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Manner Modification Across Modalities:
Insights from Gesture, Sign, and Spoken Language

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Manner Modification Across Modalities: Insights from Gesture, Sign, and Spoken Language

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Manner Modification Across Modalities:
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Abstract

This dissertation investigates whether event-related modifiers contribute uniformly to interpretation across modalities, with a focus on contrasts between manner and other modifier types, including path and temporal expressions. It combines morphosyntactic analysis with experimental investigation across three empirical domains: Turkish Sign Language (TİD), English (including co-speech gesture), and Turkish. Across these domains, manner expressions diverge from other event-related modifiers and show a distinct interpretive profile under negation and in contrastive environments.

First, I develop a morphosyntactic analysis of classifier constructions in TİD, showing that depictive content is grammatically integrated rather than extralinguistic. Crucially, this system isolates the source of the asymmetry: path-only expressions remain acceptable under negation, whereas constructions encoding manner movement show degradation, identifying manner as the key factor. Second, I present controlled experiments in written English and with co-speech gesture examining how path and manner are interpreted under negation. While gestural contributions degrade under negation, they do not reproduce the path-manner asymmetry observed in TİD. By contrast, linguistic expressions in written English show a clear divergence between path and manner that cannot be reduced to syntactic position, modality, or linear order. Third, I investigate manner adverbials and ideophones in Turkish. The results show that manner expressions across lexical and depictive forms pattern together and diverge from other modifier types. In particular, manner and time adverbials exhibit distinct interpretive profiles under negation and contrastive focus, and ideophones align with lexical manner adverbs, indicating that their behavior is determined by semantic class rather than depictive form.

Across these domains, the observed asymmetries are not reducible to modality, syntactic position, or depictive format. Rather, they point to a systematic difference in how manner contributes to event structure. By providing evidence for a distinction between manner and other event-related modifiers, this dissertation contributes to research on event structure, negation, and multimodal composition, and offers new empirical constraints on how event representations are interpreted across modalities.

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Abbreviations

1	First person
3	Third person
ACC	Accusative
ABL	Ablative
BPCL	Body Part Classifier
CL	Classifier
CVB	Converb
DAT	Dative
EXTCL	Extension Classifier
FEM	Feminine
GER	Gerund
H1	Dominant hand
H2	Non-dominant hand
HCL	Handling Classifier
I	Class I
IDEO	Ideophone
ING	Ingressive
LOC	Locative
N	Neuter
NEG	Negation
NOM	Nominative
PL	Plural
POSS	Possessive
PST	Past tense
PRES	Present tense
PERF	Perfective aspect
PROG	Progressive aspect
SG	Singular
SUB	Subject
WECL	Whole Entity Classifier

Sign language specific notations[1]	
SIGN	Gloss for a sign in English
SIGN++	Reduplication of a sign
IX	Pointing sign/Pronoun
IX_1	First person
IX_a	Referential locus/Non-first person
$_xSIGN_y$	Verb sign moves from one location to another, indicating the source and goal of the movement or the directionality between the arguments
$\overline{\text{SIGN}}$	Non-manual marker
$\overline{\text{SIGN}}^{t}$	Topicalization
S-I-G-N	Fingerspelling
SIGN− − − − −	Sign held in space
SIGN∧SIGN	Compound and/or incorporation
Languages	
ASL	American Sign Language
DGS	German Sign Language (Deutsche Gebärdensprache)
HKSL	Hong Kong Sign Language
LIBRAS	Brazilian Sign Language (Língua Brasileira de Sinais)
LIS	Italian Sign Language (Lingua dei Segni Italiana)
LSA	Argentine Sign Language (Lengua de Señas Argentina)
LSC	Catalan Sign Language (Llengua de Signes Catalana)
LSF	French Sign Language (Langue des Signes Française)
NGT	Sign Language of the Netherlands (Nederlandse Gebarentaal)
RSL	Russian Sign Language
SSL	Swedish Sign Language
SZJ	Slovenian Sign Language (Slovenski Znakovni Jezik)
TİD	Turkish Sign Language (Türk İşaret Dili)

[1]Adapted from Baker et al. (2016; pp. 338-340).

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Aileme

Chapter 1

Introduction

Events are central to human experience. We perceive them, think about them, and talk about them. Describing an event is not merely reporting that something happened; it requires representing a structured configuration of meaning. Information about an event is usually not mapped onto a single lexical item but is distributed across phrases, clauses, and larger chunks of discourse (Bohnemeyer et al. 2007; p. 496). These pieces identify event participants, locate events in space and time, and characterize how an action unfolds. A common assumption in formal semantics, particularly in event semantics, is that clauses describe events whose meanings can be characterized through several components (Champollion 2015; Davidson 1967; Parsons 1990; Williams 2021; among others). For instance, a sentence such as (1) expresses who participated in the event and what the central eventuality was:

(1) The girl ate the sandwich.

Event descriptions often provide additional information beyond the core participants to specify where, when, and how the event occurred. This information is typically expressed through modifiers:

(2) a. The girl ate the sandwich at the restaurant.
    b. The girl ate the sandwich yesterday.
    c. The girl ate the sandwich silently.

If all of these components are relevant in context, they can co-occur to describe a single event:

(3) The girl ate the sandwich silently at the restaurant yesterday.

A great deal of linguistic work has investigated asymmetries among event participants and how different participant roles pattern in syntax and semantics, often relating such differences to broader representational hierarchies (Baker 1997; Dowty 1991; Grimshaw 1981; Kratzer 1996; Levin & Rappaport Hovav 2005; among others).[1] By contrast, comparatively less work has examined whether other components of event descriptions, such as temporal, locative, and manner modifiers, exhibit uniform behavior across constructions. The question under discussion in the current work, then, is whether event-related modifiers behave uniformly in the grammar or whether they exhibit systematic asymmetries. Throughout this dissertation, I use the term "semantic class" to refer to distinctions among types of event-related modifiers, such as manner, path, time, and locative modification, as defined by the kind of information they contribute to event representation.

A natural starting point for thinking about event-related modifiers comes from formal semantics. In standard Davidsonian event semantics (Davidson 1967), event modifiers, namely manner, time, and location, are typically modeled as predicates of events.[2] Within this system, modifiers contribute conjunctive information about a single event variable introduced by the verb. As a result, different types of event modification are treated in a parallel way. Under such an analysis, there is no inherent semantic distinction among these types of event modifiers.

This dissertation investigates how event modifiers behave across modalities. In particular, it examines whether the apparent uniformity of event modification is borne out when event modifiers are evaluated in environments that probe alternative structure. The study addresses this question across three empirical domains: classifier constructions in Turkish Sign Language (Türk İşaret Dili - TİD), co-speech gesture in English, and event adverbials in Turkish. The analysis uses negation and contrastive focus as diagnostics for how different event components participate in interpretation.

The motivation for this approach comes from contemporary alternative semantics (Rooth 1992). In this framework, focused expressions introduce sets of alternatives, and operators such as negation and contrast evaluate propositions relative to those alternatives (Fălăuş 2020; among others). If temporal, locative, and manner modifiers contribute meaning in the same compositional way, as simple predicates of events, they are expected to interact with these operators in parallel ways. Conversely, systematic differences in how modifiers behave in alternative-sensitive environments can reveal differences in how distinct event components participate in interpretation.

Among event modifiers, one component that warrants particular attention is the "how" dimension.

[1] Related work in cognitive science has likewise documented asymmetries in how speakers perceive and represent event participants (Rissman & Majid 2019; Ünal et al. 2024; among others).

[2] Please refer to other semantic accounts that posit a distinct manner variable for a different analysis of manner (Dik 1975; Maienborn & Schäfer 2019; Schäfer 2008; among others).

Manner is the event-internal property that specifies how an event proceeds. It can be realized through a range of morphosyntactic and multimodal strategies. In spoken language, it may appear as a lexical adverb, as in "The car went *fast*," or as an ideophone, as in "The car went *vroom*," that evokes sensory impressions (Dingemanse 2012; among others). It can also be expressed through a co-speech gesture that supplements or even replaces speech, conveying a meaning such as "The car went *like this*."[3] Similarly, manner can be encoded through lexical adverbs in sign languages. It can also be conveyed through modulation of the movement component of classifier constructions, or through non-manual markers. Across modalities, manner plays a crucial role in event representation and appears to exhibit greater diversity in its morphosyntactic realization and degree of iconicity than other event components.

Manner plays a foundational role in semantic typology, most prominently in the path-manner distinction in motion events. Following Talmy (1985, 2000), motion events can be decomposed into at least two core components: *path*, which specifies the trajectory of movement, and *manner*, which specifies how the movement unfolds. Talmy's (1985, 2000) key observation is that languages systematically differ in how these meanings are lexicalized. In satellite-framed languages such as English, manner is often lexicalized in the verb while path is expressed in particles or other satellite elements (e.g., *run into*, *roll out*); in verb-framed languages such as Turkish, path is lexicalized in the verb and manner is expressed peripherally or may be omitted altogether (e.g., *koşarak gir* "enter running," *yuvarlanarak çık* "exit rolling"). While Talmy's (1985, 2000) typology is often discussed as a theory of lexicalization patterns, it also highlights that path and manner represent distinct dimensions of event structure whose distribution across structure is systematic rather than accidental. The question, therefore, is not simply how languages lexicalize manner, but whether manner participates in interpretation in the same way as other dimensions of event structure once it is grammatically encoded.

Manner is theoretically revealing for additional reasons. First, as Morzycki (2019) emphasizes, the notion of manner itself occupies an uneasy position in semantic theory. Whereas temporal and locative modifiers are naturally associated with well-defined entities such as times and locations, it is less clear whether there are corresponding objects in the ontology that can straightforwardly be identified as "manners." This has led to the observation that the concept of manner has a somewhat "ghostly status" in semantic analysis, raising the question of whether manner constitutes a uniform

[3]The examples are intended to illustrate the range of strategies available for conveying manner-related meaning, rather than to provide a strict minimal contrast among modifiers of a single verb or event type. They show that manner-related information can be encoded not only by lexical adverbs, but also by ideophonic or sound-symbolic expressions and by co-speech gestures. The latter strategies differ from ordinary lexical adverbs in their syntactic distribution. In English, for example, ideophones and gestures do not pattern syntactically with ordinary lexical adverbs; instead, they are typically introduced through a quotative verb "go" or a quotative construction involving "like". Thus, the examples here exploit certain idiosyncratic properties of the English verb "go", and should be interpreted as illustrative rather than as establishing a fully general syntactic contrast.

semantic category at all (pp. 219-220).

Second, manner is a domain in which iconic resources are often integrated alongside symbolic ones. Although formal linguistic theory has historically emphasized the arbitrariness of the form-meaning relation (Saussure 1916/1966), natural languages make systematic use of motivated correspondences. Manner, in particular, can be expressed through a wide range of forms that vary in their degree of iconicity. Some expressions are fully lexical and conventionalized, such as adverbs or affixes. Others occupy a more gradient space, including classifier constructions in sign languages and ideophones in spoken languages. Still others, such as co-speech gestures, are overtly depictive and multimodal.

The examples below illustrate the range of strategies through which manner can be expressed across modalities. In Turkish, manner can be expressed through a lexical adverb, a conventional linguistic expression that contributes descriptive propositional content:

(4) Turkish (Schroeder 2008; p. 346)

Saliha bir süre onu *sessizce* dinledi.
Saliha.NOM for.a.while him silently listen-PST.3SG

"Saliha listened to him silently for a while."

In sign languages, manner can likewise be expressed through a lexical sign, a conventional linguistic element that functions as a manner modifier, as illustrated in (5):

(5) Italian Sign Language (Lingua dei Segni Italiana - LIS) (Branchini & Mantovan 2020; p. 302)

SARA READ FAST

"Sara reads quickly."

Alternatively, rather than appearing as a separate lexical sign, manner can be encoded simultaneously through modifications of the predicate sign itself, including non-manual markers and modulation of the movement component:

(6) LIS (Branchini & Mantovan 2020; p. 302)

		closed eyes blow
SARA	BOOK	READ$_{\text{fast}}$

"Sara reads a book quickly."

In other cases, manner can be expressed through ideophones, lexical items that depict sensory properties of events through sound-symbolic form (Slobin 2006). For instance, Turkish ideophones encode manner by evoking characteristic sounds or movements associated with the event:[4]

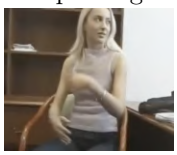
(7) Ideophones in Turkish (Jendraschek 2001; p. 95)

Kuş *pır pır* uç-tu.
bird IDEO fly-PST.3SG

"The bird fluttered away."[5]

Co-speech gesture likewise provides a multimodal resource for encoding manner, accompanying spoken language with visible depictions of manner-related information:

(8) Co-speech gesture in Turkish (adapted from Kita & Özyürek 2003)



Yuvarlana yuvarlana gidiyor.
yuvarlan-a yuvarlan-a gid-iyor
roll-CVB roll-CVB go-PROG.3SG

"As (it) keeps rolling, it goes."

These examples illustrate a range of strategies through which manner can be expressed across languages and modalities. Although they differ in form and modality, they all encode the same semantic dimension

[4] A possible connection between the use of ideophones in a language and Talmy's (1985, 2000) typological motion-framing has been suggested in the literature. In a written interview, Talmy suggests that ideophones can function as a characteristic locus for manner specification in motion descriptions, and he further proposes that this manner-specifying strategy appears "extensively" in verb-framed languages, where the main verb typically encodes path and manner must be encoded in other material (Ibarretxe-Antuñano 2005; p. 344).

[5] A closer translation that makes the structure of the sentence explicit would be "*The bird flew away fluttering.*"

of the event, namely manner.

The empirical picture developed in this dissertation reveals that event modifiers do not pattern uniformly but differ in environments that probe alternative structure across the linguistic domains investigated here. In elicited judgments and controlled experimental settings that require participants to evaluate structured alternatives explicitly, expressions that encode manner show a distinct acceptability profile from other event-related modifiers, despite the diversity of strategies through which manner can be expressed. Importantly, the sentences presented to participants are not ungrammatical but independently well-formed and truth-conditionally interpretable. The contrast is gradient and sensitive to contextual and pragmatic evaluation, rather than reflecting categorical ill-formedness.

These findings connect to a broader set of observations in the literature on multimodal semantics. Several authors have noted that depictive gestures tend to degrade in the scope of negation and polar questions. These observations have prompted competing explanations for why depictive content behaves differently from symbolic language in such environments. One influential line of work treats gesture and speech as distinct but interacting compositional systems (Schlenker 2018; Tieu et al. 2017; among others). On these accounts, gestures often contribute projective or presuppositional content integrated at a different compositional layer from at-issue propositional meaning. Since negation primarily targets at-issue content, depictive material may escape its scope. The apparent incompatibility of gesture with negation is therefore taken to reflect structural properties of multimodal composition rather than a semantic difference in kind, treating gestures as contributing not-at-issue content.

Davidson (in press b) proposes a related but distinct explanation that shifts the focus from modality to representational format. She argues that the interaction between depiction and negation cannot be reduced to modality alone, since similar effects arise even in written language, where gesture is absent. In her analysis, expressions involving depiction tend to display degraded acceptability under negation regardless of their modality. These observations suggest that the relevant distinction does not simply track the visual-manual modality but instead reflects differences in representational format. On Davidson's (in press b) account, the crucial contrast is between descriptive iconicity and depictive iconicity. Descriptive iconicity, such as conventional onomatopoeia (e.g., "*chirp*") or the handshape component of sign language classifier constructions (e.g., "  "), is lexically stored and contributes ordinary propositional content. By contrast, depictive iconicity, such as co-speech gestures, expressive onomatopoeia (e.g., "*chiiiiirp*"), quotations, or the movement component of classifier constructions, derives its meaning from mapping a particular utterance token to a visual or auditory representation of the event it depicts (p. 5). Because propositional operators such as negation operate over structured

alternatives, descriptive content integrates more naturally into their scope than depictive content.

These accounts attribute degradation under negation either to properties of modality, specifically the interaction between depictive representations and logical operators, or to differences in representational format between descriptive and depictive forms. The present dissertation introduces a third possibility. Drawing on comparable evidence from additional grammatical domains, it suggests that the asymmetry may also reflect the semantic role encoded by the expression itself rather than, or perhaps in addition to, the effects of modality and/or representational format. In particular, this study examines whether the observed pattern tracks a specific dimension of event structure, namely manner.

I argue that manner constitutes a grammatically privileged dimension of event structure whose interaction with alternative-sensitive operators diverges from that of other event components. Event components exhibit asymmetric behavior under negation and focus, with manner showing a distinct interpretive profile. These asymmetries persist even when structural position is controlled for, and they cannot be reduced to syntactic configuration, modality, or representational format. Rather, they indicate that manner occupies a distinct status within event representation and interacts with logical operators differently from other types of event-related modification, revealing an internal differentiation in event structure that is not captured by a uniformly conjunctive view of modification.

This hypothesis is tested by comparing three cases that encode manner across different modalities and grammatical systems: classifier constructions in Turkish Sign Language (TİD), co-speech gesture in English, and manner expressions in Turkish, including ideophones.

These cases provide an ideal basis for comparison because they encode manner while differing in modality and grammatical status. Classifier constructions in sign languages encode event participants through conventionalized handshapes, while the movement component of the predicate can be modulated to depict how an event unfolds, thereby encoding manner. Because these constructions combine categorical linguistic structure with gradient iconic depiction, they provide a natural testing ground for how depictive content interacts with logical operators. Co-speech gesture constitutes a second relevant domain, as it likewise conveys event information through visible depiction and shares the same visual-manual modality as sign languages. Finally, ideophones offer a third point of comparison. These lexical items have often been analyzed as depictive expressions in spoken languages and frequently encode manner information through sound-symbolic form.

Moreover, these cases have been argued to show similar properties. Ideophones have been analyzed as resembling iconic co-speech gestures in that they contribute expressive, often non-at-issue content (Barnes et al. 2022). Certain components of classifier constructions in sign languages, such as movement

and location, have been argued to be gestural in nature (Emmorey & Herzig 2003), and classifier constructions have correspondingly been compared to gestural depictions (Davidson 2015; Liddell 2003; Schlenker 2021; Zucchi 2017; among others). More broadly, both sign languages and co-speech gesture exploit the visual-manual modality and share access to spatial representation (Perniss et al. 2015). In addition, classifier constructions in sign languages have been compared to ideophones in spoken languages in that both involve a conventionalized categorical element that can support gradient iconic depiction (Lu & Goldin-Meadow 2018; Davidson in press b). By comparing these cases while holding the semantic dimension of manner constant, the present study evaluates whether the observed asymmetry arises from modality, representational format, or the semantic contribution of manner itself.

The empirical studies presented in this dissertation draw on data from multiple modalities and stimulus formats. The investigation of classifier constructions in TİD relies on visual stimuli consisting of signed utterances presented in video format. The study of co-speech gesture examines multimodal speech-gesture productions in English, in which participants evaluated video stimuli containing both auditory and visual information. In addition, this chapter includes written English stimuli in order to examine how path and manner modifiers behave within a purely linguistic domain where gesture is absent. Finally, the investigation of Turkish adverbials focuses on spoken Turkish, presented to participants in written form. These methodological choices make it possible to compare cases across modalities while isolating the semantic dimension under investigation.

The argument developed in this dissertation unfolds across three main chapters, each addressing a distinct empirical domain. Chapter 2 develops a morphosyntactic analysis of classifier constructions in TİD within the Distributed Morphology framework. I argue that classifier constructions are built on a single underspecified root, $\sqrt{\kappa}$, which lacks inherent phonological and syntactic specification. These constructions are derived through the interaction of this root with category-assigning heads, argument-introducing heads, and semantically motivated classificatory features. Rather than treating the depictive properties of classifier constructions as external to the grammar, that is, as gestural or imagistic enrichments that merely accompany a linguistic element, I argue that these properties are grammatically integrated and their source lies in the interaction between the root $\sqrt{\kappa}$ and syntactic structure. In doing so, this analysis captures the distribution of classifier constructions across verbal and nominal domains while locating their depictive properties within grammatical structure. The chapter further examines the role of the non-dominant hand in transitive classifier constructions. In TİD, two-handed classifier constructions are structurally motivated realizations in which distinct arguments of a single predication are encoded simultaneously on separate articulators, rather than

functioning as optional articulatory additions.

The chapter also establishes the empirical foundation for the broader investigation pursued in the remainder of the dissertation. It shows that degradation under negation does not uniformly affect classifier constructions in TİD. Constructions encoding only path movement remain acceptable under negation, whereas constructions encoding additional manner movement show degradation. The restriction tracks manner encoding rather than depiction per se. By demonstrating that the asymmetry arises within a single grammatical construction, the chapter isolates manner as the critical variable and reframes the debate about depiction and compositionality in terms of internal event structure.

Chapter 3 extends the investigation beyond sign languages by examining co-speech gesture in English as a depictive but non-grammatical comparison domain. Through controlled acceptability experiments, it tests whether co-speech gestures conveying path and manner information behave symmetrically under negation, asking whether the asymmetry in the "depictive" component of sign language classifiers is also attested in another depictive but non-linguistic domain. The results show that co-speech gesture type influences interpretation in affirmative contexts, indicating that participants reliably distinguish path and manner cues. Under negation, however, gestural contributions are largely suppressed, replicating prior findings (Davidson 2023; Ebert & Ebert 2014; Tieu et al. 2017; among others). These results show that gesture does not reproduce the path-manner asymmetry observed in classifier constructions in TİD. This divergence demonstrates that the TİD pattern cannot be reduced to depiction alone, and instead reflects how manner is grammatically integrated into linguistic interpretation within event structure.

In addition, Chapter 3 examines written English in order to determine how path and manner modifiers behave within a purely linguistic domain and whether the restriction observed in TİD reflects a more general property of manner in grammar. The results reveal a systematic asymmetry in which path and manner modifiers do not interact with negation in parallel ways, but instead exhibit distinct interpretive profiles. Importantly, this asymmetry cannot be reduced to linear order, syntactic position, or surface configuration. Rather, it indicates that the contrast tracks the semantic dimension encoded within event structure. The findings suggest that the observed asymmetry is best understood as a property of manner encoding itself, rather than as a consequence of depiction or modality.

This observation shifts the explanatory burden. If degradation arises precisely when manner is encoded, across both classifier constructions in sign languages and lexical modifiers in spoken languages, depiction alone cannot account for the effect. Instead, the pattern suggests that manner itself occupies a distinct status within the architecture of event representation and interacts with alternative-sensitive

operators such as negation and focus in ways that differ from other event components.

Chapter 4 turns to Turkish to evaluate whether the observed asymmetry tracks the semantic class of adverbials. Through a series of acceptability experiments manipulating negation, focus position, and adverbial type, the chapter contrasts manner and temporal modifiers in alternative-sensitive environments. The results demonstrate a systematic divergence between these adverbial types, indicating that distinct event components constrain the construction and evaluation of alternatives in different ways, with manner behaving differently from other types of event modification.

The chapter then investigates ideophones in Turkish as a subtype of manner expression. Although ideophones, by definition, exhibit expressive and iconic properties, the results show that they pattern with lexical manner adverbs rather than forming a distinct grammatical class in Turkish. Their behavior under negation aligns with that of other manner modifiers, indicating that compatibility with alternative-sensitive operators is not determined by modality or iconicity alone. Instead, the decisive factor is semantic class: manner expressions, regardless of their formal realization, participate in alternative structure differently from temporal modifiers. Chapter 4 therefore isolates semantic class within event structure as the source of the observed asymmetries and argues for an alternative-based explanation of these interpretive asymmetries.

The remainder of this dissertation proceeds as follows. Chapter 2 develops a morphosyntactic analysis of classifier constructions in TİD and establishes how manner-related content is grammatically integrated. Chapter 3 presents experimental evidence from written English and co-speech gesture, examining the interaction between type of event component and negation. Chapter 4 investigates manner adverbials and ideophones in Turkish, providing an alternative-based analysis of interpretive asymmetries. The final chapter synthesizes the findings and discusses the implications for theories of event structure, negation, focus, and multimodal composition.

Chapter 2

Events in Space:

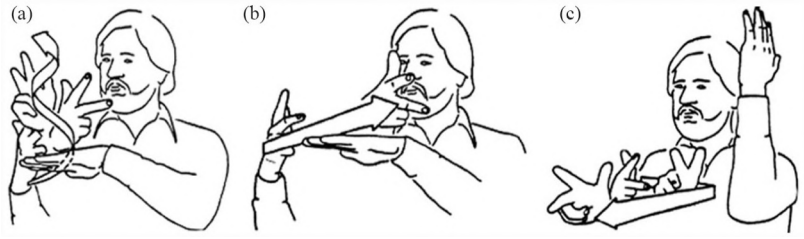
Sign Language Classifiers

Sign languages are natural languages (Stokoe 1960; Klima & Bellugi 1979; among others), and like spoken languages, they are governed by systematic grammatical principles and exhibit rich structure at all levels of linguistic organization, including phonology, morphology, syntax, semantics, and pragmatics (Brentari 2019; Davidson in press a; Sandler & Lillo-Martin 2006; Sandler 2012; Shepard-Kegl 1985; Stokoe 1960, 1980; Supalla 1982; Padden 1988; among others). Sign languages are not gestural renditions of spoken languages; rather, they constitute autonomous linguistic systems with their own lexicons and grammars.

At the same time, there are some aspects of sign languages that seem especially notable given their visual-manual modality. They can express motion events using constructions that convey information about the movement, location, and relevant physical properties of one or more arguments (Schick 1990; Supalla 1986; among others). In such constructions, the handshape encodes properties of participants while movement and location depict trajectories and spatial relations in signing space.[1] These are commonly known as classifier constructions. (1) illustrates examples of classifier constructions in American Sign Language (ASL):

(1) ASL (Supalla 1978)

[1]Throughout this chapter, I use the terms "depict, depictive, and depiction" to refer to cases in which there is an iconic mapping between form and meaning, without presupposing a theoretical distinction between depiction and description.



In this example, the signer describes a sequence of events in which (a) a car moves along a winding road, (b) crosses a bridge, and (c) passes a tree. The movement, indicated by the arrows, encodes the motion of the subject while the handshapes encode the arguments. The subject argument, car, is represented with the handshape 🤞, while the oblique arguments, bridge and tree, are represented with the handshapes 🫲 and 🤚, respectively.

A striking property of classifier constructions is that they appear to combine linguistic elements with depictive content. Classifier handshapes are drawn from finite, language-specific inventories and show systematic correlations with argument structure (Benedicto & Brentari 2004; Supalla 1982, 1986; Zwitserlood 2003; among others). On the other hand, the movement and spatial configuration of the hands can closely resemble real-world motion in a way that appears continuous and analogue (Cogill-Koez 2000; Liddell 2003; among others). This dual character, which integrates depictive properties into linguistic elements (Emmorey et al. 2002; Emmorey & Herzig 2003; Schembri 2003; Wilcox 2004; among others), makes these constructions an interesting case, raising the question of how depictive content can interact with grammatical constraints on argument and event structure.

Classifier constructions have been widely argued to parallel verbal classifier systems in spoken languages (Benedicto 2018; Gökgöz 2024; Zwitserlood 2003, 2012; among others). Yet, they are not confined to the verbal domain. They are also attested in nominal environments across a range of sign languages, including Hong Kong Sign Language (HKSL; Koenders 2024) and Swedish Sign Language (SSL; Bergman & Wallin 2003). This broader distribution raises a fundamental theoretical question: what determines the syntactic domains in which classifier constructions may appear?

The depictive use of signing space has been argued to be facilitated by the visual-manual modality of sign languages (Emmorey et al. 2000; Zwitserlood 2012; among others).[2] In the visual-manual modality, linguistic forms are produced with the hands, body, torso, eye gaze, and mouth, and are perceived visually rather than auditorily. These articulators can be used simultaneously to contribute to the linguistic structure and meaning, such that non-manual markers such as eye gaze and mouth

[2]Extensive research has shown that modality differences do not undermine the linguistic status of sign languages; rather, modality primarily affects how linguistic information is externalized and linearized in the signal.

movements can accompany manual signs (Emmorey 2002; Lillo-Martin & Gajewski 2014; Sandler & Lillo-Martin 2006; Sutton-Spence & Woll 1999; Tang et al. 2007; among others). Classifier constructions make use of this potential to express spatial relations as illustrated in (1). Nonetheless, novel data from Turkish Sign Language (Türk İşaret Dili - TİD) present a distinct pattern that requires closer attention to understand the structure of these constructions. In certain transitive classifier constructions, the two hands simultaneously encode different arguments of the same predication, rather than merely contributing spatial information. This pattern is not straightforwardly predicted by current accounts of classifier constructions and raises a question for grammatical analysis: how can classifier constructions license multiple simultaneous classifier handshape realizations within a single predicational domain, and what is the grammatical status of the information contributed by the non-dominant hand?

This dissertation investigates how manner interacts with other components of linguistic representation. The present chapter lays the groundwork for this broader investigation by focusing on classifier constructions, where morphology, syntax, semantics, and depiction, frequently of manner, intersect in systematic ways (Emmorey & Herzig 2003; Schembri 2003; among others). Drawing on elicited data from Turkish Sign Language (TİD), the chapter revisits the previous approaches to classifier constructions and develops a morphosyntactic analysis that addresses three issues: (i) how classifier constructions are licensed in the grammar across verbal and nominal environments, (ii) how two-handed classifier constructions in TİD can be analyzed as a structurally motivated phenomenon rather than a matter of articulatory convenience, and (iii) how this dual nature of classifier constructions, which blends visually motivated depictive properties into the grammatical structure, can be captured. While answering these questions, the chapter presents how these constructions encode manner information as part of event structure, in particular through the movement component.

Before introducing the Turkish Sign Language data and the proposed analysis, the next section reviews core empirical properties of classifier constructions in sign languages as background.

2.1 Core properties of classifier constructions

Classifier constructions in sign languages encode information about the shape, size, and handling of an entity involved in an event or present in a location, and are typically associated with a specific class of predicates, namely spatial verbs[3]. Based on similarities with spoken language classifier systems, which

[3]Padden (1988) groups sign language verbs into three categories: agreeing verbs, spatial verbs, and plain verbs. Agreeing verbs encode the number and person features of their arguments and denote a transfer between them. Spatial verbs encode the location and position of their argument(s). Classifier constructions are considered to be a subset of these spatial verbs that show "agreement" with location. Unlike agreeing and spatial verbs, plain verbs do not show spatial

categorize nouns based on intrinsic properties of their referents such as shape, size, and substance (Allan 1977; among others), Frishberg (1975) introduced the term classifier (henceforth CL in the glosses) to describe these constructions in sign languages.[4] Importantly, classifier constructions in sign languages are cross-linguistically pervasive (Zwitserlood 2012).

What distinguishes classifier constructions from lexical signs in sign languages? Both classes are structured by the same core linguistic parameters, namely handshape, movement, orientation, location, and non-manual markers (Brentari 1993; Sandler & Lillo-Martin 2006; among others). For instance, the lexical ASL sign "PENNY" is signed with ☝ handshape as illustrated in (2):

(2) Lexical sign in ASL (From asl-lex.org)

"penny/cent"

In this sign, handshape, movement, and location function as phonological components of the lexical item "PENNY", and they do not carry meaning on their own (Brentari et al. 2018). In contrast, classifier constructions are morphologically richer, utilizing a broader range of features than lexical signs (Eccarius & Brentari 2007; Cogill-Koez 2000; among others). Each component functions not only phonologically but also morphologically, actively contributing to the interpretation of the constructions:

(3) Classifier construction in ASL (From lifeprint.com)

"An entity is moving in this direction."

agreement. This distinction among verb classes has been argued to reflect interactions between phonology, syntax, and morphology (Battison 1978; p. 83).

[4]The use of the term "classifier" to describe these constructions in sign languages is not without controversy, as theoretical approaches to their analysis vary widely. As summarized by Schembri (2003), these constructions are also referred to in the literature as classifier verbs, classifier predicates, spatial-locative predicates, polymorphemic predicates (p. 4), or depicting signs. For consistency, the term "classifier" is used in this work.

Unlike the case in (2), each component of the classifier construction in (3) contributes to meaning. The ☝ handshape represents an upright entity while the movement refers to the motion of that entity.

On this basis, classifier constructions have been widely analyzed as complex multimorphemic structures (Schembri 2003; Supalla 1982; among others). These morphemes present a non-arbitrary relationship between their form and meaning (Supalla 1982; among others). The handshape, a meaningful unit in a classifier construction, is widely analyzed as the classifier morpheme. This bound morpheme attaches to a verbal root of location, movement, or manipulation (Sandler & Lillo-Martin 2006; Supalla 1982, 1986; among others), creating a complex predicate in which multiple morphemic components are realized simultaneously in monosyllabic and polymorphemic verbs (Brentari 1993; Aronoff et al. 2003).

The choice of a classifier handshape relies on the salient properties of the referent(s) in the structure. That is, the handshape encodes a contextually relevant categorization of the referent(s), such as, in ASL, a two-legged entity (✌), a vehicle (🤞), an upright being (☝), or handling or manipulation of an object (e.g., 🤏, 🤙, 🤌), or the handled object itself (Benedicto & Brentari 2004, among others; see Zwitserlood 2003 for data from Sign Language of the Netherlands (Nederlandse Gebarentaal - NGT)). For instance, in Russian Sign Language (RSL), the classifier handshape ☝ represents an upright figure and refers to the argument MAN in (4):

(4) Russian Sign Language - RSL (Kimmelman et al. 2020; p. 540)

H1: CL☝-MOVE.FORWARD

"The man moves forward."

Comparable patterns are found in certain spoken languages. For example, in Haida, spoken in the Queen Charlotte Islands off the western coast of British Columbia (Kess 1968), the classifier "sɢa-" encodes a physical property of the subject argument, namely its one-dimensional, extended shape (such as ropes, lines, and roads), as illustrated in (5):

(5) Haida (Hori 2022; p. 4)

sɢan=ʔad='uu qwaayaay gay-sɢa-iŋ-aŋ.
red.cod=with=FOC the.rope by.floating-CL-be.on.the.water-PRES

"The line floats up with red cod."

Furthermore, Özyürek & Perniss (2011) argue that classifiers can provide specific and often more iconic meanings to an utterance. They flexibly encode context-sensitive properties of the referent, such as size, shape, and manner of handling.

This flexibility parallels patterns in certain spoken languages. For instance, in Navajo, an Athabaskan language spoken in the Southwestern United States, verbal morphology encodes the physical characteristics of the theme argument.[5] As shown in (6), the noun "*bèèsò*" (money) is realized with different classificatory verbs depending on whether the referent is a coin, a note, or a pile of coins:

(6) Classification in Navajo (adapted from Schembri (2003; pp. 12-13))

a. bèèsò sǐ-ʔa
money PERF-lie:round object
"A coin is lying there."

b. bèèsò sǐ-ltsòòz
money PERF-lie:flat flexible object
"A note is lying there."

c. bèèsò sǐ-nǐl
money PERF-lie:collection
"A pile of change is lying there."

Sign language classifiers exhibit a comparable pattern.[6] Supalla (1982) argues that a noun can be associated with different classifier handshapes available in the inventory of that noun in classifier constructions of a sign language, depending on the referent's physical characteristics and the discourse context. Wilbur et al. (1985) also observe a "many-to-one relationship whereby several classifiers may be used for a particular noun" (p. 3). In discourse, different classifier handshapes may be selected for the same noun in order to focus on the particular characteristics of the referent entity:

(7) American Sign Language - ASL (Supalla 1982)

a. MONEY BE_LOCATED.CL: 
"The coin is located [on the table]."

[5] A similar pattern is observed in Ch'ol, a Mayan language, as indicated by Bale et al. (2019).

[6] Examples (6) and (7) illustrate a partial parallel between spoken and sign languages. It is crucial to note that Navajo has classificatory verbs, which, as explained by Zwitserlood (2012), are different from classifier verbs. Classifier verbs include both a verb stem and a classifier, similar to the sign language classifier constructions, while classificatory verbs are the units responsible for classification (p. 175). For this reason, despite the surface similarities illustrated by the examples above, researchers have been cautious about collapsing these systems entirely. Nonetheless, as indicated before, sign language classifier constructions are commonly analyzed as verbal classifiers (see Zwitserlood 2012 and Gökgöz 2024, among others).

b. MONEY BE__LOCATED.CL:

"The banknote is located [on the table]."

c. MONEY BE__LOCATED.CL:

"A pile of coins is located [on the table]."

The semantic properties of the referents are not the only criteria in the choice of classifier handshape in sign languages (Benedicto & Brentari 2004; Wilbur et al. 1985; among others). Previous studies show that classifier morphemes are realized in different forms depending on the syntactic properties of the arguments in the structure (Benedicto & Brentari 2004):

(8) ASL (Benedicto & Brentari 2004; p. 752)

a. 

"The book fell on its side."

b. 

"S/he took the book and laid it down on its side."

The examples in (8) show that when two sentences are identical except for the classifier handshape, the valency of the clauses differs, yielding unaccusative and transitive structures, respectively. In other words, the structural properties of the arguments play a crucial role in determining the choice of classifier handshape and classifier type.

These properties motivate analyses that treat classifier constructions as grammatically structured, multimorphemic units (Schembri 2003; Supalla 1982, 1986; Benedicto & Brentari 2004; among others). Moreover, developmental evidence supports this view, showing that Deaf children acquire classifier

constructions incrementally, component by component (Supalla 1982).[7] However, it is important to highlight that approaches that restrict each component of classifier constructions to a finite and discrete set of values (see Supalla 1982; Benedicto & Brentari 2004) risk overlooking the depictive and analogue mapping of movement and location.

Why could this be an issue? Sign language classifiers have attracted extensive research interest due to the non-arbitrary relationship between the form and meaning of their components (Benedicto & Brentari 2004; Padden 1988; Supalla 1982, 1986; among others). Because of the role of iconicity and the systematic resemblance of classifier constructions across sign languages, these constructions have often been argued to have an iconic foundation (Aronoff et al. 2005). Some researchers have suggested that the highly depictive properties of classifier constructions pose challenges for analyses that treat them as purely categorical linguistic units (Cogill-Koez 2000; among others).

As noted by Emmorey & Herzig (2003) and others, the handshape component of classifier constructions functions as a conventionalized linguistic element, while the movement and location components resemble gestural elements in certain respects (see Liddell 2003).[8] In response to this gradient and analogue behavior, some authors analyze classifier constructions as a combination of both linguistic and analogue elements (Emmorey & Herzig 2003; Liddell 2003; Schembri 2003; among others). Under such an analysis, handshape functions as a conventionalized morpheme drawn from a finite, language-specific inventory, while movement and location may exhibit depictive properties.

Cross-linguistic variation in handshape inventories across sign languages has been shown as evidence for the linguistic status of classifier handshapes, as illustrated in Figure 2.1 (Kimmelman & Khristoforova 2025).[9] In contrast, movement and location components have been argued to pattern more analogically and resemble the motion contour and rhythmic properties of the real-world event being depicted (Brennan 1992; Davidson 2015; Emmorey & Herzig 2003; Liddell 2003; Schick 1990; Schlenker 2021; Zucchi et al. 2011; Zucchi 2017; among others).

[7] Throughout this chapter, I follow the common convention in which the term *deaf* with a lowercase *d* to refer to the audiological condition of hearing loss, whereas *Deaf* with an uppercase *D* refers to membership in a cultural and linguistic community centered on sign language.

[8] This remains a subject of ongoing debate. However, there are previous experimental studies that support the distinction between handshape and other components (Emmorey et al. 2002; among others)

[9] Although they may reproduce the shapes of real world objects, classifier handshapes do not necessarily resemble the objects in the classes they denote. The handshape for vehicle in ASL can refer to car, a boat or a bicycle. There is no obvious sense in which the handshape resembles these objects.

