate (Cramer’s $V = 0.21$). Straight closed fingers during the expression of a cyclic gesture occurred with human subject referents at a frequency significantly higher than expected (Pearson residual = 2.31). Curved lax fingers occurred during the expression of a cyclic gesture with human subject referents at a frequency significantly less than expected (Pearson residual = -2.49). Curved lax fingers occurred with expressions without human subject referents at a frequency significantly greater than expected (Pearson residual = 2.08).

**Person:**

First-person subject referents (first, other) were found to have a highly significant relationship with finger-spreading status during the production of a cyclic gesture ($X^2 = 17.59, df = 3, p < .001$). The effect size was weak (Cramer’s $V = 0.19$). Closed fingers during the expression of a cyclic gesture occurred with first-person subject referents at a frequency significantly higher than expected (Pearson residual = 2.26). A significant relationship was also found between first-person subject referents and the timing
(asynchronous, synchronous, unimanual) of the cyclic gesture strokes across the hands ($\chi^2 = 10.14, df = 2, p < .001$). The effect size was very weak for these two variables (Cramer’s V = 0.14). Asynchronous bimanual cyclic gestures were used with expressions with a first-person subject referent at a frequency significantly higher than expected (Pearson residual = 2.33).

Number:

There were no significant relationships found between variables associated with the form of the cyclic gesture and the variable of number for subject referents.

Identifiability:

After $\chi^2$ tests were run on the variable of identifiability (see §3.4.4 for a description of the categories) two new binary variables were created. The first variable combined indefinite subject referents of all types as and coded them as *indefinite* and coded all other values as *other*. The second variable coded definite subject referents as *definite* and all other types as *other*. These new variables provided a more direct understanding of any associations that might exist between the definite-indefinite distinction and formal properties of the cyclic gestural expression.

Significant relationships were found between indefiniteness and the following variables associated with gesture form: finger-spreading status, finger-bending, combined finger configuration status, one handshape, and gesture timing combined with finger-spreading. Table 12 shows significant results for the indefinite variable. The first column lists the variable found to be significantly associated with indefiniteness in subject reference. The second column shows the values for the variable. The third column shows the $p$-value (obtained through $\chi^2$). The fourth column provides significant standardized residual values and describes the cells that are significant. The last column gives a measure of the strength of the relationship between the variables using Cramer’s V. This same format will be used to present results for spoken variables that have significant relationships with several formal properties in the gestural expression.
Table 12: Significant results for the indefinite subject variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>(X^2)</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>finger-spreading status</td>
<td>closed</td>
<td>(X^2 = 28.46) (df = 3), p &lt; .001</td>
<td>3.93 spread + indef. -2.27 lax + indef. -2.17 other + indef.</td>
<td>moderate 0.24</td>
</tr>
<tr>
<td></td>
<td>spread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>lax</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>finger-bending</td>
<td>bent</td>
<td>(X^2 = 16.98) (df = 1), p &lt; .001</td>
<td>3.77 bent + indef.</td>
<td>weak 0.19</td>
</tr>
<tr>
<td></td>
<td>non-bent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>combined finger config. status (simplified)</td>
<td>curv_bent_spread</td>
<td>(X^2 = 15.08) (df = 1), p &lt; .001</td>
<td>3.18 curvbent/ spread + indef</td>
<td>weak 0.18</td>
</tr>
<tr>
<td></td>
<td>nocurv_nospread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>combined finger config. status (complex)</td>
<td>straight_spread</td>
<td>(p &lt; .001) (using Fisher’s exact test)</td>
<td>3.924 bent/spread + indef</td>
<td>moderate strong 0.28</td>
</tr>
<tr>
<td></td>
<td>curv_spread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>bent_spread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>curv_lax</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>straight_lax</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>straight_closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>bent_curv_closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>one handshape (pointing)</td>
<td>one handshape</td>
<td>(X^2 = 5.22) (df = 1), p = 0.02</td>
<td>-2.27 one handshape + indef.</td>
<td>very weak 0.11</td>
</tr>
<tr>
<td></td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>async + spread</td>
<td>async_spread</td>
<td>(X^2 = 4.37) (df = 1), p = 0.04</td>
<td>2.00 async_spread + indef.</td>
<td>very weak 0.10</td>
</tr>
<tr>
<td></td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Indefinite subject referents were expressed with cyclic gestures with spread fingers at a frequency significantly greater than expected and with non-spread or other handshapes (not able to be characterized by spreading) at frequencies significantly less than expected. The effect size was moderate for this relationship. Indefinite subject referents were associated with cyclic gestures displaying bent fingers and bent or curved spread fingers at frequencies significantly greater than expected. The frequency for indefinite subjects occurring with bimanual cyclic gestures with asynchronous timing of strokes was
significantly greater than expected. Indefinite subject referents were expressed with cyclic gestures that displayed one handshapes at a frequency significantly less than expected.

Definite subject referents were found to have a highly significant relationship with finger-spreading status during the production of a cyclic gesture ($X^2 = 13.18$, $df = 3$, $p < .001$). The effect size was weak (Cramer’s $V = 0.16$). The actual frequency for cyclic gestures with closed and other (special) handshapes occurring with definite subjects was significantly greater than expected. However, no specific cell contributed significantly to the $X^2$-statistic.

Indefinite Pronouns:

There were no significant relationships found between variables associated with the form of the cyclic gesture and indefinite pronouns, which were coded even when occurring outside of the subject argument phrase.

Quantifiers:

Formal properties of cyclic gestural expressions were tested for independence with the quantifier variable. The quantifier variable did not include distinctions between different types of quantifiers nor did the variable account for different functions of quantifiers across constructions. Quantifiers were found to have a significant relationship with particular hand configurations expressed with cyclic gestures. The form variables that were found to have a significant relationship with the expression of quantifiers are shown in Table 13.

Quantifiers were found to occur with cyclic gestures with spread fingers, spread fingers with asynchronous timing across two hands, bent fingers, and curved or bent spread fingers, at frequencies significantly greater than expected. While no cell contributed significantly to the $X^2$-statistic for quantifiers and timing of cyclic strokes, quantifiers occurred with asynchronous bimanual gestures at a frequency greater than expected. Quantifiers occurred with spread fingers with bending or curving at frequencies
significantly greater than expected. Effect size was weak for each significant relationship involving quantifiers.

Table 13: Significant results for quantifier variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>$X^2$</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s V)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>spread fingers</strong></td>
<td>spread non-spread</td>
<td>$X^2 = 5.7299$</td>
<td>1.95 spread + quant</td>
<td>very weak 0.12</td>
</tr>
<tr>
<td></td>
<td>df = 1, $p = 0.02$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>bent fingers</strong></td>
<td>bent non-bent</td>
<td>$X^2 = 5.7299$, df = 1, $p = 0.02$</td>
<td>2.67 bent + quant</td>
<td>very weak 0.14</td>
</tr>
<tr>
<td><strong>combined finger config. status (simplified)</strong></td>
<td>curvbent_spread nocurv_nospread</td>
<td>$X^2 = 11.115$, df = 1, $p &lt; .001$</td>
<td>3.18 curvbent/spread + quant</td>
<td>weak 0.16</td>
</tr>
<tr>
<td><strong>combined finger config. status (complex)</strong></td>
<td>straight_spread curv_spread bent_spread curv_lax straight_lax straight_closed bentcurv_closed other</td>
<td>$p &lt; 0.02$ (using Fisher’s exact test)</td>
<td>2.14 bent/spread + quant. 2.08 curv/spread + quant. -2.31 straight/lax + quant.</td>
<td>weak 0.18</td>
</tr>
<tr>
<td><strong>timing + hand</strong></td>
<td>unimanual async bimanual sync bimanual</td>
<td>$X^2 = 4.06$, df = 1, $p = 0.04$</td>
<td>no significant cells</td>
<td>very weak 0.11</td>
</tr>
<tr>
<td><strong>asynch + spread</strong></td>
<td>async_spread other</td>
<td>$(X^2 = 4.06$, df = 1, $p = 0.04$</td>
<td>async_spread + quant</td>
<td>very weak 0.14</td>
</tr>
</tbody>
</table>

Locations:

There were no significant relationships found between variables associated with the form of the cyclic gesture and locational meanings expressed in speech.

Results for properties of clausal constructions. This section presents the results for independence tests between formal properties of the gestural expression and event-related
variables that were co-expressed in speech. The coding requirements for the spoken language variables are described in §3.4.5.

**Tense:**

There were no significant relationships found between variables associated with the form of the cyclic gesture and tense.

**Lexical aspect:**

Durative aspect was found to share a significant relationship with number of rotations ($\chi^2 = 14.82$, $df = 1$, $p < .001$). The effect size was weak for these variables (Cramer’s $V = 0.18$). Single cyclic rotations were used with expressions with durative aspect at a frequency significantly less than expected (Pearson residual = -1.97). Single cyclic rotations were used with expressions without durative aspect (with expressions that weren’t event related) at a frequency significantly greater than expected (Pearson residual = 2.54).

Telicity was found to share a significant relationship to number of rotations ($\chi^2 = 16.24$, $df = 2$, $p < .001$). The effect size was weak for these variables (Cramer’s $V = 0.18$). Single cyclic rotations were used with expressions with atelic aspect at a frequency significantly less than expected (Pearson residual = -2.38).

States were found to have a slightly significant relationship to the lateral plane variable ($\chi^2 = 5.12$, $df = 1$, $p < .02$). Effect size was weak (Cramer’s $V = 0.11$). When cyclic gestures were used with stative expressions, the gesture was performed to the sides of the body at a frequency significantly greater than expected (Pearson residual = 2.09).

**Polarity:**

There were no significant relationships found between variables associated with the form of the cyclic gesture and polarity.

**Presence of modal marker:**

There were no significant relationships found between variables associated with the form of the cyclic gesture and presence of modal markers.
Phasal verbs:

Phasal verbs were found to have a slightly significant relationship to timing of the gesture strokes across the hands ($X^2 = 6.35, df = 2, p < .04$). The effect size was very weak (Cramer’s V = 0.11). No specific cell contributed significantly to the $X^2$-statistic; however, phasal verbs occurred with asynchronous bimanual cyclic gesture strokes at a frequency greater than expected (Pearson residual = 1.613) and with synchronous bimanual strokes at a frequency less than expected (Pearson residual = -1.817).

Agentive semantic role:

Agentive subject participants were found to have a significant relationship with gesture size ($X^2 = 4.76, df = 2, p < .03$). The effect size was very weak (Cramer’s V = 0.11). While no specific cell contributed significantly to the $X^2$-statistic, the expected frequency for agentive subjects occurring with large sized cyclic rotations was greater than expected (Pearson residual = 1.866).

A significant relationship was also found between the agentive variable and the sagittal spatial plane variable ($X^2 = 9.52, df = 1, p < .001$). The effect size was very weak (Cramer’s V = 0.14). When cyclic gestures were used in expressions with agents, the gesture was performed away from the body at a frequency significantly lower than expected (Pearson residual = -2.56).

Event frequency and iteration:

Expressions occurring with cyclic gestures that included meanings related to event frequency (including habitual) and repetition were found to share significant relationships with four variables: number of rotations, gesture size, one handshape, and path movement. The form variables that were found to have a significant relationship with the expression of this variable are shown in Table 14.

Event frequency and iteration meanings were expressed with single rotations at a frequency significantly less than expected. Iterative-frequency meanings were expressed with one handshapes and path movements at a frequency significantly greater than expected. While no cell contributed significantly to the significant relationship found
between the large gesture size and event frequency and iteration, large cyclic gestures occurred at a frequency greater than expected with event frequency and iteration meanings. The effect sizes were very weak across each of the relationships.

Table 14: Significant results for event repetition and frequency

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>$X^2$</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rotations</td>
<td>single</td>
<td>$X^2 = 6.74$,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>multiple</td>
<td>$df = 1, p &lt; .001$</td>
<td>-2.05 single + iter/freq</td>
<td>very weak 0.12</td>
</tr>
<tr>
<td>large size</td>
<td>large</td>
<td>$X^2 = 11.115$,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>other</td>
<td>$df = 1, p = 0.04$</td>
<td>no significant cells</td>
<td>very weak 0.10</td>
</tr>
<tr>
<td>one handshape</td>
<td>one handshape</td>
<td>$X^2 = 4.45$,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>other</td>
<td>$df = 1, p = 0.03$</td>
<td>2.01 one + iter/freq</td>
<td>very weak 0.10</td>
</tr>
<tr>
<td>path</td>
<td>path</td>
<td>$(X^2 = 4.06,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>nopath</td>
<td>$df = 1, p = 0.04$</td>
<td>2.08 path + iter/freq</td>
<td>very weak 0.10</td>
</tr>
</tbody>
</table>

Evaluations:

Evaluations were found to have significant associations with finger-spreading status. There was also a significant relationship found between evaluations and the variable that combined handedness, timing of gesture strokes across hands, and spread fingers. The final significant relationship found for evaluations was with combined finger configuration status. Table 15 provides specific details about these relationships. Evaluations were expressed with spread fingers, spread fingers co-expressed with asynchronous circles, and spread fingers co-expressed with curved fingers at a frequency significantly greater than expected. The effect sizes were moderately strong for the relationship between evaluations and finger-spreading and evaluations and finger-spreading combined with handedness and timing.

Table 15: Significant results for evaluations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>$X^2$</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>finger-</td>
<td>closed</td>
<td>$X^2 = 33.36$</td>
<td>4.17</td>
<td>moderately</td>
</tr>
</tbody>
</table>
### spreading status

<table>
<thead>
<tr>
<th></th>
<th>spread</th>
<th>lax</th>
<th>other</th>
<th>df = 3, p &lt; .001</th>
<th>spread + evaluation</th>
<th>df = 5, p &lt; .001</th>
<th>spread + eval</th>
<th>strong 0.26</th>
</tr>
</thead>
<tbody>
<tr>
<td>uni_spread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uni_other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_spread_sync</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_other_sync</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_spread_async</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_other_async</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### combined hand/timing/finger-spr

<table>
<thead>
<tr>
<th></th>
<th>uni_spread</th>
<th>uni_other</th>
<th>bi_spread_sync</th>
<th>bi_other_sync</th>
<th>bi_spread_async</th>
<th>bi_other_async</th>
</tr>
</thead>
<tbody>
<tr>
<td>uni_spread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uni_other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_spread_sync</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_other_sync</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_spread_async</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_other_async</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>.uni_spread</th>
<th>uni_other</th>
<th>bi_spread_sync</th>
<th>bi_other_sync</th>
<th>bi_spread_async</th>
<th>bi_other_async</th>
</tr>
</thead>
<tbody>
<tr>
<td>uni_spread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uni_other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_spread_sync</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_other_sync</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_spread_async</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bi_other_async</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### combined finger config. status

<table>
<thead>
<tr>
<th></th>
<th>curv_bent_spread</th>
<th>nocurv_nospread</th>
<th>df = 1, p &lt; .001</th>
<th>curv_bent_spread + evaluation</th>
<th>weak 0.16</th>
</tr>
</thead>
<tbody>
<tr>
<td>curv_bent_spread</td>
<td>curv_spread</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nocurv_nospread</td>
<td>curv_lax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### combined finger config. status

<table>
<thead>
<tr>
<th></th>
<th>straight_spread</th>
<th>curv_spread</th>
<th>bent_spread</th>
<th>curv_lax</th>
<th>straight_lax</th>
<th>straight_closed</th>
<th>bentcurv_closed</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>straight_spread</td>
<td>curv_spread</td>
<td>bent_spread</td>
<td>curv_lax</td>
<td>straight_lax</td>
<td>straight_closed</td>
<td>bentcurv_closed</td>
<td>other</td>
<td></td>
</tr>
</tbody>
</table>

### Hedges and stance markers:

All of the tokens previously coded as hedges or stance markers were grouped under a single *hedge* variable. This was done because often times it was hard to distinguish which group a token belonged to and because these categories share semantic properties in common (see §4.3.2).

Hedges were found to have significant associations with six variables related to the form of the gesture. Significant results for hedges are shown in Table 16. Effect size was weak for all of the significant associations. Bimanual gestures were expressed with hedges at a frequency greater than expected; although, this cell did not contribute significantly to the $X^2$ statistic comparing gesture timing and hedges. Hedges occurred
with cyclic gestures that featured a wide distance between the hands (for bimanual cyclics) at a frequency significantly greater than expected. Hedges also occurred with the following properties in the cyclic gesture form at a frequency significantly greater than expected: spread fingers, curved spread fingers, asynchronous bimanual cyclic gestures, spread fingers with asynchronous bimanual cyclic gestures. Hedges were expressed with cyclic gestures with closed fingers at a frequency significantly less than expected.

Table 16: Significant results for hedges

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>( X^2 )</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>handed</td>
<td>bimanual, unimanual</td>
<td>( X^2 = 7.09, df = 1, p &lt; .001 )</td>
<td>no significant cells</td>
<td>very weak 0.13</td>
</tr>
<tr>
<td>hand distance (for bimanual)</td>
<td>wide, near neutral, other (unimanual)</td>
<td>( X^2 = 12.39, df = 3, p &lt; .001 )</td>
<td>2.67 wide + hedge</td>
<td>weak 0.16</td>
</tr>
<tr>
<td>finger-spread status</td>
<td>closed, lax, spread, other</td>
<td>( X^2 = 13.85, df = 3, p &lt; .001 )</td>
<td>2.31 spread + hedge</td>
<td>weak 0.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-2.49 closed + hedge</td>
<td></td>
</tr>
<tr>
<td>timing</td>
<td>synchronous, asynchronous</td>
<td>( X^2 = 10.62, df = 2, p &lt; .001 )</td>
<td>2.44 asynch + hedge</td>
<td>weak 0.15</td>
</tr>
<tr>
<td></td>
<td>unimanual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>async + spread</td>
<td>async_spread, other</td>
<td>( X^2 = 7.40, df = 1, p &lt; .001 )</td>
<td>2.47 async_spread + hedge</td>
<td>very weak 0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>combined finger config. status (simplified)</td>
<td>curv/bent_spread, nocurv_nospread</td>
<td>( X^2 = 6.59, df = 1, p = 0.01 )</td>
<td>2.37 curv/bent + spread + hedge</td>
<td>very weak 0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>combined finger config. status (complex)</td>
<td>straight_spread, curv_spread, bent_spread, curv_lax, straight_lax, straight_closed, bentcurv_closed, other</td>
<td>( p &lt; .001 ) (using Fisher’s exact test)</td>
<td>2.77 curv/spread + hedge</td>
<td>moderate 0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-2.09 straight/closed + hedge</td>
<td></td>
</tr>
<tr>
<td>combined hand/uni_spread</td>
<td>uni_spread</td>
<td>( p &lt; .001 )</td>
<td>2.97</td>
<td>weak</td>
</tr>
</tbody>
</table>
**Results for properties related to complex sentences.** This section presents the significant results for associations between gesture form and coded properties for complex sentences (see §3.4.7 for a description of these variables).

**Complex sentence type:**

There were no significant relationships found between variables associated with the form of the cyclic gesture and type of complex sentence.

**Assertion:**

Non-asserted (subordinate) clauses that aligned with cyclic gesture strokes were found to have a significant association with gesture size ($\chi^2 = 4.90, df = 1, p < 0.03$). The effect size was very weak (Cramer’s $V = 0.11$). No cell contributed significantly to the $\chi^2$-statistic; however, nonasserted clauses occurred with large sized cyclic gestures at a frequency that was less than expected (Pearson residual = -1.92).

**Linker Alignment:**

Cyclic onset alignment with a linker (coordinator or subordinator) was found to have a significant relationship with bent fingers ($\chi^2 = 6.63, df = 1, p < 0.01$). The effect size was very weak (Cramer’s $V = 0.12$). Cyclic gesture strokes that began on linkers occurred with bent fingers at a frequency significantly greater than expected (Pearson residual = 2.27).

**Results for specific constructions:** This section presents significant results from independence tests involving gesture form and specific constructions that were repeatedly used with cyclic gestures.

**Progressive construction:**
The English Progressive construction was found to have mildly significant associations with handedness, gesture size, and timing of gesture strokes across the hands. Effect size was weak for all of the significant associations. Table 17 provides further details about these relationships.