Figure 2.1: *Variation in classifier handshapes for a vehicle; RSL (a), NGT (b), and ASL (c) (Kimmelman & Khristoforova 2025)*

These properties of classifier constructions motivate analyses in which classifier constructions are treated as grammatically structured while permitting the integration of depictive content.

Having established the core properties of classifier constructions, I turn to the major classifier types distinguished in the literature. Previous work has proposed a range of approaches and classification systems for sign language classifiers (Schick 1990; Shepard-Kegl 1985; Supalla 1982; among others). Following Benedicto & Brentari (2004), I adopt the classification proposed by Engberg-Pedersen (1993), which groups sign language classifiers into four main types:

i. Whole Entity Classifiers (WECL)

ii. Body Part Classifiers (BPCL)

iii. Handling Classifiers (HCL)

iv. Extension Classifiers (EXTCL)

Each type encodes different aspects of referent structure and event description, contributing to the overall complexity and flexibility of classifier constructions.

A whole entity classifier (WECL) represents an inanimate or animate object in its entirety. Body part classifiers (BPCL), on the other hand, refer to a specific part of the referent, especially to the limbs of an animate entity (head, mouth, legs, etc.):

(9) BPCL and WECL (French Sign Language - LSF) (adapted from Zwitserlood 2012; p. 159)

H1: MOVE.FORWARD.BPCL:
H2: WECL:

"A two-legged entity is jumping over a fence."

Another classifier type is handling classifiers (HCL). This classifier type describes how an object is handled by another entity. It does not represent the whole object but it represents the object indirectly by describing how it is used or manipulated:

(10) HCL (TİD) (adapted from Zwitserlood 2012; p. 159)

H1: MOVE.BACKWARD.HCL:

"A person is taking an object by holding it."

The last classifier type is extension classifiers (EXTCL). This classifier type does not refer to the whole object but instead denotes a physical property of the object. It typically either traces the perimeter or the surface of an object and expresses the size and shape of entities:

(11) EXTCL (ASL) (adapted from Schembri 2003; p. 7)

H1: MOVE.EXTCL:
H2: MOVE.EXTCL:

"(An object with) a circular shape"

These classifier types illustrate the range of interpretive and structural distinctions encoded in classifier constructions. Having established this background, I turn to the proposal that aims to account for the characteristics of classifier constructions within a unified morphosyntactic framework.

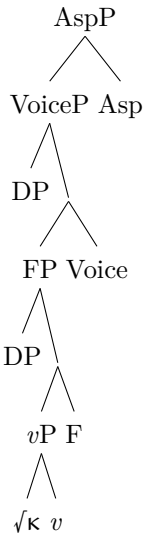
The proposal in a nutshell

This proposal aims to provide an account of classifier constructions that captures their depictive nature while demonstrating how tightly constrained they are by structural configuration. For this purpose, I propose that classifier constructions are complex words built on a radically underspecified root, √κ,

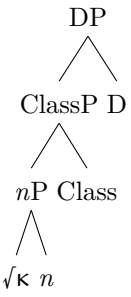
which contributes no descriptive content but introduces a requirement within morphosyntactic structure that it be realized via depictive mapping. This root can combine with different category-defining heads, yielding verbal and nominal classifier constructions within a single unified architecture:

(12) Proposed structure for classifier constructions in TİD

a.



b.



On the present analysis, a Classification Phrase (ClassP) immediately dominates *n*P within the nominal domain. ClassP introduces semantically motivated classificatory features associated with the referent of the DP. These features restrict the interpretation of the DP in the nominal domain and may function as controllers of agreement in the verbal domain in the presence of √κ. Syntactic category and argument structure are introduced independently by functional heads (*n*, *v*, F, Voice) which participate in the derivation of classifier constructions.

Building on this structure, I propose that TİD involves post-syntactic fusion of argument-introducing heads in the verbal domain, yielding handling classifier constructions as portmanteau exponents. When such a portmanteau exponent is not available as a vocabulary item in the language, a dislocation operation distributes classificatory features across multiple morphological loci, resulting in the simultaneous realization of classifier constructions on both the dominant and non-dominant hands. Thus, two-handed classifier constructions follow from morphosyntactic properties rather than being driven by non-linguistic depictive pressures.

Before presenting the proposed analysis in detail, the following section reviews previous morphosyntactic accounts of classifier constructions and situates the present proposal within the existing literature.

2.2 Previous analyses of classifier constructions

A substantial body of previous work has examined the structure and function of these constructions, with particular emphasis on the handshape component, which is widely regarded as the central element of classifier constructions (Supalla 1982; among others). This component has been assigned a range of grammatical functions. It has been analyzed as a reference marker (Zwitserlood 2012), as pronominal elements (Klima & Bellugi 1979; p. 13), as an agreement marker (Benedicto 2018; Glück & Pfau 1998; Zwitserlood 2003), and as a marker of verbal valency (Benedicto & Brentari 2004; Benedicto et al. 2007). The following subsections review these major lines of analysis, focusing on accounts that situate classifier constructions within the verbal domain. Two prominent approaches are examined: those that analyze classifiers as (i) functional heads encoding valency, and those that treat them as (ii) agreement markers. Throughout this discussion, data from TİD are used to highlight empirical challenges for each of these approaches.

2.2.1 Classifiers as functional heads

One influential approach to classifier constructions is the framework proposed by Benedicto & Brentari (2004) (henceforth B&B). B&B observe that an argument can be realized with an identical handshape in the environment of different predicates:

(13) ASL (Benedicto & Brentari 2004; p. 748)

a. BICYCLE MOVE_UP.CL:
bicycle move_up.vehicle$_{\text{WECL}}$
"The bicycle went up (the mountain)."

b. BICYCLE BE_LOCATED.CL:
bicycle be_located.vehicle$_{\text{WECL}}$
"The bicycle is standing (over there)."

In both examples, the argument "bicycle" is realized with the same 3-handshape (). However, as shown in (14), similar events realized with the same verbal movement may involve different handshapes:

(14) ASL (Benedicto & Brentari 2004; p. 751)

a. ROSIE BOW.CL
Rosie bow.upright$_{\text{WECL}}$
"Rosie bowed."

b. ROSIE BOW.CL
Rosie bow.head$_{\text{BPCL}}$
"Rosie bowed."

While sentences in (14) share the same verbal movement, they differ in the classifier handshape. The

choice of handshape correlates with argument structure and valency alternations. B&B argue that (14-a) is an unaccusative clause, where the single argument "Rosie" functions as an internal (theme) argument, marked by a WECL classifier referring to the whole entity. In contrast, (14-b) is analyzed as an unergative clause, where Rosie is an external (agent) argument, marked by a BPCL that refers to a specific body part, in this case, the head. B&B further support this analysis using syntactic diagnostics that distinguish internal from external arguments. For instance, they show that in ASL, the negative quantifier NOTHING in a sentence with a lexical predicate can be associated with an internal argument, but not with an external argument, in a clause-final position:

(15) ASL (Benedicto & Brentari 2004; p. 759)

a. BUTTER MELT
"The butter melted."

b. BUTTER MELT NOTHING
"None of the butter melted."

c. WOMAN LAUGH
"The woman laughed."

d. *WOMAN LAUGH NOTHING
#"No woman laughed."[10]

(15) illustrates the structural differences between the subject arguments. The subject of the unaccusative predicate MELT can fall within the scope of the negative quantifier NOTHING, while the subject of the unergative predicate LAUGH cannot. B&B draw a parallel to clauses with classifier constructions, where the choice of handshape similarly affects how the negative quantifier associates with the argument(s), as illustrated below:

(16) ASL (Benedicto & Brentari 2004; p. 760)

a. ACTOR BOW.CL☝
actor bow.upright$_{\text{WECL}}$
"The actor bowed."

b. ACTOR BOW.CL☝ NOTHING
actor bow.upright$_{\text{WECL}}$ nothing
"None of the actors bowed."

c. ACTOR BOW.CL✊
actor bow.head$_{\text{BPCL}}$
"The actor bowed."

d. *ACTOR BOW.CL✊ NOTHING
actor bow.head$_{\text{BPCL}}$ nothing
"#None of the actors bowed."

B&B argue that the negative quantifier NOTHING can take scope over the subject in clauses with WECL, similar to the case of unaccusative predicates, as in (15-b). In contrast, the negative quantifier cannot take scope over the subject in clauses with a BPCL, similar to the case of unergative predicates, as in (15-d). Based on these contrasts, B&B propose that the handshapes in these constructions, commonly

[10]As indicated by B&B, this sentence means "The woman did not laugh at all."

regarded as the classifier morpheme (Schembri 2003; Supalla 2003; among others), are functional heads, *f1* and *f2*. These heads host their respective arguments in their specifier positions: *f1* is associated with external arguments (à la *Voice* proposed by Kratzer 1996), while *f2* is associated with internal arguments. Arguments undergo specifier-head agreement with their heads, resulting in the sharing of morphological and syntactic features (p. 752). Furthermore, these functional heads determine the argument structure of the clause:

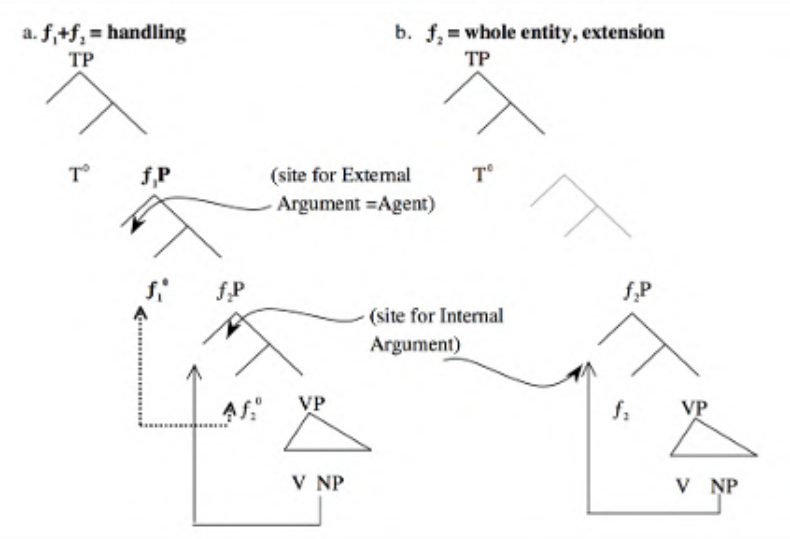


Figure 2.2: *Structure proposed by Benedicto & Brentari (2004; p. 767)*

Following Engberg-Pedersen's (1993) classification, B&B propose that a WECL is encoded by the functional head *f2*, which forms an unaccusative predicate. A BPCL is encoded by the functional head *f1*, which forms an unergative predicate. For transitive predicates that have both internal and external arguments, B&B propose that ASL employs a complex morpheme, an HCL, which includes "an instantiation of both an *f1* head and an *f2* head" in the structure (p. 769). This *portmanteau* morpheme illustrates how an agent manipulates or handles an object. The proposal of B&B can be summarized as follows:

Table 2.1: *Summary of B&B's analysis of classifiers (Benedicto & Brentari 2004)*

Classifier type	Argument encoded	Via
BPCL	AGENT	Higher functional head (*f1*)
WECL	THEME	Lower functional head (*f2*)
HCL	AGENT | THEME	Two functional heads (*f1* and *f2*)

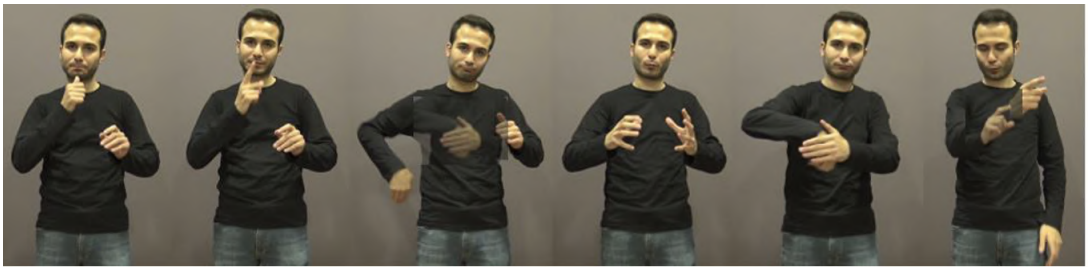
The proposed alignment between classifier type and argument structure is widely attested across various sign languages, including Catalan Sign Language (Llengua de Signes Catalana - LSC), Argentine Sign Language (Lengua de Señas Argentina - LSA), NGT, Slovenian Sign Language (SZJ), TİD, among others (Benedicto et al. 2007; de Lint 2018; Pavlič 2016; Gökgöz 2024; among others). Under B&B's analysis, different classifier types are associated with unaccusative, unergative, and transitive configurations. However, subsequent studies have challenged the generality of this alignment. For instance, de Lint (2020) argues that B&B's analysis requires amendments regarding the status of the external argument. Specifically, de Lint (2020) proposes that distinguishing between the thematic roles of the external argument, i.e., agent and causer, offers a more accurate analysis of the data.

Moreover, Kimmelman et al. (2019) further question the generalizability of the proposed alignment. Drawing on data from multiple sign languages, they show that the predicted correlation between argument structure and classifier type does not consistently hold. For example, transitive clauses are sometimes realized with a single WECL classifier, contrary to B&B's expectation that such clauses should involve a complex morpheme, HCL.[11]

In more recent work, Gökgöz (2024) investigates the systematic association between classifiers in sign and spoken languages, extending B&B's framework. This study proposes a more fine-grained analysis of classifiers in TİD, focusing particularly on the morphophonological patterns associated with hand parts and selected fingers. TİD adds further complexity to the picture by employing two distinct types of classifiers within a single transitive clause, which contrasts with B&B's expectation of a single handling classifier (HCL) in such syntactic contexts, as indicated by Gökgöz (2024), who leaves the analysis of the non-dominant hands for future investigation. This chapter aims to address this gap.

[11]The status of the counterexamples presented in Kimmelman et al. (2019) is not straightforward. Closer inspection suggests that some of these examples may involve instrumental or otherwise complex event structures, rather than simple transitive clauses in which an agent directly acts on a theme. Others may involve numeral information, which may affect classifier realization. In TİD, comparable sentences are ungrammatical if the handshape does not encode the relevant number information, suggesting that classifier realization can be determined not only by argument structure but also by numeral structure. Based on these patterns in TİD, I take the latter cases to involve more complex structures containing numeral information, rather than true WECLs. While these examples motivate a more restricted formulation of Benedicto & Brentari's (2004) proposed alignment, they do not constitute direct counterexamples to the narrower generalization concerning classifier constructions in simple transitive clauses at issue here.

(17) TİD



H1: MAN ONE FORWARD.CL:BPCL(☝) BALL FORWARD.BPCL(☝) IX_a

H2: CL:WECL(✊) BALL CL:WECL(✊)

"One man kicks the ball, (the ball) moves."

In (17), the signer uses both hands to express the event of kicking. The dominant hand depicts the movement of the man's foot, a body part classifier (BPCL). The non-dominant hand represents the ball, a whole entity classifier (WECL). This simultaneous use of two classifier types within a single transitive clause is widely observed in classifier constructions in TİD (Gökgöz 2024).

At first glance, B&B's account appears compatible with the use of two-handed classifiers in TİD. For transitive clauses, they argue that two functional heads combine to form a complex morpheme (p. 769), the HCL, which incorporates distinct morphological components (p. 753). Their analysis implicitly assumes a single handshape per sign, while it does not explicitly address the possibility of arguments being split across hands. In addition, the proposed hierarchical structure does not straightforwardly explain why the higher functional head (*f1*), introducing the external argument, is realized together with the movement component rather than the lower functional head (*f2*), the complement of the predicate. As a result, the grammatical status and structural position of the non-dominant hand in object-related classifier realizations remain in need of further theoretical elaboration.

Finally, while B&B's analysis offers a detailed account of the morphosyntactic licensing of classifier handshapes, it does not explicitly address the depictive nature of classifier constructions.

2.2.2 Classifiers as agreement markers

Several works analyze sign language classifier constructions as instances of the agreement phenomenon (Benedicto 2018; Glück & Pfau 1998; Zwitserlood 2003; among others), treating the classifier handshape as an agreement marker. For instance, Glück & Pfau (1998) argue that classifiers are morphosyntactic units assigned within a particular phrasal projection, triggered by the salient semantic features of the arguments. Example (18) illustrates the correspondence between classifier handshapes and the physical

properties of the relevant arguments in German Sign Language (Deutsche Gebärdensprache - DGS).

(18) DGS (Glück & Pfau 1998; p. 61)

a. CAT WALK.CL:

"The cat walks."

b. BALL ROLL.CL:

"The ball rolls."

c. IX_1 FLOWER $_1GIVE_2$.CL:

"I give the flower to you."

d. PERSON WALK.CL:

"The person walks."

e. PENCIL ROLL.CL:

"The pencil rolls."

f. IX_1 APPLE $_1GIVE_2$.CL:

"I give the apple to you."

Based on these observations, Glück & Pfau (1998) argue that classifier constructions are an inflectional process. They further claim that classifier constructions share core properties with agreeing verbs[12], such as licensing null arguments and permitting left dislocation:

(20) DGS (Glück & Pfau 1998; p. 12)

a. $\overset{t}{\overline{\text{MAN IX}_i}}$, CHILD THINK IX_i $TABLE_j$ $GLASS_a$ $_jTAKE{:}CL_a$

"The man_i, the child thinks, he_i takes the glass off the table."

b. *$\overset{t}{\overline{\text{MAN IX}_i}}$, CHILD THINK pro_i $TABLE_j$ $GLASS_a$ $_jTAKE{:}CL_a$

c. $\overset{t}{\overline{\text{GLASS}_a\ \text{IX}_i}}$, CHILD THINK MAN IX_i $TABLE_j$ $_jTAKE{:}CL_a$

"The $glass_i$, the child thinks, the man takes it_i off the table."

Glück & Pfau (1998) argue that topicalization of "a classified" argument is grammatical without a resumptive pronoun as in (20-c) since the classifier "license[s] pro just like person agreement does" (p. 12). They indicate that the verb TAKE shows agreement with its object but not with its subject. Therefore, the subjects cannot be dislocated without a resumptive pronoun as illustrated in (20-b). On the other hand, the object GLASS can be dislocated without a resumptive pronoun since the same

[12] Agreeing verbs are commonly described as directional, and they encode transfer relations between subject and object via movement as illustrated in (19)

(19) ASL (Adapted from https://www.lifeprint.com)

$_aGIVE_1$

"He gave it to me."

verb "classifies its object". Based on these similarities, Glück & Pfau (1998) propose that classification in sign languages constitutes an instance of agreement, parallel to agreeing verbs.

Glück & Pfau's (1998) influential analysis relies on null argument licensing as a central diagnostic for agreement. Glück & Pfau (1998) distinguish classifier and agreeing verbs from plain verbs, which they claim do not license null arguments because they lack agreement (p. 70), and exclude plain verbs from their analysis. However, Lillo-Martin (1986) shows that plain verbs, similar to agreeing verbs, allow null arguments in ASL, and further argues that null argument licensing may be determined by discourse factors in addition to agreement. Similarly, TİD permits null arguments with plain verbs as well as with agreeing verbs (Kayabaşı et al. 2020). Moreover, Lourenço & Wilbur (2018) argue that plain verbs may also exhibit agreement in Brazilian Sign Language (Língua Brasileira de Sinais - LIBRAS) when phonological constraints do not block spatial modification, as illustrated below:

(21) LIBRAS (Lourenço & Wilbur 2018; p. 71)

IX$_a$ WORK$_a$ TEACHER$_a$ ALL-DAY, IX$_1$ $_1$HELP$_a$ HOUSE$_a$

"She works as a teacher all day. So, I help her with the house."

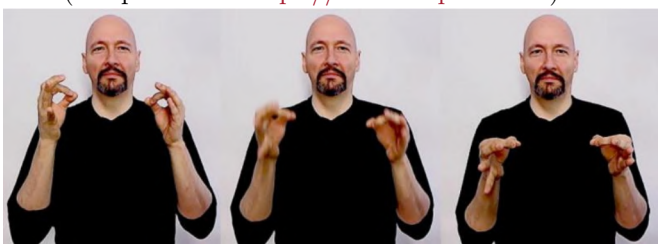
In this example, the plain verb WORK (see the video clip for the lexical sign which has on both hands and is articulated on the chest area) is produced at the same spatial locus as its subject rather than in neutral space. Following previous work, I take null argument licensing to be insufficient as a diagnostic for agreement properties in classifier constructions. In addition, Glück & Pfau (1998) do not explicitly address the morphosyntactic mechanisms underlying this agreement relation.

Another influential analysis that treats classifier handshapes as agreement markers is proposed by Zwitserlood (2003) for Sign Language of the Netherlands (NGT). She argues that classifier constructions in NGT exhibit properties comparable to verbal classifiers in spoken languages; however, classifier handshapes function as agreement markers in a manner similar to noun class agreement (p. 183). Like Glück & Pfau (1998), she proposes a unified analysis of agreeing verbs and classifier constructions, formalized within the Distributed Morphology (DM) framework (Halle & Marantz 1993), while acknowledging the presence of two types of agreement systems: agreement by means of loci, and agreement by means of classifiers (p. 204).

Zwitserlood (2003) proposes a phonological well-formedness requirement for sign languages according to which a sign must surface with both a minimal and a maximal number of phonological components. Minimally, a sign must contain a handshape, orientation, location, and movement, while maximally it may contain two handshapes connected by orientation and movement (pp. 32-33). For

example, the root of the ASL lexical sign DECIDE contains these components specified in the lexicon:

(22) ASL (Adapted from https://www.lifeprint.com)



"decide"

The lexical sign DECIDE is produced with the handshape 🤏 on both hands and a downward movement articulated in front of the chest. Zwitserlood (2003) argues that, in contrast to lexical signs, the roots of agreeing verbs and classifier constructions are underspecified for certain phonological components: the roots of agreeing verbs lack a location component, while the roots of classifier constructions lack a handshape component. These components are not specified in the lexicon but are instead determined by the syntactic context and the properties of the arguments, a proposal that the analysis developed in this chapter builds on, though it diverges in certain implementation details discussed below. Therefore, agreeing verbs and classifier constructions share the same underlying structural representation as illustrated in Figure 2.3, with differences in surface realization arising from the content of the root.

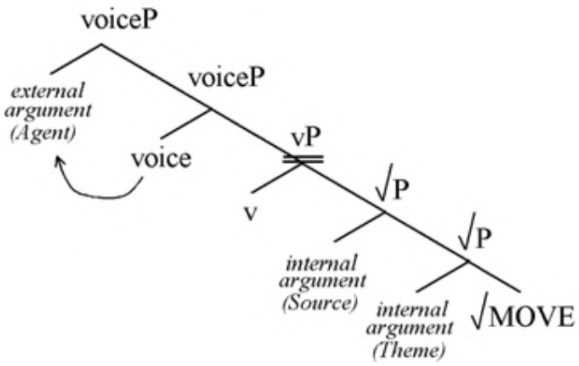


Figure 2.3: *Syntactic structure proposed by Zwitserlood (2003; p. 211)*

Another difference between these two agreement systems is that the directionality encoded by agreeing verbs is a φ feature of the internal argument, while classifier constructions employ features comparable to noun class systems in Bantu languages (p. 192). Zwitserlood (2003) proposes three types of feature specification for classifier constructions in NGT (pp. 192-193):

i. features indicating animacy and leggedness: [± animate] and [± legged]

ii. features indicating shape: [± straight], [± small], [± flat] and [± volume]

iii. features indicating the amount of control exercised by a manipulator: [± control]

Zwitserlood (2003) further argues that these classificatory features are realized post-syntactically at spell-out, where they provide the handshape component that is not specified in the verbal root, thereby yielding the surface classifier handshape.

Zwitserlood (2003) further develops the agreement-based approach by proposing that classifier handshapes in NGT pattern like noun class agreement markers. At the same time, the focus of her proposal lies primarily on the grammatical encoding of classificatory features, and less attention is given to the depictive contributions of classifier constructions. In addition, the analysis is mainly developed for certain classifier types, leaving open questions about how other types, such as body part classifiers and extension classifiers, fit into this agreement-based framework.

The final analysis is that of Benedicto (2018), who develops a syntactic account of verbal classifier constructions in sign languages and situates them within a broader crosslinguistic comparison with spoken-language classifier systems. She argues that classifier constructions and agreement in sign languages share the same underlying syntactic operation, AGREE, but differ in the directionality and interpretive consequences of feature transfer. In agreement, the argument DP functions as the controller and determines the morphology of the agreeing head. In classifier constructions, by contrast, the classifier functions as the controller, where the classifier determines the interpretation of the DP. In this respect, argument DPs function as targets in classifier constructions, in contrast to the configuration observed in standard agreement relations.

Benedicto (2018) motivates this asymmetry by showing that there is no one-to-one correspondence between a noun and a particular classifier. A single referent may be compatible with multiple classifiers, yielding distinct interpretations without resulting in ungrammaticality. This point is illustrated by the ASL example in (7) above, where the noun MONEY occurs with different classifier handshapes, such as  ,  , or  , depending on how the referent is construed.

In the analysis of Benedicto (2018), verbal classifiers are the realization of [α-class] features bundled with functional heads in the verbal spine, rather than features inherent to the argument DP. These functional heads also carry an uninterpretable D-feature (uD), which triggers AGREE with an argument DP. As part of this operation, two feature-transfer processes take place. The first, COPY-a, is a forward-looking operation common to both ordinary agreement and classifier constructions, whereby

the D-value of the DP values the *u*D feature on the functional head. The second, COPY-b, is the classifier-relevant backward transfer operation. In classifier constructions, the [α-class] feature is transferred from the functional head to the DP in its specifier position, thereby contributing to the DP's classificatory interpretation.

This account captures the flexibility of classifier choice while maintaining a syntactic connection between classifier type and argument structure, where WECL classifiers are associated with unaccusative predicates, BPCL classifiers with unergative predicates, and HCL classifiers with transitive predicates. However, the remaining issue is where the relevant classificatory features are introduced and what independently constrains their distribution. In Benedicto (2018), verbal classifiers are analyzed as [α-class] features bundled with functional heads in the verbal spine, and the syntactic behavior of a classifier construction follows from the particular functional head with which [α-class] is bundled. However, the analysis does not independently derive why [α-class] is bundled with one functional head rather than another, or why classifier morphology is restricted to certain predicate domains rather than appearing wherever the relevant functional structure is present. Indeed, Benedicto (2018) explicitly raises this as an open question, asking why certain predicates can host classifier morphology and proposing a predicate hierarchy for classifier distribution. Thus, while the analysis provides a detailed account of how classifier constructions are licensed once [α-class] is present, the source and distribution of the classificatory features themselves remain partly stipulated.

2.2.3 Interim summary

Previous analyses of classifier constructions, developed within different theoretical frameworks and employing distinct mechanisms to represent their structure, show that they are not holistic gestural units but complex grammatical structures. At the same time, as reviewed in the previous section, these accounts leave open a number of empirical and theoretical questions that motivate further investigation.

A central issue concerns the status of depictive components in classifier constructions. While formal morphosyntactic analyses successfully capture the morphosyntactic regularities of these constructions, they typically abstract away from the depictive contributions that are characteristic of classifier use. Formal semantic analyses can capture how these constructions can compositionally incorporate a demonstration component, yielding meanings that depend on a resemblance-based mapping between signing space and event space (Davidson 2015; Zucchi et al. 2011; Zucchi 2017). The present challenge, therefore, is not to replace these semantic accounts, but to develop a morphosyntactic representation that licenses and constrains depictive content, determining when such interpretation is available and

how it is integrated with argument structure and event representation.

These observations motivate the analysis in the following section, which turns to classifier constructions in Turkish Sign Language (TİD). By examining their empirical properties in detail, the next section provides the basis for an analysis that integrates structural and depictive aspects of classifier constructions in TİD.

2.3 Classifier constructions in TİD

This section introduces the empirical foundation of this chapter: a dataset of classifier constructions from Turkish Sign Language (Türk İşaret Dili; TİD) and a set of descriptive generalizations that the analysis should capture. I first provide brief background on TİD and the elicitation methodology (§2.3.1), then illustrate key patterns in the data (§2.3.2), including argument-structural sensitivity, context-dependent handshape choice, and two-handed realizations. These patterns motivate the proposal developed in the next subsection.

2.3.1 Background and data collection

Turkish Sign Language (TİD) is a natural language used by the Deaf community in Türkiye.[13] It exhibits structural complexity at all linguistic levels. It is not derived from Turkish, the dominant spoken language in the region, and has a distinct grammatical system (Zeshan 2002; p. 233). TİD follows a default Subject-Object-Verb (SOV) word order, although this order is sensitive to information structure (Sevinç 2006; Kubus 2008; Dikyuva et al. 2017; among others). Beyond its structural properties, TİD has been argued to be typologically significant. Zeshan (2003) argues that it constitutes an isolated language, unrelated to European sign languages due to substantial typological differences.

Like other sign languages, TİD productively employs classifier constructions (Arık 2003; Kubus 2008; Özkul 2013; among others). The data analyzed here were originally collected by the author in Istanbul, Türkiye, as part of a larger project on TİD.[14] The data were elicited from eight native Deaf TİD signers who were born deaf and had at least one Deaf parent (see Newport 1990 for a discussion of

[13] Reports indicate the existence of rural sign languages in Türkiye, such as Central Taurus Sign Language (Ergin 2017) and Mardin Sign Language (Dikyuva 2012), which are genetically unrelated to TİD.

[14] The elicitation tasks at Boğaziçi University were carried out under two funded projects: "Supporting Sign Language Development of Deaf Children with Hearing Parents through Linguistically Informed Preschool Stories" (Boğaziçi University, #14458; PI: Kadir Gökgöz) and "The Sign Hub: Preserving, Researching and Fostering Linguistic, Historical and Cultural Heritage of European Deaf Signing Communities with an Integral Resource" (European Union, #693349; PI: Meltem Kelepir Wood). Follow-up one-to-one elicitation sessions were subsequently conducted with the support of the Department of Linguistics at Harvard University.

effects of age of first language exposure in language acquisition). As a result, all participants received linguistic input from birth and did not experience delayed exposure to a natural language.

The participants, four female and four male, ranged in age from 24 to 35 ($M_{\text{age}} = 27.6$). Despite varying birthplaces, all signers resided in Istanbul at the time of elicitation. They attended different elementary schools for Deaf students. Six signers graduated from high school, while two completed university education.

The elicitation materials used in this study were originally developed by Inge Zwitserlood as part of her dissertation research (see Zwitserlood 2003) and were subsequently used in the present study with her permission.[15] The stimuli included a range of event types and referents varying in animacy and physical properties:

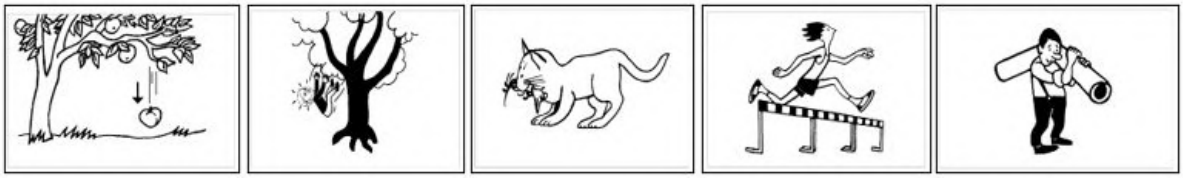


Figure 2.4: *Sample elicitation item*

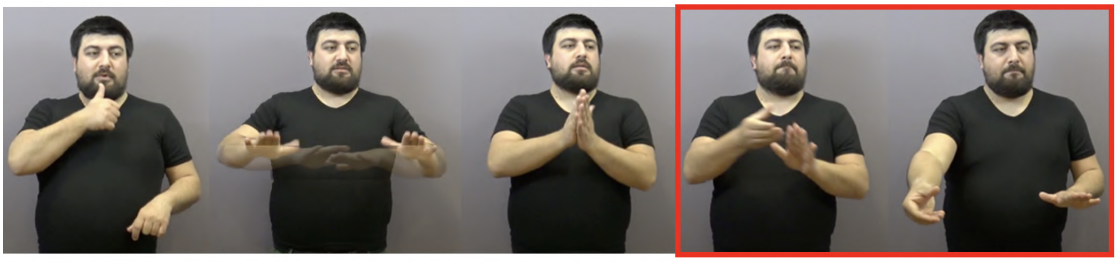
Before the task, a Deaf native TİD signer, who was a researcher at Boğaziçi University at that time, explained the procedure to participants in TİD. Signers were asked to describe each stimulus to the camera as if addressing a Deaf friend with no prior knowledge of the event in the stimuli. They were not explicitly instructed to use classifier constructions. A picture-signing task was employed rather than a translation task to minimize the potential effects of spoken or written language. Stimuli were presented one by one in a fixed order; participants produced a signed description of each event.

2.3.2 Core patterns in the TİD data

The participants produced a range of classifier constructions that provide detailed information about a variety of referents and event types. In many cases, the distribution of classifier types aligns with the argument-structural generalizations proposed by Benedicto & Brentari (2004). An example is illustrated in (23):

[15] See Appendix A for the elicitation materials used in this study.

(23) TİD



H1:	MAN	TABLE	BOOK	$_a$HCL: $_b$
H2:		TABLE	BOOK	

"The man puts the book on the table."

In (23), H1 in the glosses denotes the dominant hand (the signer's right hand in this example), while H2 refers to the non-dominant hand. In this example, the signer introduces the arguments using lexical signs, as illustrated in the first three frames, which are composed of sublexical features specified in the lexicon (Brentari 2019). The frame outlined in red highlights the classifier construction, where the handshape () of the handling classifier (HCL) encodes the salient features of the theme argument (the book) and agent argument (the man) simultaneously, representing how the agent manipulates the object. Furthermore, the motion trajectory from point a to point b visually shows the placement of the book by the agent.

Classifier constructions also occur in intransitive events as in (24):

(24) TİD

H1:	MAN	RUN	$_a$BPCL: $_b$
H2:	- - - - - - - - - - -	RUN	CL:

"The man runs and jumps."

The subject argument MAN is first introduced by a lexical sign, followed by the lexical predicate RUN. Subsequently, the signer uses a classifier construction to represent the motion event. In this construction, the signer uses a bent-V-handshape () along with an upward and forward movement. Simultaneously, the non-dominant hand is maintained in a stable configuration, representing the surface over which the event takes place.

A third pattern concerns argument structure and referent properties in unaccusative events:

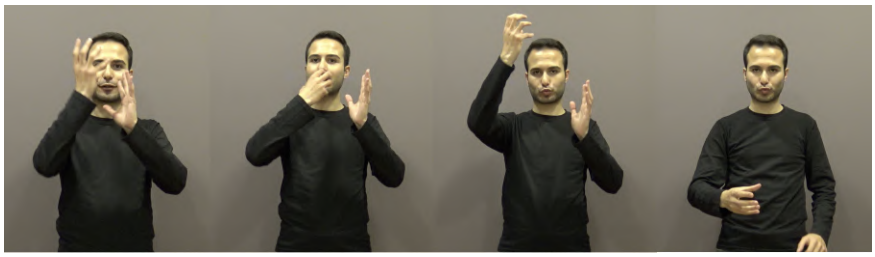
(25) TİD

H1:	WOMAN	TREE	CL:	$_{a}$WECL: $_{b}$
H2:		TREE		CL( )

"The woman falls from the tree."

In (25), the signer introduces WOMAN and TREE lexically, then reintroduces the oblique argument TREE via classifier with the handshape . Finally, both participants are represented simultaneously: the classifier referring to the oblique argument TREE is maintained on H2, while the classifier referring to the theme argument WOMAN is realized on H1. Crucially, the same event type may involve a different handshape when the referent changes as in (26), showing that handshape choice is sensitive to referent properties as noted by Supalla (1982), in addition to argument structure:

(26) TİD



H1:	TREE	APPLE	$_{a}$WECL: $_{b}$
H2:		CL: − − − − −−	

"The apple falls from the tree."

Although the event type in (26) is identical to that in (25), the classifier handshape differs. While the falling human referent in (25) is represented with a handshape, the falling apple referent in (26) is represented with handshape. This contrast reflects the role of referential properties in classifier choice, as well as of the argument structure. At the same time, it is crucial to note that classifier handshapes do not correspond one-to-one with classifier types. The same handshape may occur in clauses with different argument structures and different classifier types, as illustrated in (27):

(27) TİD

H1:	ONE	CHILD	BOTTLE	$_{a}$HCL: $_{b}$
H2:			BOTTLE	

"One child throws the bottle."

In (27), the handshape is a part of a handling classifier that refers to both the agent (CHILD) and the theme (BOTTLE). Although the same handshape appears in (26), where it is a WECL, the two constructions differ in their argument structure and semantic interpretation, reflecting the polysemy of classifier handshapes noted by Zwitserlood (2003) (see Appendix A for an inventory of classifier handshapes in TİD).

Beyond these well-documented patterns, TİD also productively employs two-handed classifier constructions in which distinct participants of the event are represented simultaneously on the dominant and non-dominant hands, contributing information about the different arguments of the event. These constructions are particularly informative for understanding the structural properties of classifier constructions. An example of such a construction is illustrated in (28):

(28) TİD

H1:	MAN	BALL	$_{a}$BPCL: $_{b}$
H2:		BALL	WECL:

"The man kicks the ball."

In (28), the dominant hand depicts the movement of the agent's foot using a BPCL while the non-dominant hand represents the theme with a WECL. The two hands, thus, encode distinct participants within a single event, with each hand contributing structurally and semantically different information to the clause. Similar patterns are attested in TİD for events involving active body parts, such as

kicking, biting, and licking (Gökgöz 2024; Sevgi 2019; Sevgi & Gökgöz 2023). Assuming that these express a single predicate, these constructions pose a challenge for analyses that assume a single classifier realization per predicate.

As presented in the background section, classifier constructions in sign languages are often analyzed in parallel with verbal classifier systems in spoken languages (Benedicto 2018; Gökgöz 2024; Zwitserlood 2012; among others), and they are particularly associated with motion events and locative expressions. The TİD data presented here are broadly consistent with this characterization, in that classifier constructions frequently occur in verbal contexts.[16] This perspective captures important generalizations across sign and spoken languages; however, it does not entail that classifier constructions are inherently restricted to the verbal domain.

Indeed, a primary focus on the verbal domain has led to comparatively less attention being paid to classifier constructions in non-verbal contexts. In Italian Sign Language (LIS), for example, nominal expressions have been shown to exhibit systematic morphological structure that interacts with classifier constructions (Pizzuto & Corazza 1996; Branchini & Mantovan 2020), such as plurality. Similarly, some sign languages are argued to have noun classifiers. For instance, Bergman & Wallin (2003) argue that Swedish Sign Language employs noun classifiers within the nominal domain, and Koenders (2024) shows that Hong Kong Sign Language exhibits classifier constructions that occur in nominal environments and function independently of verbal predication.

Turkish Sign Language shows comparable patterns. Classifier handshapes have been observed in nominal contexts, where they contribute to reference tracking, pluralization, and noun modification (Dikyuva et al. 2017; Kubus 2008; Kelepir 2020). Without rejecting analyses that treat classifiers as fundamentally verbal, I take these observations to suggest that classifier constructions in sign languages are not necessarily verbal in nature. Rather, they may be licensed in different syntactic environments with different grammatical functions.

Classifiers in the nominal domain could, in principle, be accounted for by derivational accounts that relate non-verbal classifiers to verbal structure (see Abner 2014, 2017; for further discussion). However, such an approach is less straightforward for cases in which no clear verbal mediation can be identified. In this chapter, I pursue an alternative analysis in which verbal and non-verbal classifier constructions are derived from a single underspecified root. On this view, the distribution of classifier constructions follows from the syntactic environment in which the underspecified root is licensed,

[16]The high frequency of classifier constructions in the verbal domain in the present study is likely to be a product of the elicitation materials, which primarily targeted motion events. Consequently, the verbal domain is overrepresented in the dataset, and this distribution should not be taken to reflect the full range of contexts in which classifier constructions may occur.

rather than from a derivational relation to verbal structure.

In sum, existing accounts provide a rich foundation for understanding classifier constructions, but the TİD data highlight some unresolved issues. First, while much of the literature has focused on classifier constructions in the verbal domain, classifiers are not confined to a single syntactic domain, but also occur in nominal environments. Second, the TİD data reveal systematic cases of two-handed classifier constructions, in which distinct classifier realizations simultaneously encode different participants within a single event. Existing analyses, which typically assume a single classifier realization per predicate, do not provide a clear mechanism for licensing such simultaneous structures. Finally, current morphosyntactic approaches do not explicitly model the depictive aspects of classifier constructions, especially the movement component. Any adequate analysis of classifier constructions must explain how such depictive properties are integrated into grammatical structure without undermining compositionality.

The next section introduces the proposal, which aims to capture these generalizations by accounting for the syntactic distribution of classifier constructions in TİD and their depictive properties.

2.4 The proposal

This chapter develops a morphosyntactic analysis of classifier constructions in TİD that accounts for (i) their syntactic properties, including their sensitivity to argument structure and their distribution across verbal and nominal domains, (ii) two-handed transitive clauses, and (iii) their characteristic integration of linguistic elements with depictive content, building on the existing accounts.

I argue that these properties follow from the interaction between a single underspecified root, argument-introducing functional structure, and semantically motivated classificatory features that are realized as handshapes post-syntactically. The analysis builds on existing work (notably Zwitserlood 2003 and Benedicto & Brentari 2004) and extends it to account for two-handed classifier constructions and non-verbal classifier environments in TİD. Central to the proposal is the claim that depictive properties can be constrained by morphosyntactic structure, shaping how they are mapped to a form.

The proposal builds on the following assumptions and analytical steps:

i. Classifier constructions have a single, radically underspecified root that lacks inherent phonological and structural specifications, providing the basis for their depictive properties.

ii. Syntactic category and argument structure are introduced by functional heads in the syntax, yielding a unified account of classifier constructions across verbal and nominal domains as well

as capturing their argument-structural properties in the verbal domain.

iii. Classifier handshapes are the realization of classificatory features comparable to noun-class features, reflecting the physical or semantically motivated classificatory properties of the referent(s).

iv. Classifier constructions are derived via head movement, yielding complex morphological units that capture their multimorphemic structure.

v. A post-syntactic dislocation operation applies in specific environments, yielding two-handed classifier constructions in transitive clauses.

The remainder of this section outlines the architecture of the analysis. Its individual components are motivated and developed in detail in the following sections, based on empirical evidence from TİD.

I propose that classifier constructions are licensed by a single root, $\sqrt{\kappa}$, which is underspecified for handshape, movement, and location. The presence of $\sqrt{\kappa}$ in the syntactic structure signals that the event or entity must be depicted in the signing space and enables the inclusion of depictive movement and location components within the morphosyntactic representation.

This proposal extends Zwitserlood's (2003) analysis in which she argues that the root in a classifier construction lacks a lexically specified handshape. However, in her analysis, the movement component is still lexically specified, leaving the depictive and analogue properties of the movement component unaccounted for. In contrast, I propose that $\sqrt{\kappa}$ is underspecified for all phonological components. The phonological realization of classifier constructions is determined by the syntactic structure, the classificatory features of the referent(s), and depiction.

The idea that classifier constructions involve depiction is not novel to the present proposal. A body of work in formal semantics has argued that classifier constructions in sign languages involve demonstration as part of their interpretation (Ceccheto & Zucchi 2006; Davidson 2015; Zucchi et al. 2011; Zucchi 2012, 2017; among others). These analyses propose that classifier constructions combine linguistic structure with an accompanying demonstration, yielding meanings that depend on a resemblance-based mapping between signing space and real or imagined event space. The depictive component is modeled at the level of semantic interpretation and contributes compositionally to meaning.

The present proposal aims to capture the depictive nature of classifier constructions while departing from these semantic analyses. Rather than treating depictive content only as a semantic argument (Davidson 2015) or as an indexical/demonstrative component in the interpretation of a predicate (Zucchi 2012, 2017), I assume that the requirement for depictive realization is encoded in the morphosyntactic structure itself, as a property of an underspecified root. Since this root lacks lexically specified

phonological content, its form is supplied through an iconic mapping, while the surrounding syntactic structure determines how that depictive form is interpreted. This provides a systematic analysis of how classifier constructions can be interpreted in relation to either events or entities.

Adopting the assumptions of Distributed Morphology (Halle & Marantz 1993), I treat roots as acategorial. Both lexical roots and √κ merge with category-defining functional heads. When √κ combines with verbal structure, the resulting classifier construction is interpreted with respect to an event, and its movement and location components are mapped onto the relevant event structure. When √κ combines with nominal structure, the resulting classifier construction is interpreted with respect to an entity, and its form depicts properties of that entity. This analysis accounts for the presence of classifier constructions across syntactic categories without positing a derivational relationship between nominal and verbal classifier constructions.

Argument structure is introduced by functional heads rather than by the root itself, following neo-Davidsonian approaches (Borer 2005; Ahn 2016, 2022). Internal arguments are introduced by an F head, and external arguments by a Voice head. This departs from analyses in which the root selects an internal argument as its complement (Benedicto & Brentari 2004; Zwitserlood 2003; among others).

Classifier constructions involve a handshape component that classifies the referents based on their physical properties. As indicated in the previous sections, unlike having a one-to-one mapping between a distinct DP and a classifier handshape, the realization of the classifier handshape is sensitive to the properties of the referent in the discourse and event context. Following previous work (Zwitserlood 2003; among others), I argue that classifier constructions are the realization of a bundle of classificatory features, including the presence of argument-introducing functional heads. These semantically motivated classificatory features are associated with the referent introduced by the DP. In the verbal domain, argument-introducing functional heads enter into a specifier-head agreement relation with the DPs in their specifiers, making the relevant classificatory features available for post-syntactic realization as classifier handshapes in the presence of √κ.[17]

Classifier constructions are derived via head movement, which bundles √κ together with relevant functional heads into a complex morphological unit (Halle & Marantz 1993; Harizanov & Gribanova 2019; Matushansky & Marantz 2016; among others).[18] Following Benedicto & Brentari (2004), the

[17] These semantically motivated classificatory features are realized only in the presence of the underspecified √κ since lexical roots already carry phonological specification.

[18] Head movement in word formation has been widely debated, particularly with respect to whether it is syntactic or post-syntactic. Different approaches adopt different assumptions. For concreteness, I assume here that this step is post-syntactic following Harizanov & Gribanova (2019), though this is not the only possible analysis. Alternative assumptions would be equally compatible with the data discussed here, and the available evidence does not allow a clear choice between them. Resolving this issue requires further investigation, both within TİD and in related domains.

argument-introducing heads undergo a fusion process that amalgamates two heads in transitive clauses, which results in HCL. Moreover, where no portmanteau exponent is available to realize the combined feature bundle at a single locus, the theme-related features get dislocated into another node, distributing the classificatory features across articulators and yielding two-handed classifier constructions.

The next section focuses on the properties of the underspecified root and lays the groundwork for the derivations developed in the following sections.

2.4.1 One root to build them all

The analysis developed in this chapter builds on the assumption that classifier constructions involve an underspecified root. Building on Zwitserlood's (2003) analysis, I propose that the root involved in these constructions is underspecified for all phonological components and lacks inherent syntactic specification. Unlike analyses that posit lexically specified movement predicates such as EXIST, BE_LOCATED, or MOVE (Benedicto & Brentari 2004; Zwitserlood 2003; among others), the present analysis treats movement as a component that is not stored in the lexicon but instead as a depiction of a real-world event or entity, licensed by morphosyntactic structure.

I propose that this root introduces a requirement that some aspect of the construction be realized depictively in signing space, rather than contributing descriptive lexical meaning.[19] This requirement is satisfied by the movement and location associated with the relevant event or entity. Therefore, the movement and location components in classifier constructions are not a fixed lexical property of the root, but a depiction of aspects of real-world entities and events, mapped onto signing space.[20] Drawing an analogy to the Greek word κάτοπτρον (katoptron, "mirror"), I use √κ to highlight the role of the root in enabling depictive realization, reflecting the properties of the real world.

Such a division of labor may appear controversial from a narrow syntactic perspective. However, as indicated in the previous section, it builds on the shared assumption that classifier constructions involve a depictive component (Davidson 2015; Zucchi et al. 2011; Zucchi 2017; among others). Davidson (2015) argues that classifier constructions involve a demonstration that modifies the described event, modeling the depictive component at the level of semantic interpretation via event modification. In

[19] Another way to think about this is that because the root is radically underspecified, depiction is the only available mechanism for deriving meaning from form when no lexeme exists. In this sense, depictive mapping is the ultimate means by which an otherwise underspecified root receives interpretable content.

[20] More generally, the presence of this root entails the use of topographic space rather than purely syntactic space. As summarized by Perniss (2012), signing space may be used either syntactically, with arbitrary loci serving grammatical functions such as pronominal reference, or topographically, where spatial relations iconically correspond to locations and relations in the real or imagined world. Classifier constructions are characteristically associated with this latter use of space, in which handshape classifies referents according to their properties, while movement and location map topographically onto spatial configuration and motion.

her analysis, the gestural component of a classifier construction, which corresponds in the present discussion to movement and location, functions like a demonstration of how the event unfolds, yielding an interpretation roughly paraphrasable as "moves like this."[21] The present proposal preserves the central insight that depiction is grammatically integrated and compositionally interpreted. It differs, however, in locating the source of depictive licensing in the morphosyntactic representation, specifically, in an underspecified root, thereby accounting for the syntactic distribution of these constructions.

As noted earlier, classifier constructions in sign languages are not restricted to the verbal domain. They are also attested in nominal environments, including noun, adjectival, and numeral classifiers (see Koenders 2024 for an analysis of HKSL). One possible approach is to derive nominal classifiers from verbal classifier structures through nominalization (see, e.g., Abner 2014, 2017). However, Koenders (2024) argues that not all noun classifiers can be straightforwardly derived in this way. These observations suggest that classifier constructions are not inherently verbal, but may instead be licensed in different syntactic domains.

To provide a unified account of lexical and classifier constructions, I adopt a common assumption of the Distributed Morphology framework (Halle & Marantz 1993) and argue that the roots of lexical signs in TİD, like the classifier root √κ, are not specified for syntactic category in the lexicon. Instead, they are acategorial. Under this view, syntactic categories are not inherent properties of roots, but are determined "in terms of their distribution with respect to other elements" (Embick 2021; p. 72). These specifications are introduced in the syntactic structure via category-defining functional heads.

There is independent motivation for this direction in the analysis. A well-attested cross-linguistic phenomenon is that a set of noun-verb pairs differ primarily in their movement properties (see Abner 2021; Özkul 2013; Supalla & Newport 1978; among others). As illustrated in (29), the two signs share the same handshape () and location (), but differ in their movement properties:

(29) Lexical noun-verb pair in ASL (Abner 2021; p. 214)

"TO-SIT" "CHAIR"

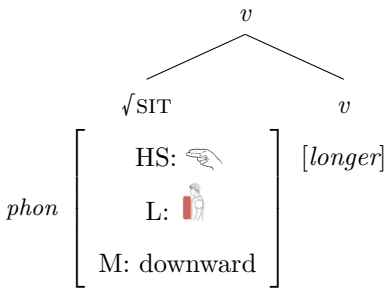
[21] The analysis of Davidson (2015) offers a unified treatment of classifier predicates and quotation as instances of event modification by demonstration, thereby integrating depiction into a broader theory of compositional meaning.

In (29), the relatively longer movement corresponds to verbs as in the left frame, while shorter, quick, and repeated movements correspond to nouns as in the right frame. Supalla & Newport (1978) indicate that short, repeated movement distinguishes nouns from related verbs which express an activity performed with or on the object (pp. 101-102). Moreover, as Abner (2017) further demonstrates, this pattern is also observed in sign pairs denoting more abstract concepts, such as ACCEPT/ACCEPTANCE and JOIN/PARTICIPATION, indicating that the contrast reflects a difference in syntactic category rather than purely iconic considerations. When available, the properties of the movement thus constitute a systematic modulation of the movement component of a sign that signals syntactic category (Abner 2017, 2021; Pyers & Emmorey 2022; Supalla & Newport 1978; among others).[22]

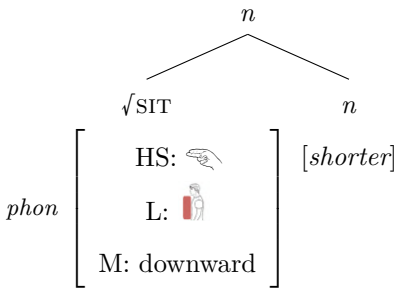
Building on the observation that the movement component can distinguish noun-verb pairs in sign languages (see Dikyuva et al. 2017; Kubus 2008; Özkul 2013 for discussion of TİD, where verbs have longer movement and nouns have shorter movement), I argue that acategorial roots merge with category-defining functional heads, such as the verbalizing head (v) or the nominalizing head (n).[23]

Throughout this chapter, I adopt the following notational conventions. In the structural representations, "HS" refers to the handshape component, "L" to the location component, and "M" to the movement component. I use *phon* to denote the phonological components of a root. Therefore, a lexical root will bear an explicit *phon* specification.

(30) a. Lexical sign SIT in TİD



b. Lexical sign CHAIR in TİD



As illustrated in (30), the root of a lexical sign is specified in the lexicon for handshape, movement,

[22] This phenomenon has often been analyzed as an instance of derivational morphology in sign languages (Sandler & Lillo-Martin 2006; Supalla & Newport 1978; among others). However, in a recent work, Sampson (2026) argues against a synchronically derivational analysis, noting the semi-productive nature of the pattern and its semantic unpredictability. Instead, Sampson (2026) proposes a diachronic constructionalization account in which noun-verb pairs emerge as reduced forms of iconic pluractional constructions embedded in relative clauses. Therefore, the noun-verb contrast is historically emergent rather than synchronically derived.

[23] Please refer to Makaroğlu & İşsever (2018) for another discussion of acategorial roots in TİD. In their analysis, handshape and location are treated as part of the root, while movement is analyzed as a separate category-defining head. They further propose that TİD exhibits templatic morphological properties, including classifier constructions. The present proposal differs in treating the root as underspecified for all phonological components and in maintaining a distinction between lexical and classifier constructions.

and location, which constitute the phonological components of the sign. The functional heads v and n define the syntactic category of the root while constraining or modulating the realization of the movement component that is already specified in the lexicon.

I further argue that when $\sqrt{\text{K}}$, which lacks any specifications and is represented as an empty array, merges with a v head, it introduces an eventuality (see Marantz 2001; Anagnostopoulou 2017; among others), forming the structural core of a classifier construction in the verbal domain. When the same root merges with an n head, it introduces an entity, thereby providing the basis for a classifier construction in the nominal domain:

(31) Merge with a category-assigning head

Despite the shared structural architecture between the roots of lexical signs and the roots of classifier constructions, the realization of category-defining heads differs between these two root types. In lexical signs, roots are specified in the lexicon for handshape, movement, and location, and category-defining heads serve primarily to constrain or modify these pre-existing specifications as illustrated in (30). In classifier constructions, by contrast, the underspecified root $\sqrt{\text{K}}$ lacks inherent phonological content. The properties of the movement component are determined depending on the category-defining head that merges with this root. When $\sqrt{\text{K}}$ merges with the verbalizing head (v), the structure licenses eventive path movement, that is, movement that iconically corresponds to motion in the related event. When $\sqrt{\text{K}}$ merges with the nominalizing head (n), it contributes to the depiction of the entity, reflecting how it extends in signing space.

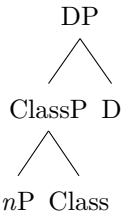
In sum, I propose that $\sqrt{\text{K}}$ is a distinct, radically underspecified root used specifically in classifier constructions. Unlike ordinary lexical roots, which are specified for descriptive phonological and semantic content, $\sqrt{\text{K}}$ does not contribute descriptive lexical meaning. Instead, it introduces a structural requirement that some aspect of the construction be realized depictively. Whether and how depictive content is licensed is determined by the surrounding functional structure. In this sense, $\sqrt{\text{K}}$ functions as a structural trigger for depiction, enabling the depictive content to be integrated into grammatical structure. The realization of movement and location is supplied through a depictive mapping and it is not stored in the lexicon. This mapping yields an iconic correspondence between aspects of the

grammatical structure and properties of the real or imagined event or entity being represented.

Before presenting the details of the derivations, it is necessary to clarify the status of semantically motivated classificatory features used in classifier constructions. These features are treated here not as inherent lexical properties of the root or the noun, but as properties associated with the referent introduced by the nominal projection.[24] This is consistent with the assumption that roots are acategorial and lack inherent specifications, and it enables us to capture the flexible, context-sensitive encoding of referential properties that a single noun may exhibit in classifier constructions.

These features are similar but not identical to gender and noun class in spoken languages which sort nouns into classes, restricting the reference of the noun within the DP, and are reflected in agreement morphology on determiners, adjectives, verbs, and other syntactic categories (Aikhenvald 2004; Corbett 1991; Kramer 2015; among others).[25] Structurally, I propose that these features are hosted in a dedicated functional projection, a Classification Phrase (ClassP), which immediately dominates *n*P:

(33) Internal structure of a DP



I assume that ClassP introduces semantically motivated classificatory features that are interpreted as properties of the referent associated with the DP. In this respect, the proposal aligns with approaches that separate nominal class features (such as gender) from the lexical root (Kramer 2015; Lowenstamm 2008; among others). Crucially, however, it departs from analyses that locate gender or class features on (or around) *n*. On the present view, *n* is responsible solely for introducing syntactic category, whereas Class independently introduces referential classification. Separating *n* and Class as distinct

[24] Here labeled DP, without committing to a particular analysis of nominal structure.

[25] It is important to note that the semantically motivated classificatory features are not identical to those found in canonical grammatical gender systems. Similar to those, they take part in the nominal and verbal domain as in (32):

(32) Russian (Corbett 2006; p. 2)
lamp-a stoja-l-a v ugl-u
lamp-F.SG stand-PST-F.SG in corner-SG.LOC
"The lamp was standing in the corner."

However, unlike grammatical gender, the features in classifier constructions are not lexically fixed. Rather, their assignment depends on the properties of the referent such as animacy, humanness, shape, or size. In this respect, they are similar to gender in English which is not lexically fixed but based on the natural/notional gender of the referent (Pollard & Sag 1994; McConnell-Ginet 2013; among others).

functional heads allows for their independent exponence and maintains a principled division of labor between category assignment and nominal classification.

This analysis also diverges from approaches that posit a dedicated classifier head as the structural source of classifier morphology. Rather than treating classifiers as independent nominal heads projected in the syntax, I analyze classifier constructions in TİD as the realization of classificatory features introduced in ClassP and made morphologically visible through interaction with the underspecified root √ĸ. In other words, classifier constructions build compositionally through the interaction of acategorial roots, functional structure, and post-syntactic operations.

The proposal is implemented here within the Distributed Morphology (DM) framework (Halle & Marantz 1993). DM's realizational and non-lexicalist architecture provides explicit tools for representing underspecified syntactic structure and post-syntactic realization, as well as a piece-based view of morphemes that is well suited to capturing the internal complexity of classifier constructions. Nonetheless, these intuitions are not inherently tied to the Distributed Morphology framework and could potentially be implemented in a variety of frameworks.

With these assumptions in place, the next section turns to concrete derivations where I show how √ĸ combines with argument-introducing functional structure and how post-syntactic operations yield the variety of one- and two-handed classifier constructions attested in TİD.

2.4.2 Classifiers in the verbal domain

This section investigates classifier constructions in the verbal domain, focusing on how the proposed architecture derives these constructions and their argument-structural properties in TİD.

Previous studies have argued that the movement component of classifier constructions exhibits strongly depictive properties, in that it iconically reflects motion in the real-world event (Davidson 2015; Emmorey & Herzig 2003; Schembri 2003; Schlenker 2021; Zucchi et al. 2011; among others). Building on this insight, I analyze the movement component in a classifier construction as the reflection of the path motion of a referent involved in the event. Such path motion reflects the real-world motion of the referent and can include forward, backward, upward, or downward movement (henceforth illustrated with the relevant arrows in the representations while glossed as FORWARD, BACKWARD, UPWARD, and DOWNWARD, respectively), depending on the event being depicted.[26]

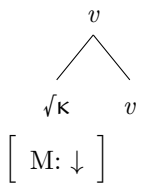
For instance, in the classifier construction expressing the event in (34-a), the downward motion of

[26] I assume that the path movement is the core of classifier constructions in the verbal domain. Any other possible movements in a construction result from further modifications, such as manner, which will be touched upon in the following sections.

the real-world event is used as the movement component of the classifier construction. I propose that the merge of √κ with v enables the use of the path motion information associated with the real-world event which is realized as the movement (and the location) of the classifier construction.[27] In the representations that follow, the location component is not explicitly represented in order to facilitate a clearer comparison between handshape and movement components. This simplification is motivated by the fact that movement and location both contribute to depictive event encoding, and movement itself encodes locational information through its starting and ending points in signing space.

(34) a. Taken from the elicitation materials used in Zwitserlood (2003)

b.



At this stage, this structure cannot be spelled out since it still lacks the handshape component. To complete the structure and make it eligible for spell-out, additional functional material must be introduced, such as the functional heads responsible for argument structure. Turning to argument structure, I adopt the view that arguments are introduced by functional heads rather than by the root itself, following Borer (2005), Ahn (2022) among others, and related work. Internal arguments are introduced by an F head, while external arguments are introduced by a Voice head, with arguments occupying the specifier positions of these heads. Although this approach shares similarities with the proposal of Benedicto & Brentari (2004), who posit argument-introducing heads specific to classifier constructions, the present analysis differs in treating these heads as part of a general mechanism for argument introduction across the grammar, rather than as classifier-specific devices.

This proposal departs from analyses in which roots in classifier constructions take internal arguments as their complements (Benedicto & Brentari 2004; Zwitserlood 2003; among others). I assume that arguments are severed from the root and introduced by distinct functional heads corresponding to

[27] This depictive component is illustrated with an arrow on √κ in the representations. It should not be understood as a lexical specification of √κ.

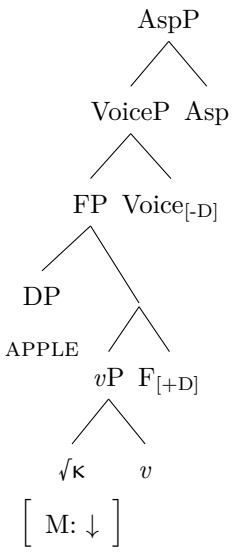
distinct semantic roles. Such a structure is more compatible with the underspecified nature of √κ and it allows for a transparent neo-Davidsonian semantics (Ahn 2016, 2022; among others). In the structures assumed here, an F head immediately dominating *v*P introduces the internal argument (theme), while the Voice head introduces the external argument (agent), each in its respective specifier position.

For representational purposes, I follow previous work in assuming that the Voice head is bivalent. $\text{Voice}_{[+D]}$ requires an argument in its specifier position, whereas $\text{Voice}_{[-D]}$ prohibits the presence of an argument in that position (Alexiadou et al. 2015; among others).[28] In other words, structures with $\text{Voice}_{[+D]}$ introduce an external argument, while structures with $\text{Voice}_{[-D]}$ lack an external argument.

I make a parallel assumption for the functional head F. The F head is likewise treated as bivalent: $\text{F}_{[+D]}$ requires an argument in its specifier position, whereas $\text{F}_{[-D]}$ prohibits the presence of an argument in that position. Accordingly, structures with $\text{F}_{[+D]}$ introduce an internal argument, while structures with $\text{F}_{[-D]}$ lack an internal argument. These feature specifications are adopted for representational clarity in the derivations and are not intended as a broader theoretical claim.

Since TİD, like several other sign languages, has been argued to lack grammatical tense (Karabüklü 2018; among others), only an Aspect head is assumed in the representations here. The structure of the classifier construction expressing the event in (34-a) is as follows:

(35)



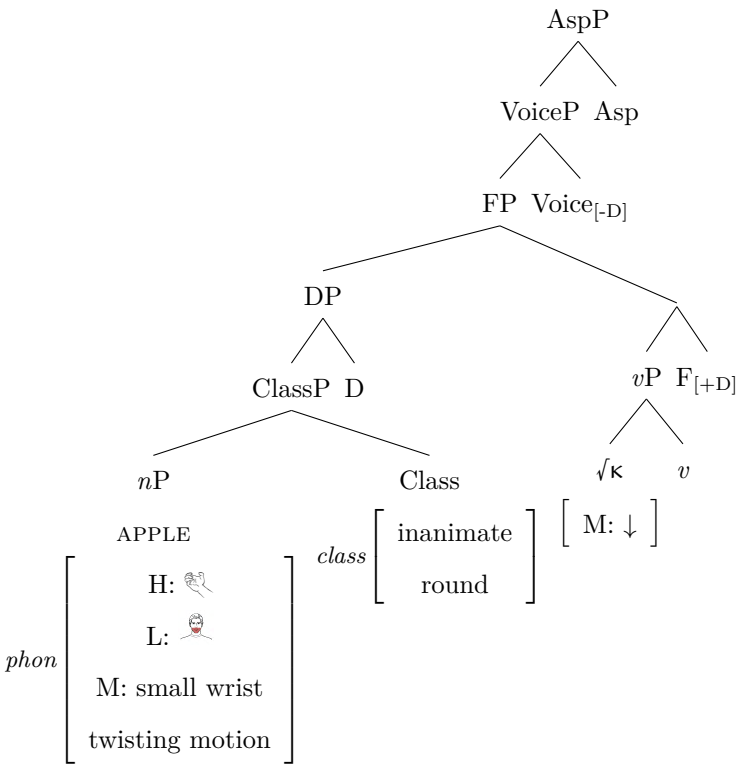
For this event, the single internal argument APPLE is introduced in the specifier position of the F head. At this stage of the derivation, the structure still lacks a phonological realization for the handshape

[28] Some studies have argued that the Voice head may be trivalent (Kastner 2016; Tan 2023; among others). I adopt a bivalent conception of Voice for reasons of analytical simplicity. This choice is guided by the fact that the data under consideration do not require a trivalent Voice head, rather than by any rejection of trivalent approaches more generally.

component. Following previous work on sign language classifiers, I assume that the relevant functional head agrees with the DP in its specifier position (Benedicto & Brentari 2004; Zwitserlood 2003), and that this specifier-head agreement relation mediates the realization of the handshape component in a classifier construction.

The argument introduced in the specifier position is a DP. When a lexical item is involved, the lexical root within this DP contributes phonological content (*phon*), as specified in the lexicon. In addition, I assume that the DP contains a Classification Phrase (ClassP), which hosts a distinct set of semantically and visually motivated classificatory features (*class*). As indicated before, these features are interpreted as properties of the referent and are independent of lexical phonological specification:

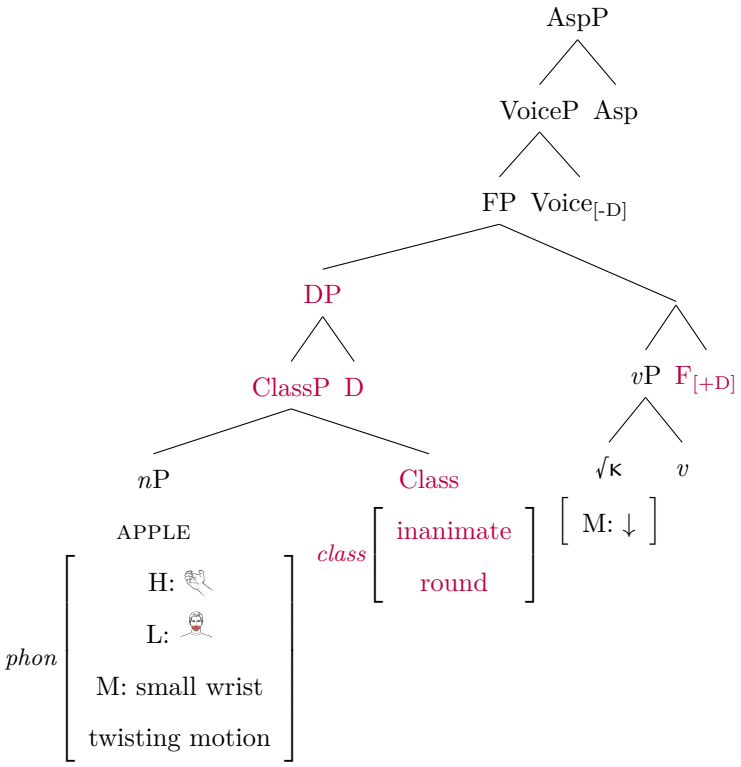
(36)



The phonological features are responsible for the spell-out of the lexical sign APPLE. The classificatory features, by contrast, determine the handshape component in classifier constructions in the environment of √K. I assume that the argument-introducing head F and the DP in its specifier position undergo specifier-head agreement. The class features introduced in ClassP form part of the DP's feature composition and are accessible to F in this configuration. In this way, a structural dependency is established between the nominal domain and the verbal spine, allowing classificatory features to be realized as the handshape component of a classifier construction.

The fact that classificatory features are introduced within ClassP, rather than on the highest nominal head, might raise the question of how they become visible to F. However, the accessibility of features introduced in lower nominal projections for higher syntactic dependencies has been independently discussed in the literature (see Danon 2011). Such features need not originate on the highest nominal head in order to participate in external agreement relations; rather, they may become available at the DP level through syntactic feature sharing or valuation. Under this view, the DP in Spec,FP can enter into an agreement relation with F, while the class features introduced in ClassP remain available for valuation within the specifier-head configuration, as indicated by the color coding in (37):

(37)



For concreteness, I assume these processes occur in the narrow syntax. There is one more step to derive a classifier construction. I propose that this is achieved through a post-syntactic head movement (Harizanov & Gribanova 2019), yielding a complex head in which the root √κ and the relevant functional material are bundled into a single unit.[29] This complex head includes the root, *v*, and the argument introducing functional heads. While this post-syntactic head movement has no semantic effect on the

[29] It is possible to argue that "words" are spans that include more than one terminal node. As Svenonius (2020) proposes, the spanning hypothesis is a valuable tool to eliminate additional operations in DM, such as fusion and head movement, among other operations. Within the scope of this paper, I do not investigate the (dis)advantages of each account, and I leave this discussion for further studies.

structure, it facilitates "the construction of complex morphological words" (Harizanov & Gribanova 2019). The result of this head movement yields the following structure:

(38) [[√ĸ v] F]

√ĸ is licensed to reflect the path motion of the event by v, the other necessary component, the handshape, is received through the semantically motivated classificatory features on the F head, [inanimate] and [round]. In this case, the Voice head does not participate in this process, since it is not valued due to the absence of an external argument. The result of this structure is a classifier construction with a Whole Entity Classifier (WECL), encoding the referent in its entirety and reflecting the downward movement of the falling event:

(39) [[√ĸ v] F]

DOWNWARD.WECL:

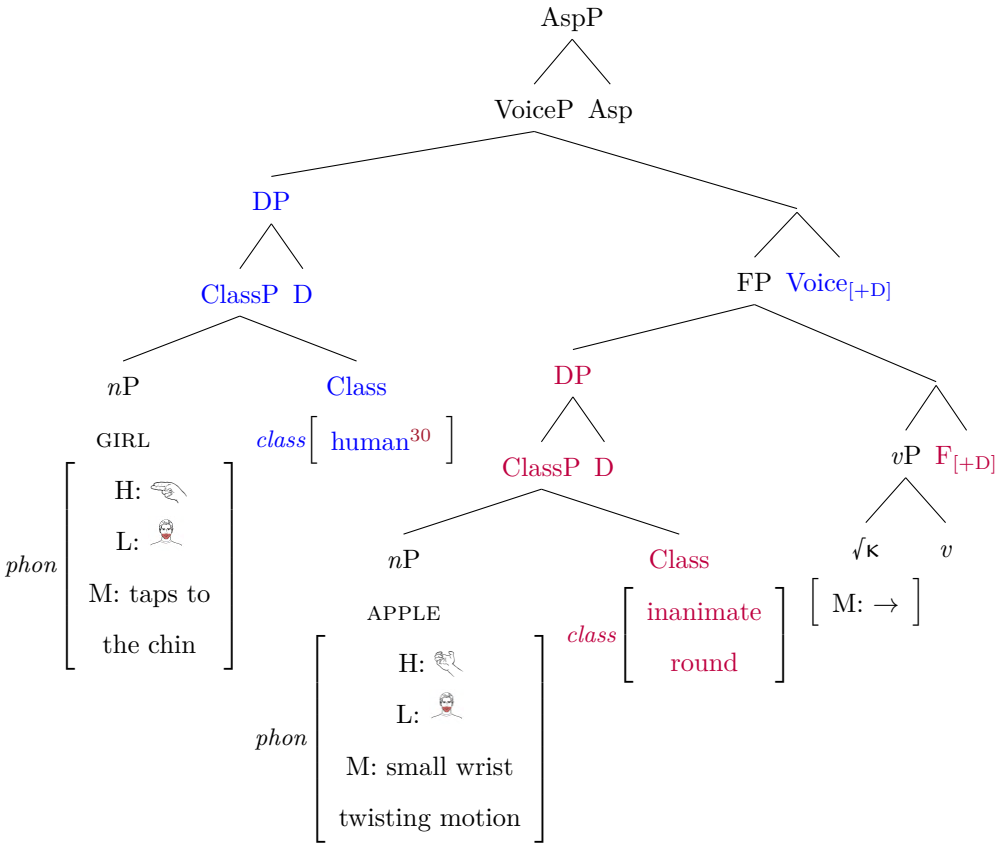
Analyzing classifier constructions under a head movement approach further provides a structural account for their multimorphemic nature and their compositionality. Similar complex head formation analyses have been proposed for the realization of agreement morphology in sign languages, including the distinction between agreeing verbs and plain verbs (Pfau et al. 2018).

The presence of any other handshapes in this specific structure, for instance 🤞, is not acceptable since the handshape features mismatch with the classificatory features of the referent, while this handshape would be licensed in a context where the falling object is a pencil rather than an apple.

Next, (40) shows the representation of a transitive clause with classifier construction under the current analysis. In this structure, the Voice head introduces the external argument:

(40) H1: GIRL APPLE FORWARD.HCL()

"The girl throws the apple."



The post-syntactic head movement results in the following complex formation:

(41) [[[√K *v*] F] Voice]

In B&B's analysis, the handling classifier (HCL) is a complex morpheme instantiating two functional heads. I argue that this complex form can be derived from independently motivated assumptions about morphological insertion. In classifier constructions, the dominant hand provides a single morphological locus for handshape realization. When both F and Voice contribute classificatory features, the morphology cannot realize them as separate exponents on this locus. To allow the features of F and Voice to be realized at a single locus, these heads must undergo post-syntactic fusion, a morphological operation that combines sister nodes into a single node bearing the features of both original heads (Halle & Marantz 1993; Bobaljik 2017; among others).[31] The resulting fused node constitutes a single

[30] In a recent series of works, Kimmelman & Khristoforova (2025) among others use the term "anthropomorphic referents" which covers humans, fictional human-like animals, and can be extended to entities with human-like properties, such robots. This term more accurately captures the relevant class. However, I retain [human] as a shorthand to avoid unnecessary terminological complexity here.

[31] Alternative approaches to portmanteau realization have been proposed in the literature. For instance, Radkevich (2010) discusses mechanisms such as the Spanning Vocabulary Principle and the Universal Contiguity Principle, and

insertion site and may be realized by a portmanteau exponent.[32]

The output of head movement in (41), however, does not provide the necessary basis for fusion since F and Voice are linearly adjacent but not sisters. Therefore, fusion cannot apply directly, given the restriction that fusion targets sister nodes. I assume the presence of an additional morphological merger that groups adjacent argument-introducing heads into a single but internally complex head:

(42) Morphological merger of argument-introducing heads:
[[√κ v] [F Voice]]

At this stage, merger collapses the functional heads into a single unit in which F and Voice form the local configuration required for fusion. As a next step, fusion creates one insertion site compatible with portmanteau morpheme. This fused node is realized as a handling classifier (HCL), which encodes how an object is manipulated by an agent simultaneously:

(43) Fusion of argument-introducing heads:
[[√κ v] [F/Voice]]
H1: FORWARD.HCL:

This section presents the derivation of verbal classifier constructions in TİD from a single root, √κ. I argue that the movement component is not lexically specified but it is a depiction of event-related path motion. Classifier handshapes are introduced through a specifier-head relation with the argument-introducing heads, and post-syntactic head movement derives the observed multimorphemic forms. I further argue that the dominant hand constitutes a single insertion site where only one exponent may be realized at that locus. Therefore, when both argument-introducing heads contribute classificatory features, fusion applies yielding a single structural node that can be realized by a single exponent.

develops her own Vocabulary Insertion Principle as an alternative to fusion within a DM framework. For the current analysis, fusion provides the appropriate formal mechanism for deriving portmanteau morphology since it directly captures the structural and featural conditions on exponence argued for in this chapter.

[32] See Bobaljik 1997 for a case where complementary distribution between tense and agreement morphology in Germanic languages is taken to reflect competition for insertion at a single node (Agr/T), necessitating fusion of these functional heads in the structure.

The next section presents general information on the use of the non-dominant hand sign languages and then turns to cases in which classifier realizations are distributed across both hands, yielding two-handed classifier constructions.

2.4.3 Two-handed classifier constructions

Before providing the analysis, this section presents key background information about the use of the non-dominant hand in sign languages.

The use of a second articulator is widely recognized as one of the key distinctions between signed and spoken languages (Lillo-Martin & Gajewski 2014; Loos et al. 2022; Kimmelman et al. 2016; Sáfár & Kimmelman 2015; among others). Previous studies show that the presence of a second articulator does not necessarily imply that the system treats the two hands as fully independent articulatory units (Sandler & Lillo-Martin 2006; p. 182). Rather, the non-dominant hand (H2) is typically considered weaker than the dominant hand (H1) and phonologically dependent on it (Brentari 1993; among others), such that H2 does not occur freely at all linguistic levels. As a consequence, two-handed lexical signs are subject to phonological constraints.

Battison (1978) proposes two phonological constraints on the occurrence of the non-dominant hand in lexical signs (pp. 33-35).[33] The symmetry condition states that if both hands move in a sign, they must share the same handshape, location, and movement. The dominance condition states that if the hands have different handshapes, only H1 may move, while H2 must remain stationary.

The use of the non-dominant hand is not restricted to lexical signs; it serves a range of functions across different linguistic domains in sign languages. In addition to the phonetic and phonological functions (Nespor & Sandler 1999), the non-dominant hand has been shown to have morphological and syntactic functions (Branchini 2020; Engberg-Pedersen 1994; Gu 2023), as well as discourse-level functions (Liddell 2003).

A key question is if the phonological constraints also apply to classifier constructions. Zwitserlood (2003) argues that such constraints do not extend to these constructions since each hand has an independent structure. Hence, H1 and H2 can move without any constraints, as illustrated in (44):

(44) ASL (Aronoff et al. 2005; p. 312)

[33]These word-level analyses typically focus on the phonological features of a single lexical sign.

"A person proceeds forward, dragging a dog behind."

However, this does not mean that there are no constraints on classifier constructions (see Eccarius & Brentari 2007 for the phonological constraints on the two-handed classifier constructions). I argue that the TİD data indicate the presence of structural constraints on the realization and distribution of classifier types across the dominant and non-dominant hands in classifier constructions in transitive clauses. In such contexts, the dominant hand typically realizes a BPCL representing the subject (agent), while the non-dominant hand realizes a WECL representing the object (theme) as in (47):[34]

(45) TİD

H1:	CHILD	BOOK	FORWARD.BPCL()
H2:		BOOK	CL:WECL()

"The child kicks the book."