Table 17: Significant results for progressives

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>$X^2$</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>handedness</td>
<td>bimanual</td>
<td>$X^2 = 5.74$</td>
<td>no significant cells</td>
<td>very weak 0.11</td>
</tr>
<tr>
<td></td>
<td>unimanual</td>
<td>$df = 1, p = 0.02$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>large size</td>
<td>large</td>
<td>$X^2 = 5.20, df = 1, p = 0.02$</td>
<td>2.00 large + progressive</td>
<td>very weak 0.11</td>
</tr>
<tr>
<td></td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>timing</td>
<td>synchronous</td>
<td>$X^2 = 7.25, df = 2, p = 0.03$</td>
<td>no significant cells</td>
<td>very weak 0.12</td>
</tr>
<tr>
<td></td>
<td>asynchronous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>unimanual</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Progressive constructions were expressed with bimanual cyclic gestures at a frequency greater than expected (Pearson residual = 1.74) and with unimanual cyclic gestures at a frequency less than expected (Pearson residual = -1.65). These cells did not contribute significantly to the $X^2$-statistic. Progressive constructions were also expressed with asynchronous bimanual cyclic gestures at a frequency greater than expected (Pearson residual = 1.87). This cell also did not contribute significantly to the $X^2$-statistic. Large sized cyclic gestures occurred with progressives at a frequency significantly greater than expected.

Questions:

Questions were found to have a highly significant relationship to a number of formal variables displayed with cyclic gestures: site of rotation, handedness, space along the sagittal plane, and eye gaze. The effect size was strong for gesture space along the sagittal plane and weak for all other variables. Questions were found to have a mildly significant association with finger-spreading status. Table 18 provides further details about these relationships.
Table 18: Significant results for questions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Values</th>
<th>$X^2$</th>
<th>Standardized residual (+ cell)</th>
<th>Effect size (Cramer’s $V$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>site or rotation</td>
<td>wrist</td>
<td>$X^2 = 12.72$</td>
<td>2.67 wrist + question</td>
<td>weak 0.17</td>
</tr>
<tr>
<td></td>
<td>nonwrist</td>
<td>$df = 1, p &lt; .001$</td>
<td>-2.40 nonwrist + question</td>
<td></td>
</tr>
<tr>
<td>handedness</td>
<td>bimanual</td>
<td>$X^2 = 8.35$,</td>
<td>2.02 uni + question</td>
<td>very weak 0.14</td>
</tr>
<tr>
<td></td>
<td>unimanual</td>
<td>$df = 1, p &lt; .001$</td>
<td>-2.13 bi + question</td>
<td></td>
</tr>
<tr>
<td>sagittal plane</td>
<td>away (from Ego)</td>
<td>$X^2 = 55.73$,</td>
<td>6.32 away + question</td>
<td>strong 0.34</td>
</tr>
<tr>
<td></td>
<td>neutral</td>
<td>$df = 1, p &lt; .001$</td>
<td>-3.78 neutral + question</td>
<td></td>
</tr>
<tr>
<td>finger-spreading</td>
<td>closed</td>
<td>$X^2 = 4.06$,</td>
<td>-2.173 spread + question</td>
<td>very weak 0.14</td>
</tr>
<tr>
<td>status</td>
<td>lax</td>
<td>$df = 1, p = 0.04$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>spread</td>
<td></td>
<td>-2.173 spread + question</td>
<td></td>
</tr>
<tr>
<td></td>
<td>other</td>
<td></td>
<td>-2.173 spread + question</td>
<td></td>
</tr>
<tr>
<td>eye gaze</td>
<td>toward-address</td>
<td>$X^2 = 13.23$,</td>
<td>2.46 toward + question</td>
<td>weak 0.16</td>
</tr>
<tr>
<td></td>
<td>away</td>
<td>$df = 2, p &lt; .001$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>other</td>
<td></td>
<td>2.46 toward + question</td>
<td></td>
</tr>
</tbody>
</table>

Questions were found to be associated with with unimanual cyclic gestures, cyclic gestures with primary rotation at the wrist, and with eye gaze toward the interlocutor at frequencies that were significantly greater than expected. Cyclic gestures that were expressed with questions were performed in gesture space away from the body on the sagittal plane at a frequency greater than expected. Bimanual cyclic gestures with spread fingers were each found to occur with questions at a frequency that was significantly less than expected. Contrastively, questions were found to occur with closed fingers at a
frequency greater than expected; although, this cell did not contribute significantly to the $X^2$ statistic (Pearson residual = 1.942).

**Results for semantic class.** This section presents significant results for independence tests examining semantic class and gesture form variables. For coding requirements for this variable see §3.4.3.

*Events:*

Events were found to have a significant association with number of rotations ($X^2 = 14.29 \, df = 1, \ p < .001$). Effect size was weak (Cramer’s V = 0.17). Non-events were found to occur with single rotations at a frequency significantly higher than expected (Pearson residual = 2.49). Events occurred with multiple rotations during the production of the cyclic gesture at a frequency greater than expected (Pearson residual = 1.387) and with single rotations at a frequency less than expected (Pearson residual = -1.944). These two residuals did not contribute significantly to the $X^2$ statistic.

*Object concepts:*

Object concepts were found to have a significant relationship to bent or curved handshapes with spread fingers ($X^2 = 17.866 \, df = 2, \ p < .001$). Effect size was weak (Cramer’s V = 0.19). Objects occurred with bent or curved handshapes with spread fingers during the production of the cyclic gesture at a frequency significantly greater than expected (Pearson residual = 3.593).

**4.4.4 Summary and discussion of findings for $X^2$**

There were many properties associated with the form of gestures incorporating a cyclic movement that were found to be associated with functional-semantic properties in speech. The first column in Table 19 provides a list of the gesture form variables that were found to have significant associations with properties in speech. The other two columns list the specific cells within speech variables that were found to deviate significantly from expected values for each formal variable. The second column shows those cells that occurred significantly more often than expected with each formal
variable. The third column shows those cells that occurred significantly less often than expected with each formal variable.

Notably, groupings of functional-semantic properties patterned similarly with certain formal properties. Indefinite subject referents, quantifiers, hedges and evaluations each occurred with the formal properties of spread fingers, curved or bent fingers, combinations of the spreading and bending features, and asynchronous bimanual gestures with spread fingers at frequencies significantly greater than expected. On might wonder why these spoken language variables share similar distributional patterns with the forms of cyclic gestural expressions. Were functional-semantic variables associated with one another in the data? \( \chi^2 \)-tests were performed across these variables and it was determined that some were significantly associated in the data.

There was a highly significant relationship found between evaluations and hedging (\( \chi^2 = 47.249, df = 1, p < .001 \)). Effect size was strong (Cramer’s V = 0.31). Evaluations were used with hedges during cyclic gesture strokes at a frequency significantly greater than expected (Pearson residual = 6.065). Evaluations were used without hedges during cyclic gesture strokes at a frequency significantly less than expected (Pearson residual = -2.404). Similarly, hedges were used without evaluations during cyclic gesture strokes at a frequency significantly less than expected (Pearson residual = -2.505).

Table 19: Summary of significant form-function relationships

<table>
<thead>
<tr>
<th>Formal property</th>
<th>Frequencies significant more than expected</th>
<th>Frequencies significantly less than expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>single rotation</td>
<td>non-event semantic classes</td>
<td>atelic, event frequency and iteration; human subjects</td>
</tr>
<tr>
<td>multiple rotations</td>
<td>durative aspect; human subjects</td>
<td>non-events</td>
</tr>
<tr>
<td>bimanual</td>
<td>hedges; progressive</td>
<td></td>
</tr>
<tr>
<td>unimanual</td>
<td>questions</td>
<td></td>
</tr>
<tr>
<td>wide hand distance</td>
<td>hedges</td>
<td></td>
</tr>
<tr>
<td>asynchronous bimanual</td>
<td>1st person; quantifiers; progressive</td>
<td></td>
</tr>
<tr>
<td>wrist rotation</td>
<td>questions</td>
<td></td>
</tr>
<tr>
<td>closed fingers</td>
<td>human subjects; 1st person; definiteness</td>
<td>non-human subjects; hedges; indefiniteness</td>
</tr>
<tr>
<td>spread fingers</td>
<td>hedges; indefiniteness; quantifiers</td>
<td>questions</td>
</tr>
<tr>
<td>asynchronous bimanual with spread fingers</td>
<td>indefiniteness; evaluations; hedges; quantifiers</td>
<td></td>
</tr>
<tr>
<td>curved or bent fingers</td>
<td>indefiniteness; quantifiers; hedge; linker alignment</td>
<td></td>
</tr>
<tr>
<td>curved/bent with spread fingers</td>
<td>indefiniteness; quantifiers; evaluations; hedges; object semantic class</td>
<td></td>
</tr>
<tr>
<td>large gesture size</td>
<td>agentive subjects; event frequency and iteration; progressive</td>
<td></td>
</tr>
<tr>
<td>lateral plane: sides</td>
<td>states</td>
<td></td>
</tr>
<tr>
<td>sagittal plane: away</td>
<td>questions</td>
<td>subject agents</td>
</tr>
<tr>
<td>one handshape</td>
<td>event frequency and iteration</td>
<td>indefiniteness</td>
</tr>
<tr>
<td>path</td>
<td>event frequency and iteration</td>
<td></td>
</tr>
</tbody>
</table>

A highly significant relationship was also found between evaluations and indefinite subjects ($\chi^2 = 30.192, df = 1, p < .001$). Effect size was moderately strong (Cramer’s V = 0.26). Indefinite subjects were used with evaluations during cyclic gesture strokes at a frequency significantly greater than expected (Pearson residual = 5.026). Indefinite subjects were used without evaluations during cyclic gesture strokes at a frequency significantly less than expected (Pearson residual = -2.076).

There was no significant association found between the following variables: quantifiers and evaluations, quantifiers and hedges, quantifiers and indefinite subjects, and hedges and indefinite subjects. The association found between evaluations and hedges and indefinite subjects and evaluations suggests that the distributional similarities of these groups with cyclic gesture forms are likely motivated (at least in part) by their co-occurrence in constructions occurring with cyclic gestures.
Another observation that can be made by looking at the results of the $X^2$ and residual analyses are that event-related meanings, such as semantic role and aspectual meanings, occur more frequently than expected with cyclic gestures that are larger in size. Event related expressions that occurred with cyclic gestures, which all had durative aspect, were found to occur more frequently than expected with multiple rotations. Non-event related expressions occurred with multiple rotations less frequently than expected. The larger size cyclic gestures occurring with event-related meanings might relate to the broader function of the gestures in these situations. Perhaps the gestures are larger in size because they have meanings that are central to the substantive conceptual content expressed in speech. This idea will be discussed further in Chapter 6.

In considering how the findings of these analyses relate to the second research question, it is the case that certain formal variants of the cyclic gesture share relationships with different functional-semantic properties in speech. As it was shown, effect size was weak for almost all form-function relationships, the exception being certain relationships involving evaluations, hedges, indefinite subjects, and questions. The occurrence of a particular formal property with a cyclic movement gesture, even if it shares a significant relationship with a particular meaning, is typically not a good predictor for that meaning. There are many reasons why effect size might be small. Some variables that were tested did not provide very coherent semantic groupings. For example, quantifiers that occurred with cyclic gestures served many different functions (see §4.3.1). It would have been beneficial to test more specific functional categories of quantifiers against different forms. While these specific distinctions were included in the coding scheme, there were not enough tokens for each quantifier type to make that analysis very strong. Future studies that examine a greater number of cyclic gesture tokens occurring with quantifiers would want to test for this. In general, a larger number of tokens might have an impact on the relationships with small effect sizes.

Another reason that the effect size might have been small for the majority of the relationships that were found across form and functional variables is that in many cases a single cyclic token was expressed with spoken expressions that had multiple semantic properties that potentially could be interacting with the occurrence of the cyclic. The meanings found to be recurrently used with cyclic gestures in the first part of this study
do not exist in a vacuum. Often times multiple categories of meanings that are potentially related to cyclic gestures use were co-expressed during a single gesture stroke. For example, in the use of the cyclic in the following expression *I’m a recovering drug addict*. [We are constantly c- criminalized and persecuted and imprisoned, the construction involves an evaluation and a habitual reading (evoked by constantly). In cases in which multiple meanings associated with cyclic gestures were juxtaposed, there is no way of knowing (based on the coding and methods of analysis) which meaning is most relevant to a particular use of the cyclic gesture. The meaning that is most salient to a particular token might “override” the form to function mapping of semantic variable that is not in focus. This is a major limitation of the current study that I hope to resolve in future research.

Finally, a number of formal variables that were coded were not found to have significant relationships with any of the semantic-functional variables. These were the variables of palm orientation, direction of movement, and path movement. In the data there were 35 tokens of cyclic gestures tokens that traversed along a path. Palm up orientation, specifically with an open handshape (PUOH), was used during the gesture stroke with 69 tokens. It is possible that these variables are associated with functional-semantic categories that weren’t included in the coding scheme. Palm up orientation will be discussed further in Chapter 6 as it occurs in certain examples that are analyzed as an instance of a particular gestural construction in the cognitive-semantic analysis.

### 4.5 Behavioral profiles and cluster analysis.

Behavioral profiles and hierarchical cluster analysis were used to analyze similarities and differences between gesture form objects. In this study, similarities and differences between objects are determined based upon each object’s distribution across meanings expressed in speech. These analytic tools make the assumption that semantic properties and distributional properties are tightly linked. These methodological tools have been used to resolve problems related to near synonymy and polysemy in lexical semantic studies using corpus data (Divjak and Gries, 2006; Gries, 2010; Gries and Divjak, 2009).

In order to perform a cluster analysis, behavioral profiles must be created for each object included in the analysis. The idea of behavioral profile was first introduced by
Hanks (1996) who was trying to manage the complexity associated with distributional patterns and verbal semantics. Behavioral profiles are vectors that combine the formal distributional properties in which a particular meaningful structure in language is used with the specific semantic properties expressed by the formal properties. Levshina (2015) notes that creating a behavioral profile vector “typically requires many instances of a construction or a word coded for a number of semantic, syntactic and other categorical variables that characterize the local context, which is usually defined at the level of the sentence where the word occurs.”

In this study, different formal variants of gestures that included a cyclic movement were examined to see how much they have in common with one another in terms of their semantic distribution. Do cyclic gestural expressions that share formal properties, such as spread fingers or bent fingers share similar distributions in terms of the spoken language meanings with which they are expressed? To explore this question, behavioral profiles were created for each value of a particular gesture form variable. The form variables that were explored were *finger-spreading status*, combined *handedness/timing/finger-spreading status*, and combined *handedness/timing/finger-spreading/finger-bending status*. Variables had to be combined to have enough objects to make a cluster analysis interesting. Based upon the results of the $X^2$ and residual analyses, the most interesting formal properties to combine and explore were *handedness*, *timing* of the gesture across the hands (for bimanual gestures), *finger-spreading status*, and *finger-bending status*. The behavioral profile vectors combined the proportions of each value’s distributional patterns across functional-semantic variables. The behavioral profile vectors were created specifically using the functional-semantic variables that were found to have significant associations with the formal variables being tested.

Distance matrices were then created to measure the distances between pairs of vectors. These matrices were used in the hierarchical cluster analysis to create dendrograms that group similar objects based upon their distance matrixes. The results of these analyses are described in the next section.
4.5.1 Results of cluster analyses

The first formal variable that was examined was finger-spreading status. This variable only has four possible values: spread, closed, lax, and other. Four vectors were created using the distribution of each formal value across the functional-semantic variables with which they were found to be associated (see §4.4.3): evaluations, hedges, quantifiers, animacy of subject referent, identifiability of subject referent, person (for subject referent), and co-occurrence with questions.

Figure 21 shows the results of the cluster analysis for finger-spreading status. Distance matrices for this variable were calculated using the Euclidean distance method. This is the default method for calculating distance. It represents the “straight line” or most direct distance between objects. The clustering method used for each of the cluster analyses was Ward. It is the most commonly used clustering method. Ward uses an algorithm that “minimizes the increase in the variance in the distances between the members of clusters” and makes tighter clusters (Levshina, 2015).

Figure 21: Dendrogram for finger-spreading status with AU/BP values
A multiscale bootstrapping resampling was used to validate the clusters. Levshina (2015) provides R code for this test and further details about this method. In Figure 21, the numbers above the two clusters represent the probability that subsequent bootstraps will result in the same clusters. The closer the number is to 1, the stronger the cluster. Levishina notes that number on the left is taken as the more precise probability value (p. 316). The clusters for finger-spreading status are very strong. Lax and spread values are most similar to one another in terms of their distribution. Closed and other (i.e., handshapes not able to be characterized by finger-spreading) are different from lax and spread and more similar to one another than to spreading and lax in their distribution.

Figure 22: Snakeplot of the differences between lax/spread and closed/other clusters

A snakeplot of the functional-semantic differences between the two clusters (lax/spread and closed/other) is shown in Figure 22. The properties associated with the Lax/spread cluster are shown on the right and those associated with the closed/other cluster are shown on the left. The biggest differences between the clusters relate to the variables of animacy, definiteness, and person. Lax and spread finger handshapes are used with spoken expressions that have a higher proportion of non-human and non-
definite subject referents than closed and other handshapes. Lax and spread also occur with a higher proportion of evaluations and hedges than closed and other hand configurations.

The next formal variable that was examined for similarities and differences between the distributional properties of different values for the variable of combined finger configuration status (finger-spreading status + finger-curt/bending status). The specific interest was in examining whether curved or bent finger handshapes with spread fingers had similar or different distributions with straight finger handshapes with spread fingers. Bent-spread handshapes had shown associations with certain functional-semantic variables in the \( \chi^2 \) analysis. There were nine categories within this variable: straight-closed, straight-lax, straight-spread, bent-curved closed, curved-lax, curved-spread, bent-spread, and other. Bent and curved fingers with closed spreading status were combined because there were very few values of either. The other category was used for handshapes that couldn’t be classified in terms of spreading and or bending status.

Vectors were created using the distribution of each formal value across the following functional-semantic variables that were found to be significant through an additional \( \chi^2 \) and residual analyses. These variables were evaluations, hedges, quantifiers, occurrence with human subject referent, identifiability of subject referent, co-occurrence with questions, and linker alignment.

Figure 23 shows that a three-cluster solution is optimal across the nine objects. These clusters were again formed using the Euclidean distance method and the Ward method of clustering. The optimal numbers of clusters were determined by identifying the average distance between clusters (called the silhouette width) and selecting the number of higher-level clusters with the greatest average distance between them. We see that bent finger handshapes with closed fingers pattern form its own cluster.

Figure 24 shows a snakeplot of the functional-semantic differences between the first cluster and the other clusters. The biggest differences between the first cluster and the other two are associated with the variables of animacy, evaluations, hedges, and questions. Those objects in the first cluster are used with spoken expressions that have a higher proportion of non-human subject referents. They also occur at a higher proportion
with evaluations and hedges. The first group is associated with a lower proportion of questions than the other two groups.

Figure 23: Optimal # of clusters for combined finger configuration status (using average silhouette width)

![Cluster Dendrogram of fingerspreading+fingerbending](image)

Figure 25 displays the results of the multiscale bootstrapping resampling. The results show relatively strong clusters in most cases. There is evidence that lax handshapes with either straight or curved fingers show functional-semantic distributions that are more similar to bent and curved handshapes with spread fingers. Straight finger handshapes with spreading show different distributions across these functional semantic variables tested than other spread handshapes. Straight finger handshapes with spreading pattern most similarly with closed straight fingers for the particular spoken language variables that were tested.
Figure 24: Snakeplot for combined finger configuration status

![Snakeplot for combined finger configuration status](image)

Figure 25: Cluster dendrogram for combined finger configuration status (AU/BP values)

![Cluster dendrogram with AU/BP values](image)

- Distance: euclidean
- Cluster method: ward.D2
The formal variable of finger-spreading status combined with timing (and
groundedness by extension) was examined for similarities and differences between the
distributional properties. There were eleven different values possible for this combined
formal variable: asynchronous/closed, asynchronous/spread, asynchronous/lax,
synchronous/closed, synchronous/spread, synchronous/lax, unimanual/closed,
unimanual/spread, unimanual/special, and other. The other value combined special
handshapes for bimanual gestures because they were so infrequent in the data. Vectors
were created using the distribution of each formal value across the following functional-
semantic variables: evaluations, hedges, quantifiers, animacy of subject referent,
identifiability of subject referent, person (for subject referent), agent subject referent, co-
ocurrence with questions, co-occurrence with progressives, linker alignment, and
semantic class. This analysis used the Canberra distance method rather than the
Euclidean method of the number of different values within this variable, leading to some
rare categories. The Canberra method treats small value differences proportionally and by
doing so increases their contribution to the cluster analysis.