This pattern aligns with Branchini's (2020) analysis of relative clauses in Italian Sign Language (LIS), where the syntactic roles of the arguments determine on which hand they will occur. In other words, subjects are signed with the dominant hand, while objects are signed with the non-dominant hand.[35]

[34] Two-handed classifiers raise the question of whether they constitute a single clause or multiple clauses, and whether they encode a single event or multiple events. As Kimmelman et al. (2020) note, these questions are not straightforward to address since diagnostics commonly used in spoken languages, such as movement tests or negation tests, do not create clear results in sign language classifiers (p. 570). In addition, it is important to note that the present case differs from the data discussed by Kimmelman et al. (2020) where single-handed classifier constructions are argued to be mono-clausal including a complex event structure.

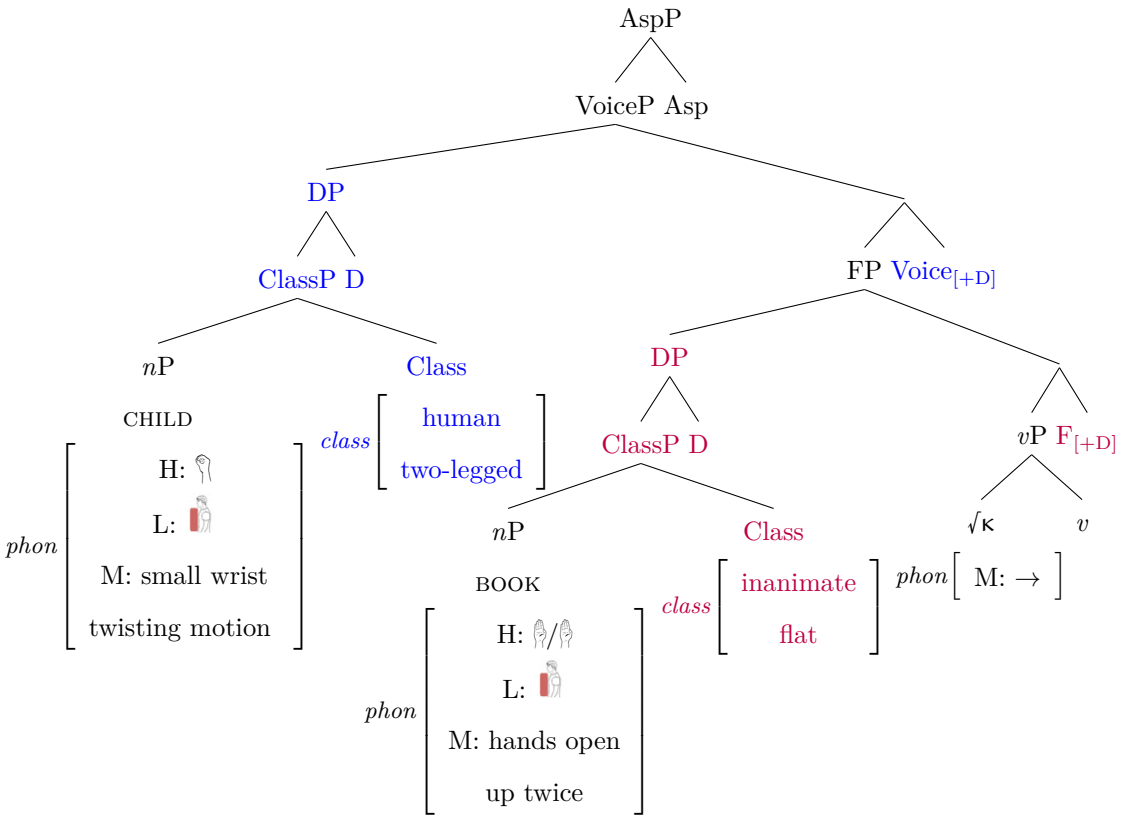
[35] Branchini (2020) argues that hand selection is determined by the syntactic roles of the arguments, irrespective of their thematic roles. However, it is important to note that Branchini (2020) investigates complex transitive structures including internally headed object relative clauses (see Branchini 2015 for an analysis of relative clauses). The analysis focuses on the thematic roles of the arguments within these relative clauses, which still function as the object of the main clause and have a theme role.

The co-occurrence of classifier types in TİD transitive structures, where each hand refers to a distinct argument of the clause, is not random but systematic: Pairs such as BPCL-BPCL, WECL-WECL, HCL-BPCL, or HCL-WECL are not observed in these constructions in general.[36] For instance, TİD signers do not accept sentences containing the pairs as exemplified in (46):

(46) *H1: CHILD BOOK FORWARD.BPCL(🤏)
H2: BOOK CL:HCL(🤏)

This pattern is consistent with the close relationship between the classifier type and the argument structure as proposed by Benedicto & Brentari (2004). However, it presents a difference at the surface level where some transitive clauses in TİD can be realized with two separate morphemes on two hands, instead of a complex morpheme, an HCL, as illustrated in (47) above. For these cases, the syntactic structure is identical to the ones with HCL presented in the previous section:

(47) H1: CHILD BOOK FORWARD.BPCL(🤏)
H2: BOOK CL:WECL(🤏)
"The child kicks the book."



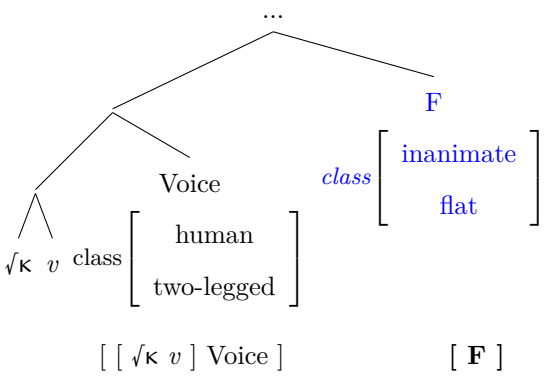
[36] It is worth emphasizing that the analysis proposed here is restricted to transitive constructions in which the hands express features of the subject and object within a single clause. Other arguments, such as instrumentals or locatives, as well as multi-clausal structures, fall outside the scope of this chapter.

Moreover, similar to transitive classifier constructions realized with an HCL, a post-syntactic head movement applies to the structure to form a verb complex following the syntactic operations:

(48) [[[√ʞ *v*] F] Voice]

I assume this step is followed by the morphological merger in this structure. The crucial difference between the transitive structures with an HCL and the current one is that fusion cannot apply in (47). Therefore, the F head and its features which are related to the object argument get dislocated to a separate node:

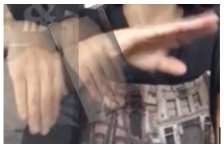
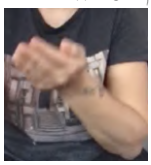
(49) Dislocation of features



The result of this process is a BPCL on the dominant hand and a WECL on the non-dominant hand:

(50) [[√ʞ *v*] Voice] [**F**]

H1: FORWARD.BPCL: H2: WECL:

A remaining question concerns what prevents fusion in certain transitive classifier constructions, yielding two-handed realizations in TİD. Since the verbal root √ʞ is radically underspecified and does not encode event-specific information, the difference cannot be attributed to lexical properties of individual verbs. Rather, the distinction follows from the constraints on the exponents, which are somehow related to the argument structure and the classificatory features of the referents.

I take the dominant hand to constitute a single morphological insertion site at which only one

exponent may be realized. When F and Voice introduce distinct classifier features, fusion yields a single structural node following the morphological merger, and it creates an insertion site for an exponent that carries the combined feature bundle of the two heads. This fused node is realized if an exponent is available whose specification matches the combined feature bundle of F and Voice. In handling classifier constructions, the language contains such a portmanteau exponent, specified for the relevant external and internal classifier features where the agency of the external argument and the manipulation of the internal argument are encoded within a single handshape especially in the cases where an external argument with [human] feature and an event configuration with unified realization, particularly grasp-like configurations.

However, when no portmanteau exponent matches the fused feature bundle, realization at a single insertion site does not take place.[37] Such cases typically include events like kicking, biting, and licking. The grammar resolves this by distributing the distinct feature bundles across separate articulatory loci. The resulting two-handed construction reflects the interaction between the classifier feature specifications and the inventory of available exponents, rather than verb-specific lexical properties or any non-linguistic depictive pressures.

Hence, this analysis accounts for the presence of the non-dominant hand (H2) in two-handed constructions. The argument-introducing heads are realized as a single morphological unit due to the fusion process, yielding a handling classifier (HCL) as proposed by Benedicto & Brentari (2004). When the relevant features cannot be encoded within a single exponent, the grammar resolves the incompatibility by distributing the feature bundles across distinct articulatory loci. Rather than leaving a set of features unrealized, the system externalizes this feature bundle onto an additional insertion site, namely the non-dominant hand.

In two-handed classifier constructions, internal argument-related classificatory features are systematically realized on the non-dominant hand (H2), while external argument-related features are realized on the dominant hand (H1) as part of a complex form together with $\sqrt{\kappa}$ and v. Following Branchini (2020), I argue that TİD permits internal argument-related features to be realized on the non-dominant hand under dislocation. The consistent alignment of external argument-related features with H1 and internal argument-related features with H2 suggests that this asymmetry is structurally

[37] This raises a broader question concerning the distribution of exponents within a sign language. While the present analysis motivates the relevant post-syntactic operations through constraints on Vocabulary Insertion, the deeper principles governing exponent distribution remain to be fully understood. One possibility is that the range of possible exponents is not arbitrary and reflects deeper principles on feature compatibility. Certain external and internal argument features may be structurally well-suited to unified realization. Handling configurations, in particular, involve feature bundles that naturally co-occur and thus permit realization by a single exponent. A full exploration of these issues is beyond the scope of the present study. These issues merit further investigation, particularly through systematic cross-linguistic comparison to determine which feature combinations are consistently attested and which are excluded.

grounded rather than purely articulatory.

This pattern resonates with broader typological observations concerning subject-object asymmetries in verbal morphology. Cross-linguistically, subject agreement on the verb is more common than object agreement, and the presence of object agreement typically presupposes the availability of subject agreement (Moravcsik 1974; Gilligan 1987; Bobaljik 2008; among others). Moreover, objects are frequently encoded through clitic-like elements rather than full agreement morphology (Siewierska & Bakker 1996), as illustrated in Italian:

(51) Italian

la ved-o
3SG.FEM.ACC see-1SG.PRES
"I see her/it."

The derivational facts in TİD suggest a comparable structural hierarchy. The movement component of the classifier construction co-occurs with the handshape associated with the features of the external argument, while the features of the internal argument may be externalized onto a distinct articulatory locus. This does not imply that object-related features are absent; rather, it suggests that subject-related features are more tightly integrated with the verbal spine, while object-related features may be realized in a structurally more peripheral position.

Moreover, as indicated before, LIS shows a similar distinction in which the dominant hand correlates with subject-related agreement and the non-dominant hand with object-related marking (Branchini 2020). If cautiously extended to TİD, this might suggest that the dominant hand functions as the primary agreement locus, whereas the non-dominant hand serves as a secondary realization site. On this view, the H1/ H2 asymmetry reflects an underlying structural asymmetry between subject- and object-related features.

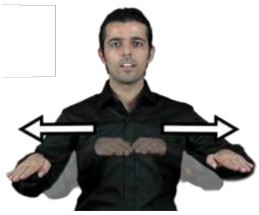
In other words, the result of fusion is realized on the dominant hand. When fusion of both argument-related feature bundles does not take place, this primary locus, the dominant hand, is available for the subject-related features that are introduced higher in the structure. In such cases, the object-related features surface via dislocation, resulting in clitic-like realization on the non-dominant hand. The handedness asymmetry in TİD thus is consistent with general cross-linguistic patterns of subject prominence, while remaining derivable from independently motivated morphological operations.

Having established the structural organization of classifier constructions in verbal domain, I now turn to their nominal counterparts.

2.4.4 Classifiers in the nominal domain

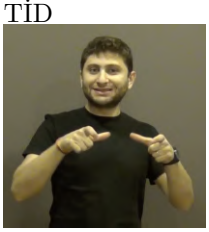
As discussed earlier, classifier constructions in sign languages are not restricted to verbal environments but also occur in the nominal domain (Bergman & Wallin 2003; Koenders 2024; among others). The goal of this section is to demonstrate how the same morphosyntactic architecture developed for verbal classifier constructions can also derive nominal classifier constructions in TİD, while accounting for their distinct interpretive and formal properties. In this section, I focus on nominal forms whose form involves an iconic mapping to the shape or spatial properties of the referent, as illustrated in (52):

(52) a. TİD (Dikyuva et al. 2017; p. 154)



"TABLE"

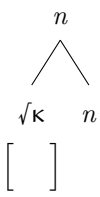
b. TİD



"PLATE"

These lexical signs iconically reflect salient physical properties of their referents. More importantly, these signs can further encode how their referents extend in the signing space through the movement component, indicating its size (Dikyuva et al. 2017; p. 157). The extent of the movement provides depictive meaning about the physical properties of the referent. To capture the presence of depictive content in nominal contexts, I propose that nominal classifier constructions arise when $\sqrt{\kappa}$ merges with a nominalizing head. This derivation mirrors the verbal case, with the crucial difference that the root combines with n rather than v, yielding a structurally parallel yet categorically distinct configuration:

(53)



The following example illustrates a nominal classifier construction in TİD:

(54) TİD

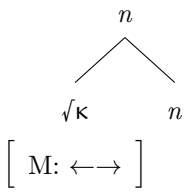
H1:	CHICKEN	CL:	BABY	EXIST	IX
H2:	CHICKEN	CL:	- -		

"There are babies in the chicken nest."

In (54), the signer uses a classifier construction in the third frame, reflecting the shape of the referred argument, a nest.

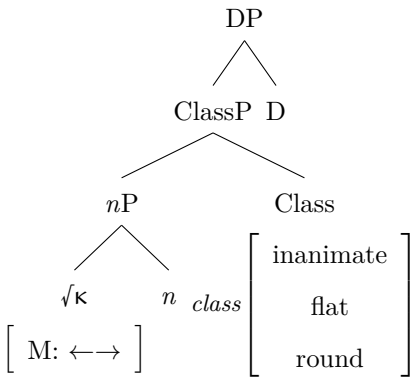
As in the verbal domain, √ĸ does not contribute lexical meaning or phonological content. Instead, it introduces a requirement for depictive realization. As with the classifier constructions in the verbal domain, the category-defining head determines the type of depictive realization that is licensed. When √ĸ merges with n, an entity is introduced instead of an event. As a result, these constructions do not involve a depictive movement associated with an event. Rather, the movement component depicts the spatial contour or surface configuration of the referent:

(55)



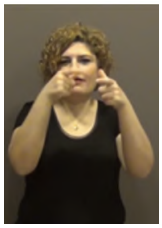
The movement in (55) encodes the spatial extension of the referent in the real world, with the two hands moving in opposite directions to iconically represent its extent. At this point in the derivation, the structure lacks the handshape component. As argued in the previous sections, I assume the presence of a functional projection, ClassP, which introduces semantically motivated classificatory features. These features are responsible for determining the handshape component of the classifier construction:

(56) Classifier construction in nominal domain in TİD



Head movement applies to form a morphologically complex word, yielding the surface sign:

(57) NEST



These classificatory features impose semantic restrictions on the DP in the nominal domain. Rather than identifying a specific lexical referent, they encode general shape or property based predicates, such as [flat] or [round], which constrain the range of possible interpretations. As a result, a single nominal classifier construction may denote any entity instantiating the relevant property, including PLATE, CD, or other flat circular objects. The construction yields a semantically underspecified nominal expression, whose precise reference is resolved through contextual and discourse factors.

In sum, classifier constructions in the nominal domain are derived through the same core architecture as classifiers in the verbal domain. However, they differ only in the category-defining head with which √ĸ merges. In both constructions, the handshape is determined by the classificatory features of the referent and the structural properties of the clause, while reflecting the depictive properties encoded in their movement component.

One way or another?

Having provided the derivations in both the verbal and nominal domains, I now turn to a possible alternative way of understanding the dependency between classifier handshapes and the referential properties of the DPs with which they are associated. This clarification is important because the analysis above has used the language of agreement, but the central claim of the proposal does not depend on a strict syntactic agreement implementation.

Throughout the analysis, I have described this dependency in terms of agreement, specifically a specifier-head agreement, following Benedicto & Brentari (2004). On this implementation, the relevant functional head enters into an agreement relation with the DP in its specifier position, and the classificatory features within that DP are copied to, shared with, or otherwise made available to the functional head. This relationship mediates the realization of the classifier handshape. Crucially, the features involved in this dependency are not treated here as fixed lexical features of the noun; they are referential/classificatory features associated with the referent. The agreement terminology is intended to capture the fact that classifier handshapes are not freely selected, but are constrained by grammatically accessible properties of the referent and by the argument-structural configuration in which that referent occurs.

At the same time, the data considered here do not provide independent evidence that this dependency must be implemented as syntactic agreement in a narrow sense. An alternative implementation would treat classifier handshapes as imposing presuppositional restrictions on the referential properties of the referent with which they are associated. On such an analysis, a classifier handshape is licensed only if the relevant referent satisfies the semantic or classificatory conditions introduced by that handshape (see, among others, Davidson 2015; Zucchi 2012).

A related way of thinking about such dependencies comes from approaches in which agreement morphology is sensitive not only to formal syntactic features, but also to semantic or index features. For instance, in the HPSG framework, Pollard & Sag (1994) distinguish between features of syntactic categories and features associated with referential indices. These indices are abstract discourse objects used to track the entities under discussion, and certain grammatical dependencies may be sensitive to properties associated with those indices rather than to purely syntactic features.

The current data can be captured by either implementation. For the purposes of the present analysis, the crucial point is that classifier realization is grammatically constrained, sensitive to argument structure, and built on an underspecified root. The data considered here do not provide independent evidence for choosing between syntactic agreement and a presuppositional/index-based

restriction. For this reason, I leave the choice between these implementations open.

2.4.5 Interim summary

I have argued that classifier constructions in Turkish Sign Language (TİD) are derived from the interaction of a single underspecified root, argument-introducing functional structure, and semantically motivated classificatory features that are realized as handshapes post-syntactically. The depictive content, which is characteristics of classifier constructions, can be morphosyntactically represented by √κ. Moreover, this depictive component is constrained by the category-assigning heads while they account for the distribution of classifiers across verbal and nominal domains.

The idea that grammar may license depictive elements is not unprecedented. Jackendoff (1984) argues that grammar can license elements that do not have a lexical description, motivating the inclusion of structurally licensed but semantically non-lexical material within syntactic representations.[38] Furthermore, he argues that such constructions should not be excluded from linguistic analyses since languages allow some elements to be inserted into a structure while they do not have a phonological content. He particularly investigates N-E constructions, such as "the sound *****" (for instance, blowing a raspberry), "the pattern *da-dum da-dum da-dum*" (p. 26), where the phrases "the sound" and "the pattern" constitute the N part while the rest of the phrase, "*****" and "*da-dum da-dum da-dum*", is labeled as E of this construction.[39] In these constructions, the noun (N) provides a category and contextual constraints that determine the interpretation of the illustrative element (E), which contributes depictive content rather than descriptive lexical meaning.

The underspecified root √κ shares certain properties with E in Jackendoff's (1972) analysis. However, it is important to note that in sign language classifiers, this underspecified root is not free to depict anything. They are licensed and constrained by the syntactic structure.

I further extended the analysis, focusing on the role of the non-dominant hand in transitive clauses. By incorporating processes such as fusion and dislocation, I provided a structural explanation for the presence of the non-dominant hand in these constructions. I propose that the presence of a non-dominant hand in transitive clauses in TİD is due to constraints on exponence that results in

[38] From a different perspective, Clark (1996) argues that language use involves multiple methods of communication, including both description and demonstration, treating demonstrations as contextually grounded communicative acts that complement symbolic language rather than being conventional lexical items (see Davidson 2015, in press b for formal implementations of depiction as demonstration). By contrast, Jackendoff (1984) proposes that grammar can license illustrative or non-lexical material within syntactic structure, effectively integrating such content into the formal system. The present proposal aligns more closely with Jackendoff's (1984) perspective in locating depictive licensing within morphosyntactic structure, while remaining compatible with Clark's (1996) broader distinction between description and depiction.

[39] I would like to thank Jonathan Bobaljik for bringing this work to my attention.

the dislocation of theme features onto a distinct node, allowing for their realization on a separate articulator. Offering a structural motivation for the use of the non-dominant hand is crucial for understanding its function within the broader grammatical system of sign languages.

Of course, classifier constructions in sign languages form a complex phenomenon, and classifier choice is influenced by a range of factors that have not been addressed in detail here. For instance, Perniss & Özyürek (2008) distinguish between character perspective and observer perspective in signing, and argue that perspective can influence classifier selection. Under character perspective, the event space is projected onto signing space from the vantage point of a participant within the event, therefore, there is a tendency toward the realization of an HCL. Under observer perspective, by contrast, the event space is projected from an external vantage point, the signer is not part of the depicted event, therefore, the tendency is the realization of a WECL. More recently, Gökgöz (2024) suggests that perspective may affect classifier choice in sign languages, potentially accounting for cross-linguistic patterns that have been described as non-canonical in the literature.

In addition, classifier constructions, particularly the handshape choice, have been shown to be sensitive to factors such as discourse status of the referent, the presence or absence of manner of motion, and whether the action is controlled or uncontrolled by the moving referent (Kimmelman & Khristoforova 2025; Engberg-Pedersen et al. 2025; Zorzi et al. 2025; among others). The present analysis does not aim to account for the full range of these interactions. Rather, it provides a general architectural sketch of how classifier constructions are licensed and structurally integrated while including a depictive content, which can be refined and extended in future work to incorporate these additional dimensions.

As a next step, the chapter turns to an additional dimension of event representation, namely manner, and examines how manner information is expressed in TİD and how it interacts with the depictive characteristic of classifier constructions.

2.5 Manner in the movement

The preceding sections examined the structural representation of events in Turkish Sign Language (TİD), with particular attention to classifier constructions. I now turn to a dimension of event representation that is central to the broader claims of this dissertation: manner. Specifically, I investigate how manner information is represented in classifier constructions. The crucial distinction for this section is between path, which contributes to the core trajectory of the event, and manner, which specifies how that event

unfolds internally. As will become clear, this distinction is crucial for understanding how different components of event structure interact with compositional operators such as negation.

While manner adverbials have been extensively studied in spoken languages, their grammatical realization in sign languages has received comparatively limited systematic treatment. Existing work primarily consists of language-specific studies (Fischer & Gough 1978; Harmon 2015, 2017; Moncrief 2021; among others) and descriptive overviews in reference grammars (Branchini & Mantovan 2020; Dikyuva et al. 2017; Kelepir 2020; among others). The goal of this section is not to propose a new formal analysis of manner, but rather to establish a set of empirical generalizations that will be central to the chapters that follow.

Sign languages can express manner information through manual lexical signs, in a way broadly comparable to manner adverbs in spoken languages. An example from TİD is given in (58), where the lexical adverbs SLOW and FAST occur as independent manual signs modifying the verb WRITE.

(58) TİD (Kelepir 2020; p. 125)
COMPETITION EXAM IX TAKE WRITE SLOW ALL FAST WRITE FINISH GO IX ALONE LEAVE
"I took an exam. While I was writing slowly, everybody wrote quickly and went. I was left alone."

In such cases, manner information is realized via a discrete lexical sign. However, manner in sign languages is not restricted to independent adverbial elements. In contrast to English, where manner is typically expressed through separate adverbs (e.g. *slowly*, *carefully*), sign languages frequently encode manner by modifying internal properties of the predicate itself, most notably the movement component (Fischer & Gough 1978; Harmon 2015; Mohr 2014; among others). These modifications may involve changes in movement speed, intensity, rhythm, or trajectory, and they are often accompanied by non-manual markers. Facial expressions, head and torso movements, and mouth gestures can all contribute adverbial meaning, particularly in conveying affect, effort, or degree (Fischer & Gough 1978; among others).[40] This complexity may help explain why manner adverbials in sign languages have remained relatively understudied.

The relationship between manner information and the movement component makes classifier

[40] Adverbs in sign languages may be realized either as independent manual signs or as non-manual markers that occur simultaneously with the manual component. Mouth gestures, in particular, have been argued to function as manner or degree adverbs across a range of sign languages (Sutton-Spence & Woll 1999; Mohr 2014). These gestures typically co-occur with the manual sign and are often analyzed as bound morphemes rather than independent adverbial elements. This section does not address the adverbial information expressed through facial articulators.

constructions a particularly informative domain for investigation. As established in earlier sections, classifier handshapes form a conventionalized inventory associated with categories of referents, whereas movement and location components exhibit more depictive properties. Moreover, as noted by Hill et al. (2019; p. 50), the movement component of classifier constructions can encode manner information. Therefore, the movement component in classifier constructions is not uniform but includes the path and manner information (Stokoe 1960; Supalla 1986; among others). Path movement encodes the core trajectory of an event, and manner movement modifies how that trajectory unfolds. In other words, path contributes to the event's structural skeleton, whereas manner contributes to the event-internal modification. For the purposes of the present investigation, I treat these two as formally and interpretively distinct, even when both are realized through modulation of the movement component.

These distinctions are attested in classifier constructions in TİD as well. A basic classifier construction encoding an event of falling is illustrated in (59), where downward movement expresses path information:

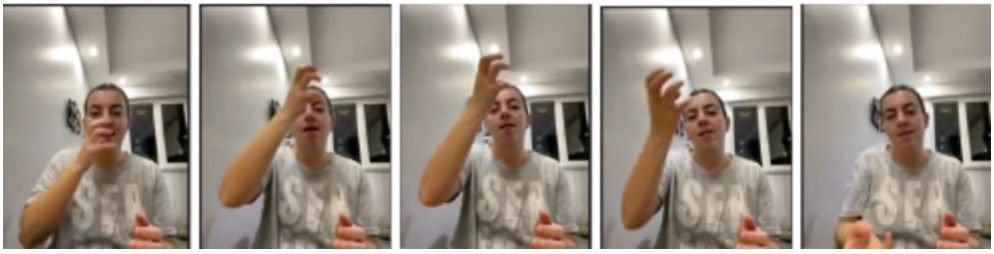
(59) H1: APPLE DOWNWARD.WECL(🤏)
"The apple falls."

At the same time, manner can be expressed through a separate lexical sign, as in (60).

(60) H1: APPLE SLOW DOWNWARD.WECL(🤏)
"The apple falls slowly."

Moreover, manner information may be introduced without altering the core direction of motion, for example through changes in speed or the addition of rotational movement, yielding interpretations such as *fall slowly* as in (61) or as *fall in a spiraling manner* as in (62):

(61) TİD



H1: APPLE [DOWNWARD__*slow*.WECL(🤏)]
"The apple falls slowly."

(62) TİD

H1: LEAF [DOWNWARD__*circular*.WECL(🤔)]

H2: LEAF

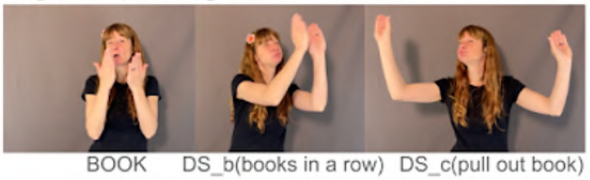
"The leaf falls in a spiraling manner."

The manner component, encoded through a modification of the movement, is indicated here by the notation "__*slow*" and "__*circular*". These examples do not contain an overt adverb expressing this meaning; rather, the interpretation arises from the movement properties themselves.

The distinction between path and manner movement becomes particularly salient in the context of negation. Previous work has argued that expressive or depictive elements tend to be incompatible with certain logical operators, such as negation (Kita 1997; Dingemanse 2017; among others). Building on this line of research, Davidson (2023) argues that classifier constructions, an instance of depictive structures, exhibit such incompatibilities:

(63) ASL (Davidson 2023; p. 54)

a. **Depiction, no negation**



'Of all the books in a row, it was difficult to pull one down'

b. **Depiction, with negation** (not acceptable)
*BOOK DS__c(books lined up), NOT DS__c(pull down w/difficulty)
'Of all the books in a row, it wasn't difficult to pull one down'

Davidson (2023) proposes that only the propositional content can be straightforwardly negated, since

depictions inherently rely on the evocation of a particular image or experience and resist generalization over alternatives.

Davidson (2023) further argues that a lexical sign modifier, HARD, is compatible with negation:

(64) ASL (Davidson 2023; p. 55)

'Of all the books in a row, it wasn't difficult to pull one down'

However, data from Turkish Sign Language suggest that the relevant factor is not classifier constructions per se, but the presence of manner information. Simple classifier constructions without manner modification are fully acceptable under negation in TİD:

(65) H1: APPLE DOWNWARD.WECL(🤏)-NOT
"The apple did not fall."

Nonetheless, when manner is present in the structure, the acceptability of the sentence significantly degrades as indicated by Davidson (2023).

(66) #H1: APPLE DOWNWARD__*slow*.WECL(🤏)-NOT
Intended meaning: "The apple did not fall slowly."

(67) #H1: LEAF DOWNWARD__*spiralling*.WECL(🤌)-NOT
Intended meaning: "The leaf did not fall in a spiraling motion."

However, a similar effect is still observed even if the manner is introduced through a lexical sign:

(68) #H1: APPLE SLOW DOWNWARD.WECL(🤏)-NOT
Intended meaning: "The apple did not fall slowly."

Crucially, these effects are observed both with classifier constructions and with lexical signs, suggesting that it is manner, rather than the depictive properties of classifier constructions, that drives the observed patterns. This raises the question of whether manner constitutes the common element underlying a range of phenomena often attributed to classifier constructions. In other words, apparent unacceptability under negation may reflect general constraints on the interaction between manner and propositional operators, rather than a property specific to classifier constructions.

These observations motivate the broader empirical investigation pursued in the remainder of this dissertation. If the restriction is truly tied to manner rather than depiction, comparable asymmetries should emerge across modalities and encoding strategies. In the following chapters, I examine manner across modalities and grammatical domains, including co-speech gestures in English and manner adverbs in Turkish, to test the hypothesis that manner occupies a distinct position in the grammar, and that its restricted interaction with propositional operators follows from general constraints on compositional architecture.

2.6 Conclusion

This chapter proposes a morphosyntactic analysis of classifier constructions in Turkish Sign Language (TİD), grounded in detailed empirical investigation. Drawing on elicited data from verbal and nominal environments, as well as systematic evidence from two-handed transitive constructions, the analysis addressed several phenomena that have remained underexplored in the literature.

This chapter demonstrated that the depictive properties of classifier constructions can be integrated into grammatical architecture while preserving compositionality, addressing the tension between the iconic and grammatical properties of these constructions. I proposed that classifier constructions in TİD are built on a single underspecified root, $\sqrt{\kappa}$, which lacks inherent phonological and syntactic specifications. Classifier constructions occur through the interaction of this root with category-assigning heads (v, n), argument-introducing heads, and semantically motivated classificatory features. This architecture captures the distribution of classifier constructions across both verbal and nominal domains without deriving one from the other, and it explains why such constructions surface precisely in environments where the root remains structurally underspecified.

A central empirical focus of the chapter was the role of the non-dominant hand in transitive classifier constructions. Building on and refining earlier analyses such as Benedicto & Brentari (2004) and Zwitserlood (2003), the chapter proposed a morphosyntactic framework that systematically accounts

for the grammatical status of two-handed classifier constructions in TİD. The data demonstrated that such constructions are not optional articulatory additions, but structurally motivated realizations in which distinct arguments of a single predication are encoded simultaneously on separate articulators, rather than being reducible to performance factors or general modality-specific effects.

More broadly, the analysis offers an account of how depiction is constrained by grammatical structure. Rather than treating depictive properties in classifier constructions as extralinguistic, the proposal locates their source in the interaction between the root $\sqrt{\kappa}$ and syntactic structure. Movement and location are not lexically encoded in $\sqrt{\kappa}$; instead, their interpretive contribution depends on the category-assigning heads with which the root combines. Verbal heads license event-related path movement, whereas nominal heads license non-eventive movement that reflects configurational properties of referents. This division of labor makes it possible to decompose classifier constructions into smaller grammatical units and to explain how they systematically encode both event structure and referent properties while remaining fully compositional.

Although the chapter focused on the structural properties of classifier constructions in TİD, the analysis also converged on a broader theoretical insight and revealed a distinction between path and manner in event representation. In classifier constructions, path movement contributes the core event meaning, while manner modifies how that event unfolds. The interaction of classifier constructions with negation revealed that restrictions often attributed to depictive properties of classifier constructions are more accurately characterized as constraints on manner. Both classifier constructions and lexical predicates exhibit degraded acceptability under negation when manner information is present, suggesting that it is manner, not depiction per se, that interacts in a restricted way with propositional operators. This observation shifts the focus from classifier constructions as a special category to manner as a structurally significant component of event representation.

The findings of this chapter open several avenues for future research. The systematic use of two-handed classifier constructions in TİD raises the question of whether similar patterns are attested in other sign languages with rich classifier systems. Cross-linguistic comparison is needed to determine whether the systematic use of two-handed classifier constructions in TİD reflects modality-driven pressures or language-specific grammatical choices. In addition, the precise morphosyntactic status of the non-dominant hand warrants further investigation, particularly in light of its apparent parallels with clitic-like realizations and agreement morphology. Addressing these issues will refine our understanding of two-handed classifier constructions in general.

An analysis that locates depiction and iconic mapping within morphosyntactic structure may have

broader cross-modal relevance. For example, Akinbo & Bulkaam (2024) argue that deictic contrasts in Tal, a West Chadic language, are reflected in grammatically conditioned tonal alternations in nominal constructions. In this language, when non-proximal deixis modifies a noun, the tones of the modified noun are lowered, whereas proximal deixis triggers final tone raising.[41] Although the empirical domain is different, such cases point to the same broader conclusion: motivated form-meaning mappings need not be peripheral to grammar, but can be integrated into core morphophonological and morphosyntactic systems. From this perspective, classifier constructions in sign languages and deictic tonal patterns in spoken languages may instantiate a more general grammatical strategy, whereby underspecified roots, morphemes, or prosodic exponents are interpreted through grammatically constrained iconic mappings. This possibility opens a promising direction for future cross-modal research on iconicity, morphology, and grammatical structure.

In sum, this chapter contributes to the study of classifier constructions by grounding depictive meaning in an underspecified root and deriving their properties through independently motivated grammatical mechanisms. By integrating depiction into compositional morphosyntax and identifying manner as a structurally constrained element of event representation, the analysis lays the theoretical foundation for the remainder of the dissertation.

The chapters that follow build on these results to examine manner across modalities and grammatical systems. If the restriction observed in TİD is indeed tied to manner rather than to classifier constructions themselves, comparable asymmetries should surface in other domains that encode manner differently. Chapter 3 tests this prediction in written English and co-speech gesture.

[41] I am grateful to Kathryn Franich for sharing this work with me.

Chapter 3

Moving Forward: Linguistic and Gestural Encoding of Path and Manner Information

Language serves not only as a medium of communication but also as a primary tool for structuring and conveying abstract ideas, emotions, and experiences. We also use language to describe and share the events we encounter in our daily lives. Although many events may be conceptually similar across individuals and cultures (see Papafragou et al. 2002), their linguistic encoding varies substantially across languages. A well-established body of research has shown that languages differ in how they represent event components, particularly with respect to the encoding of path and manner information (Talmy 1985, 2000), making path and manner especially relevant for the present study. In addition, extensive work on co-speech gestures demonstrates that linguistic and gestural modalities are tightly coordinated in the representation of event structure (Kita & Özyürek 2003; McNeill 2005; Ünal et al. 2024; Willems & Hagoort 2007; among others).

Despite this close relationship between language and gesture, particularly in expressing events, recent research suggests that the two modalities may diverge in other grammatical domains. For instance, several studies indicate that gestures and linguistic expressions do not behave uniformly under negation (Davidson 2023; Ebert & Ebert 2014; Tieu et al. 2017; among others). This divergence raises the question of whether differences between language and gesture under negation are driven solely by modality-specific constraints, or whether they also reflect deeper differences in how event

components, such as path and manner, are represented and integrated across modalities.

To address these questions, the present chapter investigates how negation interacts with the encoding of event components in both linguistic and gestural systems. Focusing on two event components, path and manner, it examines how each contributes to meaning in affirmative and negative contexts and whether negation interacts with these components differently across modalities. While previous work has documented cross-linguistic variation in event encoding and differences between speech and gesture under negation, these lines of research have not been brought together to directly test whether event components themselves condition sensitivity to negation. By comparing written linguistic modifiers with co-speech gestures, the chapter separates effects of semantic component from effects of depictive format. It further investigates whether asymmetries under negation arise from the depictive nature of certain representations or from deeper differences in how event components contribute to meaning, building on the asymmetry identified in classifier constructions in Chapter 2.

3.1 Linguistic representation of event components

Events are a fundamental part of human experience, and language provides a primary means for representing and communicating information about them. This chapter focuses on a major subtype of events, namely motion events, which Talmy (1985) defines as "a situation containing movement or maintenance of a stationary location" (p. 60). Motion events include multiple components that provide information about who performs the action, where the action takes place, the trajectory of the motion, and how the action takes place. While these components are conceptually available across languages, languages differ in how they represent and encode this information.

Cross-linguistic studies have shown that languages vary in how they lexicalize and grammaticalize components of motion events, employing a range of morphosyntactic resources such as verbs, adpositions, case markers, and serial verb constructions. Building on this line of work, Talmy (1985, 2000) proposed a typological distinction based on how languages encode path and manner in motion events. In this framework, the path component constitutes the core schematic element of a motion event (Talmy 2000; p. 218). According to this typology, languages can be broadly classified into two main groups.[1]

Languages in the first group, satellite-framed languages, typically encode the path of motion in a separate grammatical element such as a particle, preposition, or verbal prefix, while the manner of

[1]This classification is not exhaustive. Some researchers argue for an additional class, equipollently-framed languages, in which path and manner are expressed by equivalent grammatical forms, often through serial verb constructions (Slobin 2004; among others).

motion is expressed in the main verb as illustrated in the following English sentence:

(1) The bottle floated out.

In (1), the verb "*float*" encodes manner, and the preposition "*out*" provides information about the path. Languages commonly described as satellite-framed include English, German, Chinese, and the Finno-Ugric languages.

Languages in the second group, verb-framed languages, encode the path of motion directly in the main verb, while the manner of motion, if expressed at all, is typically encoded with optional adjuncts or subordinate clauses as illustrated in (2):

(2) Spanish (Talmy 1985; p. 69)

La botella salió de la cueva (flotando).

la	botella	sal-ió	de	la	cueva	(flot-ando).
the.FEM.SG	bottle.FEM.SG	exit-PST.3SG	from	the.FEM.SG	cave.FEM.SG	(float-GER)

"The bottle floated out of the cave."

In (2), the verb "*salir*" (exit) encodes the path, while manner is optionally expressed by the gerund "*flotando*" (floating). Languages commonly characterized as verb-framed include Romance languages, Turkish, Japanese, and Korean.

These examples illustrate that languages vary systematically in how components of motion events are mapped onto linguistic structures, reflecting typological preferences rather than absolute constraints (Özçalışkan 2015; Talmy 2000; among others).[2] Importantly, these typological differences are not limited to linguistic expression. Parallel patterns have also been observed in co-speech gesture, suggesting that variation in event encoding extends across modalities (Kita & Özyürek 2003).

3.2 Language and gesture

Building on Talmy's (1985, 2000) typology, Kita & Özyürek (2003) highlight differences between verb-framed and satellite-framed languages, focusing on Turkish and English, respectively. As illustrated in (3), this typological distinction provides a useful lens for describing how speakers encode motion events linguistically:

[2]The typological distinction does not imply a rigid dichotomy. Speakers of verb-framed languages may encode manner in the main verb, just as speakers of satellite-framed languages may encode path in the main verb. The distinction lies in relative frequency and preferred strategies, rather than categorical restrictions (Beavers et al. 2010; among others).

(3) Kita & Özyürek (2003; p. 22)

a. English

[He rolls down the hill.]

b. Turkish

[Yuvarlanarak] [caddeden iniyor.]

yuvarlan-arak cadde-den in-iyor
roll-CVB street-ABL descend-PROG.3SG
≈"(S/he) descends the street, as (s/he) rolls."

Kita & Özyürek (2003) show that Turkish speakers rely on path-specific verbs such as "*gir*" (enter), "*çık*" (exit/ascend), and "*in*" (descend) to encode path information, whereas English speakers typically use particles such as "*in*", "*out*", "*up*", and "*down*" to express this information.

These linguistic differences are reflected in co-speech gesture production as well. English speakers tend to conflate path and manner within a single gesture, while Turkish speakers often separate these components into distinct gestures, often temporally aligned with different parts of the utterance, as shown in (3) by the bracket notation. English speakers tend to express event components more compactly, both linguistically (within a single clause) and gesturally (within a single gesture), while Turkish speakers tend to separate these components across both modalities (Kita & Özyürek 2003).

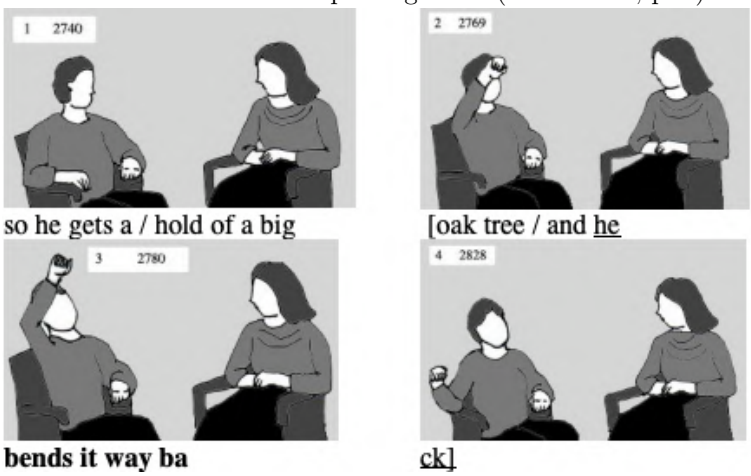
Building on these findings, Kita & Özyürek (2003) propose that speech and gesture convey semantic information within a single processing system (the "Interface Hypothesis"), rather than using two independent systems. This hypothesis predicts that typological differences in linguistic encoding influence co-speech gesture production; consequently, speakers of satellite-framed languages may produce co-speech gestures that differ from speakers of verb-framed languages. Subsequent production studies across a range of languages have supported this prediction, demonstrating that gesture patterns vary depending on speakers' language (Özyürek et al. 2005, 2008; among others).

Nonetheless, recent work has shown that co-speech gesture production is more directly sensitive to the structural properties of the utterance produced than to the typological properties of the language itself. For example, as noted by Ünal et al. (2024), speakers of typologically distinct languages tend to produce similar co-speech gestures when uttering syntactically identical structures. Likewise, speakers tend not to produce co-speech gestures encoding path or manner when that information is not overtly expressed in speech, regardless of the typological properties of their language (Sümer & Özyürek 2022). These findings suggest that co-speech gesture production is mediated by the structures speakers produce in speech, rather than arising directly from typological properties of the language. These typological

differences instead shape gesture only indirectly, through their influence on speech production.

Gestures are of broader theoretical interest because they highlight the inherently multimodal nature of human communication. Traditional research in linguistics, cognitive science, and psychology focuses on written texts based on speech (Vigliocco et al. 2014; among others), often treating language as a predominantly unimodal phenomenon. However, speech is accompanied by manual and non-manual cues, which play an important role in perception and interpretation. For instance, McGurk & MacDonald (1976) showed that the acoustic signals of a phoneme can be overridden when dubbed into the visual cues of a different phoneme. This illusion, the McGurk Effect, demonstrated the important role of non-manual visual cues on speech perception. Manual gestures, produced by the hands, also play a crucial role in the language system. Rather than merely accompanying speech, they enhance comprehension, support disambiguation of referential expressions, and facilitate the processing of complex linguistic structures (Özyürek 2014; among others). An example of a co-speech gesture is shown in Figure (4). In this case, the speaker produces a spontaneous hand movement that depicts the event of pulling down a branch, temporally aligned with the accompanying verbal description. Such gestures enrich and complement spoken language, thereby enhancing the conveyance of meaning.

(4) Illustration of a manual co-speech gesture (McNeill nd; p. 6)



As classified by McNeill (2005), gestures can be grouped into four main types: iconic, metaphoric, deictic, and beat gestures. The co-speech gesture shown in (4) is an instance of an iconic gesture, depicting concrete objects or actions and bearing a direct resemblance to its referent. This gesture type will be the focus of this chapter. Metaphoric gestures extend this depictive function to more abstract concepts. Deictic gestures involve pointing and are used to establish referential relations

in space or discourse. Beat gestures, by contrast, accompany speech rhythmically and are generally argued not to contribute semantic content (McNeill 2005).

Gesture can be defined as a deliberate, expressive "visible action" produced as part of an utterance (Kendon 2004; p. 7). Although gestures were long treated as peripheral or non-linguistic, extensive work has demonstrated that they are a universal component of human communication (McNeill 1992; Kendon 2004), integrate with language at multiple levels of linguistic structure (Abner et al. 2015; among others), and play a role in both spoken and signed languages (Vigliocco et al. 2014; among others). Further evidence indicates that gestures are an integral part of communication, and in some languages they are incorporated into the linguistic system as essential and complementary components. For example, in Nheengatú, an indigenous language spoken in Brazil, gestures are crucial for temporal encoding, and their absence yields ill-formed structures (Floyd 2016). A similar dependency is observed in Korean, where pointing gestures are obligatory with the exophoric demonstrative *ce*, whereas such gestures are incompatible with the anaphoric demonstrative *ku* (Ahn 2019). These cases illustrate how gestures can be semantically loaded and linguistically relevant.

Given this tight link between gesture and linguistic structure, one might expect gestural content to behave similarly to other linguistic elements. However, the interaction between gesture and negation does not conform to this expectation. Previous work has shown that co-speech gestures often fail to integrate straightforwardly with negation, either escaping the scope of negation (Ebert & Ebert 2016) or yielding degraded interpretations (Davidson 2023, in press b). Much of the formal semantic literature treats gestures as capable of contributing compositional, truth-conditional meaning, often under the assumption that iconic content can integrate with the same semantic mechanisms as non-iconic linguistic expressions (Schlenker 2018; Esipova 2019; Tieu et al. 2019). From this perspective, differences between speech and gesture under negation have been attributed to factors such as scope and projection behavior (Ebert & Ebert 2016), information-structural status (e.g., at-issue vs. not-at-issue content; Ebert & Ebert 2016; Schlenker 2018), prosodic alignment with focus (Esipova 2019), or the syntactic integration of gestural content into the clausal structure (Esipova 2019; Schlenker 2018).

At the same time, recent work has emphasized that difficulties with negation are not confined to gesture alone, but also arise with other forms of depictive content (Davidson 2023, in press b). From this perspective, it is not gesture as a modality that resists integration with negation, whether gestural or written and whether in signed or spoken languages, but depictive representations more generally. The proposed explanation is that depictive content does not readily generate alternatives, a mechanism that is central to the interpretation of negative constructions (Davidson 2023, in press b). On this

view, the gesture-negation puzzle reflects a broader issue concerning how different kinds of meaning, depiction vs. description, integrate with logical operators.

This raises a central question for the present chapter: is the nature of the content, namely, its depictive character, the ultimate determinant of how it interacts with negation, or does the semantic class of modification involved, specifically path versus manner, independently affect this interaction? This question is particularly relevant given the asymmetry between path and manner observed in the previous chapter, especially in highly "depictive" systems such as sign language classifiers. The issue, then, is whether these differences can be explained in terms of variation in depictiveness, or whether they reflect a more general asymmetry between these event components. The next section presents a series of experiments investigating how path and manner are interpreted under negation in both linguistic and gestural domains.

3.3 Path and manner information in English

This study investigates two components of motion events, namely path and manner, across linguistic and gestural domains in both affirmative and negative polarities, with the goal of understanding how each component contributes to meaning and how negation interacts with them in each modality. In particular, it examines whether differences in the behavior of path and manner under negation arise from their depictive properties or instead reflect a more fundamental asymmetry between these components as elements of event structure. By examining both linguistic and gestural domains, the study aims to identify whether difficulties with negation reflect differences in specific event components, independent of the communicative system in which they occur.

As a first step toward this goal, the study investigates whether native English speakers' judgments of path and manner in purely linguistic contexts reflect the underlying distinction proposed by Talmy (1985, 2000), according to which path constitutes the core schema. It further asks whether this distinction extends to negative contexts, thereby shedding light on whether path and manner differ in their semantic behavior in non-depictive linguistic representations.

Beyond linguistic encoding, this study further examines path and manner information in the gestural domain. While much prior work has focused on gesture production, the present study targets gesture comprehension, which provides a direct window into how gestural content is integrated into meaning under negation. It investigates how negation interacts with different gesture types, assessing whether the effects of negation on event encoding are comparable across linguistic and gestural systems.

This enables a comparison between linguistic and gestural representations of path and manner, and an evaluation of whether any observed asymmetries under negation are attributable to the depictive nature of gestures or differences intrinsic to the event components themselves.

To address these questions, the chapter presents three experimental studies.[3] The first two experiments used written English stimuli, targeting the linguistic elements encoding these two components. The third experiment used video stimuli consisting of spoken utterances accompanied by gestures. This step was necessary to control for the degree of depictiveness associated with each component, allowing for a direct comparison of path and manner under negation. Across the studies, the primary goal is to determine how speakers interpret path and manner information, with particular attention to whether these components exhibit differences across linguistic and gestural domains under affirmative and negative conditions. The following sections present the experimental designs and methodologies.

3.3.1 Experiment I: Path and manner modifiers in written English

This experiment investigates potential differences in the semantic contribution of two types of event-related information, path and manner, in written language, with particular attention to their interaction with negation and with a view to later comparison with the co-speech gesture study. For this purpose, an acceptability judgment task was conducted with native English speakers to assess their acceptability judgments of sentences containing path and manner modifications in controlled visual contexts. As defined by Sprouse et al. (2013), acceptability judgment tasks require participants to rate the acceptability of sentences, and they are widely used in experimental syntax, semantics, and pragmatics research on spoken languages. This method has been shown to be reliable for identifying subtle contrasts in acceptability of sentences (Sprouse et al. 2013).

Design and stimuli

The stimuli were presented as written English sentences paired with animated visual contexts. The experimental design included three independent variables: Sentence Type (Manner Modification, Path Modification, Conflated Modification), Event Type (Manner Event, Path Event, Conflated Event, No Motion), and Polarity (Affirmative, Negative). In total, the design consisted of 24 conditions (3×4×2).[4]

Each experimental sentence contained a subject paired with one of five motion verbs:

[3]The data collection was funded by a Harvard Mind, Brain, and Behavior (MBB) graduate student grant to Hande Sevgi and the data were collected under IRB protocol IRB18-0856 at Harvard University (PI: Kathryn Davidson).
[4]See Table B.1 in Appendix B for the full list of conditions tested in Experiment I.

(5) fall, float, fly, go, move

These verbs were chosen to provide minimal inherent event information, thereby allowing the modifications to play a more prominent role in expressing path and manner information. That said, it is important to note that these verbs are not semantically identical; each encodes different types of event information. For example, *fall* inherently conveys path information (i.e., downward), whereas *go* and *move* are semantically neutral, leaving both path and manner underspecified. In contrast, *float* and *fly* are manner-rich verbs that encode details about the dynamics of motion (see Talmy 2000; Slobin 2004; among others). Nonetheless, all of these verbs permit additional path and manner modification.

In this study, *path* refers to the trajectory of a motion event, including its source and goal, while *manner* refers to the specific way in which the motion is carried out. For the purposes of this experiment, *manner* is operationalized narrowly as the shape or dynamic pattern of motion, excluding attributes such as speed or medium.

To control for potential animacy effects, subjects were exclusively inanimate entities (e.g., car, chair, leaf, paper, plank). Each subject-verb pairing was carefully designed to ensure a plausible and natural semantic relationship, thus maintaining coherence across the stimuli.

Modifications were constructed using prepositional phrases with the preposition *"in"* to encode path and manner information:

Table 3.1: *Details of subject-verb pairings and their associated path, manner, and conflated modifiers.*

Subject-Verb Pair	Path Information	Manner Information
fall – leaf	in a downward direction	in a circular pattern
float – plank	in a backward direction	in a curving pattern
fly – paper	in an upward direction	in a circular pattern
go – car	in a forward direction	in a zigzagging pattern
move – chair	in a forward direction	in a circular pattern

Representative sentences from the experiment are presented below:[5]

(6) a. The chair is moving in a forward direction. (Path)

b. The chair is moving in a circular pattern. (Manner)

c. The chair is moving in a forward direction in a circular pattern. (Conflated)

[5]The complete list of experimental trials is provided in Appendix B, and the stimuli used in the experiments are available here.

As illustrated in (6-c), the conflated modification included two prepositional phrases conveying both path and manner information. Moreover, no conjunctions were used between the modifiers to prevent any structural ambiguities that might arise across polarities.

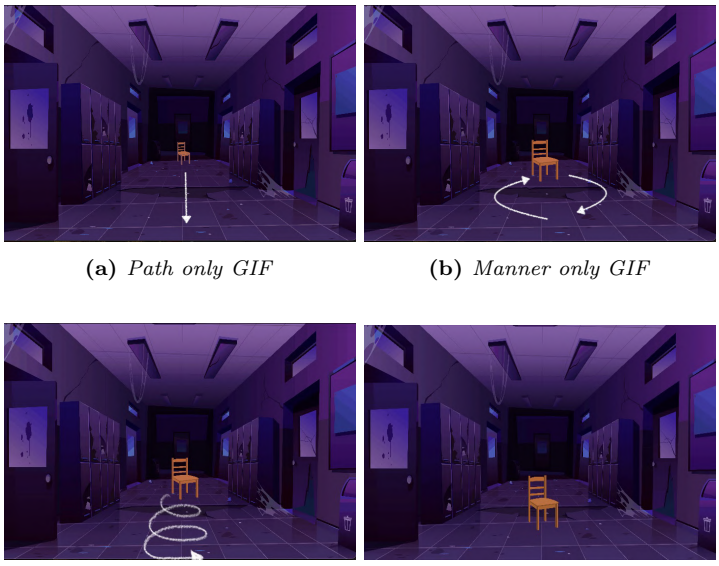
Given the focus on the differential contributions of modification types, the interaction between modification type and polarity (affirmative vs. negative) was investigated. In this study, the negation morpheme *not*, positioned immediately before the verb, was used consistently across all stimuli:

(7) a. The chair is not moving in a forward direction. (Path)

b. The chair is not moving in a circular pattern. (Manner)

c. The chair is not moving in a forward direction in a circular pattern. (Conflated)

This experiment also included a variable called "Event Type," which provided context for evaluating participants' acceptability judgments. The event type was manipulated across four conditions: (i) events involving path movement, (ii) events involving manner movement, (iii) events involving both path and manner movement (conflated), and (iv) events involving no motion. A series of GIFs (Graphics Interchange Format) was created to visually represent different event types through animation. These GIFs were developed using various graphic resources, including Freepik and PNGTree, and were designed with tools such as Adobe Animate and Wick Editor, as shown in Figure 3.1:



(a) *Path only GIF* **(b)** *Manner only GIF*

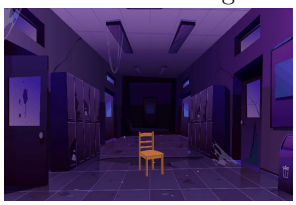
(c) *Conflated GIF* **(d)** *No Motion GIF*

Figure 3.1: *Four event types depicted in the GIFs*

Once finalized, the GIFs were integrated into the Qualtrics Survey Software platform, where the experimental questionnaires were designed and implemented.

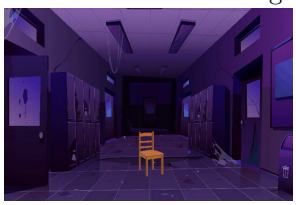
The variable "Event Type" also functioned as a validation mechanism within the experimental design. For instance, in a "No Motion" event, where an entity remained stationary, an affirmative sentence accompanied by any modification type was expected to be judged infelicitous or unacceptable relative to the visual context:

(8) The chair is moving in a forward direction.



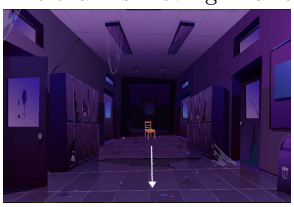
Similarly, in a "No Motion" event, where an entity remained stationary, a negative sentence accompanied by any modification was expected to be judged felicitous or acceptable relative to the visual context:

(9) The chair is not moving in a forward direction.



The path and manner-related information provided by linguistic modification was expected to affect participants' ratings in both affirmative and negative conditions. Regardless of the modification type, the ratings in the affirmative conditions were expected to be higher (closer to the ceiling) for the congruent cases, where the event type and the linguistic modification matched as in (10-a) and (10-b):

(10) a. The chair is moving in a forward direction.

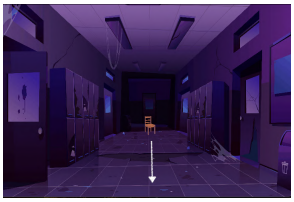


b. The chair is moving in a circular pattern.

In the negative conditions, these congruent cases were expected to be rated lower (closer to the floor).

Conversely, the incongruent cases, where the event type did not match the linguistic modification, were expected to receive lower ratings in affirmative conditions as in (11-a), but higher ratings in negative conditions as in (11-b):

(11) a. The chair is moving in a circular pattern.



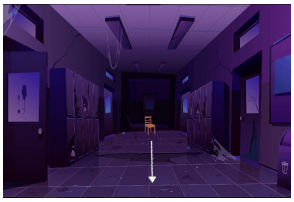
b. The chair is not moving in a circular pattern.

Differences in participants' ratings across the incongruent cases were taken to reflect potential asymmetries between modification types. Especially incongruent cases under negative polarity, as in (11-b), were expected to encourage participants to evaluate the truth conditions of the sentence relative to an event that did not contradict the negated proposition. In such cases, participants might rely on the alternative interpretations made salient by negation, resulting in higher ratings.

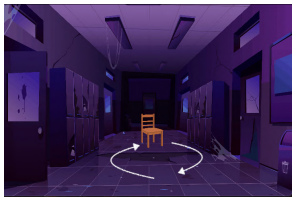
Finally, the conflated cases, in which both modification types were present, were designed to assess how each component contributes to participants' ratings and whether path and manner contribute equally to the interpretation of the event, especially under negation.

(12) The chair is not moving in a forward direction in a circular pattern.

a.



b.



The next section outlines the experimental procedure and participant sample.

Procedure and participants

A within-subjects design was implemented with item-level counterbalancing, such that each participant was exposed to 12 of the 24 possible condition combinations. Stimuli were distributed across participants using a Latin-square-style scheme. Participants were assigned to one of ten lists, each corresponding to a different subset and ordering of condition combinations. This procedure minimized repetition and order-related effects while maintaining experimental control.

In this acceptability judgment task, each trial consisted of a written English sentence paired with a depicted event. Before the task, participants were given an introductory prompt describing the study:

"We invite you to evaluate 12 short statements in English. Your task is to assess how natural these statements feel within the context of the accompanying animated pictures."

Participants were asked to provide judgments of how natural or likely each sentence was in the depicted context using a 0-100 continuous slider scale. The motivation for implementing this method, over other alternatives, was that continuous response scales allow more nuanced judgments than forced-choice tasks, provide a flexible means of assessment, and are often perceived by participants as more natural than discrete Likert-scale tasks (Marty et al. 2020).

Participants were provided with instructions on how to use the slider bar and complete the task:

"Examine the pictures: Before evaluating each sentence, carefully observe the accompanying animated picture. Some animations may involve motion, while others may not. Ensure that you watch the entire event before making your decision.

Rate the statements: Use the slider bar to indicate how natural the statement feels in the given context. Of course, there are better ways to express the provided events but please think about whether these sentences are possible statements to be used under the given circumstances."

To ensure a neutral starting point, the cursor was initially positioned at the midpoint of the slider bar. Participants were introduced to the task with the following prompt:

"Drag to the right: The statement feels natural − something you or another fluent English speaker might say in the given context.

Drag to the left: The statement feels unnatural − not something you or others you know would say. Use intermediate values for judgments that fall between entirely natural and entirely unnatural."

Before the experimental trials, participants were presented with three warm-up examples designed to familiarize them with the task instructions and to assess their attention to these instructions. These warm-up trials followed the same structure as the experimental trials. Participants viewed a GIF illustrating an event followed by a sentence on the same page. They were then instructed to evaluate the given sentence in relation to the depicted event using the slider bar. For these warm-up trials, the slider bar was labeled with "Extremely unlikely − I could not imagine myself or someone else

saying it like this" on the leftmost end and "Extremely likely − I could imagine myself or someone else saying it like this" on the rightmost end. These labels were intended to familiarize participants with the response scale and help them adjust to the evaluation task.

In line with the warm-up trials, the scale endpoints for the experimental trials were labeled "Extremely unlikely" (leftmost) and "Extremely likely" (rightmost) to capture gradient judgments without imposing rigid categorical terms such as "acceptable" or "natural." These labels were chosen to maintain methodological consistency across experiments, particularly those involving co-speech gestures, where evaluations are expected to reflect subtle variations in interpretability and integration with speech rather than absolute grammatical judgments.

The task was expected to take approximately 5−10 minutes to complete. Following the warm-up trials, participants proceeded to the experimental trials. A sample trial is shown in Figure 3.2:

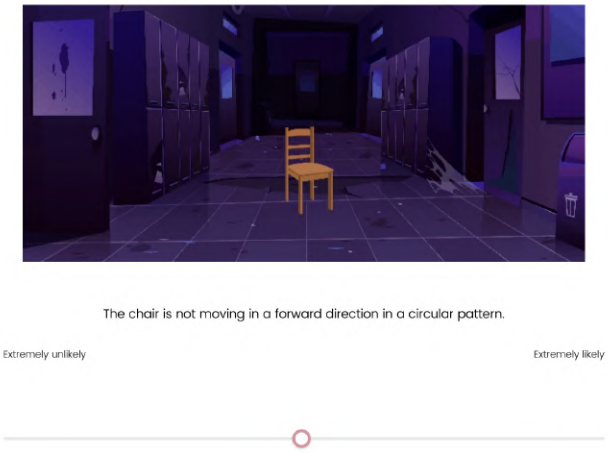


Figure 3.2: *A sample experimental trial used in the written English study*

A total of 150 participants (M_{age} = 39.6; range = 21-105; 93 female, M_{age} = 38.8; 57 male, M_{age} = 41) were recruited for this task via Prolific, an online platform for participant recruitment.[6] All participants self-reported as monolingual English speakers residing in the USA. None indicated proficiency in an additional language. On average, the task took approximately 5-7 minutes to complete, and participants were compensated in accordance with Prolific's recommended hourly payment guidelines.

[6]Although the demographic data provided by Prolific included an unrealistic age value for a participant (105 years), the data are reported here as recorded. This participant was excluded from the final analysis; however, the exclusion was based not on the reported age but on response behavior, as their ratings indicated random use of the slider bar.

Results

Before analysis, participant data were examined to ensure that all participants had remained attentive to the task. The design included both "true and natural" and "false" statements, which were expected to elicit ratings toward the extremes of the response scale. To quantify response variability, the standard deviation (SD) of ratings was calculated for each participant across trials. The distribution of SD values was examined, and the 5th percentile (15.67) was used as a conservative threshold to identify cases of minimal response variation. Participants with SDs below this value were flagged for further examination, as low variability may indicate disengagement or mechanical responding.

Further inspection confirmed that the flagged participants consistently positioned the slider bar at or near the midpoint, suggesting a lack of engagement with the task or the instructions. The mean and median SDs across the full sample (36.19 and 37.81, respectively) were substantially higher than the exclusion threshold, further justifying the criterion. This substantial difference demonstrates that the flagged participants exhibited anomalously low variability, reinforcing their classification as outliers. In total, data from eight participants were excluded, along with two participants who reported in post-task feedback that they had not paid attention to specific instructions; hence, they had provided "wrong answers" to several trials. The final dataset included 140 participants.

Figure 3.3 provides an overview of the distribution of responses across experimental conditions:[7]

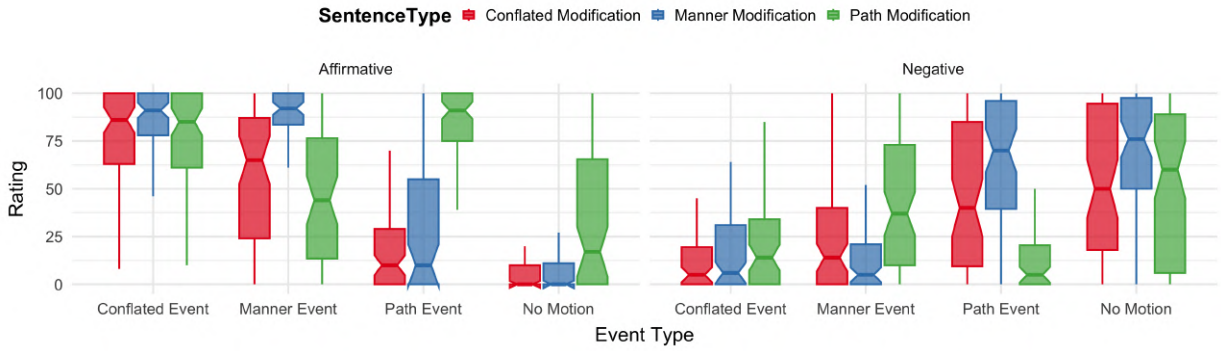


Figure 3.3: *Rating patterns across all conditions in Experiment I for written English study*

The y-axis of Figure 3.3 displays participants' ratings (0-100) and the x-axis displays event types, presented to the participants via GIFs during the task. Color coding reflects the type of information conveyed by the linguistic modification in the sentence. Ratings for affirmative conditions are shown

[7]All visualization and statistical tests were performed using R (R Core Team 2020). The results of the experiments and the analyses can be accessed here.

in the left-hand panel, while ratings for negative conditions appear in the right-hand panel.

As Figure 3.3 shows, in affirmative conditions, modifications that were semantically congruent with the event type received higher ratings. A related, though weaker, pattern was found in negative conditions, where incongruent cases, such as Path Modification and Manner Event, were rated relatively higher than their congruent counterparts such as Manner Modification and Manner Event.

Since sentences under affirmative and negative polarity differ in how linguistic content is related to visual event representations, they were analyzed separately in order to avoid conflating distinct interpretive strategies. The next analysis focuses on a narrower subset of the data, the affirmative conditions involving motion events (Path Event, Manner Event, and Conflated Event):

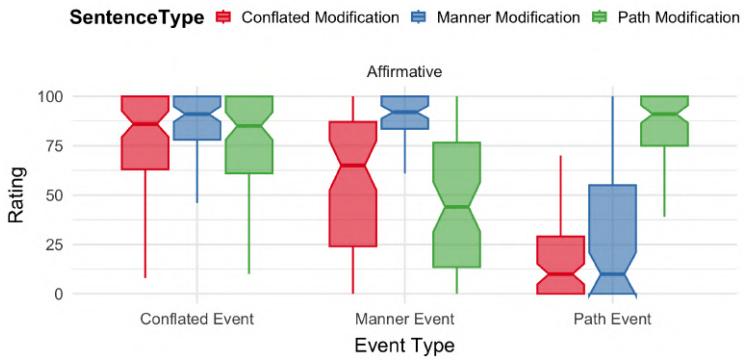


Figure 3.4: *A zoom in the raw ratings for affirmative polarity cases in Experiment I for written English study*

Figure 3.4 illustrates how path and manner information contributes to sentence acceptability. In Path and Manner events, the highest ratings were observed for the congruent modification types, Path Modification in Path Events and Manner Modification in Manner Events, whereas incongruent modifications received substantially lower ratings. In contrast, Conflated Events did not exhibit a clear preference among modification types.

The rating data were continuous, bounded between 0 and 100, and exhibited a non-normal distribution with strong skewness and ceiling effects, violating key assumptions of Gaussian linear mixed-effects models. To address these distributional properties, the data were analyzed using a generalized linear mixed model (GLMM) implemented in the `glmmTMB` package (Generalized Linear Mixed Models using Template Model Builder; Brooks et al. 2017). This framework allowed estimation of fixed effects while including random intercepts for participants and scenarios, thereby accounting for the repeated measures design as well as participant-level and item-level variability.

To model the bounded, skewed ratings appropriately, response values were rescaled to the open

interval (0, 1) using a small offset ($\varepsilon = 10^{-6}$) to avoid boundary issues in beta regression.[8] This transformation ensured that extreme values (0 and 1) fell within the range of the beta distribution. A beta regression model with a logit link was then applied. The predictors were Sentence Type (Conflated Modification, Manner Modification, Path Modification) and Event Type (Conflated Event, Manner Event, Path Event). Random intercepts for Participant and Scenario were included to account for repeated-measures structure and contextual variability (*Rating_scaled* ∼ *SentenceType * EventType + (1 | Response_ID) + (1 | Scenario), data*).

The results of the generalized linear mixed model are presented in Table 3.2:

Table 3.2: *Model results for affirmative polarity (Experiment I)*

	Estimate	Standard Error	z value	p value
Intercept	1.08	0.17	6.30	<0.001
Path Modification	-0.05	0.19	-0.27	0.8
Manner Modification	0.32	0.19	1.65	0.1
Path Event	-2.52	0.21	-11.61	<0.001
Manner Event	-0.71	0.23	-3.05	0.002
Path Modification:Path Event	2.77	0.29	9.54	<0.001
Manner Modification:Path Event	0.002	0.30	0.01	0.99
Path Modification:Manner Event	-0.71	0.29	-2.40	0.016
Manner Modification:Manner Event	0.70	0.29	2.36	0.018

Categorical predictors were coded using treatment contrasts, with Conflated Modification and Conflated Event as the reference levels. This coding scheme was chosen because the conflated condition provides a theoretically motivated baseline in which both path and manner information are present, allowing other conditions to be interpreted as deviations from a semantically complete event description. As expected, Event Type had a significant effect relative to the reference condition, indicating that ratings differed across event types. No main effect of Modification Type was observed relative to the reference condition, indicating that differences between modification types emerge primarily through their interaction with event type. However, a significant interaction was present between Modification Type and Event Type. In congruent cases, where the modification type matched the event type, participants' ratings were significantly higher ($\beta = 0.70$, $p < 0.05$ for Manner Modification in Manner Event; $\beta = 2.77$, $p < 0.001$ for Path Modification in Path Event). In incongruent cases, where Path Modification was paired with Manner Event, ratings were significantly lower (β = -0.71, $p < 0.05$). No significant effect was observed when Manner Modification was paired with Path Event ($p = 0.99$). To

[8] For this step, the transformation $(\text{Rating}/100) \times (1 - 2\varepsilon) + \varepsilon$ was used before the analysis, where $\varepsilon = 10^{-6}$.

make the interaction more transparent, Figure 3.5 presents model-predicted ratings.

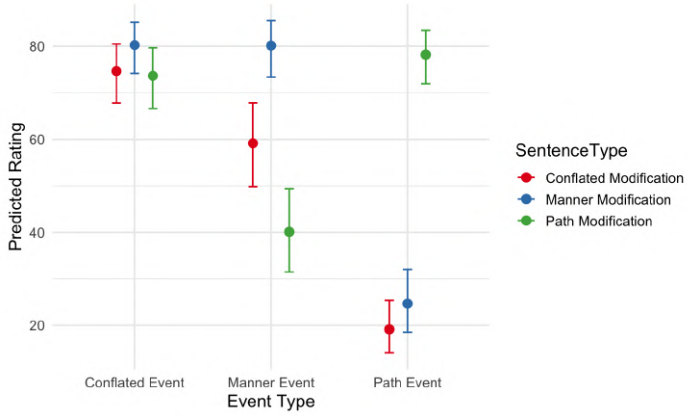


Figure 3.5: *Model-predicted ratings as a function of Sentence Type and Event Type, illustrating the interaction between modification type and event type in affirmative polarity*

The interaction shows that congruent combinations are preferred, but incongruence is not treated uniformly. When path modification is paired with a manner event, ratings were significantly lower, indicating a strong penalty for this type of mismatch. In contrast, when Manner Modification is paired with a Path Event, no statistically comparable penalty is observed. This asymmetry indicates that different types of mismatch are evaluated differently.

A separate analysis was conducted to examine whether these effects persist under negative polarity.

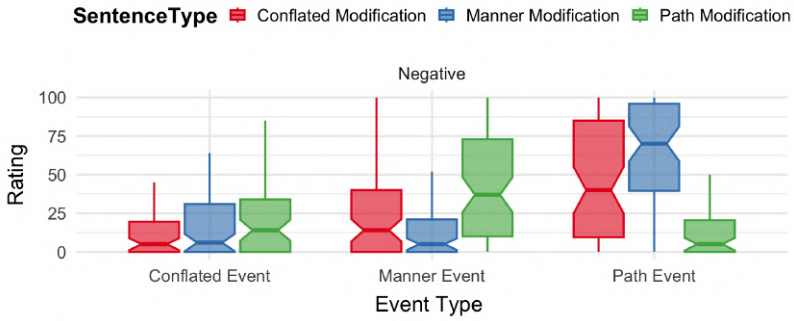


Figure 3.6: *A zoom in the raw ratings for negative polarity in Experiment I for written English study*

In negative conditions, ratings tended to be higher in certain incongruent conditions, particularly in Path Events, whereas congruent modifications received substantially lower ratings. Conflated Events, by contrast, received the lowest ratings across modification types and showed no clear preference.

Consistent with the analysis of the affirmative condition, a beta regression model was fitted to the scaled ratings of trials under negative polarity. The results are presented in Table 3.3:

Table 3.3: *Model results for negative polarity (Experiment I)*

	Estimate	Standard Error	z value	p value
Intercept	-1.02	0.17	-5.93	<0.001
Path Modification	0.17	0.22	0.76	0.4
Manner Modification	-0.08	0.22	-0.36	0.7
Path Event	0.69	0.23	3.01	0.003
Manner Event	0.26	0.22	1.18	0.2
Path Modification:Path Event	-0.98	0.32	-3.05	0.002
Manner Modification:Path Event	1.10	0.32	3.34	<0.001
Path Modification:Manner Event	0.15	0.30	0.50	0.6
Manner Modification:Manner Event	-0.42	0.30	-1.42	0.15

The statistical analysis showed that Modification Type did not have a significant effect on ratings under negative polarity. Event Type, however, had a significant effect where Path Events were associated with higher ratings ($\beta = 0.69$, $p < 0.01$), whereas Manner Events did not show a significant effect ($\beta = 0.26$, $p = 0.2$). A significant interaction between Modification Type and Event Type was observed. Specifically, when Manner Modification was paired with a Path Event, ratings increased significantly ($\beta = 1.10$, $p < 0.001$), whereas Path Modification paired with a Path Event resulted in significantly lower ratings ($\beta = -0.98$, $p < 0.01$). No significant interactions were observed for Manner Events, indicating that the asymmetry is most clearly observed in Path Events. To make the interaction more transparent, Figure 3.7 presents model-predicted ratings:

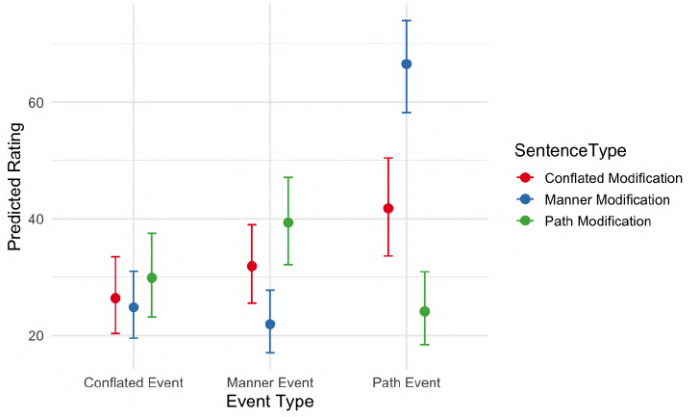


Figure 3.7: *Model-predicted ratings as a function of Sentence Type and Event Type, illustrating the interaction between modification type and event type in negative polarity*

This pattern indicates that under negation, the strongest contrast emerges in Path Events, where Manner Modification yields higher ratings than Path Modification, while no comparable contrast is observed in Manner Events.

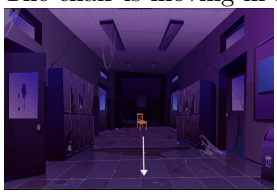
Asymmetries between path and manner modifiers

This study investigated how path and manner information contributes to sentence interpretation in written English across polarity conditions. Specifically, it examined whether the congruence between event type (Path Event, Manner Event, Conflated Event) and linguistic modification type (Path Modification, Manner Modification, Conflated Modification) influences acceptability judgments, and whether these effects differ in affirmative versus negative contexts. Of central interest was whether path and manner exhibit asymmetric behavior in interpretation.

Under affirmative polarity, congruent cases, where modification type matched event type, received significantly higher ratings:

(13) *Example of a congruent case in affirmative polarity in Experiment I*

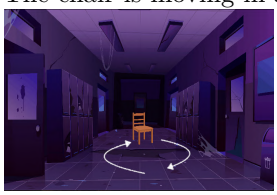
The chair is moving in a forward direction.



In contrast, incongruent cases, where the modification type did not match the event type, showed a selective effect. Path Modification was rated significantly lower when paired with a Manner Event:

(14) *Example of an incongruent case in affirmative polarity in Experiment I*

The chair is moving in a forward direction.



This pattern was consistent with the predictions. Nonetheless, this effect was not uniform across modification types. While Path Modification was significantly penalized in incongruent contexts involving Manner Events, no comparable penalty was observed for Manner Modification paired with

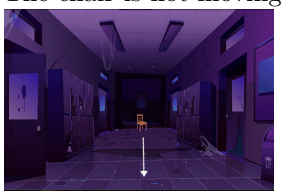
Path Events. This asymmetry suggests that incongruent cases are not treated uniformly, providing initial evidence for a difference between path and manner in this domain.

At this point, one might argue that the motion of the chair depicted in (14) appears to move both forward and in a circular pattern, since the circular path begins with a forward displacement. Therefore, this could introduce a confound, offering a possible explanation for why incongruent cases where a Manner Event accompanies a Path Modification were rated higher among the incongruent cases. However, this interpretation is unlikely to fully explain the observed pattern. The experimental design included multiple scenarios combining different path and manner configurations (see Table 3.1), including cases where no forward movement was present (e.g., circular motion combined with downward direction). Furthermore, variance in ratings across these scenarios was minimal ($\sigma^2 = 0.03$, SD = 0.17), indicating that participant judgments were consistent across scenarios. This suggests that the observed effects cannot be attributed to this specific motion overlap in a particular stimulus.

Several significant interactions were also observed under negative polarity. Congruent cases involving Path Modification and Path Events received significantly lower ratings:

(15) *Example of a congruent case in negative polarity in Experiment I*

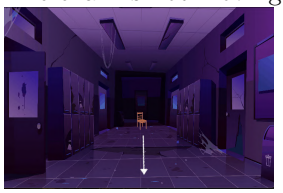
The chair is not moving in a forward direction.