The results of the cluster analysis for the combined variable of finger-spreading
status with timing across hands are shown in Figure 26. Two higher-level clusters are
formed that show that unimanual closed, synchronous spread, and unimanual spread as
being the most different from the other categories in terms of distribution across spoken
language variables tested. The majority of the clusters appear to be very strong (within
the particular methods selected) based upon the high probability values returned from the
multiscale bootstrapping resampling. One of the interesting patterns is the close
clustering of all of the asynchronous bimanual categories. Unimanual lax and unimanual
special (i.e., other handshapes) also are strongly grouped. Synchronous closed and lax
form a strong cluster.

The snakeplot in Figure 27 shows the functional-semantic differences between the
two clusters (unimanual/closed, synchronous/spread, unimanual/spread when compared
to those in the first cluster). The second cluster, unimanual/closed, synchronous/spread,
and unimanual/spread cyclic gestures occur at a much higher rate with human subjects
and event-related expressions. Note that the label PRED stands for expressions that
profile events. Those objects in the second cluster also occur at a higher rate with first-person and definite subjects.

Figure 26: Cluster dendrogram of timing+fingerspreading (AU/BP values)

![Cluster dendrogram with AU/BP values (%)](image)

Distance: canberra  
Cluster method: ward.D2

Figure 27: Snakeplot of differences between two fingerspreading+timing clusters

![Snakeplot of differences between two fingerspreading+timing clusters](image)
4.5.2 Summary and discussion of findings for cluster analysis

The cluster analysis found that cyclic gestures expressed with lax and spread finger handshapes have different distributions than closed and other types of handshapes for certain functional-semantic properties co-expressed in speech using the Euclidean distance method and the Ward algorithm for clustering. The different distributions using this model were most greatly impacted by a subject referent’s status in terms of animacy, person, and definiteness. Lax-spread and closed-other finger-spread values that occur with cyclic gestures also patterned differently in terms of their co-occurrence (or not) with evaluations and hedges.

The second cluster analysis found some evidence that similar finger-bending categories have shared distributional properties with certain properties expressed in speech using the Euclidean distance method and the Ward algorithm for clustering. Bent or curved handshapes with any finger-spread status aside from closed showed more similar distributions in terms of their co-expression with linguistic variables related to animacy and identifiability of subject referents, evaluations, hedges, questions. Straight-closed and straight-spread handshapes occurring with cyclics that show similar distribution patterns across the functional-semantic categories mentioned. Surprisingly, straight lax handshapes pattern more similarly to bent and curved handshapes across the particular spoken language variables tested. It has been noted that straight lax handshapes are the neutral basic handshape of manual gestures. This general frequency of occurrence of the straight lax handshape might interact with the way it is grouped with other formal properties based upon its distribution across spoken language meanings.

The third cluster analysis grouped cyclic gestures performed with the same handedness value (e.g., bimanual) and the same value in terms of timing across hands (e.g., asynchronous) as similar based upon their distributional patterns with certain meanings in speech. The exceptions were both unimanual closed and spread values, which show different distributions than other unimanual handshapes. Synchronous spread cyclic gestures also pattern differently from synchronous cyclic gestures with other finger-spread values. Note that this analysis measured distances between behavioral profiles using the Canberra method (for reasons described above).
One surprising finding was the importance of animacy, definiteness, and person to the formation of the various clusters that were tested against the finger configuration variables. It is unclear to me exactly how these semantic properties interact with cyclic gestural constructions and why finger configurations would specifically have a relationship to these properties. Based upon previous observations that have been made about the use of circular movement gestures, it is unlikely that they are tied specifically to the cyclic gesture. I suspect that the relationships these properties have to cyclic gestural constructions are epiphenomenal. That is, they are a result of the types of constructions with which cyclic gestures are used and the conventional ways in which these subject related properties interact with different construction. For example, evaluations are not associated with agentive subject referents. Often times they are expressed with a generic referent in the subject argument phrase, particularly when the speaker is the one doing the evaluation. The value of spread fingers was found to be associated with evaluations and hedges, which often do not include animate subjects. Animate subjects, on the other hand, were found to be significantly associated with closed fingers. Further research is needed to better understand these patterns.

The clustering techniques that were used in this chapter are intended only for exploratory purposes. Depending on the distance metrics and methods of clustering that are selected, an analysis can return different clusters and different degrees of validation for those clusters. Overall these analyses suggest that it would be a worthwhile pursuit to look at certain aspects of gesture form more generally across co-speech gesture use (i.e., not only with cyclic gestures) to see if patterns can be found to their distribution across spoken language meanings. Some formal properties of manual gestures that should be investigated in future research include finger bending status, finger-spreading status, handedness, and distribution of movements across hands.
5 A Cognitive-Semantic Framework for Multimodal Expressions

5.1 Introduction

At the end of the second chapter (§2.6), I introduced one of the problems that arises with the practice of treating gestures that share a formal property, such as a particular handshape or characteristic of movement, as variants of a single gesture. How does one account for gestures that include multiple recognizable and meaningful properties associated with different formal parameters? Familiar handshapes that are oriented in particular ways, such as PUOH gestures, can occur simultaneously with familiar movements, such as cyclic movements. How should one categorize a gesture that incorporates multiple meaningful formal properties?

In this chapter, I introduce a framework to account for symbolic complexity in gesture. This framework relies on principles from Cognitive Grammar (Langacker, 1987, 1991, 2008) and extends them to co-speech gestures. One of the benefits to expanding upon the theoretical principles of a well-established cognitive-semantic linguistic framework is that it allows for a better understanding of the specific ways in which symbolic units in gesture are integrated with symbolic units in spoken language in multimodal expressions. As speech and gesture are used together for communicative purposes in interaction, it is important that they be unified under a common approach in order to have a more comprehensive understanding of meaning in language use.

This chapter begins with an overview of construction grammar approaches within linguistics (§5.2). Cognitive Grammar is a unique framework that covers more theoretical ground than most constructional approaches. Nonetheless, it is compatible with construction grammar and shares the same basic assumptions about the relationship between grammar and meaning in language. Following the introduction to construction grammar approaches for spoken language is a summary of research examining multimodal constructions (i.e., gesture-speech constructions) and a discussion of some of the challenges associated with this pursuit (§5.3). Only recently have researchers begun to pursue this topic; however, this area of study has its base in earlier research on
interaction, which will also be discussed. Following this review of the relevant literature is an introduction to key principles in Cognitive Grammar as well as to more specific ideas in the framework that are important to the analysis of multimodal constructions (§5.4). Section §5.5 adds to the framework of Cognitive Grammar by showing how concepts can be extended to the domain of co-speech gesture. The chapter ends by applying concepts from Cognitive Grammar to the analysis of a multimodal expression (§5.6).

5.2 Constructional Approaches to Language Meaning

The framework that is developed in this chapter aligns with construction grammar theories of language. Construction grammar approaches propose that the observable patterns in the way people use language are grounded in their knowledge of constructions. Constructions are pairings of form and functional-semantic properties that vary in degree of complexity and in how specifically they can be characterized in terms of their symbolic properties (Goldberg, 2013; Langacker, 2008). Following this definition, individual morphemes, multimorphemic words, phrases, clauses, and sentences are all considered to be constructions (that vary in complexity). What this means is that complex constructions (i.e., all constructions beyond a single morpheme) are also pairings of form and meaning. Croft (2001) notes that complex constructions, such as sentence level constructions, are “the same theoretical type of representation object as lexical items” differing only in that they comprise more than one element and have at least some schematic properties. Within construction grammar (henceforth, CxG), lexical constructions, syntactic constructions, and even conventionalized grammatical rules, which are also constructions (see Fillmore, Kay, & O'Connor, 1988), are not associated with different components of language (i.e., lexicon, morphology, syntax, etc.). Instead, the lexicon and grammar are argued to form a continuum. Constructions that have been treated as corresponding to independent modules of language in generative theories of language are differentiated in CxG by the degree to which they are symbolically complex and schematic. As these are graded properties, grammar and lexicon are not clearly separated. Table 20 provides examples of English constructions that have traditionally been associated with different components of language and shows
how they are described under a cognitive constructional approach (adapted from Croft, 2001, p. 17). The components in the constructions that are predictable are italicized in the examples.

Table 20: The syntax-lexicon continuum (adapted from Croft, 2001, p. 17)

<table>
<thead>
<tr>
<th>Examples</th>
<th>Traditional name</th>
<th>Construction-based description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[SBJ be-TNS VERB-en by OBL]</td>
<td>syntax</td>
<td>highly complex and highly schematic</td>
</tr>
<tr>
<td>[pull-TNS NP-'s leg]</td>
<td>idioms</td>
<td>complex and highly specific</td>
</tr>
<tr>
<td>[NOUN-PLUR] [VERB-TNS]</td>
<td>morphology</td>
<td>complex and schematic</td>
</tr>
<tr>
<td>[DEM], [ADJ]</td>
<td>syntactic category</td>
<td>atomic and schematic</td>
</tr>
<tr>
<td>[this], [green]</td>
<td>lexicon (words)</td>
<td>atomic and specific</td>
</tr>
</tbody>
</table>

A major tenet of CxG is that meaning exists beyond words. Grammatical constructions are meaningful as well. For example, the highly schematic English Verb Phrase construction is prototypically associated with the function of predication (Goldberg, 2013). Argument structure constructions, which are responsible for the morphosyntactic realization of arguments (e.g., agreement, case marking, word order) and the semantic expression of participant roles, have conventionalized meanings. For example, the schematic English Caused Motion argument structure construction that takes the form [SUBJ [VERBACTIVE OBJ PREPPATH OBL]] is associated with a set of related meaning, such as caused motion, enabled motion, prevented motion, and assisted motion (Goldberg, 1995). The caused motion meaning in the expression I coughed the bug out of my throat cannot be reached from the semantic properties of the word cough alone. Because of this, it is argued that the argument structure construction must be providing the caused motion interpretation. However, that doesn’t mean that the lexical components don’t also contribute to the meaning of the composite construction. The specific constructional interpretation that is achieved (e.g., caused motion vs. prevented motion) is partially determined by the frame-semantic meanings of the specific components that fill the schematic slots in the argument structure construction, especially
the components associated with the predicate (pp. 24-66). Semantic frames are the structured background knowledge evoked by symbolic structures in language.

Another important proposal with CxG theories is that constructions share relationships with other constructions. Constructions can be motivated and partially derive or incorporate other constructions as components (Goldberg, 1995; Lakoff, 1987). Because of this, constructions form structured networks. There are a variety of ways in which constructions can be motivated by other constructions, such as by incorporating a more general construction into a more specific one. An example of this is the caused motion construction [SUBJ [VERBACTIVE OBJ PREP PATH OBL]] that was discussed in the previous paragraph. It incorporates the intransitive motion construction [SUBJ [VERB OBL]] as a part of the construction (Goldberg, 1995). Constructions can also be extended from a more general sense to a more specific meaning. An example of this can be seen with the related senses of the caused motion construction (mentioned in the previous paragraph). The different senses are argued to be motivated from a more general transfer of motion or caused motion meaning of the construction (pp. 75-76).

Construction grammar approaches assume that all constructions from the word level to discourse level must have some degree of conventionality because people are able to build some understanding of what other people are saying. There is, however, room for speaker creativity in these theories as speakers sometimes use less conventional arrangements of conventional units in language in novel ways for particular purposes. Goldberg (2013) describes creativity as occurring when constructions are generalized so that certain slots are open and can be filled by various tokens and sometimes types of expressions. Still, it is expected that at least some components in the construction must be conventionally structured for the construction to make sense to the interlocutor(s).

This understanding of creativity in spoken language constructions has implications that can better account for creativity in gesture. Historically, co-speech gestures with creative or unpredictable properties have been treated as fully idiosyncratic and ad hoc (McNeill, 1992). Recently, researchers are beginning to rethink these descriptions and are recognizing that even creative gestures have conventional properties (Cienki and Mittelberg, 2013; Kok and Cienki, 2016). If gestures are understood as having the potential to be complex expressions, as they are in this work, conventional and creative
components of gestures can possibly be better accounted for by extending ideas from construction grammar theories on spoken language.

5.3 Multimodal constructional approaches

Multimodality in CxG is only beginning to be explored. The Distributed Little Red Hen Lab (DLRHL), which includes a repository of more than 250,000 hours of searchable and tagged video data from many different countries, is one of the primary resources that has allowed researchers to begin applying corpus linguistic approaches to study multimodal expressions (Turner, M., & Steen, F., 2013). Turner and Steen suggest that meanings in language are “crossmodal blends that rapidly synthesize selected features of the information into new wholes” (p. 19). They argue that it should be a priority of construction grammarians and other linguists to develop methods and tools to promote the study of constructions that comprise meaningful structures from different modalities. This can also include integrated meanings from cultural artifacts, such as illustrations and paintings.

Zima’s (2014) study that looked at patterns in the types of gestures used with specific motion constructions in English was the first publication that responded to Turner and Steen’s call to action (see 2.5.5 for further discussion of this paper). However, there were earlier studies that contributed to the growing interest in multimodal constructions (Andrén, 2010; Calbris, 2003, 2011; Clark, 1996; Enfield, 2009 are discussed later in this section). In recent years, there have been dozens (perhaps hundreds) of studies presented at academic conferences that have explored the integration of co-speech gestures in linguistic constructions (see for example Hinnell, 2014; Rice & Hinnell, 2014; Wu and Cienki, 2014). As of this writing, however, there are very few publications on this topic. In 2017, a special issue of Linguistics Vanguard titled “Towards a multimodal construction grammar” contributed significantly to the growing body of literature. The remainder of this section will discuss findings of recent publications and dissertations that investigate the role of gesture within CxG frameworks and outline some of the gaps in the literature that will be addressed in this chapter and the next.
5.3.1 Theoretical perspectives on multimodal expressions

Even before the notion of multimodal construction grammar was introduced, researchers who study language use recognized that signs from multiple semiotic sources contribute to meaning in interaction. Proposals about the nature of composite expressions that combine elements from gesture and speech have been detailed by Clark (1996) and Enfield (2009; 2013). Clark introduces the term composite signals. Composite signals are meaningful actions that combine methods of signaling (p. 156). The three methods of signaling Clark discusses are descriptions, indices, and demonstrations (p. 161). Linguistic expressions are particularly apt at signaling descriptions while both language and gesture can be used for indexical purposes (e.g., pronouns and pointing). Demonstrations are performed frequently with gesture, but verbal demonstrations also exist. Quotatives are one example.

Enfield (2009; 2013) follows a similar approach to the study of meaning in interaction with his notion of composite utterances. Composite utterances comprise signs from conventional linguistic and gestural units as well as conventional affordances offered by the physical environment in which the interaction is situated. Meaning in composite utterances also includes implicatures that are not overtly expressed but that can be inferred from the linguistic, gestural, and situation contexts. Enfield (2013) suggests that hand gestures can contribute to the meaning of the composite utterance iconically, indexically, symbolically (which he uses to mean ‘conventionally’) or through some combination of the three (pp. 699-700). Importantly, both Clark and Enfield understand multimodal composite expressions as being the starting point for analysis rather than approaching meaning from a building block perspective. Gesture, speech, and other semiotic devices are joined together as meaningful wholes. This is analogous to the view in CxG theories that constructions are the basic unit of language from which categories of meaning are derived (see Croft, 2001, p. 4 for discussion).

Calbris (2003, 2011) also uses composite multimodal expressions as the starting point for analysis but provides a finer-grained account of the form to function mappings in gesture (specifically French gestures) than the approach taken by Clark and Enfield. Calbris (2011) proposes that the forms of hand gestures are derived from actions and entities in the physical world (p. 6). Because the forms themselves are believed to be
motivated, Calbris studies the gestural forms to better understand the meanings they serve in language. Calbris suggests that analogical links between gesture forms and human experiences with the “physico-cultural world” give rise to the functions gestures serve in multimodal expressions. Under this view, gestures can serve as action schemas (similar to semantic frames) that represent actual actions. One example of a gestural action schema that Calbris provides is a gesture that depicts the action of holding a fishing pole (p. 10). This gesture can be metonymically used with speech to refer to any component of the fishing action or to any participant role in the fishing action schema. It can also be extended via metaphor for use in other expressions that are not a part of the fishing action schema.

The other claim that Calbris makes that is particularly important to the current work is that different formal parameters in a gesture can be meaningful. Calbris recognizes that handshapes, hand configurations, movements, repetition of movements, locations, and other formal properties are potentially meaningful in multimodal expressions in French. That is, a single gesture can be symbolically complex. For example, Calbris states that using both hands, either with symmetrical or non-symmetrical movements can be used for emphasis, comparisons, or conflict (p. 87). Under Calbris’ analysis, the meanings expressed in speech provide cues that signal which components of the gesture are meaningful. Based upon Calbris’ assumptions, a gesture’s meaning is identifiable not only because the co-expressed speech points to the meaning but also because the form metonymically or metaphorically reflects the meaning. Calbris looks across examples of many different types of multimodal expressions and makes generalizations about the meaning of gesture forms based upon microanalysis of specific usage events. This heuristic approach is able to cover a lot of ground in terms of identifying detailed observations about the contributions of gesture in particular instances of use. Still, it is unclear whether the observations are generalizable and representative of broader patterns in the use of gestures in French.

5.3.2 CxG approaches to multimodality

Several studies, in addition to Zima’s (2014) study (previously described), have explored recurrent pairings of gesture and speech in the context of CxG. Jehoul, Brône,
and Feyaerts (2017) found that gestural components that are associated with shrugging, such as raising the shoulders, head tilts, head shakes, and eyebrow raises, can be used to indicate obviousness in Dutch. In particular, different components and combinations of components serve different types of functions related to obviousness. For example, an eyebrow raise used with a head tilt can signal that the speaker assumes the addressee will obviously align with the speaker’s stance, whereas a shoulder shrug with a head shake expresses obviousness in the context of negation. Bressem and Müller (2017) describe a meaningful pattern in German that relies on components from gesture and speech. They analyze this pattern as a construction, which they call the “Negative Assessment Construction.” The gestural expression in this construction has a relatively stable form, one which is proposed to be motivated by a schematization of physical actions of clearing the space near the body of unwanted physical entities. Bressem and Müller found this gesture to be used with limited types of spoken expressions in German. This gesture-speech construction expresses what they describe as a “ dismissive quality of negative assessment.” Zima’s (2017) study, like her earlier study, highlights the importance of expanding our understanding of spoken language constructions by examining the gestures that accompany them. Zima looked at 160 video recorded instances of the spoken English construction [all the way from X PREP Y] and found that approximately 80% of the tokens occurred with the use of a manual gesture. The manual gestures did not have a specific form, but that is likely influences by differences in the specific meaning of the spoken construction (depending on the lexical units that fill the schematic slots). In all cases in which a gesture was used, the form of the gesture conveyed a meaning that related in some way to the meaning of the construction in the specific context.

Stickles (2016) unifies multimodal expressions in which gestures and speech simultaneously encode metaphorical meanings related to motion events in English within an Embodied Construction Grammar (ECG) framework (Bergen and Chang, 2005). ECG makes predictions about the symbolic properties of constructions based upon the cognitive and neural mechanisms proposed to be responsible for patterns in language use. These predictions are formalized in a computational model of constructions, which are modified and developed through the results of empirical studies on language use. An
important claim of ECG is that embodied image schemas are simulated during language use.