By contrast, incongruent cases involving Manner Modification and Path Events received significantly higher ratings:

(16) *Example of an incongruent case in negative polarity in Experiment I*

The chair is not moving in a circular pattern.



These patterns are broadly consistent with the predicted effects of negation. However, no comparable significant interaction was observed for cases involving Manner Events. While Path Events showed

clear differences across modification types, Manner Events showed no such differences.

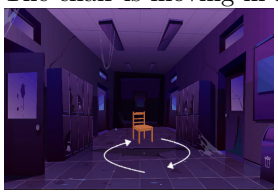
One possible interpretation is that the observed pattern is driven by differences in event type, such that participants were less sensitive to modification type in negative sentences involving Manner Events, while Path Events appeared to have a broader influence on acceptability ratings. However, this account does not fully capture the observed data. As shown in Figure 3.6, although the relevant effect does not reach statistical significance, there is a consistent tendency toward higher ratings for Manner Events paired with Path Modification. In addition, congruent cases were uniformly rated low, whereas variation in ratings arises primarily in incongruent conditions. This pattern suggests that the asymmetry is best understood in terms of modification type, with event type modulating the strength and detectability of the effect.

The results indicate a directional asymmetry in how incongruence is evaluated, such that mismatches involving path and manner are not treated symmetrically. In affirmative contexts, Path Modification is strongly penalized when paired with Manner Events, whereas Manner Modification is not comparably penalized when paired with Path Events. Under negative polarity, this asymmetry becomes most clearly visible in Path Events, where Manner Modification yields higher ratings than Path Modification, while only weaker and nonsignificant differences are observed in Manner Events. This pattern suggests that path and manner related modifiers do not contribute symmetrically to interpretation, and that the strength of mismatch effects depends both on modification type and polarity. Supporting this interpretation, sentences involving Manner Modification tend to receive ratings clustered near the extremes of the scale, indicating relatively stable intuitions about their acceptability. By contrast, sentences involving Path Modification elicit more variable judgments, particularly in incongruent cases, where ratings often fall closer to the midpoint. This contrast can be interpreted as indicating that path modifiers impose stronger constraints on interpretation, while manner modifiers are more readily accommodated or ignored when it conflicts with other cues.

The behavior of conflated modification further supports this interpretation.

(17) *Example of a conflated modification with an incongruent case in affirmative polarity*

The chair is moving in a forward direction in a circular manner.



Under the null hypothesis that two modifiers contribute equally to sentence meaning, incongruent cases involving Path and Manner Events were expected to yield comparable acceptability ratings. However, this was not the case. Instead, the results showed that conflated sentences tend to pattern more closely with sentences involving Manner Modification across Event Types and Polarity conditions, while showing a greater difference than sentences with Path Modification. Such an account would align with the view that path information, while central to event structure (Talmy 1985, 2000), may be more readily targeted under conditions of semantic competition or operator interaction, whereas manner information may be interpreted more flexibly. An alternative explanation, however, concerns information structure rather than semantic type. Prior work has argued that, in the absence of explicit focus marking, English exhibits a default prominence for sentence-final position, particularly in written discourse (Cinque 1993; Halliday 1967; Selkirk 1995; among others). In the present design, Path Modification preceded Manner Modification in conflated sentences to preserve naturalness, placing the manner phrase in the sentence-final position and potentially conferring increased informational prominence. It remains unclear whether the observed effects are driven by the semantic class of the modifiers or by the informational prominence associated with their linear position. To address this issue, a follow-up study systematically reversed the modifier order in conflated sentences to test whether acceptability ratings reflect the modifier type independently of surface order or are sensitive to sentence-final positioning.

3.3.2 Experiment II: Structural position of modifier type in written English

As a next step, a follow-up study was conducted to investigate the potential effect of modifier order in conflated cases on acceptability ratings. The design and the procedure of Experiment I was adopted, with the sole modification being the ordering of modifiers in cases where two occurred together, namely the conflated modification condition. This manipulation aimed to assess whether the differences observed in Experiment I arose from structural properties of a clause or from inherent distinctions between path and manner modifiers. The prediction was that if modifier type had no significant effect but position of the modifier in the sentence determined acceptability, judgments were expected to show difference from those in Experiment I. On the other hand, if modifier type had a significant effect on acceptability, the prediction was that the observed pattern would mirror that of Experiment I.

In Experiment I, the experimental sentences had path modifier before the manner modifier in the conflated modification condition as in (18-a) while in Experiment II the manner modifier preceded path information as in (18-b):

(18) a. Experiment I

Path Modification » Manner Modification

The chair is moving in a forward direction in a circular pattern.

b. Experiment II

Manner Modification » Path Modification

The chair is moving in a circular pattern in a forward direction.

A total of 120 participants (M_{age} = 40.29; range = 19-66; 64 female, M_{age} = 38.8; 56 male, M_{age} = 42) were recruited for Experiment II via Prolific. All participants self-reported as monolingual English speakers residing in the USA. None indicated proficiency in an additional language. On average, the task was completed in about 7 to 10 minutes, and participants were compensated at a very good rate according to Prolific's hourly payment guidelines.

Results

Similar to the Experiment I, participant data were examined to ensure that all participants had remained attentive to the task before the analysis. The distribution of SD values was examined, and the 5th percentile (15.57) was used as a threshold to detect the potential cases of minimal response variation. Participants with SDs below this value were flagged for further examination, as low variability often signals disengagement or mechanical responding. In total, data from six participants were excluded, with the remaining 114 participants.

As a first step, the data were analyzed using a generalized linear mixed model (GLMM) implemented in the `glmmTMB` package, with affirmative and negative conditions modeled separately to facilitate comparison with Experiment I. The results largely replicate the patterns observed in Experiment I.[9] In affirmative contexts, congruent cases, where modification type matches event type, receive higher ratings, with significant positive interactions for Path Modification in Path Events (β = 2.87, $p < 0.001$) and for Manner Modification in Manner Events (β = 0.99, $p < 0.01$). In contrast, incongruent cases showed a numerically asymmetric pattern that did not reach statistical significance. Path Modification tended to receive lower ratings when paired with Manner Events (β = -0.31), whereas Manner Modification was not comparably penalized when paired with Path Events (β = 0.06).

Under negative polarity, the same model structure reveals a more pronounced asymmetry. In Path Events, Path Modification was strongly disfavored (β = -1.99, $p < 0.001$). By contrast, Manner

[9]You can find the results of the analysis in Table B.4 in Appendix B.

Modification did not show a comparable penalty in Path Events ($\beta = 0.39$). In Manner Events, Path Modification was associated with higher ratings ($\beta = 0.66$, $p < 0.05$), whereas Manner Modification did not differ significantly from the reference condition (β = -0.49). These findings indicate that the directional asymmetry in how incongruence is evaluated is robust across experiments.[10]

A comparison between two experiments regarding the Conflated Modification condition was investigated particularly:

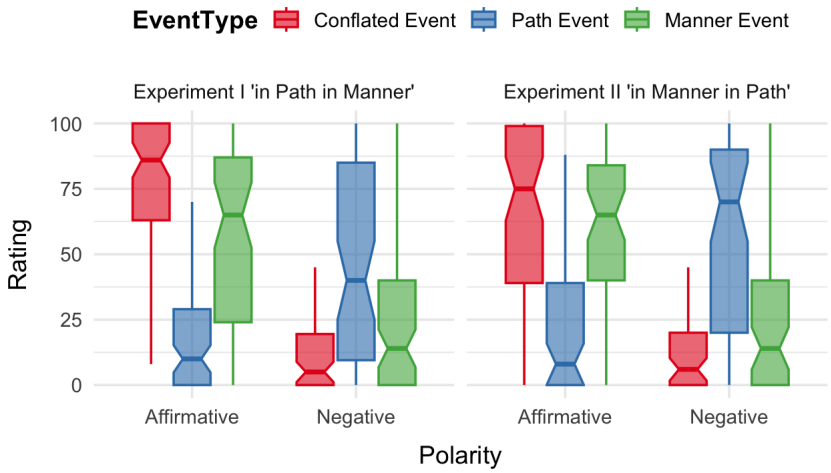


Figure 3.8: *Ratings on the conflated sentences across Experiment I and Experiment II*

The y-axis of Figure 3.8 displays participants' ratings (0-100) and the x-axis displays polarity of the conflated sentence presented to the participants during the task. Color coding reflects the event type provided by the animated videos. The ratings of the conflated sentences in Experiment I ("The chair is moving in a forward direction in a circular pattern.") are shown in the left-hand panel, while ratings for conflated sentences in Experiment II ("The chair is moving in a circular pattern in a forward direction.") appear in the right-hand panel.

To directly assess whether the observed differences between Experiments I and II could be attributed to modifier order, a between-subjects analysis was conducted focusing on the conflated condition where acceptability ratings were compared across experiments as a function of Event Type, Polarity, and Order. Crucially, no main effect of Order was observed (β = -0.25, $p = 0.25$), and no significant

[10]The primary difference between the two experiments concerns the conflated condition. In Experiment II, reversing the order of path and manner modifiers leads to reduced acceptability for conflated sentences, particularly in affirmative contexts. This suggests that the interpretation of combined path and manner information is sensitive to modifier order, possibly due to information-structural factors such as sentence-final prominence. Importantly, however, this difference does not affect the overall asymmetry between modification types.

interactions were found between Order and other predictors Event Type, Polarity, or their combination (all $p > 0.05$).

These results indicate that reversing the order of path and manner modifiers does not systematically affect acceptability ratings, either overall or in interaction with other factors. Thus, the differences observed between modification types cannot be attributed to linear order or sentence-final prominence. Instead, the asymmetry between path and manner reflects a stable property of how these modifiers contribute to interpretation, rather than an artifact of surface structure.

Modifier order does not have a meaningful effect

Experiment II was designed to test whether the asymmetries observed in Experiment I could be reduced to a structural property of the written stimuli, namely the linear position of path and manner modifiers in conflated sentences. If the pattern in Experiment I were primarily driven by sentence-final prominence, then reversing the order of the two modifiers should have altered the acceptability profile in a systematic way. This prediction was not borne out: modifier order did not systematically determine participants' judgments. These results rule out a simple linear-order account of the pattern found in Experiment I. They suggest that the contrast between path and manner is not primarily an artifact of sentence-final prominence or surface structure, but instead reflects a more robust difference in how these two types of modifier contribute to interpretation in written English.

3.3.3 Discussion

Experiment I and Experiment II addressed the initial questions of this chapter in the non-depictive linguistic domain. They asked whether native English speakers' judgments reflect an asymmetry between path and manner in written language, whether such an asymmetry extends to negative contexts, and whether any observed difference could be reduced to superficial structural factors such as modifier order. The results provide converging evidence that path and manner do not contribute identically to interpretation in written English.

Experiment I showed that congruence between modifier type and event type matters, but that incongruence is not evaluated uniformly. The results indicate that the contribution of a modifier depends not only on whether it mismatches the event, but also on which semantic component is being mismatched and on the polarity of the sentence.

Experiment II was designed to test whether this pattern could be attributed to the structural position of the modifiers. It did not support that alternative explanation. Reversing the order of path

and manner modifiers did not change the core interpretive pattern, and a direct comparison between the experiments showed no meaningful effect of Order. Thus, the asymmetry observed in Experiment I cannot be reduced to sentence-final prominence or other simple linear-order effects.

These findings establish an important baseline for the remainder of the chapter. They show that path and manner behave asymmetrically in a purely linguistic, non-depictive format. This conclusion is particularly significant in light of the asymmetry observed in sign language classifiers in the previous chapter. In that domain, classifier constructions with path and manner movement were shown to behave differently under negation, despite both relying on highly depictive movement. The present results demonstrate that a comparable asymmetry arises in written English, where path and manner are expressed through purely linguistic means rather than depictive representation. This convergence suggests that the asymmetry between path and manner cannot be attributed solely to depictiveness. Instead, it points to a more general difference in how these components contribute to meaning. Then, the question is whether we observe similar trends in another depictive domain, namely co-speech gestures. The next section addresses this question.

3.4 Co-speech gestures in English

The previous experiments in this chapter showed that path and manner modifiers contribute differently to interpretation in written English, particularly in their interaction with negation. The present section asks whether a comparable asymmetry arises when event information is conveyed through co-speech gesture, visually motivated spatial expressions that accompany speech and provide additional layers of meaning through iconicity, spatial structuring, and temporal alignment (Perniss et al. 2015), and that are closely integrated with speech in conveying event semantics (Goldin-Meadow & Alibali 2013).

Investigating co-speech gestures also provides an informative point of comparison for understanding sign language classifiers. Classifier constructions have been argued to integrate linguistic elements with depictive enrichment (Emmorey & Herzig 2003; Schembri 2003; among others). As discussed in the previous chapter, these constructions encode path and manner information through the movement component, which is often considered depictive and thus comparable to gesture. The observations in the previous chapter suggest that path and manner information in classifier constructions display asymmetries under logical operators such as negation, paralleling the pattern observed in written English here. Co-speech gesture offers a complementary domain in which to test whether difficulties with negation are due to (i) depictiveness as a representational format, or (ii) the semantic class of

the modified component, namely path versus manner. This comparison helps clarify the relationship between co-speech gesture and the movement component of sign language classifiers, while also addressing whether the observed patterns reflect differences between gestural and linguistic forms of event representation.

Before turning to the main co-speech gesture experiment, this section first presents two preliminary studies designed to establish baseline interpretive judgments for multimodal stimuli. These studies ensure that participants reliably associate gestural components with the intended event interpretations, thereby providing a controlled foundation for evaluating the interaction between gesture, negation, and event structure in the main experiment.

3.4.1 Establishing baselines for multimodal interpretation

These preliminary studies were designed to establish a baseline for English speakers' interpretive tendencies for utterances provided by multimodal stimuli, by disentangling the contributions of the individual experimental variables prior to examining their interaction in the full co-speech gesture paradigm. Specifically, event type and gesture type were investigated in separate studies, each crossed with polarity, to assess whether these factors independently influence acceptability judgments.

The methodological details of these studies are outlined below. Although the tasks are relatively simple, they play a critical role in isolating the effects of the experimental variables and ensuring that the patterns observed in the co-speech gesture study can be meaningfully interpreted.

Study 1: Event interpretation in the absence of gesture

This preliminary study followed the methodology and design of the previous experiments on written English but differed in its modality. Instead of written stimuli, participants viewed video-based stimuli in which a native speaker verbally uttered short sentences including the same subject-verb pairs as in the previous experiments in this chapter. To control for potential linguistic and gestural influences on path and manner encoding, the sentences were intentionally constructed to exclude lexical or gestural elements that might independently convey such information. An example stimulus is shown in (19):

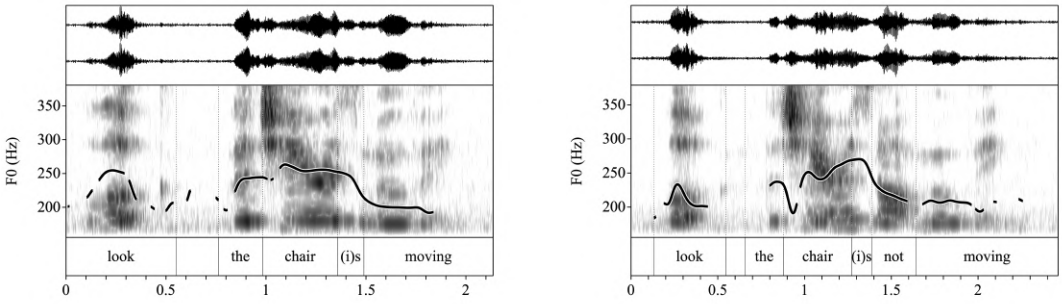
(19) Look, the chair is moving.

Stimuli were recorded in the Sign Language Recording Room of the Meaning and Modality Lab at Harvard University by a female speaker of Standard American English. The recorded videos were

manually segmented and trimmed to create individual video clips.

The aim of this task was to examine how linguistic input and visual event properties independently influence acceptability judgments in the absence of explicit path or manner cues. To this end, the study employed a 4×2 factorial design, manipulating event type in the animated videos and polarity in the utterance presented in the video stimuli as independent variables.

In the video stimuli, particular attention was given to the prosodic realization of the sentences to minimize potential influences of the accompanying suprasegmental cues, such as prosodic contours, on participants' perception (Pierrehumbert & Hirschberg 1990; Selkirk 1984; Shen & DeDe 2025; among others), with consideration of prior findings that prosodic prominence is typically associated with higher F0 values and longer segmental duration (Gussenhoven 2004; Pierrehumbert 1980; among others). Figure 3.9 presents the pitch contour of an experimental sentence in both polarity conditions:[11]



(a) *Affirmative polarity* **(b)** *Negative polarity*

Figure 3.9: *Prosodic contours for (a) affirmative polarity ("Look, the chair is moving") and (b) negative polarity ("Look, the chair is not moving"). The plots show waveform (top), spectrogram with F0 trace, and corresponding word-level segmentation (bottom).*[12]

Although no statistical analysis was performed on the recordings, both polarity conditions display similar pitch contours and amplitude distributions, showing no clear indications of unintended focus-related pitch accent on the verb as illustrated in Figure 3.9.

As in the written English task, a within-subjects design was implemented using a Latin square arrangement to ensure a balanced distribution of conditions across participants. Participants were randomly assigned to one of four groups, with each group completing ten experimental trials, ensuring that each condition was presented across participants.

[11]The graphs were created in Praat (Boersma & Weenink 2025), using "Create Pictures" script by Elvira García (2018).

Table 3.4: *Conditions tested in Study 1*

Event Type	Polarity
Path Event	Affirmative
Path Event	Negative
Manner Event	Affirmative
Manner Event	Negative
Conflated Event	Affirmative
Conflated Event	Negative
No Motion	Affirmative
No Motion	Negative

Participants viewed the video stimuli and the corresponding animated event on the same page, where they provided their acceptability judgments using a slider bar. Figure 3.10 displays an experimental trial illustrating the Path Event and Negative Polarity conditions:[13]

[12]It should be noted that the stimuli were not elicited in a sound-attenuated booth optimized for phonetic recording. As a result, the acoustic signal may contain background noise, which could introduce minor interference or artifacts in the spectrographic representations.

[13]Additional annotations, including event-type information presented on the GIF, were added later by the author for illustration purposes.

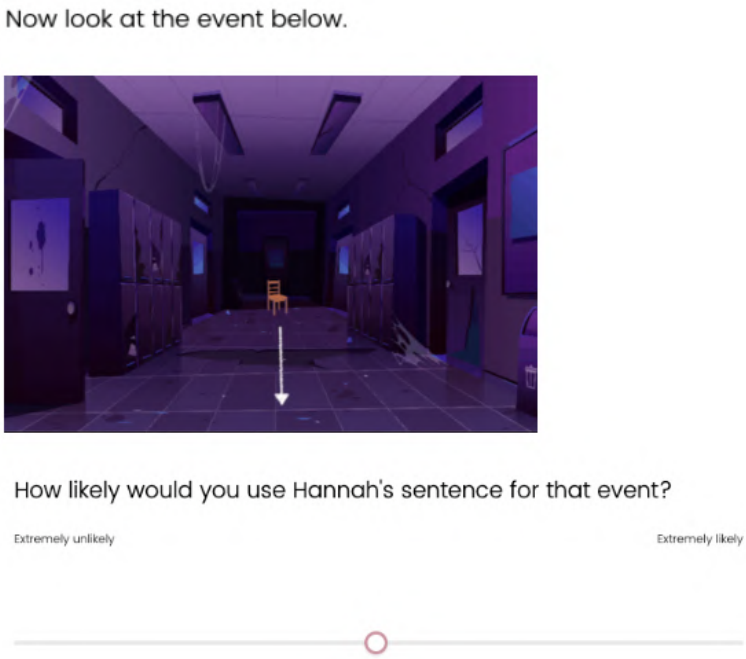


Figure 3.10: *Sample trial from Study 1 showing the video stimulus "Look, the chair is not moving" paired with a Path Event presented in the GIF.*

A total of 41 participants were recruited for the no-gesture task (M_{age} = 43.7, range = 23–65, 24 female (M_{age} = 39.4), 17 male (M_{age} = 49.8)). All participants self-reported as monolingual English speakers, and none reported proficiency in another language. One participant was excluded from the analysis due to consistently selecting the midpoint of the slider bar. Figure 3.11 illustrated the results of the remaining 40 participants:

Figure 3.11: *Acceptability ratings for Study 1*

Figure 3.11 illustrates that sentence acceptability was strongly sensitive to polarity. For events including

motion (Path, Manner, and Conflated), affirmative sentences received substantially higher acceptability ratings than negative sentences, as expected. For No Motion events, negative sentences tended to receive higher ratings than affirmative ones. Crucially, however, among the three motion event types, acceptability ratings did not differ significantly. Under sum-contrast coding, the main effects of Path, Manner, and Conflated events did not deviate significantly from the overall mean (For Path Event, β = 0.46 , p = 0.65; for Manner Event, β = -0.59, p = 0.55; for Conflated Event, β = 0.16, p = 0.88), indicating that the specific type of event did not influence acceptability judgments. On the basis of these preliminary findings, motion event type was not expected to contribute independently to (un)acceptability in the main experiment.

Study 2: Gesture interpretation without event context

This preliminary study investigated how English speakers evaluate sentences accompanied by co-speech gestures in the absence of an explicit visual event context to assess the perceived naturalness of the gestures presented in the videos. Participants were asked to evaluate an English utterance paired with a gesture, as illustrated in (20):[14]

(20) Look, the chair is $\overline{\text{moving}}^{\text{gesture}}$.

Unlike previous studies, no event type was explicitly provided to participants, allowing for an examination of the independent effect of gesture on sentence interpretation. Consistent with the written English study, the independent variable Gesture Type included Path Gesture, Manner Gesture, and Conflated Gesture. Additionally, a No Gesture condition was incorporated, in which the utterance was presented without an accompanying gesture. This condition ensured a comprehensive dataset, aligning with prior research investigating the effects of gestural absence.

The second variable was Polarity (Affirmative vs. Negative), as in the previous studies. A within-subjects experimental design was employed, utilizing a Latin square arrangement to ensure a balanced distribution of conditions across participants. Participants were randomly assigned to one of four groups, with each group completing ten experimental trials, ensuring equal exposure to all conditions.

[14]The details of the independent variable will be provided in Section 3.4.2 of the co-speech gesture study.

Table 3.5: *Conditions tested in Study 2*

Gesture Type	Polarity
Path Gesture	Affirmative
Path Gesture	Negative
Manner Gesture	Affirmative
Manner Gesture	Negative
Conflated Gesture	Affirmative
Conflated Gesture	Negative
No gesture	Affirmative
No gesture	Negative

Participants viewed the video stimuli and evaluated the utterance using a slider bar. Figure 3.12 displays an experimental trial illustrating the Manner Gesture and Affirmative Polarity conditions:[15]

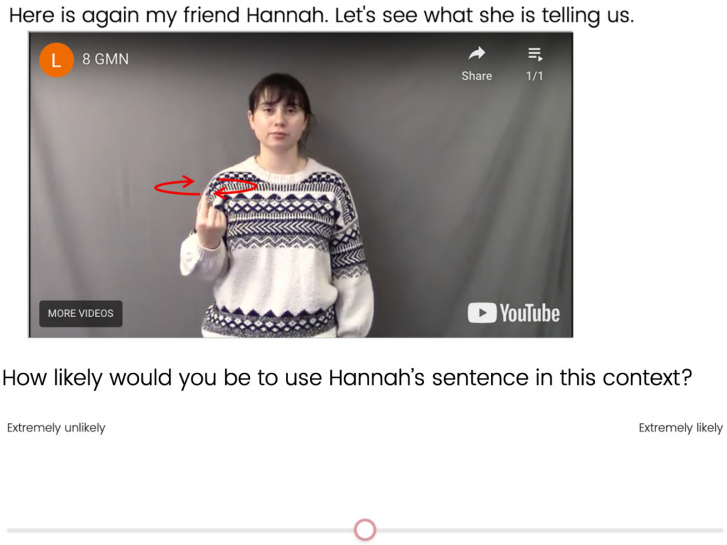


Figure 3.12: *Sample trial from Study 2 showing the video stimulus "Look, the chair is not moving" accompanied by a manner gesture.*

For this task, 40 participants were recruited (M_{age} = 36.7 years, range = 19–67; 29 female, M_{age} = 37.4; 11 male, M_{age} = 34.8). All participants self-identified as monolingual speakers of English and reported no proficiency in any additional language. Because the experiment elicited acceptability ratings, where responses could not be classified as definitively true or false, no participants were excluded on the basis of response patterns. An overview of the data from these 40 participants is presented in Figure 3.13.

[15] Additional annotations, such as gesture information, were added later by the author for illustrative purposes.

Figure 3.13: *Acceptability ratings for Study 2*

The results of the generalized linear mixed-effects model show that acceptability ratings were strongly affected by polarity ($\beta = 4.78$, $p < 0.001$). Only Manner Gesture showed a significant main effect on the acceptability ratings ($\beta =$ -2.07, $p < 0.05$). Interactions between gesture type and polarity were not significant.

To examine the effect of negation more directly, I collapsed the gesture conditions into two broader categories: Gesture and No Gesture. As shown in Figure 3.14, this comparison reveals a clearer relationship with polarity at a descriptive level. This pattern aligns with previous studies arguing that gestures are degraded in acceptability when interpreted under the scope of negation (Davidson 2023).

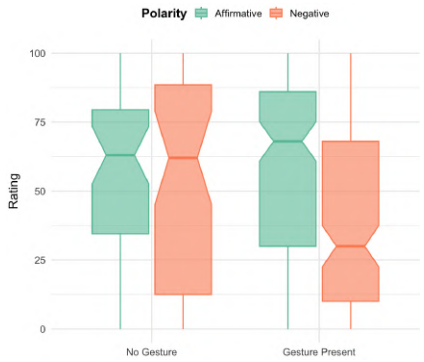


Figure 3.14: *Acceptability ratings in Study 2, collapsed by Gesture and No Gesture conditions*

The results should be understood as reflecting the general difficulty of combining gesture with negation, rather than as evidence for a contrast among Path, Manner, and Conflated Gestures (Ebert & Ebert 2014; Tieu et al. 2017; Davidson 2023; among others).

Interim summary

These two preliminary studies provide a clearer picture of how English speakers evaluate multimodal utterances in the absence of either gesture or explicit event context. Across both studies, sentence acceptability was robustly sensitive to polarity. By contrast, neither event type (Path, Manner, Conflated) nor gesture type had a consistent independent effect on acceptability, particularly under negation. In Study 1, polarity effects differed depending on whether an event involved motion, but no differences emerged among the motion event types themselves. Similarly, in Study 2, gesture type did not reliably affect acceptability under negation, and no significant interactions were observed between gesture type and polarity. These baselines establish that any effects in Experiment III cannot be attributed solely to the linguistic sentences or to gesture type in isolation, but must be evaluated in the interaction among sentence, gesture, event context, and polarity. With these findings in mind, the next section turns to an investigation of co-speech gestures in which gesture type, event type, and polarity are jointly manipulated.

3.4.2 Experiment III: Co-speech gestures and event interpretation

This study investigates how co-speech gestures contribute to utterance interpretation, with particular attention to potential distinctions among gesture types and their interaction with logical operators such as negation. The experiment focuses on how native English speakers interpret co-speech gestures in controlled contexts. An acceptability judgment paradigm was employed to examine how different gesture types contribute to meaning and to assess how their contributions are modulated by negation. This design enables a direct comparison of whether gestural content behaves like linguistic expressions in alternative-sensitive environments, or instead exhibits a distinct interpretive profile. The study addresses whether the asymmetries observed in the linguistic domain extend to multimodal representations of event structure, and provides a controlled empirical basis for investigating gesture-meaning interactions.

Design and stimuli

To investigate how manual co-speech gestures contribute to the expression of path and manner information, short intransitive English sentences were constructed for the experimental task, mirroring those used in the written English experiment. As noted earlier, the experimental stimuli were designed to manipulate the path and manner information conveyed through co-speech gestures. Therefore, unlike in the written English task, where path and manner information was conveyed through prepositional

phrases, the current task relied on co-speech gestures to express this information, without additional linguistic modifiers encoding path or manner.

It is important to reiterate that in this study, *path* refers to the trajectory of a motion event, including its source and goal, while *manner* describes the specific way in which the motion is performed.

A key variable in the co-speech study was the Gesture Type, defined as the specific form of co-speech gesture accompanying the English utterance. This variable included three levels: (i) gestures representing only path, (ii) gestures representing only manner, and (iii) gestures representing both path and manner simultaneously (in a conflated form). To examine potential differences among these gesture types, three categories of video clips were prepared, each depicting gestures corresponding to one level of the variable:

(a) *Path only gesture* **(b)** *Manner only gesture* **(c)** *Conflated gesture*

Figure 3.15: *Three co-speech gestures depicted in the video stimuli*

Consistent with the written English task, path-only gestures were designed to depict distinct trajectories, including forward, backward, upward, and downward movements. Manner-only gestures, by contrast, were characterized by dynamic patterns such as circular, coiled, zigzag, and S-shaped movements.[16] Conflated gestures naturally emerged as the simultaneous realization of both path and manner components, integrating the trajectory of motion with how it was performed. Particular care was taken to ensure that all gestures were as clear and interpretable as possible for participants:

[16]While manner-only gestures are less typical in spontaneous co-speech production, they were included to isolate manner information under controlled experimental conditions. Moreover, pilot testing indicated that participants could interpret them reliably.

Subject-Verb Pair	Path Information	Manner Information	Conflated Information
fall – leaf	Downward	Circular	Downward + Circular
float – plank	Backward	S-shaped	Backward + S-shaped
fly – paper	Upward	Circular	Upward + Circular
go – car	Forward	Zigzag	Forward + Zigzag
move – chair	Forward	Circular	Forward + Circular

Table 3.6: *Details of subject-verb pairings and their associated path, manner, and conflated gesture information.*

The video stimuli were created with the assistance of a native English speaker who was an undergraduate student at Harvard University at the time. Preparatory meetings were conducted to determine appropriate and plausible gestures for the specific motion events under investigation. During these sessions, animated illustrations, which had been designed in advance, were reviewed to ensure that the gestures aligned with the intended stimuli.

The recording process spanned two sessions, during which each sentence was recorded both with and without accompanying gestures. Upon completion, the raw footage was edited, annotated, and refined into concise video clips tailored to the experimental design. To ensure seamless playback and minimize technical issues during the experiment, the finalized clips were uploaded to YouTube, a widely accessible and reliable video-sharing platform.

The design of the video stimuli was guided by both phonological and semantic/pragmatic considerations to ensure alignment with linguistic and cognitive principles. From a phonological perspective, co-speech gestures are closely coordinated with speech and often align with prosodically prominent portions of the utterance, reflecting the integrated planning processes underlying speech and gesture production (Esteve-Gibert & Prieto 2013; Franich et al. 2025; among others). In addition, Leonard & Cummins (2011) report an asymmetry in the perception of gesture-speech timing mismatches, demonstrating that such mismatches are more noticeable to participants when the gesture lags behind the speech than when it slightly precedes it. This finding underscores the perceptual salience of fine-grained timing in the alignment of gesture and speech. From a semantic-pragmatic standpoint, Schlenker (2017) argued that the temporal alignment of gestures with speech plays a crucial role in their pragmatic contribution. Specifically, gestures occupying a dedicated temporal slot within an utterance, namely post-speech gestures, "must make a non-trivial contribution to the sentence," whereas gestures lacking a separate temporal slot, namely co-speech gestures, are less constrained in this regard (Schlenker 2017; p. 884). In this study, all gestures are realized as co-speech gestures, temporally aligned with the verbal predicate, in order to isolate gesture-speech integration without

introducing the interpretive effects associated with post-speech gestures.

To ensure precise coordination and consistency across stimuli, the co-speech gestures in this study were timed to begin as closely as possible to the onset of the verb in the accompanying utterance. This alignment was intended to reflect natural co-speech timing while adhering to the linguistic and cognitive principles outlined above:

(21) Look, the chair is $\overline{\text{moving}}^{\text{gesture}}$.

Each verb occurred with the three co-speech gesture types across trials. The onsets of each verb and its accompanying gesture were synchronized for all trials to ensure temporal alignment. However, in trials involving conflated co-speech gestures, which take relatively longer to perform, their offsets did not always align with the verb:

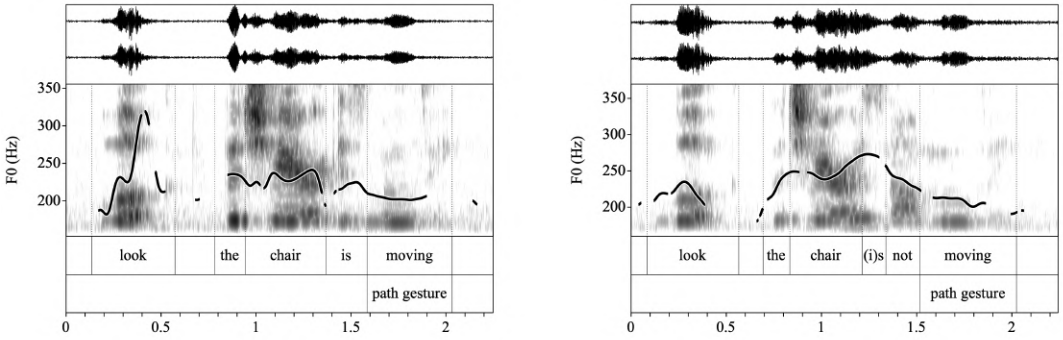
(22) Illustration of a conflated gesture

As in the previous tasks, this study included two other independent variables: Polarity and Event Type. Previous research argues that gestural content interacts differently with negation, either escaping the scope of negation (Ebert & Ebert 2016) or exhibiting degraded acceptability under negation (Davidson in press b). The present study investigated how different gesture types interact with negation, examining whether and how negation influences their contribution to utterance interpretation. The polarity variable had two levels: affirmative as in (21) above and negative as in (23) below:

(23) Look, the chair is not $\overline{\text{moving}}^{\text{gesture}}$.

During the video recording of the stimuli, careful attention was given to avoiding emphasis on either the verb or the negation, ensuring that no unintended inferences of contrastive focus could arise. This approach was motivated by the observation that co-speech gestures can be interpreted as "at-issue" when they occur in contexts involving contrastive focus (Esipova 2019). In such contexts, co-speech gestures are argued to assert a metalinguistic meaning that enables them to be treated as at-issue while they are generally treated as not-at-issue (see Ebert & Ebert 2014; Esipova 2019; Schlenker

2018; among others). Despite the subtle differences, both polarity conditions display comparable pitch contours and amplitude patterns, indicating that no obvious unintended focus-related pitch accent on the verb was introduced as illustrated in Figure 3.16:



(a) *Affirmative polarity*

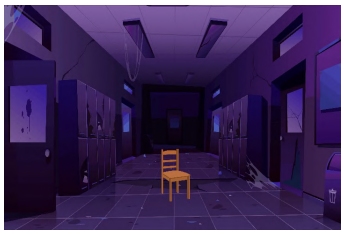
(b) *Negative polarity*

Figure 3.16: *Prosodic contours for (a) affirmative polarity ("Look, the chair is moving") and (b) negative polarity ("Look, the chair is not moving"). The plots show waveform (top), spectrogram with F0 trace, and corresponding word-level segmentation (bottom).*

The variable Event Type was identical to that used in the previous tasks in this chapter. In the present task, this variable provided contextual information against which participants evaluated English sentences accompanied by co-speech gestures. By comparing different gesture types within the same event context, the design allows for an assessment of whether participants' acceptability judgments vary depending on the specific gesture present. The study aims to determine whether certain gestures influence interpretation more than others, and whether the presence of a particular gesture type affects comprehension differently under negation. If any systematic differences emerge, this would provide insight into the role of gestures in meaning construction, particularly with respect to linguistic operators such as negation.

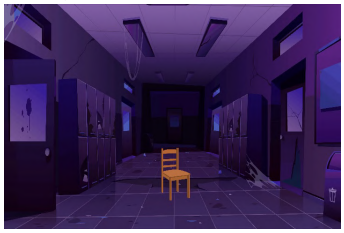
Furthermore, this variable served as a validation mechanism within the experimental design. For instance, in a "No Motion" event, where an entity remained stationary, an affirmative sentence accompanied by any gesture type was expected to be perceived as false and, consequently, deemed unacceptable by participants:

(24) Look, the chair is $\overline{\text{moving}}^{\text{path gesture}}$.



Similarly, in a "No Motion" event, where an entity remained stationary, a negative sentence accompanied by any gesture type was expected to be perceived as true and deemed acceptable by participants:

(25) Look, the chair is not $\overset{\text{path gesture}}{\overline{\text{moving}}}$.



These trials were incorporated to ensure that participants engaged with the full spectrum of the response scale, rather than defaulting to midpoint selections. This methodological consideration helped maintain the integrity of the data by preventing response bias and reinforcing the reliability of the acceptability judgments.

The experiment was designed and implemented using Qualtrics. It included three independent variables: Gesture Type (Manner Gesture, Path Gesture, Conflated Gesture), Event Type (Manner Event, Path Event, Conflated Event, No Motion), and Polarity (Affirmative, Negative). The resulting design consisted of 24 conditions (3×4×2).[17]

Co-speech gestures encoding path and manner information were expected to influence participants' ratings to the extent that they contribute interpretable or inferentially relevant content. Prior work has shown that gestures can give rise to structured inferential content, even in the absence of lexical material (Tieu et al. 2019). However, because co-speech gestures are often analyzed as contributing not-at-issue content, whether they directly introduce alternatives remains an open question. In the present task, if gestural content contributes to interpretation in a way that is relevant under negation, gestures should affect participants' judgments in both affirmative and negative contexts. In affirmative conditions, incongruent cases were expected to yield lower ratings than congruent cases, reflecting a mismatch between the depicted event and the information conveyed by the gesture. In negative

[17] See Table B.7 in Appendix B for the full list of conditions tested in Experiment III.

conditions, gestures were expected to interact with negation by contributing content that could support or constrain the set of event descriptions relevant for interpretation. To the extent that gestures shape the alternatives considered by participants, incongruent negative cases were expected to yield higher ratings than their affirmative counterparts.

Finally, building on Talmy's (1985, 2000) distinction between path and manner, I consider whether these components differ in how they contribute to gesture interpretation. If path constitutes a more structurally constrained dimension of event representation, path-related gestures may give rise to more stable interpretive contrasts under negation than manner-related gestures. The present experiment focuses on co-speech gestures that contribute directly to the event description, in order to assess how gesture type and semantic content jointly shape interpretation.

Differences in participant ratings across incongruent cases were taken to reflect potential asymmetries between modification types. In particular, incongruent cases under negative polarity, as in (11-b), were expected to introduce a contrast between the negated proposition and other event descriptions compatible with the gestural content. In such cases, participants were expected to evaluate the sentence relative to an event that satisfies the negation while remaining compatible with the gestural information. To the extent that gestures can support or constrain the set of alternatives made relevant in interpretation, this should result in higher ratings for incongruent cases under negation.

The next section outlines the experimental procedure and participant sample.

Procedure and participants

A within-subjects experimental design was implemented to address the research questions while ensuring a balanced distribution of conditions across participants. To achieve this, a Latin square arrangement was employed, ensuring that each condition appeared an equal number of times across groups. This method organized participants into ten distinct groups, each encountering a unique sequence of conditions, thereby minimizing biases and maintaining experimental control.

In this acceptability judgment task, each trial consisted of an English utterance accompanied by a co-speech gesture. To ensure that participants attended to the gestures, their presence was explicitly indicated in the prompt at the beginning of the task:

"We invite you to carefully evaluate 12 short statements in English. You are going to watch short videos where our friend Hannah will communicate not only through words but also with hand gestures to express various events. Imagine that Hannah is speaking directly to you. Your task is to assess how natural these statements feel within the context of the accompanying animated pictures."