Stickles research primarily focuses on spoken language expressions that evoke the Location Event Structure metaphor in which states are construed as locations. Stickles finds that gestures that occur with Location Event structure metaphors expressed in speech often evoke image-schematic components of the metaphor through the form of the gesture’s trajectory and direction of movement. This is interpreted to suggest that speakers’ gestures in English privilege path in the use Location Event Structure metaphors. Stickles then uses the ECG framework to illustrate how specific formal components in a gesture can evoke image-schematic information associated with different properties in the source domain of metaphors. Stickles also shows how ECG can be used to represent both the gestural and spoken contributions to metaphoric meanings evoked in multimodal expressions.

These very recent studies (as of this writing) reflect the rapidly growing interest among linguists, particularly cognitive linguists, to better account for the multimodal nature of constructions. Stickles’ study is particularly important because it provides an example of how the formalizations used in a specific CxG theory can be extended to include representations of meaning expressed simultaneously in gesture and speech. Despite the promise these studies offer in the development of multimodal CxC approaches, there are a number of challenges that arise in trying to extend CxG theories to multimodal expressions. The primary concerns are discussed in the following section.

**5.3.3 Addressing challenges to a multimodal CxG**

There are a number of issues that have hindered efforts to incorporate gestures into CxG theories. Several issues are outlined in Schoonjans (2017) and relate to the discussion I presented in §1.2 concerning the challenges to including gesture in existing linguistic frameworks due to widely held assumptions about the nature of gesture meaning.

One of the problems for the development of a multimodal construction grammar that Schoonjans notes is that a high degree of variation exists in the formal expression of recurrent gestures. Gestures, even those that share a formational core (e.g., cyclic
gestures), are never produced identically across different instances of use. Schoonjans points out that variation in the production of an expression is not a phenomenon that is specific to gesture. The phonetic and phonological properties of spoken language expressions are also variable, even within a single speaker. Schoonjans further suggests that the issue of variation in gesture production for CxG can be resolved if one considers that every aspect of a gesture’s form is not necessarily contributing to meaning in a construction. Particular formal parameters, such as a movement, might fill a slot in the multimodal construction while other forms, such as a handshape and orientation, might be purely phonetic at times. The hands are always present in manual gestures and they must necessarily be oriented in a particular way, but they might not be a part of the multimodal construction. Schoonjans suggests that the problem of variation in the form of the gesture can be resolved if one treats gestures, like linguistic constructions, as having variable degrees of schematicity (p. 3). The current research is in line with this perspective.

Another problem that Schoonjans identifies for the development of a multimodal construction grammar theory is how to determine when a multimodal pattern is frequent enough to be considered a construction. This issue necessarily ties into the requirement of most CxG theories that a pattern be conventionalized in order to be considered a construction (Croft, 2001; Fillmore et al., 2007; Goldberg, 2006). Conventionalization is, of course, a matter of degree (as will be discussed in 5.4.2) and frequency is not a sufficient condition for establishing conventionality (Bybee, 2008). Schoonjans notes that the problem of frequency is not specific to gesture but is more generally a problem for CxG. Currently, there is no agreement on how to operationalize frequency for determining an expression’s status as a construction. Furthermore, there are spoken language constructions that are relatively infrequent and likely less entrenched for speakers that are still considered to be constructions (for an example see Hoffmann, 2017). Schoonjan’s point is that frequency should not be used as an argument against the existence of multimodal constructions because frequency alone cannot establish spoken language constructions.

Cienki (2017) provides a perspective on multimodal constructions that offers additional solutions to the issues Schoonjans raises. The approach, which Cienki
identifies as *Utterance construction grammar* UCxG, views multimodal constructions as being conventional to different degrees. In UCxG, degree of conventionality of an expression is determined by how prototypical different components (including gestural) are for that construction. This account suggests that the occurrence or non-occurrence of co-speech gestures that appear to be optional in multimodal expressions (because they are not always present) is partially motivated by how peripheral or central they are to the prototypical representation a speaker has for a particular construction. As UCxG is a usage-based perspective, representations or knowledge about constructions are understood as being built up through linguistic experiences. A multimodal construction is only a metonymic realization of the conceptualization. Cienki suggests that more peripheral, less salient components of the conceptualization are more likely to be absent from the expression. Gestural elements can be more or less central to the prototype for a given construction, which can, in part, account for variability in their occurrence. Cienki also recognizes that cognitive constraints also interact with the selection of different constructional elements for an expression. The interaction between gesture use and cognitive constraints on the working memory is supported by psycholinguistic research (see §2.2 and §2.3).

In the next section, I discuss key principles in the theory of Cognitive Grammar. The perspective that Cognitive Grammar takes on language offers solutions to the problems discussed in this section.

### 5.4 Cognitive Grammar

#### 5.4.1 Fundamentals

Cognitive Grammar (CG) is a theory of grammar (first outlined in Langacker, 1987, 1991) that falls within cognitively oriented, usage-based linguistic approaches. In CG, it is argued that speakers’ knowledge about language emerges from their experiences with language. It is a cognitive approach because it assumes that language relies on basic cognitive abilities grounded in perception and memory as well as more specific human abilities for abstraction and categorization. The study of grammar in CG begins with an understanding that grammar, in addition to lexical items, is meaningful. This view of
meaning beyond words aligns with construction grammar theories (discussed in the previous section). Throughout this section, technical terms are bolded following the convention used in CG.

A central proposal within CG is the **content requirement**. The content requirement proposes that only three types of elements are needed to account for speakers’ linguistic knowledge. There are three types of structures that occur in linguistic expressions that are argued to be included in speakers’ representations of language: semantic, phonological, and symbolic structures. **Semantic structures** are conceptualizations that are recruited for meaning in language. **Phonological structures** are the perceivable elements or forms of language. These include sounds, gestures, and orthographic representations. **Symbolic structures** incorporate phonological and semantic structures and form an associative link between them, “such that one is able to evoke the other” (Langacker, 2008). In other words, symbolic structures pair form and meaning. Symbolic structures are described as being **bipolar** as semantic structures are talked about as residing in the **semantic pole** and phonological structures discussed as residing in the **phonological pole**. Unlike traditional approaches to the meaning in language, the semantic pole includes “an expression’s full contextual understanding—not only what is said explicitly but also what is inferred, as well as everything evoked as the basis for its apprehension” (Langacker, 2008, pp. 457-458).

The content requirement also permits schematizations of each of the three structures that occur in linguistic expressions. Language users identify patterns across linguistic experiences and are hypothesized to develop schemas or abstracted representations for those patterns. More specific structures in language are treated as **elaborations** or **instantiations** of schemas. For instance, Langacker notes that the English symbolic structure *ring* can be characterized very schematically at the semantic pole as ‘circular object’ (ibid, p. 17). If *ring* is used to refer to a ‘circular piece of jewelry worn on the finger’ it would be considered an elaboration of a more abstract schema at the semantic pole. To extend this example further, the more complex symbolic structure *wedding ring* would be considered an elaboration of *ring* for all three structures. *Wedding ring* provides a more specific instantiation of *ring* at the semantic pole (i.e., ‘circular piece of jewelry worn on the finger by someone who is married’). It is elaborative because it provides a
finer-grained characterization of the schematic circular object that is characterized by ring. Wedding ring is also an elaboration at the phonological pole because it includes more phonological content than ring. Finally, wedding ring is a composite symbolic structure that is symbolically more elaborate than ring alone because it incorporates more than one symbolic structure to form a new symbolic whole.

The final types of elements permitted within the content requirement are categorizing relationships across the three structures. Categorizing relationships account for the specific instantiations of schemas in actual usage events. They capture the fact that language users recognize how structures relate to other structures, such as when they share a common schema. Categorizing relationships explain why speakers of English know what types of verbs are appropriate in the Caused Motion Construction (see §5.2 for a discussion of this construction).

In CG, language use or discourse takes place within a shared ground (Langacker, 2001). The speech event, interactions between the participants in the event (which canonically are the speaker (S) and hearer (H)), their conception of reality, and the time and place of the speech event are all included in the ground. Important to the study of discourse in CG is the concept of current discourse space (CDS). The CDS is “the mental space comprising those elements and relations construed as being shared by the speaker and hearer as the basis for communication at a given moment in the flow of discourse” (p. 144). In discourse, the speaker and hearer aim to focus their attention on the same conceived entity within this shared discourse space. Langacker compares the language users’ attentional flow in discourse to the visual field of visual perception.

Metaphorically, it is as if we are ‘looking at’ the world through a window, or viewing frame. The immediate scope of our conception at any one moment is limited to what appears in this frame, and the focus of attention – what an expression profiles (i.e., designates)–is included in that scope (p. 145).
Profiling is an important concept in CG. A proper noun, such as *Anita*, profiles the general schema **thing**. *Thing* is used technically in CG for “any product of grouping and reification” in language (Langacker, 2008, p. 105). It is the most abstract schema to which all nouns (i.e., expressions associated with the semantic class of objects) belong. Anita is a highly specific elaboration of the thing schema (and the subschema of noun). If the symbolic structure *Anita* is integrated into the expression *Anita hugged Rahul*, the entire construction profiles a **relationship** schema because the expression evokes relationships between the participants in the context of the hugging event. More specifically, the expression profiles a **process** relationship schema because the hugging event unfolds through time. The two participants in the event also share a **trajector/landmark** relationship. Anita in this case is the trajector, the most focal participant in the event, which is conventionally designated in English as the referent in the subject argument phrase. Rahul, having secondary focus as the participant expressed in the object argument phrase, is the landmark in the profiled relationship. While symbolic structures in an utterance can profile distinct types of meanings at the semantic pole, the meanings of component and lower-level composite structures in an expression are activated to different degrees in processing time. Langacker (2001, pp. 31-32) notes that there are no instances “when all facets of it are simultaneously active and accessible.”
5.4.2 Symbolic assemblies in cognitive grammar

Langacker (2008, p. 61) writes, “Most of the expressions we employ are symbolically complex, being assembled out of smaller symbolic elements.” Speakers’ knowledge of the patterns for constructing complex expressions in a language, which result in actual expressions in language use, is what is considered to be the grammar of a language. Complex expressions in language are called symbolic assemblies in CG. Symbolic assemblies are combinations of symbolic structures. The semantic and phonological structures that comprise a symbolic structure \([\Sigma_1]\) (first image in Figure 29) are integrated with the phonological and semantic structures of at least one other symbolic structure \([\Sigma_2]\) to form a composite symbolic structure or a symbolic assembly \([\Sigma_3]\) (second image in Figure 29). Minimally a symbolic assembly comprises two symbolic structures. This composite structure \([\Sigma_3]\) can then combine with other symbolic structures to create a more complex symbolic assembly (third image in Figure 29). By examining the process of composition for symbolic assemblies one can identify the categorizing relationships that exist between words, phrases, clauses, sentences, and discourse structures (p. 15).

Figure 29: Symbolic structures and symbolic assemblies (from Langacker, 2008, p. 15)

Importantly, symbolic assemblies are more than the sum of their component symbolic structures. Notice in the second image in Figure 29 that the symbolic assembly is labeled \([\Sigma_3]\) rather than \([\Sigma_1 + \Sigma_2]\). And in the third image, the integration of the composite structure \([\Sigma_3]\) with the component structure \([\Sigma_4]\) forms a new symbolic structure \([\Sigma_5]\). The meanings of composite structures (i.e., symbolic assemblies) are not
directly predicted from the meanings of their component structures. Composite symbolic structures are symbolic structures in their own right. Langacker writes the following about the relationship between component and composite expressions (p. 164):

As a general matter, component structures should be thought of as resources drawn on [...] in arriving at the composite expression. While they motivate the composite structure to varying degrees, and may supply most of its content, they should not be thought of as building blocks that need only be stacked together to form the composite whole.

In CG, symbolic assemblies are equivalent to constructions. The characterization of symbolic assemblies suggests nothing about the status of a construction in terms of conventionality within a speech community. Symbolic assemblies (i.e., constructions) vary in the degree to which they are conventional. While individual component structures might be highly conventional, the integration of those components as a symbolic assembly might be more creative. It is, however, expected that at least some degree of conventionality must exist for communication to be successful. Likewise, a symbolic assembly might be entrenched for a particular speaker without being conventional across a community of speakers.

An important concept in CG (and in particular to the study of the relationship between symbolic components in a symbolic assembly) is the distinction between autonomous and dependent structures. Langacker (2016) describes this distinction in the following way:

An autonomous structure (A) has the potential to be manifested independently. A dependent structure (D) requires the support of an autonomous one for its full manifestation: ((A)D). It thus makes schematic reference to A as part of its internal structure. Being autonomous, A is usually more substantive than D, and by definition it has priority [...] D elaborates A to form a higher-level structure AD. Because it incorporates A, this higher-level structure is normally autonomous as well and may in turn be elaborated.
Another way of characterizing the relationship between autonomous and dependent structures is that a salient substructure in the dependent structure is specified by the autonomous structure. The term elaboration site or e-site is used in CG to describe the salient substructure in the dependent structure that gets elaborated by the autonomous structure.

The alignment between autonomous and dependent structures (A/D alignment) is observable within each pole as well as across poles in a symbolic structure. An example of A/D alignment at the phonological pole is the distinction between obstruents and sonorants. A syllable can consist of only a sonorant. Obstruents, on the other hand, are dependent on sonorants because they are realized by obstructing the airflow of sonorants (which results in other acoustic changes). They are not clearly produced or discernible without being paired with sonorants. At the semantic pole, autonomy and dependency can be observed in the difference between things and relationships. It is possible to conceptualize of things on their own while relationships are dependent on participants in the relationship. A/D is also present across poles in symbolic assemblies. Any structure in a symbolic assembly that “elaborates a salient substructure within it” is a dependent structure (Langacker, 2008, p. 201). For example, the relative clause (bolded) in the symbolic assembly the man who walks his dog by my house every morning elaborates the content evoked by the substructure the man.

5.4.3 Conceptualization and Vocalization channels

Langacker (2001) notes that symbolic structures incorporate multiple channels (shown in Figure 30). At the semantic pole, there are several broad conceptualization channels proposed, including objective content,22 information structure, and speech management. The objective content channel is associated with substantive and concrete meanings, such as those evoked by forms associated with traditional parts of speech. Langacker (2008, p. 462) also describes objective content as “the object of description,” noting that the channel has both central and peripheral elements with “the center being an

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22 Langacker (2001) refers to this channel as “objective situation” as well as “conceptual content” and as “objective content” in 2008. I use the latter term.
expression’s profile.” The objective content channel is bolded in because it is taken to be the core conceptualization channel. Langacker argues that objective content meanings are typically more salient in our focus of attention (p. 146). Meanings associated with the information structure channel are typically evoked by symbolically more complex expressions, such as clauses, sentences, and discourse. Functions that Langacker associates with this channel are emphasis, discourse topic, and information status (i.e., accessibility). Intonation units (as described by Chafe, 1994), or what Langacker (2001) calls attentional frames, also evoke meanings in the information structure channel. The intonation groupings of attentional frames function to manage attention in discourse by presenting symbolic assemblies as “windows of attention.” Attentional frames are considered to be symbolic in CG “in that the very act of imposing a particular intonational grouping effects and symbolizes the act of imposing the corresponding conceptual grouping” (p. 155). The final conceptualization channel, the speech management channel, is associated with interactional functions, such as holding the floor and turn-taking.

Figure 30 shows that the phonological pole also consists of several channels, which are called “vocalization” channels. Segmental content is taken to be the core vocalization channel for speech because of its relative saliency at the phonological pole. The other vocalization channels that Langacker identifies are intonation (i.e., prosodic properties) and gesture.

Symbolic structures vary in how salient a particular conceptualization channel is to the meaning evoked at the semantic pole. For example, a sentence-level symbolic assembly that is packaged as a question is quite salient across all three conceptualization channels. The objective content is important in knowing the specific substantive information needed to understand the question. The information structure channel is evoked by the ordering of the symbolic structures in the composite expression as well as by prosodic properties associated with the intonation channel. Together these signal that the discourse function of the expression is a question. The speech management channel is also evoked with symbolic assemblies that take the form of questions. Questions indicate that a response from the addressee is expected. Other types of constructions may be fairly
specific with regard to particular conceptualization channels and more schematic with regard to other channels.

Figure 30: Conceptualization and vocalization channels (modified from Langacker, 2001).

While the various channels correspond to qualitatively different articulatory modes at the phonological pole and to different dimensions of meaning at the semantic pole, it would be erroneous to interpret them as separate, independent components of language. Language typically occurs as complex symbolic assemblies in interaction. Symbolic assemblies simultaneously incorporate multiple vocalization channels and evoke meanings across and within each of the conceptual channels. Channels can be understood as a theoretical tool that can help to more clearly describe properties of symbolic structures. One of the benefits offered by this framework is that it emphasizes that the semantic pole includes more than strictly propositional meanings. Like substantive meanings in language, functions associated with information structure and interactional functions related to speech management are included as aspects of the semantic pole.

5.5 The Gestural Channel

This section elaborates on the structure of the gestural channel as well as expands on the nature of symbolic structures evoked by gestures using principles from CG. Many of the ideas presented here have been developed over the years with colleagues and
presented at academic conferences (Hirrel & Wilcox, 2015; Wilcox & Hirrel, 2016; Wilcox, Hirrel, & Occhino, 2016). These ideas are also advanced in Ruth-Hirrel and Wilcox (in press) and influenced by the constructional analysis of signs presented by Wilcox and Occhino (2016) and by observations noted by Wilcox (2004a).

As identified in the previous section, the term ‘gesture’ is associated with a vocalization (i.e., articulatory) channel in CG. In other words, gestures are perceivable elements at the phonological pole. I would like to propose that, rather than being associated with a single channel, gestures be divided into at least three vocalization channels. This proposal includes separate channels for manual gestures, facial gestures, and body positioning. Meanings can be expressed using each of these types of body movements (see §1.3 and Chapter 2), which is the motivation for their treatment as different vocalization channels. An expanded version of the vocalization and conceptualization channels (for spoken language) that Langacker proposed is shown in Figure 31. This adapted model will be used in the remainder of this chapter and the next. Note that eye gaze is included with facial content. It is likely that eye gaze actually forms a separate vocalization channel, but as this hypothesis is not explored in the current work, it is included with the facial content for simplification. Also note that Langacker’s speech management conceptualization channel is labeled as interactional function in Figure 31. The new label is meant to capture interactional (pragmatic) functions beyond turn-taking and floor holding. In addition to functions related to conversation management, the interactional function channel includes all discourse functions. Some examples of interactional functions are speech act functions (e.g., commanding, exclaiming, promising) and stance-related functions (e.g., evaluating and aligning). The information structure channel is thus reserved for functions that are traditionally associated with it (i.e., topic, focus, identifiability, and accessibility).

23 Perhaps a better term for this channel would be expressive channel. For the time being, I use the term vocalization channel that is used in CG.
This work focuses on meanings expressed using hand gestures through the manual content vocalization channel. There are a number of formal properties of manual gestures that have the potential to serve as symbolic structures. Several of these properties correspond to the classification of phonological parameters that have been proposed for sign languages (Battison, 1978; Stokoe, 1960). These include *handshapes* that are oriented in particular ways (e.g., PUOH gestures), *movements* (e.g., cyclic gestures, path gestures), *manners of movement* (e.g., beat gestures), and *locations* (e.g., personal gesture space vs. interpersonal gesture space). The findings of the second part of the study presented in chapter 4 suggest that other properties of form that are associated with the manual content vocalization channel might be available for the expression of meaning. Fine-grained properties of handshapes, such as status of the fingers in terms of spreading and bending, are potentially symbolic.

Unlike symbolic assemblies expressed in speech, symbolic assemblies in gesture can simultaneously incorporate symbolic structures that are associated with the same channel in the phonological pole. For example a single hand gesture can, all at once, include a cyclic movement and a PUOH handshape/orientation while being performed in interpersonal space. All of those aspects of form are meaningful components that contribute to the meaning of the whole gesture. Like spoken symbolic assemblies, the meanings of gestural symbolic assemblies are not expected to be directly predictable from the meaning of their component structures. Furthermore, it is not expected that

![Figure 31: Expanded conceptualization and vocalization channels](image_url)
every formal slot in a gesture (i.e., handshape, orientation, movement, etc) is construed in a meaningful way in every gesture. The hands must always be present in a manual gesture and they must always have a value in terms of handshape and orientation (and configuration). That does not mean those values are always symbolic. As Schoonjans (2017) noted (albeit in a more general sense), handshape and orientation values might be, in a sense, purely phonetic (i.e., present only because of the design of the manual gesture articulatory system). The use of so-called “unmarked” handshapes, such as B and lax 5 (see §3.3.4), are possible examples of this. However, from a CG perspective, unmarked values at the phonological pole of symbolic structures, are meaningful because of the fact that they are unmarked (see Langacker, 2008, p. 358 for an example). Still, having some material that is only unipolar at the phonological pole would not be a unique property of gesture. Langacker (2008) recognizes that spoken language has many unipolar units that “contribute to the formation of phonological structures but do not themselves participate in symbolizing relationships” (p. 174). As an example, Langacker notes the unipolar nature of individual sounds.

Like the segmental content vocalization channel of speech, the manual channel also exhibits A/D asymmetry within the phonological pole. These observations have previously been made for sign languages (Wilcox, 2004a) and are extended here to co-speech gesture. At the phonological pole of the manual gestural channel, handshapes are the most autonomous properties. They are physical entities that can be conceived of independently of other formal properties. However, in actual usage, handshapes do require an orientation of some sort and must occupy a location in space. All handshapes include an orientation and location but both of those properties are dependent on the hands. Movements are dependent properties because they require moving entities, which in manual gestures are the hands (and sometimes arms). A manner of movement is also dependent because it requires both something moving and a movement of which it alters the quality. Dependency at the phonological pole for manual content is relative; the handshapes are the most autonomous and manners of movements are the most dependent.

It is possible that A/D alignment also exists for symbolic structures expressed through different vocalization channels in gesture. Wilcox (2004b) notes that for sign languages the meaning of a “facial gesture often modulates the meaning of the manual
gesture in some way” (p. 59). This suggests that for sign languages the meanings evoked through formal properties associated with the facial content vocalization channel are dependent on the meanings evoked through the manual content channel. Research exploring the semantic relationships between co-expressed facial gestures and manual gestures in spoken language is needed before this can be confirmed as a general pattern for co-speech gesture.

At the phonological pole, Figure 31 places manual content in gesture directly next to segmental content in speech. It also places facial content in gesture next to segmental content in speech. This reflects a working hypothesis that manual gestures are more similar to segmental content in the nature of the meanings they prototypically express. However, the functions of facial gestures don’t necessarily correspond to the functions of intonation in speech. For example, Cassell et al. (1994) has noted that a wrinkled nose can stand in place of words after the spoken expression “she was dressed ___..” Another important difference between facial gestures and intonation/prosody is that facial gestures are autonomous from manual gestures at the phonological pole (i.e., they can be produced independently of manual gestures) while intonation is dependent on a segmental carrier for manifestation. Manner of movement, which is associated with the manual content channel, can be used for functions that are associated with the intonation channel in speech (Ruth-Hirrel & Wilcox, in press). It is possible that trying to draw parallels between vocalization channels in gesture and speech is misguided because each mode offers unique affordances as well as constraints, which might hinder a felicitous comparison of the two modes.

In terms of the symbolic potential of manual content in gesture, the hands are well suited to serve as entities and things, including those that serve as participants in events. Examples of this were shown in Chapter 2 with the modes of representation. In Müller’s representation mode (see Figure 7), the hands serve to represent actual entities (either concrete or abstract). In terms of the molding mode (see Figure 5), entities are schematically evoked by the form of the molded hands.24 In contrast to the hands,

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24 I hypothesize that a semantic frame is evoked through the form of molding gestures. The evoked frame is perhaps the Manipulation frame (FrameNet). Because an entity is one of the core participant roles in the frame evoked by the form of the gesture, the gesture is able to profile entities and things. These are preliminary hypotheses about the referential
movements are particularly good at expressing event-related meanings, such as manner and path of motion, and aspectual properties that express information about the unfolding of events through time. These observations have also been made for sign languages (Wilcox, 2004a). One can think of the hands and handshapes as prototypically serving functions similar to nouns and properties of movement as prototypically being more similar to verbs in spoken language.

This section has argued that component symbolic structures that are vocalized in gesture integrate to form more complex gestural constructions (i.e., gestural symbolic assemblies). Gestural constructions are expected to be schematic at the semantic pole because they typically require symbolic structures in speech for elaboration. In language use, symbolic components and symbolic assemblies in gesture integrate with symbolic assemblies in speech to form **multimodal constructions**. The next section draws upon an example of a multimodal construction from language use. It illustrates how the principles of CG that have been discussed in this chapter can be used to better understand the how symbolic components in gesture are integrated in gestural constructions and how those constructions are symbolically integrated with spoken language constructions.

### 5.6 A CG Analysis of a Multimodal Symbolic Assembly

The example analyzed in this section comes from the U.S. television talk show *Ellen*. In this episode, the host Ellen DeGeneres is interviewing Hillary Clinton during the 2016 primary elections. DeGeneres’ previous turn ended with her saying, “Let’s talk about Donald Trump.” She then quotes the Republican presidential candidate as saying that he “will be good for women.” DeGeneres asks Clinton, “What do you think about that?” Clinton then takes a turn of nearly a minute in which she cites specific examples of things Trump has done that make her skeptical that he will in fact be good for women. Clinton ends her turn saying, “There’s just no evidence that he has an understanding of what women’s lives are like today.” Clinton is the only participant that is visible at the end of

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nature of the molding mode of representation. Further research is needed to delineate the expressive nature of this mode.
her turn. Following the end of Clinton’s turn, the camera angle switches to show both participants.

The current analysis examines the usage event involving the first two sentences that DeGeneres utters following the end of Clinton’s turn. A transcription of DeGeneres’ speech is shown in (55). The bolded and bracketed content is the specific interest of the analysis. The gestural expression that is produced during the bolded and bracketed speech in (55) is shown in Figure 31. The broad transcription of the speech follows discourse conventions described in DuBois et al., (1993).

(55)  DEGENERES  [He’s (0.2)

gonna be the nominee.

I _mean,

did you ever think you would get to this point where] (0.2)

you’re gonna be (0.9)

up against Trump?

Figure 32: Gestural expression produced with (57)
In this example, the spoken expression includes a declarative sentence followed by a question. The declarative utterance is predicational, asserting additional information about a previously established topical referent (evoked by “He”), who in this case is Donald Trump. The question that follows the declarative statement elaborates on the assertion made in the previous utterance (that Donald Trump “will be the nominee”). The question makes a request to Clinton, asking her to share her reaction to the asserted proposition. The prosodic properties of the both sentences evoke a sense that DeGeneres’ is incredulous that Trump is the nominee.

I discussed this example with phonologist, Caroline Smith who specializes in the study of prosody and discourse. Smith noted that the first word on Ellen’s turn (He) forms a prosodic unit (offset by the pause). This pattern adds salience to the symbolic structure that evokes Trump. Furthermore, the f0 contour on the final syllable of nominee rises sharply from a low tone, which has been found to contribute to a general meaning of contrast (Watson et al., 2008). Smith (email correspondence, May 5, 2018) offered that the idea of contrast, while it typically refers to a contrast with something that was previously stated, might be used here to make a “contrast with what seemed possible” (i.e., Trump becoming the nominee). While I did not more closely analyze the prosodic properties of the second sentence, the use of the introductory stance marker I mean as well as the word ever (Did you ever) contribute to a continued reading of surprise or disbelief in the interrogative construction. In a more nuanced sense, DeGeneres’ question invites Clinton to join her position of incredulity about the nomination of Trump (see Clark, 2006 for a discussion of questions as requests for joint positioning).

The gesture that DeGeneres makes during the bolded and bracketed speech in (55) is characterized by an open hand oriented up (a PUOH) with lax fingers. DeGeneres’ arm is resting on the arm of the chair but is extended out toward Clinton into interpersonal “shared” space (Sweetser and Sizemore, 2008). The gesture is held in this position throughout the declarative sentence, across the stance marking expression “I mean” and through the first part of the interrogative sentence. The gesture hold ends before the complement of the interrogative. DeGeneres’ eye gaze is directed toward Clinton. There are at least three identifiable symbolic structures in the manual gesture that are integrated into this gesture: (1) a symbolic structure involving the PUOH handshape and orientation,
(2) a symbolic structure involving the location of the gesturing hand, and (3) a symbolic structure involving the movement or, in this case, a lack of movement (a hold).

These features have already been identified as being meaningful in previous research. As discussed in §2.5.4, Müller (2004) and Bressem and Müller (2014b) have analyzed PUOH handshapes as having the general function of “presenting, offering, showing, or receiving” an abstract discursive object. Kendon (2004) also described the use of the PUOH with expressions that introduce new referents into the discourse or that elaborate on a previously established referent or topic. Furthermore, Kendon (2004) identified the combination of the PUOH with a location out toward the addressee (in “interpersonal space”) as being used to either request something from the addressee or to show agreement with something the addressee has said. Importantly, this shared interpersonal space between the speaker and hearer has been recognized as a meaningful location for gestural expressions even when the handshape/orientation is not a PUOH. Sweetser and Sizemore (2008) have noted the following about interpersonal space in their study of the functional differences in the use of different regions of gesture space in language use:

> when they [speakers] reach outside their personal space into interpersonal space, this is a sure sign that (1) they are engaged in regulating the speech interaction, and (2) that the regulation is highlighted rather than backgrounded (p. 27).

Furthermore, Ruth-Hirrel and Wilcox (in press) describe an example in which the use of interpersonal space with a pointing construction and PUOH shows a contrast between the stance of the speaker and the stance of the interlocutor. Wilcox and Occhino (2016) more generally describe meaningful locations in space, in the context of sign languages, as symbolic structures that they call Places. The capitalization of Place emphasizes that it is a technical term that is for a particular type of symbolic structure that is phonologically realized as a location in space. The findings of previous studies

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25 There is a small movement during the gesture hold that I believe relates to a metaphorical mapping of time onto space using a lateral timeline. If this is the case, then the movement is symbolic. However, it is excluded from the analysis, as it is not directly relevant to the current theoretical objectives.
strongly suggest that locations in gesture space, including interpersonal space, have the potential to be symbolic structures. In this case, the location of the gesture in interpersonal space is meaningful. In terms of the gestural hold, McNeill (1992) has described holds as serving a cohesive function, as discussed in §2.5. This supports the treatment of gestural holds as symbolic structures.

Figure 33 shows my analysis of the phonological and semantic structure of the individual symbolic components in the gesture shown in Figure 33. This analysis uses the channel framework in CG that was introduced in the previous section. The schematic meanings of each symbolic structure, as they relate to the different conceptualization channels, are shown at the semantic pole. The features of *handshape* together with the phonologically dependent and obligatory property of handshape, *orientation*, form a symbolic structure [F₁]. Phonologically, [F₁] consists of an open hand oriented upward (a PUOH). Based upon existing scholarship that examines the functions this form serves in language use, I analyze the PUOH as schematically evoking a thing at the objective content channel of the semantic pole (i.e., the thing that is introduced, presented, requested). The schematic thing that is evoked by the PUOH is also topical to some degree at the level of information structure. A second component symbolic structure, [F₂], is realized as a location at the phonological pole. Following Wilcox and Occhino’s analysis, [F₂] would be considered a Place. In this case, the location of the Place structure can be characterized (rather crudely) as proximal to the addressee. I analyze this location as evoking a schematic interactional relationship between elements of the ground at the channel of interactional function. The final component symbolic structure in the gesture that is shown in Figure 33, labeled as [F₃], is phonologically associated with the feature of movement. In this particular gesture, it is the lack of movement in the form of a static hold that is meaningful. Gestural holds evoke a schematic function within the channel of interactional function. I describe this function as relevant scope because the hold signals that the gesture is relevant to the speech with which the hold aligns. Previous research supports this characterization of the function of the hold. Harrison (2010) observed that speakers of English use holds after gestures that occur with negation in speech until the speech included in the scope of the negation is completed.
In the actual usage event under analysis, the component symbolic structures shown in Figure 33 are integrated and form a symbolic assembly. This symbolic assembly is simultaneously produced as a single gesture. Figure 34 shows the integrated composite gestural expression \([G_1]\) as well as the component symbolic structures that comprise it. Note that the label \([G_1]\) reflects that the composite symbolic structure is a meaningful unit that is distinct from the individual component structures. I analyze this composite gestural construction as schematically functioning to present something as topical for an interactional purpose. Below I describe the elaboration of the general function of this gestural construction within this particular usage event.
The composite gestural expression and the spoken utterances that are bolded and bracketed in (55) are integrated as a multimodal symbolic assembly. A schematic representation of the symbolic properties of the multimodal assembly is shown in Figure 35. As shown in the diagram, the form of the composite gesture \([G_1]\) evokes the function *present something as topical for an interactional purpose*, which is most salient to the interactional function channel. While component symbolic structures that are integrated in the composite gesture evoke meanings associated with all three channels, the whole gestural expression profiles an interactional function. For example, one might note that the meaning of the symbolic structure that is phonologically characterized by a hold of movement \([F_3]\) is not clearly represented in the meaning that is profiled by the entire gestural expression \([G_1]\). Rather \([F_3]\) can be understood as providing a cohesive link between the meaning of the gestural expression and the meaning of the speech by showing that the function of \([G_1]\) is elaborated across spoken utterances. The two spoken utterances that, by way of the gestural hold, align with \([G_1]\) further specify the gesture’s function by providing the topical content with which the speaker wants to interact and by specifying the nature or type of interaction the speaker wants to initiate.

Figure 35: Multimodal symbolic assembly for (55)
The first spoken sentential utterance \([S_1]\), which takes the form “He’s gonna be the nominee,” elaborates the semantic pole of the gestural construction by establishing a specific topic that the speaker wants to offer for joint activity (i.e., that Trump will be the Republican nominee for President). Elaborative relationships are indicated by dashed lines in Figure 35. In the sentence that follows, the portion of the sentence that aligns with the gesture \([S_2]\) (i.e., “I mean, did you ever think you would get to this point where”) further elaborates the function of the gestural construction as well as the function of \([S_1]\). The semantic pole of \([S_2]\) profiles the speech act function, which is a question. When considered in relationship to the meaning of the prior utterance, \([S_2]\), it specifies that the speaker wants the addressee to engage with the topic established in \([S_1]\). Specifically, the speaker wants the addressee to respond to a question about the topic. Moreover, the stance-marking expression “I mean” that occurs sentence-initially, provides a cohesive link between \([S_1]\) and \([S_2]\) by “forewarning” that the speaker is making an adjustment to what was said in the previous utterance (Fox Tree & Schrock, 2002).\(^{26}\) In terms of the gestural expression, the ‘interactional purpose’ that is schematically evoked by \([G_1]\) is specifically instantiated by \([S_2]\). The profiled function that is evoked by \([S_2]\) elaborates that the interactional purpose evoked by the gesture is a call for a response. Specifically, DeGeneres asks Clinton to share her thoughts and, perhaps more importantly, to share in DeGeneres’ own surprise about Trump’s nomination.

In this example, the function of the composite gestural construction is complementary to the function of the spoken utterance with which it aligns. However, the meaning of the gesture is much more schematic than that of the speech because it is dependent on the meanings expressed in speech for elaboration. One should be careful not to assume that the gesture is simply a redundant expression of meanings already expressed in speech. The analysis presented here is still very coarse-grained. The phonological and semantic pole of the symbolic structures and the relationship the symbolic structures have to the multimodal construction can be analyzed in greater detail, particularly the spoken expressions. Furthermore, an examination of the use of this type

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\(^{26}\) What exactly the speaker is forewarning would require a fine-grained analysis of the symbolic properties of the speech that are evoked both by the segmental content and the intonation, which is outside of the scope of the primary goals for the current work.
of gestural construction across usage events might reveal a motivation for complimenting the speech act functions expressed in speech with a functionally similar gesture. Perhaps the gestural expression is used more generally as a form of emphasis or foregrounding for the speech act functions performed by the speech. It would also be worth exploring whether this gestural construction occurs more generally in environments where the speaker expresses a stance of incredulity or with related stance meanings.

I propose that the gestural construction that DeGeneres uses in this example is an instantiation of a more general gestural construction. I characterize this construction as the Joint Action Construction in English. In the next chapter, I discuss this construction in more detail and analyze another instantiations of this construction that incorporates cyclic gestures.

5.7 Conclusions

Researchers have long recognized that gestures display complexity at the phonological pole (perhaps using a term other than ‘phonological pole’). In this chapter, I have analyzed this complexity in terms of vocalization channels as developed in CG. I have argued that gesture as an expressive mode comprises several channels. The focus of attention for this research has been on the manual vocalization channel in gesture.

What research on gesture has tended to overlook is that the phonological complexity in gesture can be reflective of symbolic complexity in gesture. I have shown that there are particular features within the manual channel that can be recruited for the expression of meaning. When used in meaningful ways, they become symbolic structures. Schematically characterized, the features within the manual content channel that have the potential to be meaningful are handshapes (and oriented handshapes), locations, movements, and manners of movement. There are likely other, less central features in this channel that can also be construed as meaningful. The results from the second part of the study presented in Chapter 4 suggest that finger-spreading status and finger-bending status are two additional features that might carry meaning. Specific features in the manual channel (e.g., ‘cyclic’ movements or ‘fist’ handshapes) have the potential to become independently meaningful through processes of schematicization and categorization of our experiences.
A meaningful use of a manual gesture feature creates a component symbolic structure. However, gestural component structures are frequently integrated with other symbolic structures in gesture. These integrated composites take on meanings that are distinct from the meanings of the individual features. Co-occurring spoken expressions elaborate (or potentially extend) the meanings of these conceptually dependent gestural composites.

Not every gestural expression will make use of every feature slot in the manual channel for symbolic purposes. Furthermore, some features, such as movement, can express multiple symbolic structures simultaneously (e.g., cyclic gestural rotations moving along a linear path). The example analyzed in the previous section incorporated symbolic structures from the features of handshape, movement, and location. Following Cienki’s (2017) perspective, the integration of this symbolic assembly in gesture with the spoken utterances was likely partially motivated by how central the meaning of the gesture (i.e., gestural construction) was to the prototypical representation the speaker had for the spoken language constructions. Given the close semantic relationship that was revealed between the gestural construction and the speech, this interpretation is persuasive.

Historically, gestures have been regarded as holistic and non-componential. I have shown evidence that carries implications that the widely held assumption that gestures are not analyzable is misguided and actually impedes our understanding of how gestures mean. Gestural “variants,” which are different gestural forms that have at least one salient formal feature in common and are used in different (yet related) contexts, are actually different symbolic assemblies in gesture that incorporate some of the same symbolic structures. Recognizing symbolic complexity in gesture and identifying meaningful component structures that are integrated into composite structures allows for a finer-grained characterization of the meanings of gestures and a clearer understanding of relationships across gestures. Extending the study of symbolic complexity within constructions beyond speech to the gestural mode is an important and (I argue) necessary step in the creation of multimodal construction grammar approaches.
6 Cyclic Gestures: Symbolic Components in Multimodal Assemblies

6.1 Introduction

In the last chapter, I illustrated how principles of Cognitive Grammar can be used and developed for the purpose of studying the integration of symbolic structures expressed through gesture and speech in multimodal constructions. This chapter returns to the case of cyclic gestures and applies the framework described in the previous chapter to analyze functions of cyclic gestures in English. This analysis of cyclic gesture meaning also relies on the findings of the study presented in Chapter 4.

First, I will propose a schematic meaning for cyclic gestures in English that is motivated by the findings of the study presented in §4.3. This meaning relies both on image-schematic properties evoked by the gesture’s form as well as the linguistic contexts in which cyclic gestures are used in English. Drawing upon data and the findings from the study from Chapter 4, I analyze how the schematic meaning of cyclic gestures in English is specifically instantiated and extended for the expression of particular functions (§6.2). Following the analysis of the meaning of cyclic gestures in English, I then examine certain cases in which cyclic gestures are integrated with other symbolic structures in gesture and analyze how those symbolically complex gestural constructions function in multimodal expressions. This chapter will specifically discuss examples in which cyclic gestures are integrated in gestural constructions for the expression of epistemic stance (§6.3). I will also return to the Joint Action Construction that was introduced in the previous chapter, and propose a specific instance of that construction that integrates cyclic gestures (§6.4).