Participants received detailed instructions on how to complete the task:

"Watch the video: Our friend Hannah is providing you with the sentence. Feel free to watch the videos multiple times if needed.

Please note that the videos may take some time to play, we appreciate your patience.

Examine the pictures: Before evaluating each sentence, carefully observe the accompanying animated picture. Some animations may involve motion, while others may not. Ensure that you watch the entire event before making your decision."

Although participants were explicitly informed in the prompt that they could replay the videos as many times as they wished, no data were collected on the frequency of video replays or response times. Participants were asked to provide gradient judgments of how natural or likely each utterance was in the depicted context using a continuous response scale from 0 to 100. This scale allows for more nuanced judgments than forced-choice tasks, provides a more flexible form of assessment, and is often experienced by participants as more natural than Likert-scale tasks (Marty et al. 2020).

The cursor was initially positioned at the midpoint of the slider bar to provide a neutral starting point. The endpoints of the scale were labeled "Extremely unlikely" (leftmost) and "Extremely likely" (rightmost). Participants were introduced to the task with the following prompt:

"Rate the statements: Use the slider bar to indicate how natural the statement feels in the given context. Of course, there are better ways to express the provided events but please think about whether these sentences are possible statements to be used under the given circumstances.

Drag to the right: The statement feels natural − something you or another fluent English speaker might say in the given context.

Drag to the left: The statement feels unnatural − not something you or others you know would say.

Use intermediate values for judgments that fall between entirely natural and entirely unnatural."

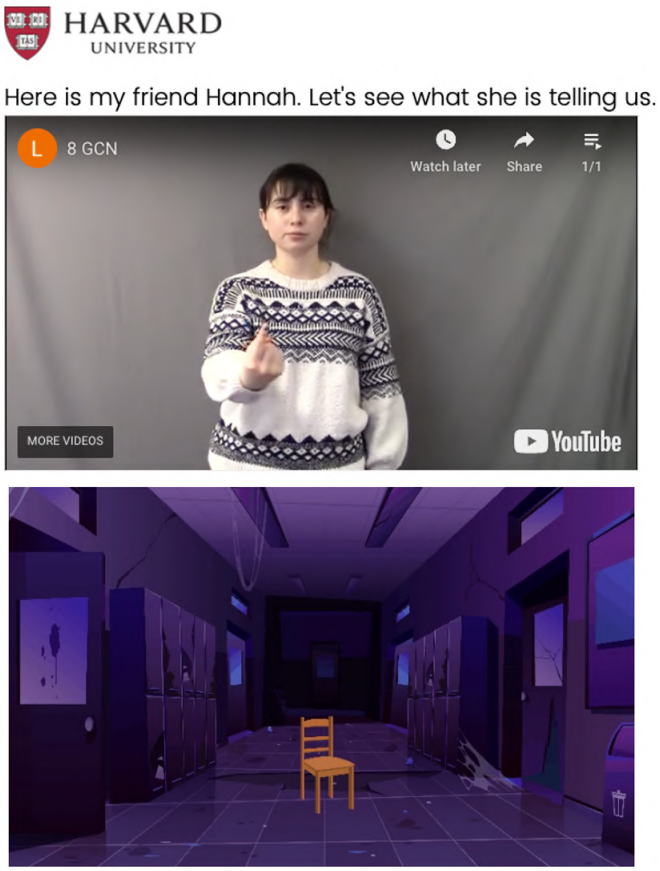
The task was expected to take approximately 10−15 minutes to complete. Before the experimental trials, participants were presented with two warm-up examples designed both to familiarize them

with the task instructions and to assess their attention to these instructions. These warm-up trials followed the same structure as the experimental trials: participants viewed a video containing an English utterance accompanied by a co-speech gesture temporally aligned with the verb, followed by a GIF illustrating an event on the same page. They were then instructed to evaluate the given utterance in relation to the depicted event using the slider bar:

"How likely would you use Hannah's sentence for that event?"

For the warm-up trials, the slider bar was labeled with "Extremely unlikely – I could not imagine myself or someone else saying it like this" on the leftmost end and "Extremely likely – I could imagine myself or someone else saying it like this" on the rightmost end. These labels were intended to familiarize participants with the response scale and help them adjust to the task.

After the warm-up trials, participants proceeded to the experimental trials, as illustrated in 3.17.



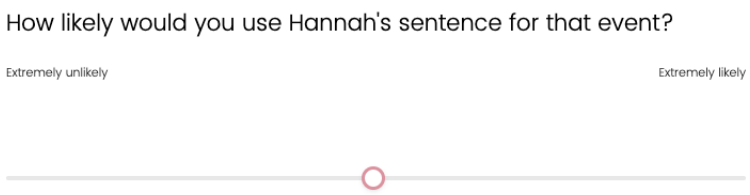


Figure 3.17: *Sample trial from Experiment III*

For this task, 150 participants were recruited (M_{age} = 37.8) through Prolific, including 80 female participants (M_{age} = 40.3) and 70 male participants (M_{age} = 34.9), with an age range of 18−79. To minimize potential linguistic and cultural influences, participation was restricted to monolingual English speakers who were born and currently residing in the United States. All participants self-reported having no language difficulties. On average, the task was completed in about 9 to 10 minutes, and participants were compensated in accordance with Prolific's recommended hourly payment guidelines.

Results

Before conducting the analysis, the data were assessed to ensure that participants remained attentive to the task. As previously noted, the design included "true" and "false" statements, which were expected to prompt the use of the extreme ends of the slider bar. To assess response variability, the standard deviation (SD) of ratings was calculated for each participant across trials. The distribution of SD values was examined, and the 5th percentile (14.84) was used as a threshold to detect cases of minimal response variability, which could indicate disengagement with the task. Participants with an SD below this threshold were flagged for further inspection and subsequently excluded if their response patterns demonstrated clear inattention, such as consistently selecting the midpoint of the scale. To contextualize this exclusion criterion, the mean SD across all participants was 41.10, while the median SD was 44.21. This substantial difference between the exclusion threshold and the central tendency measures suggests that the flagged participants exhibited anomalously low variability, reinforcing their classification as outliers. Further inspection confirmed that the excluded participants consistently positioned the slider bar at or near the midpoint, supporting their lack of engagement with the task and/or the directions. Based on these criteria, data from eight participants were excluded, resulting in a final sample of 142 participants for statistical analysis.

The experimental design consisted of twenty-four trial types, resulting from the full factorial combination of the independent variables: Gesture Type (Manner Gesture, Path Gesture, Conflated

Gesture), Event Type (Manner Event, Path Event, Conflated Event, No Motion), and Polarity (Affirmative vs. Negative).

This study tests whether path and manner information conveyed by gestures contribute to meaning in distinct ways and whether they interact with negation in unique ways. Before addressing these questions, it is essential to understand the extent to which participants incorporated gestures into their sentence evaluations. If participants entirely ignored gestures, their judgments would be expected to align solely with the truth conditions of the verbal part of the sentences, showing no differences across gesture types: affirmative sentences should receive higher ratings when an event involving motion was present, while negative sentences should be accepted when no motion occurred. Conversely, if participants fully integrated gestures into their evaluations, their judgments would be expected to resemble those from the written English study.

Figure 3.18 provides a visualization of the data, offering an initial perspective on the distribution of responses across experimental conditions:[18]

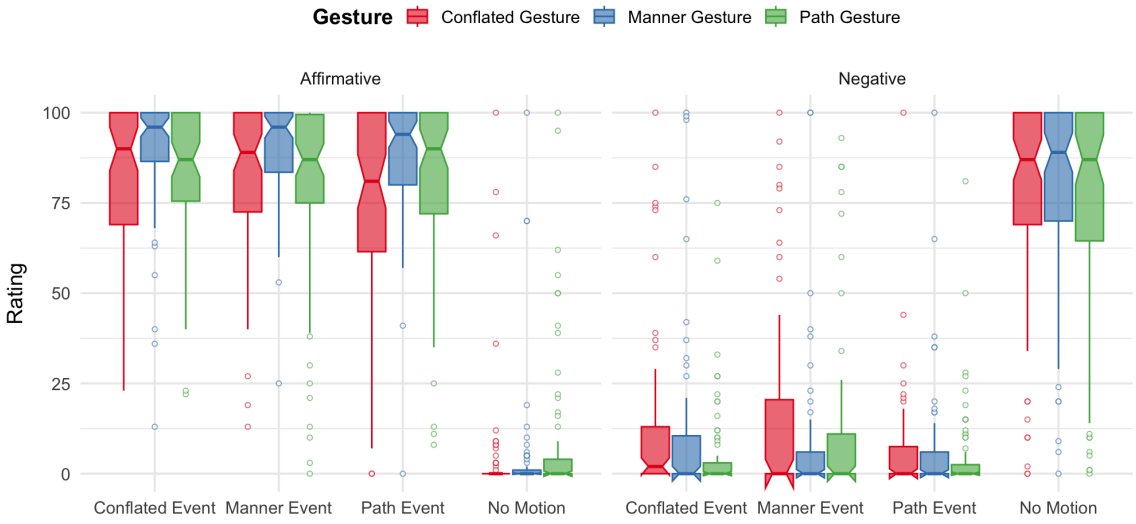


Figure 3.18: *Response patterns across all conditions in Experiment III*

Figure 3.18 illustrates that participants did not rely solely on information provided by the gestures to evaluate the sentences. As expected in the case where gestures were ignored, polarity had a dominant effect. Acceptability ratings were consistently higher for affirmative sentences but dropped significantly under negation across all event types involving motion, namely Path, Manner, and Conflated Events.

No Motion condition showed that participants were sensitive to linguistic polarity and congruence

[18]See Table B.8 in Appendix B for the mean acceptability ratings and standard deviations (SD) across conditions in Experiment III.

between event type and the truth conditions of the sentences, where affirmative sentences were rated significantly lower, while negative sentences were rated higher, regardless of the co-speech gesture type.

While polarity and event type effects were strong and consistent, the impact of gesture types appeared to be more subtle. To explore potential influences of gesture type, a focused analysis was performed, restricting the dataset to conditions where an event with motion was present while omitting No Motion conditions. This refined approach enabled a more precise assessment of whether certain gestures interacted with linguistic or visual factors, shaping acceptability ratings in ways that were not immediately evident in the broader analysis.

As a first step, the affirmative polarity with three Event Types involving a motion (Path Event, Manner Event, and Conflated Event) were investigated separately:

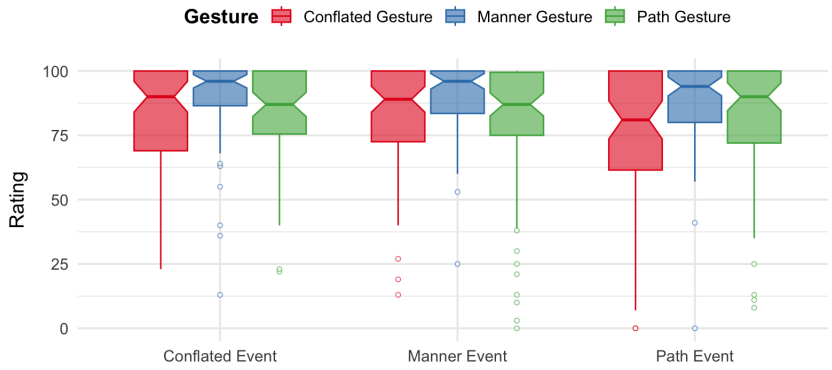


Figure 3.19: *A zoom in the ratings for affirmative polarity cases in Experiment III*

A statistical analysis was conducted to capture the meaningful differences between the variables. Given the continuous and bounded nature of the data, ratings were scaled, and a beta regression model with a logit link function was fitted to assess the impact of Gesture Type and Event Type on acceptability judgments while accounting for the random effects (*Rating_scaled* $\sim$ *GestureType * EventType + (1 | Response_ID) + (1 | Scenario), data*).

The results of the model are presented in Table 3.7:

Table 3.7: *Model results for affirmative polarity (Experiment III)*

	Estimate	Standard Error	z value	p value
Intercept	1.72	0.15	11.90	<0.001
Path Gesture	-0.09	0.06	-1.49	0.13
Manner Gesture	0.30	0.07	4.32	<0.001
Path Event	-0.09	0.06	-1.45	0.14
Manner Event	0.03	0.10	0.26	0.8
Path Gesture:Path Event	0.29	0.09	2.95	<0.01
Manner Gesture:Path Event	-0.0002	0.11	-0.002	1
Path Gesture:Manner Event	-0.24	0.09	-2.70	<0.01
Manner Gesture:Manner Event	-0.01	0.09	-0.96	0.9

All categorical predictors were coded using sum-to-zero (effects) contrasts.[19] Under this coding scheme, the model intercept represents the grand mean of acceptability ratings across all levels of Gesture Type and Event Type, and each coefficient reflects the deviation of a given level from this overall mean. As a result, main-effect coefficients should be interpreted as average deviations from the mean across conditions, rather than as comparisons to an arbitrary reference level.

The results indicate an effect of gesture type on participants' acceptability ratings in the affirmative polarity. Specifically, ratings were significantly higher for the Manner Gesture condition ($\beta = 0.30$, $p < 0.001$), suggesting that, on average, Manner Gestures were associated with higher acceptability in affirmative contexts. In contrast, Path Gesture did not exhibit a significant main effect ($p = 0.13$), indicating that its presence alone did not influence ratings.

Similarly, Event Type did not yield a significant main effect, with Manner Events ($p = 0.8$) and Path Events ($p = 0.14$) showing no significant impact on acceptability ratings. However, a significant interaction emerged between Path Gesture and Path Event ($\beta = 0.29$, $p < 0.01$), indicating that Path Gestures received a higher acceptability rating when paired with Path Events. In contrast, a significant negative interaction between Path Gesture and Manner Event ($\beta = -0.24$, $p < 0.01$) indicates that Path Gestures were penalized in incongruent event contexts. Together, these patterns demonstrate a clear congruent-incongruent asymmetry for Path Gestures. However, Manner gestures did not show a

[19]The choice of contrast coding differed across experiments to reflect the underlying structure of the stimuli. In the written English experiment, treatment contrasts were used with the conflated condition as the reference level, as it represents a semantically complete event description in which both path and manner information are explicitly encoded. This allows other conditions to be interpreted as deviations from a theoretically meaningful baseline. In the gesture experiment, however, no comparable reference condition was available, as gestural expressions do not encode event structure in a uniform or canonical way. Accordingly, sum contrasts were used to evaluate each condition relative to the overall mean, avoiding the imposition of an arbitrary baseline.

corresponding match advantage in Manner Events, nor were they strongly penalized in Path Events.

There was substantial individual variability among participants, with an intercept variance of 0.73 (SD = 0.85), indicating that participants exhibited notable individual differences in their ratings. In contrast, variability at the scenario level was relatively low, with an intercept variance of 0.06 (SD = 0.25), suggesting that differences across scenarios contributed minimally to the overall variance.

Next, the negative polarity with three Event Types involving a motion (Path Event, Manner Event, and Conflated Event) were investigated to examine whether these effects persist under negation:

Figure 3.20: *A zoom in the ratings for negative polarity in Experiment III*

Following the same statistical approach as in the affirmative condition, a beta regression model was fitted to the scaled ratings. The results of the beta regression model are presented in Table 3.8:

Table 3.8: *Model results for negative polarity (Experiment III)*

	Estimate	Standard Error	z value	p value
Intercept	-1.88	0.08	-21.80	<0.001
Path Gesture	-0.11	0.06	-1.66	0.1
Manner Gesture	-0.02	0.06	-0.29	0.8
Path Event	-0.09	0.06	-1.42	0.15
Manner Event	0.06	0.07	0.88	0.4
Path Gesture:Path Event	0.01	0.09	0.12	0.9
Manner Gesture:Path Event	-0.002	0.09	-0.03	0.9
Path Gesture:Manner Event	0.09	0.09	1.03	0.3
Manner Gesture:Manner Event	-0.07	0.09	-0.76	0.4

The results showed no main effect of Gesture Type in the negative polarity condition, in contrast to the affirmative case. Similarly, Event Type did not yield a significant effect, suggesting that the type

of event alone did not influence participants' evaluations.

Furthermore, no significant interaction was found between Gesture Type and Event Type, indicating that the combination of these factors did not affect ratings in the negative polarity condition. This lack of interaction suggests that gestural and event-based motion cues do not jointly contribute to acceptability judgments in a systematic manner under negation.

The model revealed that participant-level variance was 0.08 (SD = 0.27), indicating some individual differences in acceptability ratings. In contrast, scenario-level variance was substantially lower (0.003, SD = 0.06), suggesting that differences across scenarios had a negligible impact on ratings.

Discussion

By shifting from written English stimuli to gesture-based stimuli, this study examined how co-speech gestures, which provide complementary information absent in speech, contribute to utterance interpretation, focusing on distinctions among gesture types and their interaction with negation.

A key finding of Experiment III is that participants did not entirely disregard gestures in their evaluations. If gestures had been ignored, judgments would have aligned strictly with the linguistic content of the sentences and the depicted events, and no differences across Gesture Types would have emerged. Instead, gesture type subtly shaped responses, indicating that participants were sensitive to the semantic contribution of co-speech gestures. At the same time, participants were clearly sensitive to polarity and to the relation between the utterance and the depicted event. In particular, the No Motion conditions showed that ratings tracked the compatibility between the spoken sentence and the visual event, confirming that participants were engaged with the task.

In affirmative contexts, gesture type and event type did not contribute uniformly. In particular, Path Gestures displayed a clear congruent-incongruent asymmetry: they were rated more favorably when paired with Path Events and were penalized in incongruent contexts, especially with Manner Events. By contrast, Manner Gestures showed higher overall acceptability in affirmative contexts but did not exhibit the same strong match advantage. This asymmetry suggests that, in affirmative contexts, participants were sensitive to gestural content, but that different gesture types contributed differently to acceptability. Incongruent Path Gestures led to a stronger decrease in acceptability than incongruent Manner Gestures, while incongruent Manner Gestures were more easily tolerated.

At first glance, the consistently high ratings associated with Manner Gestures might suggest that they contributed positively to interpretation across event types. However, this pattern should be interpreted with caution. The absence of a significant interaction between Manner Gesture and

Event Type suggests not that manner was more strongly integrated into interpretation, but rather that Manner Gestures were less tightly tied to event congruence. Therefore, the observed effect is best characterized not as an increase in acceptability for manner gestures, but as an asymmetry in how incongruent gestures are penalized. In other words, manner gestures may have been easier for participants to background or ignore when evaluating the utterance-event pairing.

A closer examination of Path Gestures further supports this interpretation. As predicted, Path Gestures had a significant positive effect in Path Event contexts under affirmative polarity. This suggests that participants recognized these gestures as meaningful when they directly aligned with the underlying event structure, lending support to the view that gestures contribute to meaning in a context-sensitive, rather than uniform or isolated, manner.

This asymmetry suggests that different gesture types are not equally central to event interpretation. Path information, which is often treated as a core component of motion event structure (Talmy 1985, 2000), appears to be more difficult to ignore when it conflicts with the depicted event, whereas manner information may be more easily backgrounded or discounted. On this view, the higher ratings associated with Manner Gestures might reflect a weaker constraint, where incongruent manner gestures are less disruptive because they are more easily ignored. This interpretation is consistent with the absence of an interaction between Manner Gesture and Event Type.

In negative contexts, the role of gesture type was less pronounced. Neither Path nor Manner Gestures showed significant interactions with Event Type, and the congruent-incongruent asymmetry visible for Path Gestures in affirmative contexts did not persist under negation. This finding aligns with previous work suggesting that gestural content is more difficult to integrate under negation, whether because it escapes the scope of negation or because its contribution becomes less stable in operator-sensitive environments (Davidson 2023; Ebert & Ebert 2016; Tieu et al. 2017; Zlogar & Davidson 2018). Specifically, any path-specific advantage visible in affirmative contexts did not persist under negation, further reinforcing the idea that gestures contribute meaningfully only when they align with event structure in affirmative contexts.

The preliminary studies helped clarify the interpretation of the overall results. The task without gesture (Study 1 in 3.4.1) showed that the event types did not independently affect the relevant ratings of the sentences in the absence of gestures, which were intended to provide information about the event. This baseline supported the contribution of gestures in interpretation. On the other hand, the co-speech gesture task without context (Study 2 in 3.4.1) showed that gestures are rated relatively lower in the absence of any referential context, aligning with findings demonstrating that gestures are

rarely interpreted in isolation but rather in conjunction with linguistic and visual cues (McNeill 1992; Özyürek et al. 2007; Zlogar & Davidson 2018).

These results bear directly on the broader question of whether asymmetries under negation are driven by depictiveness itself or by the semantic class of the modifier. In this respect, the comparison with sign language classifiers is particularly revealing. In the previous chapter, classifier constructions in TİD were shown to exhibit an asymmetry between path and manner encoding forms under negation, even though both involve depictive movement. The present experiment shows that co-speech gesture does not robustly replicate this pattern. This contrast suggests that depictiveness alone is not sufficient to generate the path-manner asymmetry observed in TİD. Rather, the asymmetry appears to emerge most clearly when path and manner are encoded as part of the grammatical representation, as in classifier constructions or written linguistic modifiers. By contrast, when path and manner are conveyed through co-speech gesture, negation appears to reduce the contribution of gesture more generally, without yielding a stable contrast between gesture types. Therefore, the gesture data suggest that depiction alone cannot account for the TİD pattern.

3.5 General discussion

This chapter investigated how path and manner information contribute to meaning across linguistic and gestural modalities, with particular focus on their interaction with negation. The central goal was to determine whether asymmetries under negation arise from the depictive nature of certain representations or reflect more fundamental differences between event components themselves. Across three experimental studies, the results reveal a consistent but nuanced asymmetry between path and manner in the present design.

As expected, the results showed a fundamental distinction between the contributions of gestural and linguistic modification to sentence interpretation and acceptability. As argued by Tieu et al. (2017) and others, co-speech gestures differ from ordinary linguistic modifiers in that their absence does not render the spoken sentence ungrammatical. Instead, the absence of a gesture typically results in a minor interpretive penalty rather than a complete breakdown in meaning. This stands in contrast to linguistic modifications, where omitting a crucial word or phrase, especially an argument, often leads to an incomplete or uninterpretable sentence. However, the results of the written English task further indicated that the observed effects are also present with modifiers, and that these effects varied depending on the type of information conveyed.

In the written language experiments, both path and manner modifiers clearly contributed to sentence evaluation, as reflected in the consistent sensitivity to congruence between modification type and event type. However, mismatches were not treated uniformly. Path modification was associated with stronger penalties in incongruent contexts, particularly when paired with manner events, whereas manner modification was less strongly penalized when paired with path events. This pattern indicates that incongruent cases involving manner modification are tolerated to a greater extent than those involving path modification.

Turning to the gesture domain, one of the main takeaways of the present paradigm is that gestural content does not support the same polarity-sensitive contrasts as written linguistic modifiers. In affirmative contexts, participants were sensitive to gestural content, and path and manner gestures did not behave identically. This asymmetry did not extend robustly to negative contexts. Additionally, affirmative sentences provided a more favorable environment for integrating gestural information, whereas negative sentences were less conducive to gestural interpretation. Crucially, the presence of negation diminished the influence of gestural information, in line with previous research (Davidson 2023; Ebert & Ebert 2016; Schlenker 2018; among others).

Within this broader context, this chapter contributes additional empirical evidence to the growing literature on the semantics of co-speech gesture using a distinct experimental paradigm. Tieu et al. (2019) show that iconic gestures and visual representations can support a range of inferential types, including implicatures, presuppositions, and supplements, suggesting that inferential structure is not restricted to lexicalized linguistic material but may arise from domain-general cognitive mechanisms. In their analysis, gestural content can participate in these inference systems and exhibit characteristic behavior under negation. The present results refine this picture. While gestures can support inference in principle, they do not, in the current paradigm, reliably support the contrastive alternatives required for evaluating negated propositions. In particular, unlike linguistic modifiers, gestures do not consistently establish or sustain contrastive alternatives under negation.

One possible explanation is that negative interpretation depends on the availability of alternatives, and depictive content may support those alternatives less readily or less stably than descriptive linguistic material as proposed by Davidson (2023). Under this pragmatic approach, gesture is not excluded from interpretation under negation, but it contributes less robustly to the alternative structure required for evaluating the negated proposition. This would explain why negation disrupts the interpretability of gestures to a greater extent than linguistic modifications.

More broadly, these findings contribute to a growing body of work on the multimodal nature of

human communication, while demonstrating that multimodality does not imply uniformity. First, they demonstrate that gestures are not uniformly integrated into sentence interpretation, particularly in affirmative contexts. Second, they show that different types of event information, such as path and manner, contribute meaning in distinct ways, even within the same modality. Third, they highlight how event structure and modality interact, revealing that path and manner are not evenly distributed across language and gesture, nor are they equally affected by polarity. Finally, the comparison with sign language classifiers suggests that the "gestural" component of classifier constructions does not align straightforwardly with co-speech gesture, but instead patterns more closely with the behavior of linguistically integrated modifiers. These findings suggest that path and manner differ in constraint strength in language, and that this asymmetry becomes most clearly visible under negation when information is grammatically integrated, i.e., in sign and spoken languages. By contrast, although gestures can be inferentially meaningful, their contribution is less stable under negation, as they do not reliably support the contrastive alternatives required for interpretation.

Beyond its implications for linguistic theory, this chapter also contributes to a multimodal perspective on meaning. Although prior work has emphasized the general importance of visual cues in language comprehension (Drijvers & Özyürek 2017; Yap et al. 2011; among others), the present findings show that not all forms of visual information contribute to interpretation in the same way as evident in the varying contribution of co-speech gesture depending on the type of information conveyed.

Methodologically, this study represents a step forward in gesture research. As noted by Kita & Emmorey (2023), research on gesture comprehension remains comparatively underdeveloped relative to the extensive literature on gesture production (pp. 416-417). Moreover, to my knowledge, it is one of the first to systematically examine path and manner gestures separately, under both affirmative and negative conditions, using a fully crossed, multimodal experimental design. The use of gradient acceptability judgments on a continuous scale allowed for the detection of subtle interpretive asymmetries. By independently manipulating gesture type, sentence polarity, and event type, the study provides a fine-grained assessment of how gestural information is integrated or fails to be integrated into sentence interpretation.

This leaves an important question open. Why do we observe these differences between path and manner information? Can we attribute these differences to the fact that path is the core component of an event as proposed by Talmy (1985, 2000)? Or should we consider the semantic complexity of these information types to explain this asymmetry? The next chapter will investigate manner adverbials in detail to find answers to these questions.

Chapter 4

Where Are Your Manners? How Negation and Focus Affect Manner Adverbials in Turkish

The previous chapter investigated how path and manner information contribute to event interpretation across linguistic and gestural modalities, with particular attention to how these components interact with negation. The results showed that path and manner do not behave uniformly under negation in the linguistic domain, and that their contributions to meaning are shaped by both modality and event structure. In particular, manner-related information exhibited distinct interpretive properties, providing motivation for a closer examination of manner as a semantic category in its own right. Building on these findings, the present chapter narrows the focus to manner adverbials in Turkish, setting aside cross-modal considerations and focusing on the interaction between manner, negation, and information structure in a more controlled grammatical domain. This chapter therefore asks whether the previously observed asymmetries reflect a general semantic property of manner, and how manner adverbials in Turkish interact with negation and focus in shaping alternative structure.

Language enables speakers not only to describe events but also to highlight particular dimensions of those events, such as when they occur, where they take place, and how they unfold. These dimensions are commonly expressed through event modifiers, which provide interpretive cues about the structure and internal properties of events. While all event adverbials situate an event within discourse, they do so in distinct ways. Time adverbials locate the event in time, and locative adverbials specify its spatial

setting. Manner adverbials, on the other hand, characterize the internal dynamics of the event itself, particularly how an action unfolds.

Among these, manner adverbials stand out due to their semantic complexity, particularly their association with gradability and the presence of degree-based structure. This complexity has led many researchers to argue that these adverbials differ fundamentally from other types of event-modifying expressions (see Morzycki 2019). Building on the asymmetries observed in the previous chapters, this chapter asks whether manner adverbials interact with negation differently from other adverbial types, such as time adverbials. More specifically, it investigates whether the asymmetries previously observed with motion predicates extend to adverbial modification more generally, and whether manner adverbials constitute a distinct class with respect to their behavior under alternative-sensitive operators.

Although manner adverbials play a central role in event representation, they remain relatively understudied in negative contexts, particularly in comparison to arguments. Negation, which is known to be a focus-sensitive operator, interacts with focus structure and alternative sets, often requiring inferential reasoning for successful interpretation (Fălăuş 2020; Kaup et al. 2007). While much of the existing literature on negation has focused on its effects on nominal or propositional arguments, comparatively little is known about how adjuncts, and adverbials in particular, interact with negation in shaping interpretation (cf. Stevens et al. 2017; Stolterfoht 2026). Addressing this gap allows us to determine whether the interaction between negation and adverbial modification is sensitive to semantic class, and whether manner contributes to the construction and evaluation of alternatives in a way that differs from other event modifiers.

A second research question concerns the role of information structure in mediating this interaction. Given that negation operates over sets of alternatives and that focus determines how such alternatives are structured, this chapter investigates whether the position associated with focus affects the acceptability of adverbials under negation. More specifically, it asks whether the interaction between manner and negation in written contexts depends in part on the information-structural configuration of the clause, and whether certain semantic classes are more compatible with contrastive interpretations than others.

These questions are especially relevant in Turkish, a language with flexible constituent order and a close alignment between syntax and information structure, which allows for fine-grained control over focus even in written stimuli where prosodic cues are absent. Although Turkish typically follows a Subject−Object−Verb (SOV) word order, the position immediately preceding the verb is recognized as the canonical focus position (Erguvanlı-Taylan 1984; Kurt & Dinçtopal Deniz 2023; among others). As a consequence, the placement of an adverbial, whether in the immediate preverbal position or earlier in

the clause, can significantly affect its interpretive prominence, particularly in the presence of negation and contrastive discourse structure. This interaction between syntactic position and discourse function makes Turkish a valuable testing ground for investigating how structural and semantic factors jointly shape the interpretation of adverbials in contrastive contexts.

To address these issues, this chapter presents a series of acceptability judgment experiments designed to investigate how Turkish speakers interpret negated sentences containing event adverbials, with the main experimental contrast focusing on manner and time adverbials and locatives serving as part of the contrastive sentence structure. The first experiment examines the relationship between adverbial type (manner vs. time) and negation, asking whether these two adverbial types differ in their compatibility with negation in contrastive contexts, understood here as contexts in which one alternative is explicitly rejected in favor of another. The aim is to identify potential asymmetries in how different adverbial classes interact with negation and contrast.

The second experiment focuses on the role of the structural position of adverbials in the acceptability of negated structures. It investigates whether adverbials in the immediately preverbal position, the default focus position in Turkish, are judged more natural in contrastive contexts than adverbials occurring earlier in the clause. It further examines the extent to which adverbial type modulates this positional effect. The experiment probes how semantic class and syntactic position interact with information structure, shedding light on how structural and discourse-level factors jointly shape the interpretation of contrast under negation.

Finally, the chapter extends the investigation to a distinct strategy for expressing manner, namely ideophones. Ideophones are a subclass of manner adverbials characterized by vivid, often sound-symbolic properties and are commonly treated as iconic enrichments in spoken language, conveying rich, imagistic information about how an event unfolds. Previous research has reported that ideophones tend to show restricted compatibility with negation, a pattern attributed to their expressive and perceptually grounded nature (Dingemanse 2012, 2017; among others). However, this restriction is not absolute. For instance, Dingemanse (2017) shows that ideophones in Siwu exhibit different behavior depending on their degree of morphosyntactic integration. In more independent constructions, ideophones are typically not negated, whereas in more integrated constructions, they may occur under negation. Moreover, Dingemanse & Akita (2017) show that there is an "inverse relationship" between the degree of grammatical integration and expressiveness, such that the more syntactically integrated an ideophone is, the less expressive it is. These findings suggest that the behavior of ideophones under negation is sensitive to their degree of morphosyntactic integration. This raises the question of whether

morphosyntactic integration systematically predicts how ideophones pattern under negation.

In addition, recent experimental work suggests that ideophones may be interpreted as less at-issue than non-ideophonic expressions of manner, contributing information that is backgrounded rather than directly asserted (Barnes et al. 2022). Accordingly, ideophones have been argued to align more closely with iconic co-speech gestures than with lexical manner adverbials, while remaining structurally and pragmatically distinct. The final experiment investigates whether ideophones in Turkish pattern with lexical manner adverbials in their interaction with negation, or whether they constitute a distinct class. To this end, grammatical integration is defined in structural terms, with morphosyntactic embedding serving as a measurable indicator of the degree to which ideophones are integrated into clause structure.

Together, these studies offer a systematic investigation of how adverbial modification, negation, and focus structure interact in shaping the interpretation of event adverbials. Rather than treating adverbials as compositionally uniform adjuncts, the chapter tests whether manner adverbials differ systematically from time adverbials in alternative-sensitive environments, and whether iconicity introduces additional constraints. By examining factors such as adverbial type, information structure, and iconicity within Turkish, where constituent order interacts with discourse structure, the chapter clarifies the role of semantic class in structuring contrast and contributes to broader discussions about event modification and the pragmatics of negation.

4.1 Event adverbs and their properties

This section provides the theoretical background on event adverbials that motivates the experimental investigations in the remainder of the chapter. It outlines how manner adverbials have been treated in the semantic literature and why they are often argued to differ from other event modifiers, such as time and locative adverbials.

The category of adverbs has been recognized as difficult to define due to its internal heterogeneity and syntactic flexibility. This category raises several puzzles in both the syntactic domain (see Alexiadou 1997; Travis 1988; among others) and the semantic domain (see Morzycki 2019; Schäfer 2008; among others). As Morzycki (2019) notes, the term adverb is often used as a cover term to describe a heterogeneous collection of loosely related lexical items and phrases belonging to various syntactic categories (p. 187). Unlike arguments, which are associated with grammatical relations and thematic roles, adverbials tend to be optional, flexible, and semantically diverse (Alexiadou 1997; Ernst 2002; Jackendoff 1972; Morzycki 2019; among others).

A central question for this chapter concerns whether different adverbials exhibit distinct interpretive properties, and how such variation is reflected in their interaction with negation. Addressing this question requires a clearer understanding of how adverbials are categorized. Given the well-known heterogeneity of the adverb class, a range of classification systems has been proposed, drawing on criteria such as syntactic distribution, semantic scope, and discourse function. For instance, building on the foundational work of Jackendoff (1972), Ernst (2002) develops a classification framework that takes into account not only syntactic positioning but also semantic distinctions, emphasizing the interaction between an adverbial's meaning and its distribution within the clause. As noted by Morzycki (2019), Ernst's (2002) first major distinction is between predicational adverbs and other types of adverbials. The class of predicational adverbs includes speaker-oriented adverbs such as *unfortunately, amazingly, probably*, which express the speaker's attitude; subject-oriented adverbs such as *accidentally, deliberately, unwillingly*, which attribute properties to the subject; and event adverbials, which are the primary focus of the chapter.

Event adverbials modify or specify properties of the event itself and are commonly divided into time, locative, and manner adverbials. Time adverbials situate the event in time, locative adverbials anchor it spatially, and manner adverbials characterize how the event unfolds, as illustrated by the examples in (1), adapted from Maienborn & Schäfer (2019; p. 478):

(1) a. Paul laughed the whole day.
b. The children played in the kindergarten.
c. Henrietta dances beautifully.

To understand how event adverbials function compositionally, it is useful to turn to event-based semantics, originally proposed by Davidson (1967). This framework assumes that the representation of a sentence contains a variable for events, which is introduced by the verbal predicate:

(2) Peter sings.
∃e [sing(Peter, e)]

Within this framework, adverbials are treated as predicates over the event variable, conjoining with the event structure of the clause:

(3) Peter sings loudly.
∃e [sing(Peter, e) & loud(e)]

Manner, time, and locative adverbials entail the existence of the event they modify (Champollion 2015; Davidson 1967; Parsons 1990; Williams 2021; among others). In other words, these adverbials add further information about the event while preserving the entailment of the core event description. The primary motivation of the Davidsonian approach lies in its ability to account for these systematic entailment patterns observed in sentences with adverbial modifiers, as illustrated in (4):

(4) Jones buttered the toast quietly in the bathroom at midnight.

a. Jones buttered the toast quietly. (Manner)

b. Jones buttered the toast in the bathroom. (Locative)

c. Jones buttered the toast at midnight. (Time)

d. Jones buttered the toast.

A simplified semantic representation of this sentence is given in (5):

(5) a. [[quietly]] = λe.quiet(e)

b. $\exists$e [butter(e) & agent(Jones)(e) & theme(toast)(e) & quiet(e) & in(the-bathroom)(e) & at(midnight)(e)]

Although event semantics treats arguments and different classes of adverbials uniformly as predicates of events, manner adverbials have often been argued to occupy a special status. As Morzycki (2019) observes, manner has a somewhat "ghostly" ontological status compared to time and location. Whereas time and locative adverbials correspond to identifiable entities in semantic representations, manner lacks a clear ontological correlate (p. 219). Under this view, the semantics of manner is inherently more abstract or underspecified, motivating analyses that distinguish manner adverbials from their time and locative counterparts.

An alternative to the Davidsonian treatment of manner adverbials is to analyze them as predicates of manners, understood as abstract entities mediating between events and their modifiers. This approach was first systematically proposed by Dik (1975) (see also Alexeyenko 2012; Piñon 2007; and Schäfer 2008 for more recent discussion).[1] As summarized by Schäfer (2008), under this view, verbs introducing dynamic situations, such as activities and processes involving agentive control or change,

[1]Related work has argued that interactions among multiple adverbials motivate a distinction between event-level and manner-level predication (Schäfer 2008; among others). Building on Dik (1975), such approaches allow event structure to introduce both an event variable and a dependent manner variable, yielding scope-sensitive interpretations in cases of stacked adverbials (e.g., *John painstakingly wrote illegibly*). These interactions are not directly investigated in the present chapter but provide useful theoretical context for analyses that treat manner as a distinct representational level.

lexically entail an implicit manner in which the event is carried out (p. 364). In other words, verbs may introduce not only an event variable but also a dependent manner variable, whose availability is constrained by the lexical semantics of the verb. As a consequence, manner adverbials apply to these manner variables rather than to the event itself:

(6) Adapted from Schäfer (2008; p. 364)
Peter sings loudly.
∃e [subject(e,Peter) & sing(e) & ∃m[manner(e,m) & loud(m)]][2]

Under this analysis, the manner adverb *loudly* is taken to modify the manner in which the event is performed, rather than the event itself, in contrast to the Davidsonian analysis in (3). On this view, the adverb specifies how the action unfolds, capturing the intuition that the sentence describes the way in which *Peter sings* rather than attributing a property to the singing event as such.

These approaches provide a useful conceptual framework for formulating empirical questions about the behavior of manner and other event adverbials under structurally and pragmatically complex conditions. If manner adverbials target a distinct level of event representation, either through direct modification of the event variable or via an abstract manner variable, then their interaction with operators such as negation and focus may reveal structural or interpretive asymmetries not observed with other types of adverbials, such as time and locative adverbials. Specifically, one might expect time and locative adverbials to pattern more closely with arguments under contrastive focus or negation, exhibiting more uniform behavior. Manner adverbials, by contrast, may deviate from this pattern. Such asymmetries are expected to be reflected in acceptability judgments, inference patterns, and structural preferences in natural language use.