This chapter concludes with a discussion of the limitations to the research presented in this dissertation and suggests topics for future investigation based upon those limitations. Finally, I discuss the contributions this research makes to cognitive approaches to the study of multimodality in language and identify important implications this research has, in a broader sense, for the field of linguistics.
6.2 Cyclic Gesture Meaning in English

Cyclic movement gestures are analyzed within the CG framework as component symbolic structures. This section explores the meaning of cyclic gestures as symbolic structures. First, I will propose a schematic meaning for cyclic gestures that is motivated by both the image-schematic properties of the gesture’s form and the functional-semantic similarities across the symbolic structures in speech with which cyclic gestures are repeatedly expressed. Following the description of this schematic meaning of cyclic gestures, I will look at more specific elaborations of the schematic meaning drawing on examples from the data.

Some researchers who explore meaning in co-speech gesture have argued that representational gestures (i.e., those that depict or represent things, events, or properties) evoke image-schematic properties (Cienki, 2005; Mittelberg and Joue, 2017; Stickles, 2016a). An image schema has been defined as “a recurring dynamic pattern of our perceptual interactions and motor programs that gives coherence and structure to our experience” (Johnson 1987: xiv). Image schemas are highly abstracted, basic conceptions of the experiential domains that we encounter most frequently. Ladewig (2014a) suggests that the form of cyclic gestures evokes the image schema CYCLE. The image schema CYCLE is a pattern that reflects our basic understanding of time (Johnson, 1987). She further argues that the contexts in which cyclic gestures are used in German can be accounted for by examining metaphorical mappings from the CYCLE image schema that is evoked by the form, which serves as the basis for the source domain of the mapping. Johnson (1987) describes the image schema CYCLE in the following way:

Most fundamentally, a cycle is a temporal circle. The cycle begins with some initial state, proceeds through a sequence of connected events, and ends where is all began, to start anew in the recurring cyclic pattern. (p. 119)

Cienki (2005) found that people reliably associated particular gesture forms with image schemas. Circular movement gestures were one of the gesture forms found to be characterized by a particular image schema, that of CYCLE. In Cienki’s experiment, participants were given a list of one-word image-schematic descriptors (as well as the
option of “other”). Participants were asked to select the descriptor that best characterized the form of different co-speech gestures in video recorded conversations. The same task was performed for speech that was used with gestures. In this condition, they were asked to select the descriptor that was the best characterization of the speech. Participants overwhelmingly selected the descriptor “cycle” to describe examples in the stimuli in which the speaker used a circular movement gesture. This pattern was found despite the fact that the accompanying spoken expression, “you can learn more that way sometimes” was most frequently characterized by the descriptor of “path.” Stickles (2016) analyzed the complex trajectory of the cyclic gesture (complex because it involves multiple dimensions of space) as evoking a dynamic type of CYCLE. This image schema was also evoked in the corresponding speech by the verb “rotate.”

The image schema CYCLE is not tied to any particular experience with cycles. Rather it reflects schematized representation patterns in our experiences with time and is dependent on our metaphorical understanding of time in terms of space. Johnson (1989) later writes that cyclic patterns “are known rhythmically through our bodies” (emphasis Johnson’s) because we are on intuitively “responding to and modulating the cycles within which we find ourselves” (p. 369). This suggests that the experiential patterns that contribute to the CYCLE image schema interact with experiences not specifically represented by this schema.

Importantly, groupings of image schemas that are frequently experienced together form gestalt structures. Cienki (1997) discusses a grouping of image schemas that frequently occur with CYCLE. These are PATH, PROCESS, ITERATION, and FORCE (p. 8). A CYCLE is a more specific instance of the PATH image schema. A cycle is a path that leads back to its origin. The act of getting from the point of origin back to the point of origin via the path involves the PROCESS image schema. The process along a cyclic path can be repeated as an ITERATION. Travel to and from the point of origin on a circular path can involve motion, which relies on the image schema FORCE.

The analysis of cyclic gestures that is presented in this work agrees with Cienki (2005), Ladewig (2011, 2014b), Stickles (2016), and others who have argued that the forms of gestures can evoke image-schematic properties that are important to understanding the meaning of the gestures. However, I augment existing observations
about the relationship between the form of cyclic gestures and image schemas by proposing that cyclic gestures evoke complex schemas that comprise multiple image schemas. Minimally, I propose there are three image schemas are evoked by cyclic gestures: PATH, CYCLE, and PROCESS. The movement of the gesture evokes PROCESS and the trajectory of the movement evokes PATH. The specific trajectory and movement together, which results in a return to the location of origin (at least approximately), evokes CYCLE. The repetition of the trajectory and movement of a cyclic gesture can evoke ITERATION, but some cyclic gestures only involve a single rotation and so this image schema is not always evoked. Note that I distinguish the image-schematic structure evoked by a cyclic gesture from a dynamic CYCLE (as Stickles has analyzed) because I believe it is important to do so in the schematic characterization of the cyclic gesture’s meaning based upon how it is used in English. I discuss the schematic meaning in the following paragraph. This work does not go in depth in exploring the relationship between image-schematic structure and the many different semantic-functional properties with which cyclic gestures are used. However, the image-schematic structure evoked by the form of cyclic gestures is important to a schematic characterization of the gesture’s meaning.

I use the term schematic meaning as it is used in CG. A schematic meaning is a characterization of the semantic pole of a symbolic structure that is abstracted from linguistic experiences and “instantiated by all instances” of that symbolic structure (Langacker, 2008, p. 34). I analyze cyclic gestures in English to have a schematic meaning of process. A process is defined in CG as “a complex relationship that develops through conceived time and is scanned sequentially along this axis” (p. 34). Relationships are conceptually dependent structures that require participants in the relationship. **Conceived time** relates to how conceptual content is construed as unfolding through time. This is contrasted with **processing time**, which relates to the actual neurological experience of time. Although symbolic structures in language serve as construals of time (conceived time), the apprehension of that construal necessarily involves processing time. When we say or hear an utterance we access it through processing time. **Sequential scanning** relies on both conceived time and processing time. We access motion events, such as running, as sequential component states that unfold through processing time.
Langacker notes that we engage in sequential scanning any time we directly observe an event (p. 111). Processes are relationships that are construed as developing through time and that conception is accessed sequentially in processing time. Processes are also complex relationships because a distinct relationship can be established with any “time-slice” (p. 99).

A highly schematic representation of a process is shown in Figure 36. The squares are the entities in the relationship. The bar and arrow at the bottom of the diagram labeled $t$ represents the unfolding of time. The bolding shows that time is foregrounded in a process. The individual pairs of entities with vertical dashes arrows in between represent the individual relationships that exist at any point in time in the process.

![Figure 36: Process (adapted from Langacker, 2008, p. 99)]

The *process* meaning that cyclic gestures schematically profile is made specific (i.e., elaborated) by the integration of cyclic gestures in specific multimodal expressions. To be clear, the schematic characterization of cyclic gestures as processes should not be taken to mean that the accompanying speech always profiles processes. Cyclic gesture meanings can be specifically elaborated by symbolic structures in speech. Alternatively, their meanings can be extended via processes of inference from the meanings of symbolic structures in speech and the situational context in which it those structures are used. It is also important to recognize symbolic complexity in the gestural channel when discussing the meaning of cyclic gestures. Cyclic gestures are often simultaneously integrated with other symbolic structures in gesture, which form new meaningful units that are distinct
from cyclic gestures used as a component structure. Some examples of symbolic assemblies involving cyclic gestures are discussed in §6.3 and §6.4.

Let us now turn to some of the categories of spoken language meanings that recurrently occurred with cyclic gestures in English (see §4.3) to see how the schematic meaning of cyclic gestures is elaborated in those contexts.

**Events**

In the study presented in Chapter 4, cyclic gestures were frequently used with the expression of events, which included both states and dynamic situations (56% of data). Events were frequently packaged in the form of predication (36% of data). All events expressed with cyclic gestures were construed as durative. In cases such as those shown in Figure 37, the process schematically profiled by the cyclic gesture is specifically elaborated by the spoken expression in the objective content channel. In the case of the example in Figure 27, the specific process is ‘get in an adventure.’ This example illustrates that speech can provide a specific characterization of the kind of process that is only schematically evoked by a cyclic gesture.

However, there is another symbolic structure expressed in the speech in this example that is relevant to the use of the cyclic gesture. The event is modified by the frequency modifier phrase *every episode*. Although this expression occurs after the cyclic gesture has ended, the scope of the frequency modifier includes the event with which the cyclic gesture is aligned. In over 26% of the cases in which a cyclic gesture was expressed with an event, the event was expressed with overt markers or with morphosyntactic constructions indicating that the event was repeated, frequent, or habitual. While the schematic meaning of the cyclic gesture does not include a representation related to the frequency or recurrence of the process, the data (see §4.3.3) suggests that cyclic gestures are associated with more specific instances of processes, specifically repeated processes, frequent processes, and continuous processes (e.g., evoked by *keep, continue*). These characterizations of the cyclic gesture’s meaning are still schematic but more specific than *process*. 
The show is about two twenty something girls (0.2) named Abby and Ilana. Uh living in New York. And they [get in an adventure]ture every episode.

This research was unable to identify whether different meanings within this broader grouping (iterative/frequent/habitual) are formally distinguished in the gesture due to a limited number of tokens of each type. These meanings were treated as a single semantic group in the quantitative study. As a group, iterative, frequent, and habitual construals of events that were expressed with cyclic gestures were significantly associated with the following formal properties (individually): number of rotations (i.e., negatively associated with single rotations), large gesture sizes, path movements, and one handshapes. This suggests that cyclic gestures may form symbolic assemblies that have some degree of conventionality that relate to the expression of these meanings.

The use of cyclic gestures for these types of meanings is potentially motivated by the affordances offered by the gesture form. Cyclic gesture movements are able to be repeated without interruption. This repetition of movement possibly evokes the iteration image schema when used with spoken constructions that also evoke this image schema. Because cyclic gestures with multiple iterations are not always used with these
types of meanings, I want to be careful not to claim that the repetition of movement always evokes the iteration image schema. Activation of this schema is more likely dependent on the meanings evoked in the spoken constructions with which cyclic gestures are integrated.

There is another interesting aspect related to cyclic gesture form when they are expressed with these meanings and more generally with meanings evoked in the objective content channel by speech. Cyclic gestures that are used to express meanings related to the objective content channel (e.g., event frequency/iteration and progressives) are often associated with forms that bring prominence to the gesture, such as large rotations, two hands (progressives), and asynchronous rotations across two hands (progressives). Perhaps these gestures receive formal prominence because the meanings they serve are related to the objective content conceptualization channel. This is a possibility that is worth exploring in future research.

Discourse Coherence

The first part of the study presented in Chapter 4 found that cyclic gestures frequently aligned with the clause boundaries of complex sentences for both coordination and subordination. Cyclic gestures also specifically aligned with linkers or connectives in many cases (i.e., subordinators or coordinators), not only with complex sentences, but with those connectives that initiated the start of new intonation phrases and occurred across coordinated phrases (§4.3.4). While these instances of cyclic gesture use did often correspond with the expression of events or processes in speech (e.g., relative clauses), there were many cases in which the cyclic did not align with spoken meanings that profile processes. A few examples are shown in Figure 30-40.

In the example shown in Figure 38, the cyclic gesture begins on a linking expression (a coordinator). It is used with a spoken language expression that profiles the posterior temporal relationship of the event that is expressed after it (evoked by addressed). The anterior event was expressed before the interlocutor interrupted the speaker (not shown) and the speaker asks for her turn back with “Wait hold on. Let me finish this last part.” The profiled relationship that is co-expressed with the cyclic gesture is non-processual.

27 Asynchronous rotations are likely multifunctional. Prominence or emphasis might be one function.
The temporal modifier “later on” does not foreground the development through time. It locates time in relation to the time of another event, but time is construed holistically rather than as unfolding.

Figure 38: Discourse cohesion and cyclic - 1

Wait hold on.
Let me finish this last part.
And then late- ((extended pause while audience laughs))
[and then later on] in the day
Tia Mowry addressed it by Tweeting.

Figure 39: Discourse cohesion and cyclic - 2

It was when Brad and Jen were still together.
So it was a long time ago.
And you could have asked for my number then.
(0.3) [Cause it was] round two.
LETTERMAN: Before he passed away he was and certainly still is very popular. But at the time the most popular uh- sh- musician in the world for god's sakes! SNOOP: Yeah. His message [was music and love and peace]ace and tranquility.

In the example shown in Figure 39, the onset of the cyclic gesture stroke aligns with a subordinator that begins after a brief pause. The subordinator specifies a non-processual causal relationship between the matrix clause (the one that precedes it) and the subordinate clause. The matrix clause (not shown in the transcription) serves as the trajector in the relationship profiled by the subordinator and the subordinate clause serves as the landmark in the relationship (§5.4.1).

Unlike the previous two examples, that shown in Figure 40 does not involve a relationship between clauses. The cyclic is used with phrasal coordination in which each conjoined conjunct profiles a thing. The conjuncts (music, love, peace) each serve as landmarks of the trajector (his message), characterizing the essence of the message Bob Marley expressed though his music. The conjuncts, being coordinated, are construed as being symmetrical and having equal status (aside from temporal ordering) in their roles as landmarks in the profiled relationship. The expression is prosodically presented as a list.

The spoken constructions used with cyclic gestures in these examples are not of the same type. They do, however, share a functional relationship. They are all used for a higher-level interactional function of bringing coherence to the discourse. They signal different types of semantic relationships between events and other entities (in the case of Figure 40) in the discourse. The study on cyclic gesture use in English did not find that
cyclic gestures were associated with constructions expressing a specific type of semantic relationship across events or entities. They were used with constructions expressing temporal, causal, temporal-causal, adversative, disjunctive, conditional, and other relationships. In the examples described above, cyclic gestures were not used with spoken expressions that profile processes. Why then are cyclic gestures, which I argue schematically profile processes, integrated in these types of constructions? In these cases, the speech cannot elaborate the schematic process expressed by the cyclic because they do not evoke processes.

I propose that these types of situations are reflective of a subjectively construed process. Rather than profiling a process objectively construed in the spoken expression, the process meaning of the cyclic gesture relates to the sequential access of related semantic material in processing time. As noted in §6.2, interlocutors try to align their attention on the same conceived entity in shared discourse space. In these situations, the cyclic meaning is associated with the real time processing of the attentional flow within the discourse. Juxtaposed clauses, even phrases, carry the expectation that they are semantically related in some way. The cyclic gesture marks the processing of that expectation and signals that the symbolic structures in speech that are aligned with the gesture are related to one another in some way. The cyclic gesture doesn’t specify what that relationship is. It is the speech that elaborates the nature of that relationship. The gesture foregrounds that the profiles of objectively construed content apprehended earlier in processing time are semantically related to the profiles of objectively construed content that participants in the interaction are either currently accessing or will access soon in processing time.

In the next section, I discuss other types of expressions that were found to frequently occur with cyclic gestures in the data. In particular, I consider certain uses of quantification, hedging, and evaluations. I suggest that cyclic gestures expressed with these functional-semantic properties in speech also involve subjective construals of processes. The uses of cyclic gestures that are discussed in the next section were found to have significant relationships with other formal properties in the gesture. These forms will be analyzed as symbolic structures that integrate with cyclic gestures for functions of epistemic assessment. Contrastively, cyclic gestures used with spoken language
expressions that relate to discourse coherence, such as those discussed here, were not found to be associated with particular formal properties (§4.4.3). The exception being cases in which the onset of the gesture stroke aligned with connectives or linkers. In these situations, cyclic gestures occurred with bent fingers at a frequency significantly greater than expected.

6.3 Cyclic Gestures and Grounding

The findings of the study presented in Chapter 4 show English speakers repeatedly using cyclic gestures in the context of evaluations expressed in speech. Evaluations include situations such as those shown in (56)-(60). In (56) and (57), the cyclic gesture stroke is aligned with speech that expresses the stancetaker (I) and the propositional attitude predicate think, which positions the speaker’s epistemic stance in relationship to the proposition expressed in the complement clause. In (59), the gesture aligns with the target of the evaluation (Elena) and (the majority of) the evaluation (did an amazing thing). The expression encoding the stancetaker (He), who in this case is someone other than the speaker, does not occur with the cyclic. In (59), the gesture aligns with the target of the evaluation (They) and the full evaluation (are amazing). In this example, the expression encoding the object or target of the evaluation anaphorically refers back to an antecedent that provides the specific identity of the evaluative target. There is no overtly expressed stancetaker in (59).

(56) Um, it’s uh, [I think] people are really concerned to see what's in those tax returns.
(57) [I think it']s really identifiable.
(58) He said it was awesome (0.3) uh that this wonderful wom[an Elena did an amazing] yknow thing for him.
(59) [They're amazing!]
(60) There is a (0.2) [a very] unique way that uh Shoshana talks on the show.

In CG terminology, the conceptualizer/stancetaker (C) in (59) is offstage and subjectively construed. Subjectivity in CG refers to cases in which the conceptualizers’
roles as the subjects of conception (i.e., the speaker and addressee(s) roles as conceptualizers of the construed content) are not overtly expressed or profiled. Instead, the conceptualizers have only an implicit presence in the linguistic expression. Subjectivity is a graded characterization. As the speaker is the prototypical conceptualizer in language, it is not unusual for a speaker’s role as conceptualizer to be construed more subjectively. The speaker as C is also subjectively construed in example (60). In this example, the cyclic gesture stroke aligns with the amplifying degree modifier (very) in the evaluation, which increases the scalar value of the gradable property modifier (unique).

It is possible to analyze some of the uses of the cyclic gesture shown above as profiling processes that are objectively construed (i.e., overtly expressed) in the proposition. For instance, the cyclic in (58) aligns with a process that is profiled by the verb did in speech. One might also analyze the use of the cyclic in (59) as relating to the process that is construed between the trajector (they) and landmark (amazing), which is profiled by the be verb. However, example (59) is not a prototypical event or process. The spoken construction construes a property associated with the subject referent as a process and foregrounds the persistence of that property of the referent in time.

It is even more of a stretch to argue that think in examples (56) and (57) are profiling mental processes in conceived time in the objective content channel. In these cases, I think is used for an interactional function to “indicate the existential status” of the proposition (Langacker, 2017, p. 44). This existential status relates to how the speaker conceives of the propositional content in their conception of reality. Langacker analyzes the processual profile of these unstressed preposed instances of I think as being backgrounded within the higher-level (i.e., matrix clause and subordinated clause) complex sentence constructions (p. 50).

Rather than profiling processes relating to the unfolding of objectively construed conceptual content is conceived time, I argue that cyclic gestures that occur with evaluations relate to the conceptualization of an assessment in processing time. In other words, the function of cyclic gestures in these cases pertains to the conceptualizing activity of making (some sort of) an evaluation. The findings of the second part of the study presented in Chapter 4 provide evidence to support the treatment of cyclic gestures
used with evaluations as distinct from other uses of cyclic gestures. Cyclics used with evaluations were found to have significant associations with other formal properties in the gestural expression, specifically spread fingers and spread fingers with asynchronous bimanual cyclic rotations. These formal properties were also shown to have a moderately strong effect size with evaluations, which means there is a strong association between the functional category of evaluations and these other formal properties in the gesture when a cyclic is expressed with an evaluation.

In the remainder of this section, I analyze the functions of cyclic gestures performed with spread fingers and asynchronous bimanual cyclic gestures with spread fingers using examples from the data. I propose that spread fingers and asynchronous rotations are symbolic structures in American English speakers’ gestures that are symbolically integrated with cyclic gestures for a number of related functions associated with epistemic assessments in multimodal expressions.

The examples shown in in Figure 41-Figure 47 illustrate the use of cyclic gestures performed with spread finger handshapes and asynchronous bimanual rotations. All of these examples occur in the context of evaluations and all share additional semantic properties that have conceptual relationships with one another. These semantic properties include the following: uncertainty, imprecision, vagueness, and lower degrees of speaker commitment to the proposition.

Figure 41: Spread-finger, asynchronous bimanual cyclic -1

I was a little intimidated by LA. I didn't [quite know how to deal] w-
I still [am not sure I] know how to deal with it.28

28 There are two cyclic gesture tokens in this example. The second token (not represented in the image), interestingly, is also expressed with a negative hedged assertion in speech.
This preschool is like, you know it's the Harvard of of of of preschools. And uh I went in there and I thought, (0.3) okay I know how to play this. [I'm gonna be kind of hard to get] in the interview.

It's beautiful. It’s [kind of got this old (0.3) there's a ghost town] vibe to it.

The cyclic gestures used in the examples shown in Figure 41-Figure 43 each occur with hedged evaluations. When performed with cyclic gestures, hedges, like evaluations, were found to have a significant relationship with spread finger handshapes and asynchronous bimanual rotations performed with spread finger handshapes (§4.4.3). Hedges were further found to have a significant relationship with evaluations when expressed with a cyclic gesture (§4.4.4). Even when hedges are not expressed in clause or
sentence-level constructions in which the primary function of the construction was to make an evaluation, they perform evaluative functions. Hedges always mark a conceptualizer’s assessment (of some sort) concerning the status of the information being expressed. The conceptualizer of hedges is almost always the speaker (an exception being quoted hedges used in directly reported speech).

The example in Figure 41 was first shown at the end of Chapter 1. In this token, actor Chris Noth produces a cyclic gesture during an evaluation (*didn’t quite know how to deal*) that includes the semantic property of uncertainty. Noth’s evaluation occurs in a negative construction with a knowledge predicate (*know*) in the matrix clause of the complex sentence construction. This negated predication in the matrix clause expresses that the speaker/stancetaker (overtly expressed with *I*) has a low degree of epistemic certainty about the proposition expressed in the complement clause. In particular, the speaker expresses a lack of knowledge or a lack of belief that he had the appropriate knowledge in his mental model of the world to feel comfortable in the city of Los Angeles. In the next utterance, he then reiterates and rephrases this lack of certainty using the aspectual modifier (*still*) and present tense (*am not sure I know how to deal*), which shows that he continues to have this uncertain stance at the time of the speech event. Like the first cyclic gesture, the second gesture aligns with speech expressing a lower degree of certainty concerning the propositions expressed in the complements. It is also performed with spread fingers and repeated asynchronous rotations.

In the example shown in Figure 42, actor Jack Black uses repeated bimanual asynchronous cyclic rotations with spread fingers during an evaluation that expresses a past belief or attitude. Black is discussing the (unsuccessful) strategy he used during an interview to try to get his child accepted into a prestigious and competitive preschool.

The evaluation that aligns with the cyclic gesture construes his stance at the time of the interview. He intended to play ‘hard to get’ in the interview. His evaluative characterization of the planned behavior is scaled down by the hedge *kind of*. This either suggests that Black had a low degree of commitment to fully engaging in ‘hard to get’

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29 This spoken expression in this example could be explained with more precision using the framework of Mental Spaces (Fauconnier, 1994). However, it is not a requisite for the current goals of this section.
behavior during the interview (e.g., showing disinterest in the interview or the school) or that he is being careful at the time of speaking as to whether his current construal of his past stance position is precise. Interestingly, as Black moves into position to perform the cyclic stroke, his fingers are closed (see topmost image). As he begins the stroke, his fingers immediately move into a spread position.

In Figure 43, actor Eva Mendes uses the same hedge as Black does (kind of) to scale down the evaluation (got this old…ghost town vibe) of the evaluative target. The target is a town in which she filmed a movie (previously established in the discourse). Mendes’ hedged evaluation suggests that she is not fully committed to the evaluative characterization she makes about the object of stance. The rephrase of the evaluation after the pause suggests that Mendes is uncertain or wants to be careful about how she characterizes the town.

Figure 44: Spread-finger, asynchronous bimanual cyclic - 4

I was very fortunate to meet Guy Richie and he put me in uh in my first film. And then uh (pause) **[things just]** sort of progressed.

The spoken expressions that are used with cyclic gestures in the examples shown in Figures 44-45 evoke meanings of vagueness and imprecision. In Figure 44, actor Jason Statham is talking about how he got his first big break in acting (after being prompted with a question from the host). The cyclic gesture aligns with the target of stance, which is vaguely characterized by the generic plural noun **things**. It also aligns with a hedged use of the modifier **just**, which precedes another hedge **sort of**. Together, **just sort of** evokes a sense that the speaker associates the content expressed in the predicate proposition as being imprecise. This spoken construction suggests Statham is uncertain of
the events that led to the big break or as to whether there was a notable big break at all and thus evaluates the circumstances of his rise to fame vaguely. In Figure 45, the cyclic is expressed with the referring expression in the predicate of an existential construction. While not a prototypical evaluation, it has functional similarities in common in that it does assign a value to an evaluative object. The generic unidentifiable referent (thing) is introduced as one reason for the delay in filming. The use of whole as a modifier of that referent invites the inference that the speaker views this particular occurrence that prevented the show from being filmed (only vaguely characterized by thing) as being unexpected. This construed unexpectedness of the occurrence serves as the evaluation.

Figure 45: Spread-finger, asynchronous bimanual cyclic - 5

They're making four new movies of the Gilmore Girls. Which is a show. Which is near and dear to my heart for four years. And we could not get those schedules to work. And (0.25) there was [a whole thing]. And then I was gonna be out of the country and blah blah blah.

Figure 46: Spread-finger, asynchronous bimanual cyclic - 6

ROSIE: But I want a bobble too. GREGG: I can arrange that for you. ROSIE: Okay well please. GREGG: [Yknow th- there's a big demand for the middle aged superhero.]
In the example shown in Figure 46, the cyclic gesture is used with an evaluation that has a non-serious, sarcastic function. The cyclic gesture aligns with the entire stance act, including the evaluation (*a big demand*) and the object of stance (*middle aged superhero [bobble head]*)). The stancetaker is not overtly encoded and is understood to be the speaker. As this evaluation does not reflect the speaker’s actual stance and is used for humor, the speaker has a low degree of commitment to the truth value of the proposition. The segmental content in speech does not express this, but it is expressed through prosodic properties, non-verbal means (e.g. smiling), and culturally-specific frame-semantic knowledge.

Figure 47: Spread-finger, asynchronous bimanual cyclic - 7

It's when you actually have that personal insecurity about yourself, and you make that agreement (0.2) with what that person is saying, [that's when it tends to- (interrupted speech)](0.5) [yeah it starts to affect] you.

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30 The participant who interrupts Mowry says, “It affects you.”
In the larger discourse context of the example shown in Figure 47, the hosts of a morning television show are discussing the challenges of dealing with public criticism as celebrities. The top image in Figure 47 is included to show the status of actor Tamara Mowry’s fingers in the gesture she performs immediately preceding the cyclic gesture. This gesture, which is more complex than what is shown in the single still image, aligns with the spoken expression *with what that person is saying* (shown in the transcription). Mowry’s fingers are closed during the performance of this gesture. The second row of images captures the finger status of Mowry during the portion of the cyclic gesture stroke that occurs before another participant in the interaction interrupts Mowry and during the interruption. The third row of images shows Mowry’s finger status during the portion of the cyclic gesture stroke that occurs after she is interrupted. In the portion of the stroke that occurs before and during the interrupted speech Mowry displays spread fingers, while Mowry’s fingers are closed after the interruption. The entire cyclic stroke is performed with bimanual asynchronous rotations.

In this example, the bimanual asynchronous cyclic gesture stroke with spread fingers aligns with the expression of the object of stance (*it*), which was previously established in the discourse as ‘public criticism’. It also aligns with the evaluation (*tends t-*) that is initiated before the interruption. The speaker is implicitly understood to be the stancetaker. The epistemic modal predicate *tends (to)* expresses that the speaker is not entirely committed to the evaluative proposition (that ‘criticism’ *affects you*). The proposition, which is not fully expressed until after the interruption, is dependent on the conditions expressed in the previous two clauses (i.e., *when you actually have that personal insecurity about yourself and you make that agreement with what that person is saying*). During the expression of the bimanual asynchronous cyclic gesture stroke with spread fingers, Mowry construes a less than certain stance that the proposition is the case using the epistemic modal predicate *tends (to)*. She construes the proposition as being likely, frequently occurring, or probable given the conditions she expressed in the previous clauses.

When the evaluation is reformulated after the interruption, the speaker shows a high degree of commitment to the proposition with the use of the inceptive verb *start* rather than repeating epistemic modal predicate. The fact that Mowry’s fingers close at this
point of the gesture stroke, suggests that the spread fingers is associated with functional-semantic properties of the predicate *tends*. However, *tends* (to) also evokes a frequency reading, which is another function associated with cyclic gestures that was discussed in the previous section. It is possible that the use of the cyclic gesture in this example is motivated by multiple functional-semantic properties in speech. However, the form of the cyclic gesture (*asynchronous rotations with spread fingers*) was found to be associated with evaluations but not with meanings expressing event frequency. Still, the direction of the cyclic gesture movement is *in* toward the speaker. This was a rare occurrence in the data (23/501 tokens). This inward direction might be analyzed as evoking the metaphor *EMOTIONS ARE FORCES*, as it seems to construe the speaker as the experiencer of the emotions. This example illustrates the potential for symbolic structures in gesture to serve multiple functions and supports the analysis of gestures as complex expressions.

Cyclic gestures co-expressed with quantifiers in speech were also associated with spread fingers and with asynchronous bimanual rotations with spread fingers. However, unlike evaluations, the effect size was weak for this relationship. In many cases in which quantifiers were expressed with cyclic gestures that had these formal properties, the quantifiers (or expressions that are functionally similar to quantifiers) occurred within the context of evaluations. Some examples are shown in (61)-(62). In all cases, the quantifiers vaguely or imprecisely quantified the amount of a countable entity.

(61) And our show is multigenerational. Like we go from the kids to the grandparents so there's so [many different points of view], I think it’s really identifiable.

(62) Y'know, so everybody [gets to see a little] (H) a little bit of a lot of different things about me.

(63) Why is the map upside down? And I said "well I disagree with their premise because (0.3) y'know, upside down is just an opinion. Right? If you were out in space it might have [any orientation].

Asynchronous bimanual spread-finger cyclic gestures that were used with quantifiers outside of the context of evaluations were distinct from those occurring with evaluations. In several cases, the fingers were also bent and the meanings expressed in speech suggested that the form of the hands were depictive, making use of the
representational mode of molding (discussed in §2.5.2). As prototypical quantifiers modify the amount of a physical thing, it is not surprising that the molding mode of representation would be used in gesture during the expression of (certain types of) quantifiers. In the example shown in Figure 48, the hands are spread and bent. These forms are possibly motivated by the act of holding the balls that are used in the physical act of juggling. Furthermore, the asynchronous rotations of the hands during the cyclic stroke might be motivated by the motion associated with the physical act of juggling. Importantly, none of the spread-finger cyclic gestures that were used with quantifiers in the context of evaluations involved the representational mode of molding. In all cases, the fingers were either straight and spread or curved and spread.

Figure 48: Cyclic gesture with spread and bent fingers

I know you're full of energy [but how are you juggling all of this]?

Cyclic gestures that occurred with evaluations that showed higher degrees of speaker commitment to the proposition often incorporated finger-spreading but not asynchronous bimanual rotations. Some examples in which this was the case are shown in (64)-(67). Other examples in which this was the case are those shown in (57)-(59). This suggests asynchronous cyclic rotations and finger spreading when used together are more closely associated with the semantic properties of uncertainty, imprecision, vagueness, and lower degrees of speaker commitment to the proposition than spread fingers alone.

(64) And you know you can it starts with you. You gotta be g- [you gotta be the man in the mirror to say you know what I'm gonna start with myself.

(65) And they get [really excited about it too. Like th- it's very th]rilling for them.
(66) Because [obviously all of us] in this business are worried that like somebody's gonna slip us a forged document, or something fake.

(67) I think it's a [normal thing] but I think people some people don't want to accept that I got married.

Cyclic gestures that were produced with asynchronous rotations during evaluations expressed in speech never occurred with closed fingers. In cases in which the fingers were not spread, the hands either displayed a special handshape (e.g., 1) or were lax. This suggests that the function of asynchronous rotations in the context of evaluations might be incompatible with the meaning of closed fingers. Remember from §4.4.3 that closed fingers were associated with human subjects, 1st person subjects, and definiteness and that spread fingers were associated with indefinite subject referents (along with the other functions already discussed). This suggests there might be a functional distinction between spread finger handshapes and closed finger handshapes in the context of cyclic gestural constructions. As mentioned earlier, there are likely differences across speakers in how much finger-spreading is present when a spread finger handshape is being used symbolically in English speakers’ gestures. Some handshapes coded as lax might actually be spread and vice versa.

The findings from the study presented in Chapter 4 suggest that bimanual asynchronous cyclic gestures produced with spread fingers in the context of evaluations expressed in English, function as a gestural hedge. I have suggested that cyclic gestures used in the context of evaluations, regardless of form, typically relate to the process of the speaker/conceptualizer making an assessment in mental processing time.

Asynchronous bimanual cyclic gestures produced with spread fingers are used to indicate a particular type of assessment. This symbolically complex gestural expression profiles that the speaker is less committed to the evaluative proposition in some way. The specific functional-semantic aspects of that low degree of commitment are elaborated by the spoken expression (as illustrated in the examples discussed above) and the context in which the multimodal expression is situated. Further research on the two component symbolic structures that are integrated with cyclic gestures in this construction (i.e.,
spread fingers and asynchronous rotations) is necessary before a semantic characterization of each symbolic structure is possible.

Asynchronous rotations might have a physical source in the action of wavering. In spoken English, the physical sense of ‘waver’ is related to the more abstract meaning of the word, which is to express doubt or indecision. It is less apparent if the meaning of spread fingers is motivated by an action in the physical environment. I suspect that it arises via some type of metaphor in English, but at this point, I’m uncertain about what that metaphor is. Before this topic can be explored further, it will first be necessary to learn more about the meaning of spread fingers in English gestures in a separate study.

The title of this section is *Cyclic Gestures and Grounding*. **Grounding** is a technical concept in Cognitive Grammar. Grounding refers to the semantic function of establishing an epistemic relationship between the ground (i.e., the speech participants, their conception of reality, and the time and place of the speech event) and the entity or process that is in focus in the speech. All finite clauses and nominals are grounded implicitly, covertly, or overtly (Langacker, 2008, p. 272). There must be grounding with nominals in order for a referent status in terms of identifiability to be understood. For clauses, grounding allows a profiled process to be situated in terms of its relationship to reality (Langacker, 2017, p. 3). Importantly, overtly expressed grounding elements do not profile the epistemic relationship between the ground and the objective content. The ground is backgrounded and subjectively construed with the use of these elements.

In the past, Langacker has focused primarily on a fixed set of overt grounding elements in English that are highly grammaticized (e.g., tense markers and articles, demonstrative). More recently, Langacker has analyzed lexical and paraphrastic grounding devices that function at a higher-level of organization (Langacker, 2017). Some examples are clausal modifiers that indicate degree of epistemic certainty (e.g., *I think, perhaps, and certainly*) and modifiers indicating the source of information (e.g., *reportedly*). These are described as higher-level grounding devices because they are typically expressed outside of the clause (within a larger construction) as opposed to clause-internally. They are also different from clause-internal grounding devices in that they are not grammatically obligatory. They are described as “optional elaborations” that
indirectly establish a relationship between the speaker and the occurrence profiled by the proposition. They are also dependent on the clause-internal grounding elements (p. 21).

Asynchronous bimanual cyclic gestures that are produced with spread fingers during evaluations are similar to higher-level grounding elements. They occur outside of the clause (in a different mode of expression for that matter), they are not always required, and they function to establish an epistemic relationship between the speaker (i.e., the ground) and proposition expressed in speech. They too are dependent on the clause-internal grounding devices expressed in the spoken expression. As a symbolic assembly in gesture, this composite construction profiles a process (grounding elements in speech also profile processes). This process is one of speaker assessment in processing time rather than an objectively construed process. This gestural construction also serves the function of grounding that assessment in relationship to the profiled occurrence, which is elaborated by the grounded proposition expressed in speech. In multimodal constructions, grounding elements establish epistemic relationships between the ground and the objective content in both expressive modes.

6.4 Joint Attention Construction and Cyclic Gestures

In this section, I return to the gestural construction that was discussed in §5.6, which I have identified as a subtype or instance of a higher-level Joint Action Construction in English. I describe two examples in which cyclic gestures are used with the Joint Action Construction and analyze how cyclic gestures are symbolically integrated into this construction. While each example that involves a cyclic gesture is a distinct instantiation of the Joint Action Construction, I argue that they are related to the same instance of the construction. Because of this, I will first describe the contexts associated with each example and then present my analysis for the instance of the Joint Action Constructions that they represent.

The first example was initially shown in Chapter 1 as Figure 2(c). It is included here as Figure 49. Prior to the occurrence of the multimodal construction shown in this example, talk show host Steven Colbert and actor Jessica Alba had been talking about the actor having tattoos and about the reason she started getting tattoos. Colbert then changes the topic, saying, ‘You are a movie star. Y’know you’re a name above the title movie star
and you went and founded a uh your own hair care product, sort of uh beauty line.” When Colbert attempts to describe the company, he presents the characterizations of Alba’s company using the referring expressions “hair care product” and “sort of beauty line.” The referring expressions are presented prosodically as lists, ending with a continuative intonation tone on “line.” Colbert also evokes the listing function gesturally by pointing to different fingers for each phrase (shown in Figure 50). This listing function and the use of the approximating hedge “sort of” before the second referring expression functions to show that Colbert is uncertain of how to characterize Alba’s company using a more general, superordinate category. The multimodal expression shown in Figure 2(c) occurs at this point.

Colbert asks Alba for clarification on how to label the type of company she founded using the two information questions shown below Figure 49. The cyclic gesture stroke is aligned with the speech that is bolded and bracketed in the transcription. Colbert’s performs the cyclic gesture stroke primarily with his right hand. The right hand displays small, repeated rotations at the wrist that rotate in towards his body. Both hands display PUOH handshapes/orientations; however, the left hand only performs a partial cyclic toward the end of the bolded and bracketed speech. The location of the primary hand used for the gesture stroke is proximal to the addressee (Alba) in interpersonal space. Colbert’s eye gaze is directed at Alba.

Figure 49: Joint Action Construction with cyclic – 1

[What would you call what you do] now? What is the Honest Company?
In the second example, shown in Figure 51, talk show host George Lopez is interviewing actor Ken Jeong. Prior to the example, Lopez and Jeong are talking about a memorable comedic scene in a movie in which Jeong starred. Lopez then shifts the topic by asking the question “Is there any performers in your family?” A cyclic gesture aligns with the start of the polarity question, specifically with “Is there any.” This cyclic is performed in relatively central gesture space for Lopez. As the cyclic stroke ends, Lopez reaches out toward Jeong while saying “in your family,” nearly touching his leg, with his palm oriented partially upward and open (possibly as a lax form of the PUOH gesture). The example shown in Figure 51 begins here.

This second question that immediately follows the first question is an information question. The cyclic stroke aligns (approximately) with the matrix clause of the question (“How did you get the bug to”). The cyclic gesture stroke is larger and more salient on Lopez’s right hand. It is also extended toward the addressee in interpersonal space. Rotations are performed at the wrist and are directed away from the speaker’s body. The palm orientation of the open (lax) 5 handshape displayed on the right hand changes somewhat but is oriented up for much of the stroke as a PUOH. The left hand is held near the body and performs reduced sized cyclic gestures with a lax (open) 5 handshape with the palm directed in toward the speaker. Lopez directs his eye gaze at Jeong.
[How did you get the bug to] do comedy and to act?

While there are some formal differences in the specific phonological realization of the gestures shown in Figure 49 and Figure 51, there are many similarities in the form that can be schematized from the specific properties. In both cases, the form of the dominant gesturing hand performing the cyclic gesture stroke can further be characterized by an open handshape with the palm oriented upward (PUOH) and by a location in interpersonal space. Both examples also include eye gaze toward the interlocutor. Furthermore, each gestural expression aligns with information questions expressed in speech.

In §5.6, I discussed an example in which the symbolic structures of PUOH, location in interpersonal space, and a hold of movement were integrated to form a symbolic assembly (i.e., a gestural construction) that had a meaning schematically characterized as presenting something as topical for an interactional purpose. While schematic in the gestural construction, the specific topical entity and interactional purpose were elaborated by the speech. I argue that the gestural expressions shown in Figure 49 and Figure 51, which also incorporated PUOH and interpersonal space as symbolic structures, are
related to the construction shown in Figure 32 via a higher-level parent construction that I am calling the Joint Action Construction.

While further research is needed to validate the existence of this proposed construction, this is the current hypothesis I put forth about the formal and functional properties associated with this construction. At the phonological pole, the Joint Action Construction consists minimally of two symbolic structures, one associated with the feature of location and one with movement. The location is specified at the phonological pole as addressee-proximal (alternatively, interpersonal space). The movement feature is schematic and can be elaborated by a movement or by some type of movement toward, within, or across interpersonal space (or by a combination of movement and hold). The function of the Joint Action Construction is highly schematic for which I propose the characterization of gesturing for an interational purpose. Specific handshapes, movements, and manners of movement have the potential to serve as symbolic structures in the Joint Action Construction. The integration of additional symbolic structures within the Joint Action Construction can elaborate the meaning of the higher-level construction (as was the case for the example discussed in §5.6) or extend the construction metaphorically to different domains. However, the construction’s occurrence with speech is necessary for full elaboration. If particular gestural symbolic structures are frequently used together in this construction for similar functions in multimodal symbolic assemblies, the Joint Action symbolic assembly (or construction inherited from the Joint Action Construction) can become entrenched within the minds of speakers. If these patterns are propagated across a community of speakers, the gestural construction may show degrees of conventionality and be established as a unit. A multimodal assembly might also become conventionalized if the particular symbolic structures in speech and gesture are frequently used together by speakers in a community for similar functions.

The example discussed in §5.6 illustrated how the PUOH and movement hold interacted with the Joint Action Construction and how the meaning of that symbolically assembly was elaborated by speech. Let us now examine the integration of the cyclic gesture in the Joint Action Construction based upon the usage events shown in Figure 49 and Figure 51. First, as was discussed in §6.2, cyclic gestures are analyzed as schematically profiling a process. The meaning of the speech that accompanies the cyclic
gesture can elaborate the meaning of the gesture by specifying a particular type of process or by evoking a particular phase of a process. Alternatively, the functional properties expressed in speech can extend the meaning of the cyclic from designating a process in conceived time to processing time, leading to more subjective readings of the cyclic gesture. Cyclic gesture meaning also interacts with and can be elaborated by other symbolic structures that are co-expressed in gesture.

In examples in Figure 49 and Figure 51 both of the spoken utterances with which the cyclic gestures are used evoke processes. In terms of the objective content channel, the spoken expression that occurs with the gesture in Figure 49 ("What would you call what you do") evokes the process of ‘describing a situation’ or ‘categorizing as a situation’. In the example shown in Figure 51, the process associated with objective content that is evoked by the speech “get the bug (to do comedy and to act)” is an emotional or mental process of desiring. In this case it is a process that is construed metaphorically by way of the EMOTIONS ARE OBJECTS metaphor, which characterizes the emotional process of desiring in terms of acquiring or coming to possess the emotions. While these processes evoked as objective content through the spoken vocalization channels might motivate the use of the cyclic gestures, the composite gestural construction into which the cyclic gesture is integrated profiles a meaning associated with the interactional function channel. The composite gestural construction is schematically represented in Figure 52 as \([G_2]\) with the label as a “Tell me” Joint Action Construction for reasons I describe below.

Figure 52: “Tell me” Joint Action Construction
The cyclic gesture as a symbolic structure is simultaneously integrated with two other symbolic structures, PUOH and a location in interactional gesture space, both of the examples (Figure 49 and Figure 51). Like the gestural construction \([G_1]\) that was described in §5.6, \([G_2]\) as gestural construction incorporates the three symbolic structures and forms a composite structure that serves a function that is motivated but not predictable from the component structures. I categorize the meaning of \([G_2]\) as *tell me something* based upon similarities across the multimodal constructions with which it is used in the data (discussed further in the final paragraph of this section).

I analyze \([G_2]\), which represents shared properties in both examples as an example of the “Tell me” Joint Action Construction. This construction minimally incorporates the interactional location that is fixed in Joint Action Constructions in English and a cyclic gesture. Symbolic uses of the handshape feature, such as the PUOH, can also be integrated into this construction. The “Tell me” Joint Action Construction seems to foreground and bring into the immediate focus, through gesture, that the speaker desires a response and active participation from the addressee. It is as if the person is saying though gesture (and perhaps is) “Tell me (something).” While the cyclic gesture profiling a schematic process cannot serve as a direct link to the “tell me” reading of this construction, when integrated with the location in interactional space, which schematically profiles an interactional function, and a question in speech, one can see how the schematic meaning of the cyclic gesture partially motivates the meaning of the composite structure.

In CG, Langacker (2008, p. 474) analyzes spoken expressions such as *tell me* as orders that express processes rather than a propositions. With orders, the speaker imposes some degree of “social and psychological force” on the addressee, the speaker’s effective stance, by intending to bring about an occurrence. *Tell me* would be characterized as having a weaker effective stance than other orders (e.g., *Get out!*). In orders, the addressee serves as the trajector of the profiled process. In the case of the “Tell me” Joint Action Construction, the process profiled by the gesture is something in between a request and an insistence for a response from the addressee. The desired outcome is, of course, a response from the addressee. Interestingly, questions, which are co-expressed with the gestural constructions in speech, do not have the same effect as the gesture.
Langacker notes that questions do share properties in common with orders, such as in prompting an action from the addressee, but they differ in that they are propositional. The “Tell me” Joint Action Construction then complements the question that is expressed in speech by foregrounding a process that is left implicit by the spoken expression.

The speech can still elaborate the meaning of more instantiations of the “Tell me” Joint Action Construction. This can be observed in the two examples discussed previously. The PUOH’s schematic meaning as topical thing contributes to the meaning the gestural construction “Tell me” Joint Action Construction as we saw with the proposed meaning of [G₂], which is tell me something. The speech elaborates on the schematic something evoked as a part of the gestural construction and identifies the thing or topic that desired response from the addressee should be about. In Figure 49, the speech elaborates the meaning of [G₂] to express Tell me about how you characterize your business. In the example shown in Figure 51, the speech elaborates [G₂] to specify Tell me about how you became interested in comedy and acting.

In terms of the phonological pole of the “Tell me” Joint Action Construction, there seem to be at least some idiosyncratic properties of form, such as the use of one hand or two and to what extent the second hand is used if participates. As the expressive side of all linguistic utterance can be characterized by some degree of idiosyncratic properties, this is not a problem. Generally, there are a number of formal properties that are significantly associated with this multimodal construction. The term multimodal construction is used because there were a number of properties that were tied to cyclic gestures used with questions.

While these weren’t the most frequent function of cyclic gesture use in the data, in 30 of 38 tokens with which cyclic gestures were used with questions, they occurred in interactional space. One of the examples in which it was not directly preceded the Lopez Jeong example and was discussed above. Not every question is obviously going to make use of the “Tell me” Joint Action Construction in gesture and not every question that occurs with a cyclic gesture necessarily involves this construction. This, as I argued in Chapter 2, is a matter of construal. In not every instance does a speaker necessarily want to foreground the response process of a question. A specific study of this construction, however, may reveal interactional or other semantic constraints on when the “Tell me”
Joint Action Construction is used. The study presented in chapter 4 did find that cyclic gestures were used with questions were strongly associated with interactional space and there was a strong effect for this relationship. This provides support for the hypothesis that the cyclic gesture and the location in interactional space are the obligatory symbolic structures in this gestural construction. Other properties were also associated with this construction, such as eye gaze toward the interlocutor, single-handed performance, and rotation at the wrist. These properties should be investigated further to see if they are making meaningful contributions to the gestural construction. Other properties that aren’t associated with the gestural construction could be making meaningful contributions but may not very conventionalized or frequently used with this construction. Still, those should also be explored. It should be noted that while the two examples of the “Tell me” Joint Action Construction involved information questions there were examples in the data that used this construction with polarity questions and so the broad type of question does not seem to play a role in the use of this construction. Overall, this proposal puts forth a fruitful point of departure for exploring symbolic assemblies involving cyclic gestures performed in interactional space and for gestural expressions performed in interactional space more generally.

6.5 Discussion

I have analyzed cyclic gestures as symbolic component structures that profile schematic processes. These processes can be associated with occurrences that are objectively construed in speech. In these cases, a grounded clause elaborates the specific type of process with which the cyclic meaning is associated. Cyclic gestures meanings can also relate to the sequential access of semantically related objective content in processing time. The ground implicitly plays a role in this function of cyclic gestures, as it is the speaker/conceptualizer who construes of the semantic relationships across juxtaposed symbolic structures in speech.

Cyclic gestures can also simultaneously integrate with other symbolic structures in gesture to form gestural symbolic assemblies that serve particular functions in multimodal constructions. I discussed two types of symbolic assemblies in gesture in which cyclic gestures participate. I interpret these gestural assemblies as having some
degree of conventionality in English because each is repeatedly used in the data for specific functions in multimodal expressions. The first gestural construction that was discussed integrates cyclic gestures and the symbolic structures of spread fingers and asynchronous bimanual rotations. This construction is used in the context of evaluations. It profiles a speaker’s assessment in processing time in cases where the speaker construes a less than total degree of commitment to the epistemic status of the proposition expressed in speech. The other construction, which incorporates cyclic gestures and the symbolic structures of interpersonal space and PUOH handshape/orientations is used to express an interactional process that is distinct from the process evoked by the grounded proposition of the spoken expression. The interactional process the gestural construction expresses is a speech act that falls somewhere in between an order and a request. These gestural constructions occur with questions in speech and complement the speech act performed verbally.

Certain types of gestures have been analyzed as evoking image schemas that contribute to the functions they serve in language use. Cyclic gestures have been argued to evoke the CYCLE image schema. I have suggested that other image schemas are also evoked by the gesture, such as PROCESS and PATH. The image-schematic structures that are activated in a particular occurrence of a cyclic gesture depend on a speaker’s construal of objective content and how the addressee apprehends the construal. In some construals, CYCLE has a more prominent role in the meaning of the gesture. For example, CYCLE is particularly salient for cyclic gestures used during the construal of circular motion events, such as the one shown in Figure 4 in Chapter 2, which illustrates the acting mode of depiction. The circular movement of the gesture in the context of the multimodal construction reflects a construal of a cycle that “begins as an initial state and proceeds through a sequence of connected events,” ending at the point of origin (Johnson, 1987, p. 119). The image schema CYCLE might also be activated for cyclic gestures that are used with the expression of undirected activities in speech that don’t involve circular movements. For example, the undirected activity sing (which was used with cyclic gestures several times in the data) involves a repeated production of sounds. With each repetition, the participant returns to the qualitative state existing at the onset of the action. Croft (2012, p. 27) calls undirected activities “cyclic activities” because they involve
connected qualitative states “which the entity goes back and forth between.” The activation of CYCLE for cyclic gestures expressed with construals of undirected activities that don’t involve motion is probably not as prominent as it is for cyclic gestures used with cyclic motion events.

In my analysis, I argued that cyclic gestures, being movements, foreground the temporal development of a relationship. Because change through time is always focus in the meaning of cyclic gestures, I would argue that PROCESS figures into the meaning of cyclic gestures in multimodal expression at least as much as CYCLE. The form of the cyclic gesture evokes a network of related image-schemas. It is the construal of the multimodal expression by the conceptualizers of the speech event that brings prominence to particular aspects of the evoked imaged-schematic structure.

The formal properties of cyclic gestures are important to the meanings they serve. Being a type of movement, cyclic gestures evoke processual relationships. Manual gesture movements are dependent expressive properties that depend on something moving: the hands. The hands have the potential to encode symbolic properties during the expression of the cyclic gestures. When they do, the gesture reflects a symbolically complex construction.

A question that arises from my analysis is whether all types of movements in gesture evoke processes. All movements necessarily develop through time. A cyclic gesture is well-suited for profiling the temporal unfolding of a relationship because they can be continually repeated without interruption. Gestural expressions with path movements, on the other hand, seem more appropriate for the expression of force-dynamic relationships between participants in events. The hands can represent participants. Manner of movement might also integrate to show magnitude of force. Perhaps gestural expressions with path movements evoke meanings more similar to argument structure constructions and expressions with cyclic movements (when used to profile objective propositional content) behave more like tense-aspect constructions. This seems likely given that tense-aspect constructions, like cyclic gestures, profile highly schematic processes. Tense-aspect constructions also serve as grounding elements in clausal constructions. As I showed in §6.3, cyclic gestures can integrate with other symbolic structures in gesture for functions related to grounding.
It is worth noting that path movements can also be integrated with cyclic gestures. This occurred with 35 cyclic gesture tokens in the data. While I did not provide an analysis of these constructions in this dissertation, they were often associated with metaphoric meanings either overtly expressed in speech or inferable from the spoken expression. Future research will more closely examine these constructions to better understand the meaning of these symbolic assemblies in gesture. I am particularly interested in examining any instances in which these gestural structures integrate during the expression of literal motion events.

This analysis was only able to scratch the surface in accounting for patterns found in the use of cyclic gestures in English. Further research is needed on individual symbolic structures in gesture that integrate with cyclic gestures. This will allow for a better account of the meanings they serve as component structures and how those meanings interact in symbolic assemblies that include cyclic gestures. Future research should pay particular attention to symbolic uses of space and finger configuration (especially, spread vs. closed fingers and bent vs. straight fingers). These structures should also be considered outside of the context of cyclic gestures. It is unclear at this time what the schematic meaning of spread fingers is and whether it is a productive symbolic structure in English speakers’ gestures outside of the context of symbolic assemblies with cyclic gestures. When used with bent fingers, it is often used for the molding mode of depiction. It’s unclear whether there is a relationship between spread fingers used in molding and spread fingers that occur with straight fingers. The cluster analysis in §4.5.1 suggests there may be functional differences between different categories associated with finger-spreading status on one hand and different categories associated with finger-bending status on the other. If these are individual symbolic structures, then spread straight finger handshapes are a symbolic assembly comprising two symbolic structures (spreading and straightening).

Asynchronous movements in gestures, not just in the context of gestural constructions with cyclic gestures, should be analyzed to determine whether a high-level schema can be proposed for asynchronous movements. At least in terms of symbolic assemblies with cyclic gestures, asynchronous seem to be multifunctional. These uses are not necessarily related to one another. Some uses of asynchronous circular movements
seem to relate to emphasis at the level of information structure while others uses relate to the expression of meanings associated with the objective content channel (such as those that integrate with cyclic gestures for grounding functions). It is apparent that asynchronous movements are used symbolically in gesture, but it is unclear how to account for those meanings at this time. Asynchronicity is an elaboration of movement, and as such, it must be expressed with a movement. It is a highly dependent symbolic structure, which will make it more difficult to characterize.

Cyclic gestures are relatively frequent in gesture use in English. The findings of the study presented in Chapter 4 and the analysis presented in this chapter suggest that they are highly productive, as they are integrated into many different symbolic assemblies in gesture. This productivity is likely the result of the basic requirement that occurrences we conceive of and construe in language have a specified temporal structure. Cyclic gestures evoke relationships that are construed as unfolding through time. The schematic meaning of cyclic gestures as processes has its source in very general cognitive abilities. Like verbs in spoken language, cyclic gesture meanings are reflective of the general cognitive abilities of understanding relationships and tracking those relationships through time (Langacker, 2008, p. 108). This is not to say that cyclic gestures are the gestural equivalent of verbs; however, they do rely on the same basic abilities as verbs.

The specific nature of the processual relationship profiled by cyclic gestures, including the type of process and the trajector and landmark of the process, are specified by the occurrence of the gesture in multimodal constructions. The process that is profiled by a cyclic gesture does not always directly correspond to an objectively construed process in speech. As I showed in §6.3, gestural constructions that incorporate cyclic gestures as a component structure can be used to evoke a conceptualizer’s epistemic assessment of an objectively construed process in speech. So while the process profiled in the co-expressed speech is associated with objectively construed conceptual content in conceived time, the process profiled by the gesture relates to the speaker’s assessment in processing time. This shows that we have the ability to simultaneously apprehend and track different types of relationships in gesture and speech. The processes profiled in gesture and speech are not unrelated but a part of a unified construed experience. This is
why the processes are apprehended and tracked cross-modally in a single *multimodal* window of attention.

### 6.6 Conclusions

This dissertation began with the intention of learning more about the functional properties of a particular type of co-speech hand gesture. In the process of examining the way speakers of English use this gesture, it became apparent that cyclic gestures could not be studied in isolation from other meaningful structures expressed in gesture. This research has revealed that various properties associated with the forms of circular movement gestures have significant associations with functional-semantic properties expressed in speech. Rather than analyze these distinct gesture forms as variants of cyclic gestures, I have argued that these formal associations are reflective of different symbolic assemblies in which cyclic gestures participate as component symbolic structures. Cyclic gestures can be simultaneously integrated with other meaningful structures in gesture to form complex gestural expressions. The broader argument I make based upon the analysis of cyclic gestures is that gestures are best analyzed as constructions.

Gestural constructions, like spoken language constructions, create higher-level meanings that cannot be strictly predicted from the component symbolic structures that comprise them. They are distinct symbolic entities. They also exhibit variable degrees of schematicity and conventionality, as is the case with spoken language constructions. Gestural constructions are expected to be more schematic at the semantic pole than most spoken language constructions because their meanings require elaboration by speech. In order to identify the meanings of individual symbolic structures in gesture, one must study the functions of the gestural symbolic assemblies in which they participate. As the meanings of co-speech gestures are dependent on the meanings expressed in speech, one must situate the study of gestural symbolic assemblies within the context of the spoken language constructions that accompany them. Through the examination of component symbolic structures in gesture being used in different gestural and multimodal constructions, one can make inferences about their meanings. It might also be possible to find cases in which a gesture is a symbolically simple structure consisting of a single component structure. A gesture always has to be expressed with a handshape and must
occur in a location in space. This fact does not require that each potentially symbolic formal feature be used in meaningful ways in every construal. Cases in which a gesture consists of a single component structure can provide more direct insight into the meanings of gestural components.

The findings in this research have important implications for the development of multimodal construction grammar theories. Recognizing gestures as symbolically complex structures is likely to minimize the degree to which gestures are analyzed as idiosyncratic. If gestures are treated as holistic structures and different formal expressions of recurrent gestures are treated as variants of a single gesture, as has been practiced previously, then gestures appear to be extremely idiosyncratic in their form to function mappings. Instead, there are likely more familiar assemblies of symbolic structures that form recurrent gestural constructions. Gestural constructions have obligatory elements as well as less fixed elements that can be expressed in open slots in the construction. For example, the proposed “Tell Me” Joint Action Construction has the obligatory elements of a cyclic movement and the use of interpersonal space. Whether the construction is expressed with a meaningful handshape or manner of movement is dependent on a speaker’s construal for a particular multimodal expression. As construal always leads to some degree of variation and idiosyncratic properties, this is not a phenomenon that is specific to gesture.

Finally, I have shown that the symbolic properties of multimodal constructions can be represented within the framework of Cognitive Grammar. This research brings the study of meaning and gesture together within a commensurable framework for better understanding the integration of meaning across modalities. The analysis presented in this work is limited because it only considers manual symbolic properties of gestures. It is certainly necessary in future research to consider the roles that non-manual gestures serve in multimodal constructions. The framework outlined in Chapter 5 is broad enough to allow for the integration of non-manual gestures. Overall, this analysis has described methods for providing finer-grained characterizations of gesture meanings than have traditionally been offered. This is a necessary step for expanding usage-based theories of language to better account for the multimodal construal of meaning in interaction.
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