This chapter presents a series of acceptability judgment experiments designed to investigate how Turkish speakers interpret negated sentences containing different types of event adverbials (manner, time, and locative). It also examines how these interpretations are modulated by the position of negation and the syntactic position of the adverbials. By focusing on Turkish, this chapter aims to evaluate whether the observed semantic-pragmatic asymmetries are typologically robust and to provide empirical evidence on the interaction between adverbial type, negation, and focus structure in

[2]For notational consistency, I adopt the representation used by Schäfer (2008) in (6). The corresponding analysis proposed by Dik (1975) is presented below, where s indicates the situation variable and M indicates the manner variable:

(7) Adapted from Dik (1975; p. 146)
Peter sings loudly.
$_{s1}(sing(\text{Peter}))_{s1}$ & $loud(M_{s_1})$

a language with rich word order variation.

The following section presents the experimental design and materials in detail.[3]

4.2 Probing adverbial semantics through negation and focus

In light of the preceding discussion, this chapter examines how event adverbials interact with negation in Turkish, with particular emphasis on manner adverbials. As Morzycki (2019) observes, manner adverbials differ from time and locative adverbials in their greater semantic complexity, especially in their gradability and degree-based semantics. Although focus-sensitive operators such as negation have been widely studied in relation to argument structure, their interaction with adjuncts remains comparatively underexplored. Because negation activates sets of alternatives and imposes interpretive demands on discourse (Fălăuş 2020; among others), it provides a useful diagnostic for probing how adverbials contribute to meaning beyond their truth-conditional content. Turkish is particularly relevant in this respect, since previous work points to interpretive differences among adverbials under negation in the language (Güven 2004). The present study asks whether manner adverbials behave differently from time and locative adverbials in contrastive structures under negation. By examining acceptability judgments across a range of configurations, it aims to clarify how semantic type, syntactic position, and pragmatic coherence interact in shaping adverbial interpretation.

4.2.1 Experiment I: Manner and time adverbials under negation

The first experiment tests whether manner and time adverbials differ in their acceptability under negation in Turkish. Given the additional complexity attributed to manner adverbials in the semantic literature, it is plausible to expect that sentences with manner adverbials may show lower acceptability under negation than sentences containing other adverbial types. Despite these theoretical predictions, the interaction between adverbial type and negation remains underexplored in the experimental literature. To address this gap, an acceptability judgment task was conducted in Turkish.

Design and stimuli

In this experiment, participants were presented with "minimal pairs" and asked to evaluate their acceptability on a bounded slider scale by directly comparing the two sentences. This design was chosen because the experimental items are expected to be grammatical but may differ in subtle degrees

[3]The data collection was funded by a Harvard Mind, Brain, and Behavior (MBB) graduate student grant to Hande Sevgi, and the data were collected under IRB protocol IRB18-0856 at Harvard University (PI: Kathryn Davidson).

of felicity. By varying only a single factor within each pair, the task encourages participants to focus on the relevant contrast and increases sensitivity to fine-grained differences in acceptability (Marty et al. 2020; Saha et al. 2023). In this way, minimally manipulated sentence pairs provide a suitable tool for probing nuanced interactions among negation, adverbial type, and interpretive felicity. The central question, then, is which configurations support or disrupt felicity in context, and what these judgments reveal about the underlying compositional and pragmatic structure of event adverbials.

Each experimental sentence consisted of two simplex clauses, one of which was negated. The first clause included a subject, a locative adverbial, a target adverbial, and an intransitive verb as in (8):

(8) Subject | Locative | Target Adverb Type | Verb
Adam, odasında **güçlükle** uyudu.

adam oda-sın-da güçlük-le uyu-du
man.NOM room-POSS.3SG-LOC difficulty-with sleep-PST.3SG
"The man slept in his room **with difficulty**."

The semantic class of the target adverbial, which immediately preceded the verb, was manipulated to reveal any differences between manner adverbials, as in (8), and time adverbials, as in (9), in addition to a third condition, ideophones, which will be addressed in Section 4.3:

(9) Subject | Locative | Target Adverb Type | Verb
Adam, odasında **sabah** uyudu.

adam oda-sın-da sabah uyu-du
man.NOM room-POSS.3SG-LOC morning sleep-PST.3SG
"The man slept in his room **in the morning**".

To maintain methodological consistency and minimize potential structural confounds, the present study limits its scope to a particular subset of manner adverbs, namely event-internal manner adverbs, excluding other categories such as sentential adverbs (e.g., luckily, unfortunately) and subject-oriented manner adverbs (e.g., carefully, reluctantly).

Each initial clause was followed by a second clause, the continuation clause, which included either (i) a semantically contrasting adverb of the same type, i.e., a manner or time adverbial (*Match Condition*), or (ii) a semantically contrasting locative adverbial (*Mismatch Condition*). That is, matching continuations preserved the target adverbial type (e.g., manner−manner, time−time), while mismatching continuations paired a manner or time adverb with a locative counterpart. The adverbs used in the experiment were selected primarily on the basis of a preliminary study conducted prior to the main task, in which a separate group of participants (n = 36, M_{age} = 31.3, range = 18–50)

completed sentence fragments.[4] The most frequent items from this pool were incorporated into the continuation clauses to ensure the naturalness of the stimuli.

(10) a. *Match Condition*

Adam, odasında **güçlükle** uyudu, **kolayca** uyumadı.
adam oda-sın-da güçlük-le uyu-du kolayca uyu-ma-dı
man.NOM room-POSS.3SG-LOC difficulty-with sleep-PST.3SG easily sleep-NEG-PST.3SG

"The man slept in his room **with difficulty**; he did not sleep **easily**."

b. *Mismatch Condition*

Adam, odasında **güçlükle** uyudu, **salonda** uyumadı.
adam oda-sın-da güçlük-le uyu-du salon-da
man.NOM room-POSS.3SG-LOC difficulty-with sleep-PST.3SG living.room-LOC
uyu-ma-dı
sleep-NEG-PST.3SG

"The man slept in his room **with difficulty**; he did not sleep **in the living room**."

No overt conjunctions were used between the two clauses. The continuation clauses were designed to introduce a contrast, either (i) by presenting an alternative to the adverbial immediately preceding the verb (Match Condition), or (ii) by presenting a locative adverbial (Mismatch Condition).

Finally, the position of negation was manipulated to assess its interaction with adverbial types:

(11) a. *Negation in the first clause*

Adam, odasında **güçlükle** uyumadı, **kolayca** uyudu.
adam oda-sın-da güçlük-le uyu-ma-dı kolayca uyu-du
man.NOM room-POSS.3SG-LOC difficulty-with sleep-NEG-PST.3SG easily sleep-PST.3SG

"The man did not sleep in his room **with difficulty**; he slept **easily**."

b. *Negation in the second clause*

Adam, odasında **güçlükle** uyudu, **kolayca** uyumadı.
adam oda-sın-da güçlük-le uyu-du kolayca uyu-ma-dı
man.NOM room-POSS.3SG-LOC difficulty-with sleep-PST.3SG easily sleep-NEG-PST.3SG

"The man slept in his room **with difficulty**; he did not sleep **easily**."

The experiment employed a fully crossed 2×2×2 factorial design, with three independent variables: Target Adverb Type (Manner vs. Time), Continuation Type (Match Condition vs. Mismatch Condition), and Position of Negation (Negation in the first clause vs. Negation in the second clause).

[4]See Appendix C for details of this preliminary study.

By varying these factors within minimally contrasting sentence pairs, the design isolates the contribution of each variable to acceptability judgments and interpretation.

Procedure and participants

Adverb Type and Position of Negation were counterbalanced across participants via a Latin square design, and Continuation Type (Match Condition vs. Mismatch Condition) was manipulated within each experimental pair. Each participant completed 14 trials in total, including 4 catch trials, 6 fillers[5], and 4 experimental trials. Each trial consisted of a pair of sentences presented together, and participants rated each sentence separately. In the experimental trials, each pair included one sentence in Match Condition and one in Mismatch Condition, with the two sentences otherwise identical.

The task was to evaluate the naturalness of each sentence using a vertical slider scale, ranging from 1 (completely unnatural) to 5 (completely natural):

Graphic emoji	Numeric Correspondence	Correspondence
	5	Very natural
	4	Natural, but still somewhat odd
	3	Neither natural nor odd / Not sure
	2	Not natural, but not completely bad either
	1	Not natural

Participants first read instructions in Turkish that outlined the purpose of the study and provided guidance on how to evaluate the sentences:

"As we mentioned before, each sentence will be followed by two continuation sentences. What we ask from you is to read the main sentence and then share with us how natural these continuation sentences sound to you.

In some cases, both sentences might feel very natural to you; in such situations, move the slider upward for both sentences. In other cases, neither sentence may feel natural at all. Similarly, move the slider downward for both sentences.

[5]Two of these six fillers were similar in form to the experimental sentences but involved ideophones expressing manner as the target adverbial. The analysis of these items will be presented in Section 4.3.

Sometimes, one sentence might feel more natural than the other. In these cases, move the slider upward for the sentence you find more natural and downward for the less natural one. Remember, the slider isn't limited to just "completely natural" and "definitely not natural" categories:

5: Very natural!

4: Natural, but still somewhat odd

3: Neither natural nor odd / I'm undecided

2: Not natural, but not terribly bad either

1: Not natural at all!"

These instructions were followed by a set of practice trials to familiarize participants with the task.[6]

As described above, participants viewed one Match Condition and one Mismatch Condition presented together on the same page, as illustrated in Figure 4.1:

Figure 4.1: *Sample trial from Experiment I. In this example, the target adverbial type is Manner, with sentential negation appearing in the second clause. Participants are first presented with Mismatch Condition ("The man slept in his room with difficulty, (he) did not sleep in the living room"), followed by Match Condition ("The man slept in his room with difficulty, (he) did not sleep easily.").*

These paired sentences shared the identical first clause ("Adam odasında güçlükle uyudu," which means "*The man slept in his room with difficulty*"), but differed in their second clauses. The continuation clauses were manipulated to include either a matching adverb (i.e., the same adverbial type as the target) or a mismatching adverb (i.e., locative adverbial). In Figure 4.1, the first sentence featured a locative adverbial in the continuation ("salonda uyumadı" which means "*he did not sleep in the living*

[6]See the Appendix C for the original Turkish prompt.

room"), yielding a Mismatch Condition. In contrast, the second sentence included a manner adverb in its second clause, with a semantic contrast to the one in the main clause ("kolayca uyumadı" which means "*he did not sleep easily*"), yielding a Match Condition.

The presentation order of Match and Mismatch Conditions in the experimental task was systematically counterbalanced to eliminate potential confounding effects related to stimulus order.

Each participant saw four catch trials, each consisting of a pair of sentences. The catch trials were included to monitor participant attentiveness throughout the experiment. These trials featured highly natural and felicitous constructions, as well as clearly unnatural and infelicitous ones, which were expected to receive correspondingly high and low acceptability ratings. Specifically, two of the catch trial pairs consisted of one felicitous and one infelicitous sentence, which were expected to be rated on opposite ends of the slider scale. One pair included two felicitous sentences, both of which were expected to receive high ratings (above 3), while the remaining pair included two infelicitous sentences, both of which were expected to receive low ratings (below 3).

Each participant also saw four pairs of filler items that consisted of ditransitive sentences, in which the continuations involved either a direct object or an indirect object, as illustrated in (12):

(12) Sekreter kolilere eski evrakları koydu,

sekreter koli-ler-e eski evrak-lar-ı koy-du
secretary.NOM box-PL-DAT old document-PL-ACC put-PST.3SG

"The secretary put the old documents into the boxes..."

a. *Continuation with a direct object*

...önemli raporları koymadı

önemli rapor-lar-ı koy-ma-dı
important report-PL-ACC put-NEG-PST.3SG

"(he) did not put the important reports."

b. *Continuation with an indirect object*

...çekmeceye koymadı

çekmece-ye koy-ma-dı
drawer-DAT put-NEG-PST.3SG

"(he) did not put (them) into the drawer."

As with the experimental items, the fillers were presented in manipulated versions varying the position of negation. Although these trials were not included in the main analysis, they served to reduce predictability in the experimental design and to ensure a balanced distribution of stimulus types. The

complete list of catch and filler items for this experiment is provided in Appendix C.

A total of 60 participants (M_{age} = 34.9, range = 24–54) were recruited via besample, an online platform that provides access to diverse participants across 42 countries worldwide, including Türkiye. All participants were native speakers of Turkish and reported residing in Türkiye at the time of participation. The task was completed in approximately 5–7 minutes, and participants were compensated with 0.75 USD, following the platform's recommended rates.

Results

Before conducting the analyses, responses to the catch trials were examined to assess participants' attentiveness. Inclusion in the final dataset was contingent upon meeting a set of accuracy criteria. Specifically, in the two mixed catch trial pairs, each containing one felicitous and one infelicitous sentence, the rating for the felicitous sentence was required to be at least two points higher than that for the infelicitous one. In the pair consisting of two felicitous trials, both items were expected to receive ratings of 3 or above, while in the pair with two infelicitous trials, both items were expected to receive ratings of 3 or below. Participants who failed to meet at least two of these criteria were excluded from further analysis. Based on this procedure, data from ten participants were removed, resulting in a final sample of 50 participants whose responses passed the attention checks and were retained for statistical analysis.

The overall distribution of ratings across trial types for 50 participants is shown in Figure 4.2:[7]

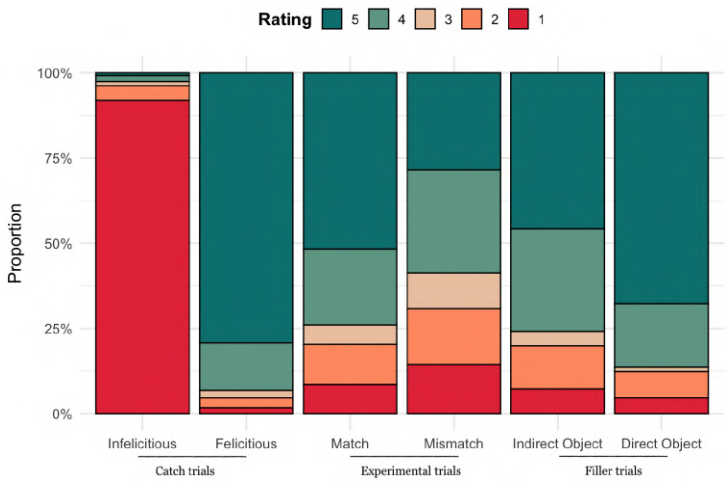


Figure 4.2: *Proportions of acceptability ratings across trial types in Experiment I, including felicitous and infelicitous catch trials, matching and mismatching experimental trials, and fillers.*

[7]The results of the experiments and the analyses can be accessed here.

The y-axis in Figure 4.2 represents the proportion of responses at each level of a 5-point Likert scale, where higher values indicate greater perceived naturalness. As expected, infelicitous catch trials were overwhelmingly rated as unnatural, with responses clustered at the lowest rating (1). In contrast, felicitous catch trials received predominantly high ratings (4 or 5), confirming that participants were attentive and responsive to the intended manipulations.

Filler trials were not included in the main analysis, as they primarily served to elicit intermediate judgments of a similar type. However, participants exhibited the expected pattern, where continuations with indirect objects were judged somewhat less natural than those with direct objects, in line with Kurt & Dinçtopal Deniz (2023). These trials further illustrate the expected interaction between word order, argument type, and negation.[8]

This experiment specifically tested whether manner adverbials differ from time adverbials in their interaction with negation and contrastive structures in Turkish. The central prediction was grounded in prior claims that manner adverbials are semantically more complex than their temporal counterparts (see Morzycki 2019; among others), potentially leading to interpretive differences under focus-related conditions. One possibility was that this complexity would not significantly affect interpretive constraints, in which case both manner and time adverbials should pattern similarly in terms of acceptability. Alternatively, if manner adverbials are indeed more susceptible to pragmatic pressure, their acceptability was expected to be lower in contrastive negation contexts.

In addition to potential baseline differences between adverb types, both types were expected to be sensitive to adverbial match versus mismatch as well as the position of negation. The primary prediction was that mismatching continuations would receive lower naturalness ratings than matching ones. Crucially, this mismatch penalty was expected to differ by adverb type, potentially revealing an asymmetry in how manner and time adverbials interact with negation and contrastive structures.

As noted earlier, each participant evaluated sentence pairs in which the first clause was identical. The continuation clause, however, varied by continuation type, appearing either as a matching continuation (same adverbial type) or a mismatching continuation (locative). Figure 4.3 summarizes the ordinal ratings using means, providing a rough estimate of central tendency and facilitating comparison of overall patterns across conditions:

[8]See Appendix C for a descriptive analysis of these filler trials and a comparison of their distribution across Experiments I and II, illustrating the role of constituent order in ditransitive sentences.

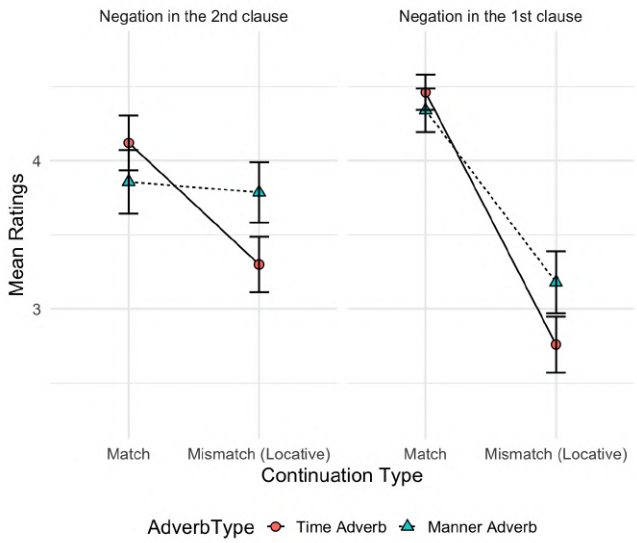


Figure 4.3: *Mean ratings of Experiment I*

Reflecting the nature of the rating scale, an ordinal mixed-effects model, namely a cumulative link mixed model (clmm), was fitted (*Rating ~ Continuation Type * Adverb Type * Position of Negation + (1|Response_ID) + (1|Scenario)*, data) using the ordinal package in R (Christensen 2023).[9] The model included fixed effects for the independent variables, along with all two-way and three-way interactions. Random intercepts were included for Response_ID to account for repeated measures across participants, and for Scenario, to account for variability across items. The fixed effects from the model are summarized in Table 4.1:

Table 4.1: *Summary of fixed effects from the cumulative link mixed model for Experiment I*

Coefficients	Estimate	Standard Error	z value	p value
Continuation Type	0.86	0.10	7.90	<0.001
Adverb Type	-0.08	0.11	-0.80	0.45
Negation Position	0.03	0.10	0.33	0.74
Continuation Type:Adverb Type	0.28	0.10	2.72	<0.01
Continuation Type:Negation Position	-0.40	0.10	-3.80	<0.001
Adverb Type:Negation Position	-0.01	0.10	-0.11	0.91
Continuation Type:Adverb Type:Negation Position	0.10	0.10	1.00	0.33

Among the main effects, Continuation Type was statistically significant ($p < 0.001$), with Match

[9] In the analysis, predictors were sum-coded so that model coefficients represent deviations from the grand mean, providing estimates that reflect effects across the full factorial design rather than comparisons to a single reference category.

Condition, where the adverbial in the continuation clause had the same adverbial type as in the first clause, consistently yielding higher ratings than Mismatch Condition, where the continuation included a locative adverbial. This result supports the prediction that contrastive structures with mismatched adverbials (i.e., manner−locative or time−locative) are perceived as less natural than those with matched adverbials. On the other hand, Position of Negation (β = 0.03, p = 0.74) and Adverb Type (β = -0.08, p = 0.45) were not statistically significant predictors of acceptability ratings. This suggests that, when considered in isolation, neither the position of negation nor adverbial type (Manner vs. Time) had an overall impact on participants' acceptability judgments in the sentences tested. Figure 4.4 illustrates the results of the model:

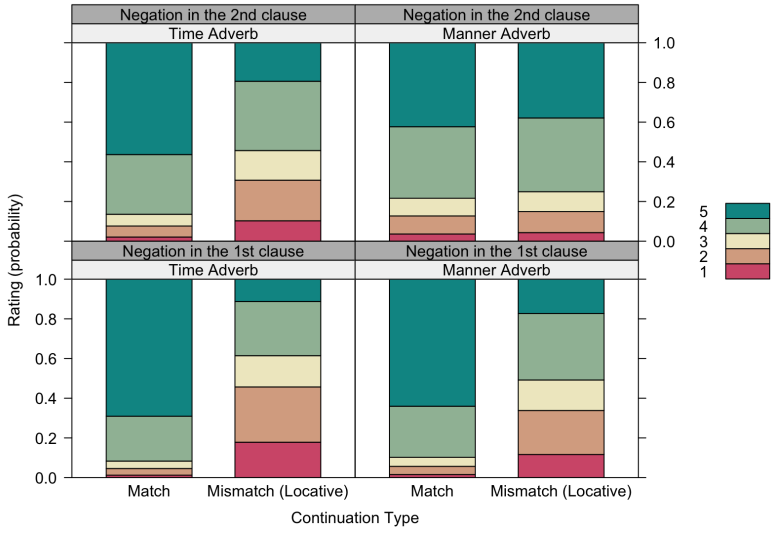


Figure 4.4: *Model-predicted acceptability ratings for Experiment I*

Several interaction effects were observed. There was a significant interaction between Continuation Type and Position of Negation (β = -0.40, p < 0.001). When negation appeared in the first clause, thereby creating a stronger expectation for contrast, participants rated mismatch conditions lower than when negation appeared in the second clause. Thus, the mismatch penalty was larger when negation appeared in the first clause. By contrast, ratings in Match Condition did not show a reliable difference depending on the position of negation.

The interaction between Continuation Type and Adverb Type was also significant (p < 0.01). This indicates that the negative effect of mismatch on acceptability ratings varied by Adverb Type, with time adverbials showing a larger penalty for mismatches compared to manner adverbials.

Nonetheless, the interaction between Position of Negation and Adverb Type was not significant,

nor was the three-way interaction between Position of Negation, Continuation Type, and Adverb Type. In other words, there is no strong evidence that all three variables interact simultaneously in a way that affects the ratings despite the presence of two-way interactions.

As for the random effects, participant-level variance was 1.30 (SD = 1.13), showing considerable individual differences in ratings, while item-level variance was smaller (0.10, SD = 0.33), indicating minimal effect of items.

Manner adverbials and contrastive flexibility

Results from Experiment I show that acceptability was primarily determined by the match between adverbial types across clauses, as reflected in the robust effect of Continuation Type. This effect was modulated by both the position of negation and the semantic type of the target adverbial.

The interaction between Continuation Type and Position of Negation indicates that negation plays a role in shaping contrastive expectations, such that mismatching continuations are more strongly penalized when negation appears in the first clause. This suggests that the presence of negation in the first clause establishes a contrastive focus structure and heightens the salience of the contrast, thereby increasing the requirement that the continuation provide a salient and appropriately structured alternative. When the continuation fails to match the adverbial type of the first clause, particularly when shifting from a manner or time adverb to a locative adverbial, it fails to instantiate an appropriate alternative within the expected set, resulting in degraded acceptability.

The interaction between Continuation Type and Adverb Type further suggests that time and manner adverbials differ in how they participate in this alternative structure. Time adverbials appear to impose more restrictive constraints on the set of relevant alternatives, leading to a larger penalty under Mismatch Condition. This may reflect their stronger role in establishing contrastive structures in discourse, leading to more rigid expectations for alignment. Manner adverbials, by contrast, allow greater flexibility in how alternatives are constructed, making them more compatible with pragmatic accommodation even when the continuation does not strictly match the target adverbial type. This difference accounts for the greater tolerance of mismatches observed with manner adverbials.

More generally, the mismatch penalty can be understood as a failure to satisfy expectations of parallelism and contrast between clauses. When negation appears in the first clause, it strengthens these expectations, making deviations more salient. At the same time, the degree to which such deviations are tolerated depends on the semantic contribution of the adverbial, with manner adverbials allowing more flexibility than temporal ones.

Although the three-way interaction did not reach significance, descriptive patterns are informative. When negation appeared in the second clause, both adverb types were rated highly in Match Condition. In Mismatch Condition, however, time adverbials showed a sharp decline, while manner adverbials showed only a modest decrease. In contrast, when negation occurred in the first clause, ratings in Match Conditions remained high for both adverb types, but Mismatch Conditions elicited lower ratings overall. These results suggest that a mismatching continuation generally reduces naturalness when the negation appears in the first clause. Nonetheless, manner adverbials seem to be more robust in tolerating mismatches, especially when negation is in the second clause, leading to less overall pressure for a contrastive structure. In sum, the findings point to distinct yet interacting roles of semantic type and structural configuration in modulating contrastive interpretations under negation.

These findings point to an asymmetry between time and manner adverbials in contrastive interpretations under negation, suggesting that this asymmetry arises from differences in how alternatives are structured when these modifiers are placed under focus. Under alternative-based approaches to focus, contrast depends on the availability and organization of such alternatives (Rooth 1992; among others), which highlights the central role of focus in structuring the relevant alternatives. The contribution of focus, however, is difficult to isolate in written stimuli, where prosodic marking is absent. Turkish provides a useful testing ground in this respect, as it has been argued to exhibit a default focus position in the absence of prosodic cues, namely the immediately preverbal position (Erguvanlı-Taylan 1984; among others). This allows for a structural manipulation of focus through word order. The next experiment tests whether the observed asymmetry between adverbial types persists when target adverbials are displaced from this position, providing a more direct test of how manner and time adverbials differ in their interaction with focus and the structure of alternatives.

4.2.2 Experiment II: Adverbials and information structure

Sentences with identical propositional content can vary in interpretation depending on how information is structured, such as the placement of focus:

(13) Adapted from Kroeger (2017)

a. If John had given [flowers]$_{F}$ to Mary, she would have been pleased.

b. If [John]$_{F}$ had given flowers to Mary, she would have been pleased.

Drawing on Rooth's (1992) theory of focus semantics, these differences introduce distinct sets of

alternatives, which in turn shape pragmatic enrichment. Rooth (1992) defines the focus alternative set as the set of all semantic objects obtained from the denotation of the object by replacing the interpretation of every focus-marked item in the sentence with any semantic object of the same type. For instance, in (13-a), the focus on "flowers" evokes alternatives to the gift (e.g., chocolates, a book), highlighting what John could have given Mary. In contrast, in (13-b), focus on "John" evokes alternatives to the subject (e.g., Bill, Tom), emphasizing who could have given her flowers. In other words, these focused constituents represent the novel or contrastive elements of the utterance, while the remaining material provides the background or presupposed context.

This pattern also holds in the context of negation. Since negation is a focus-sensitive operator, its interpretive effect often hinges on the location of focus (see Fălăuş 2020), shaping both the sentence's information structure and pragmatic coherence:

(14) Adapted from Kroeger (2017)

a. John didn't give $[\text{flowers}]_{\text{F}}$ to Mary.

b. John didn't give flowers to $[\text{Mary}]_{\text{F}}$.

Similarly to (13-a) above, the focus on "flowers" in (14-a) evokes alternatives to the object given (e.g., John didn't give flowers to Mary, but perhaps gave chocolates), whereas in (14-b), focus on "Mary" evokes alternatives to the recipient (e.g., John didn't give flowers to Mary, but perhaps to Susan).

As indicated in the examples above, information structure plays a crucial role in sentence interpretation. In English, these cues are often realized through prosodic markers such as pitch accent and stress, which are absent in written language, leading to perhaps an underappreciation for their role in linguistic structure and in experimental semantics/pragmatics more broadly. In contrast, in Turkish, an SOV and scrambling language, word order is closely associated with information structure, particularly with respect to focus and topic, making it a particularly suitable testing ground for isolating the contribution of information structure in experimental settings.[10] According to Erguvanlı-Taylan (1984), the information structure in Turkish includes constituents such as topic, immediate preverbal constituents as focus, and post-verbal constituents as background, as illustrated below:

(15) Turkish (Adapted from Gürer 2020; p. 23)

Ayşe$_{\text{TOPIC}}$ elma-yı$_{\text{FOCUS}}$ ye-di.
Ayşe.NOM apple-ACC eat-PST.3SG

[10]It is important to note that word order alone does not uniquely determine focus interpretation in Turkish; however, it provides important interpretive cues.

"Ayşe ate the apple."

This association between preverbal position and focus is further illustrated by word order alternations:

(16) Elma-yı Ayşe yedi.
apple-ACC Ayşe.NOM eat-PST.3SG
"It was Ayşe who ate the apple."

Turkish has often been considered to have a default focus position in the absence of overt focus marking, typically identified as the immediately preverbal position (Erguvanlı-Taylan 1984; among others).[11] Recent experimental work further supports this view, showing that the immediately preverbal position is associated with default focus in the absence of overt prosodic or contextual cues (Kurt & Dinçtopal Deniz 2023). This interaction between word order and focus is also evident under negation:

(17) a. Ayşe elma-yı ye-me-di.
Ayşe.NOM apple-ACC eat-NEG-PST.3SG
"It was not the apple that Ayşe ate."

b. Elma-yı Ayşe ye-me-di.
apple-ACC Ayşe.NOM eat-NEG-PST.3SG
"It was not Ayşe that ate the apple."

Previous work in the semantics-pragmatics domain suggests that the interpretation of adverbials under negation may be sensitive to information structure, with prosodic focus influencing projection behavior (Stevens et al. 2017). However, other studies report no reliable effect of structural position on the interpretation of event-modifying adverbials (Stolterfoht 2026). This divergence raises the question of how information structure and adverbial type jointly shape interpretation, and whether such effects are reflected in acceptability judgments.

In Experiment I, the two adverbials within the same clause occurred in a specific order. The target adverbial occurred in the immediate preverbal position, while the locative preceded it. If the immediate preverbal position contributes to focus interpretation, then the patterns observed in Experiment I

[11] Focus in Turkish is not straightforward and has been widely debated in the literature. Previous work has shown that it cannot be reduced to a fixed syntactic position. For instance, Göksel & Özsoy (2000) argue that Turkish lacks a fixed syntactic focus position and instead exhibits a preverbal "focus field", defined as the domain between the position bearing focal or sentential stress and the verbal complex. They argue that focused constituents and wh-phrases must occur within this domain and are identified through prosodic prominence. Similarly, İşsever (2003) proposes that information structure is realized through the interaction of syntax and prosody, distinguishing between presentational and contrastive focus. Özge & Bozşahin (2010) further argue that word order, prosody, and information structure are correlated but not directly deterministic. See also Gürer (2020) for recent discussion on the information structure of Turkish. Crucially, however, these accounts rely on prosodic prominence, in particular stress, as the primary cue for focus interpretation, which is not directly available in the present study, given its reliance on written stimuli. The present chapter adopts the standard assumption of a preverbal focus position as a baseline for analysis.

may partly reflect the privileged status of the preverbal position. This raises a more specific question about the interaction between adverbial type and information structure. If time and manner adverbials differ in how they participate in focus-driven alternative structure, then their interpretation should be differentially sensitive to the presence or absence of focus on them. In particular, displacing the target adverbial from the immediately preverbal position should affect acceptability to different degrees depending on adverbial type. Experiment II tests this prediction by placing target adverbials outside the immediately preverbal position, the default locus of focus in Turkish, thereby allowing the contribution of focus to be manipulated independently of adverbial type.

Design and stimuli

Experiment II builds on Experiment I by employing the same stimuli and parallel manipulations. The only modification targets the word order of the first clause, specifically the relative position of the target adverbial and the locative adverbial. This manipulation allows for an examination of how focus, as reflected in word order, influences the acceptability of sentences with negation in written stimuli, and whether these effects differ across clauses containing manner and time adverbials, thereby providing further evidence about their contribution to interpretation.

(18) a. *Sample trial in Experiment I*

Adam, odasında **güçlükle** uyudu, **kolayca** uyumadı.

adam oda-sın-da güçlük-le uyu-du kolayca uyu-ma-dı
man.NOM room-POSS.3SG-LOC difficulty-with sleep-PST.3SG easy-ly sleep-NEG-PST.3SG

"The man slept in his room **with difficulty**; he did not sleep easily."

b. *Sample trial in the present study (Experiment II)*

Adam, **güçlükle** odasında uyudu, kolayca uyumadı.

adam güçlük-le oda-sın-da uyu-du kolay-ca uyu-ma-dı
man.NOM difficulty-with room-POSS.3SG-LOC sleep-PST.3SG easy-ly sleep-NEG-PST.3SG

"The man slept **with difficulty** in his room; he did not sleep easily."

(18-a) illustrates a Match Condition from the first study, Experiment I, where the target manner adverb occurs in the immediately preverbal position. (18-b) is a Match Condition in the current study, Experiment II, where the immediately preverbal position is occupied by the locative adverbial while the target adverb precedes the locative adverbial.

For consistency, the same labeling scheme was used in the analyses of Experiment I and Experiment II, with conditions defined based on the correspondence of adverbial types across the two clauses in a

trial. Regardless of the position of the target adverbial, continuations containing a time or manner adverb were labeled as matching, whereas continuations containing a locative adverbial were labeled as mismatching. In Experiment II, however, the target adverbial in the first clause appeared in a non-focus position, in contrast to Experiment I.

Catch trials were identical to those used in Experiment I. Filler items were also included and manipulated with respect to the ordering of direct and indirect objects, as illustrated below:

(19) a. *Sample filler item in Experiment I*

Sekreter kolilere **eski evrakları** koydu,...
sekreter koli-ler-e eski evrak-lar-ı koy-du
secretary.NOM box-PL-DAT old document-PL-ACC put-PST.3SG

b. *Sample filler item in Experiment II*

Sekreter **eski evrakları** kolilere koydu,...
sekreter eski evrak-lar-ı koli-ler-e koy-du
secretary.NOM old document-PL-ACC box-PL-DAT put-PST.3SG
"The secretary put the old documents into the boxes..."

The manipulation of word order was intended to probe the role of focus in the interpretation of adverbials under negation. By creating distinct focus positions for the target adverbials, the design aimed to investigate whether focus structure affects the acceptability of the contrastive continuations. The prediction was that if focus alternatives play a role in the acceptability difference between contrastive continuations for manner and time adverbials, then these differences might be attenuated if the target adverbial is no longer in the preverbal focus position. As in Experiment I, Experiment II employed a fully crossed 2×2×2 factorial design.

Procedure and participants

The procedure and participant recruitment for Experiment II were identical to those of Experiment I, where the same instructions, rating scale, and trial structure were used. As in Experiment I, participants evaluated the naturalness of sentence continuations using a 5-point vertical slider scale. The only difference between the two experiments was the position of the target adverbial in the first clause, which was manipulated to probe the role of focus.

A total of 60 native Turkish speakers (M_{age} = 36.3, range = 18–56) were recruited via besample, the same online platform used in Experiment I. None of the participants had participated in the previous experiment. All participants reported residing in Türkiye at the time of participation. The

task was completed in approximately 5–8 minutes, and participants received 0.75 USD as compensation, following the platform's recommended rates.

Results

As in previous analyses, responses to the catch trials were evaluated to assess participants' attentiveness prior to conducting the statistical analyses. Participants who did not meet the predefined accuracy criteria were excluded from further analysis. Based on this procedure, data from eleven participants were removed, yielding a final sample of 49 participants whose responses passed the attention checks and were retained for statistical analysis. The overall distribution of ratings across trial types for 49 participants is shown in Figure 4.5:

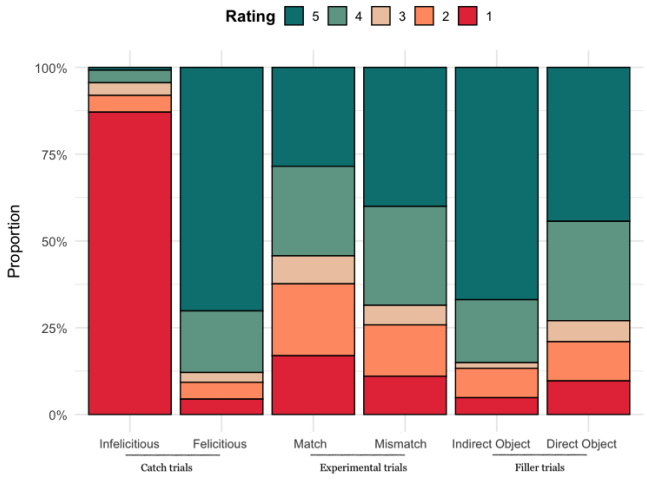


Figure 4.5: *Proportions of acceptability ratings across trial types in Experiment II, including felicitous and infelicitous catch trials, matching and mismatching experimental trials, and fillers.*

As in Experiment I, infelicitous catch trials were overwhelmingly rated as unnatural, whereas felicitous catch trials received predominantly high ratings, confirming that participants attentive to the task.

This study investigated how the default focus position in Turkish, which is argued to be the immediately preverbal position, interacts with adverbial type and shapes their interpretation under negation. Given the assumption that constituents in the immediately preverbal position are more likely to receive interpretive prominence in Turkish, it was predicted for this design that Mismatch Conditions, in which the locative adverbial occupied the immediate preverbal position, would potentially yield higher acceptability ratings.

Evidence for an effect of focus was observed in both the experimental and filler trials. In the

filler trials, continuations involving direct objects received relatively lower ratings than those involving indirect objects, an inverse pattern compared to Experiment I. A similar shift was found in the experimental trials, where Match Condition received somewhat lower ratings than Mismatch Condition. This suggests that the change in word order, and thus the displacement of the target element from the preverbal position, influenced acceptability judgments. In other words, matching continuations are more natural when the relevant adverbial occupies the default preverbal focus position, as in Experiment I, but become less natural when this position is disrupted, as in the present experiment. The remaining question therefore is the extent to which this word order effect interacts with adverbial type, and whether manner and time adverbials differ in their sensitivity to this manipulation.

As in Experiment I, the conditions were Adverb Type (Time vs. Manner) in the first clause, Position of Negation (First vs. Second clause), and Continuation Type (Match Condition vs. Mismatch Condition). As indicated earlier, Match is defined in terms of adverb-type parallelism across clauses: continuations containing time or manner adverbs preserve this parallelism and are therefore classified as Match, whereas continuations with locative adverbials disrupt it and are classified as Mismatch in order to maintain consistency across the experiments.

Figure 4.6 summarizes the ratings as means to facilitate comparison of patterns across conditions:

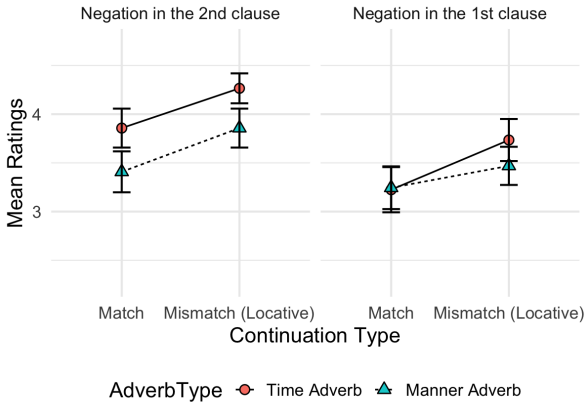


Figure 4.6: *Mean ratings of Experiment II*

As in Experiment I, an ordinal mixed-effects model, namely cumulative link mixed model (clmm), was fitted (*Rating ~ Continuation Type * Adverb Type * Position of Negation + (1|Response_ID) + (1|Scenario)*, data) using the ordinal package in R (Christensen 2023). The model included fixed effects for independent variables, as well as all two-way and three-way interactions. Random intercepts were included for both Response_ID to account for repeated measures across participants and Scenario to

account for variability across items. The fixed effects from the model are summarized in Table 4.2:

Table 4.2: *Summary of fixed effects from the cumulative link mixed model for Experiment II*

Coefficients	Estimate	Standard Error	z value	p value
Continuation Type	-0.30	0.10	-3.0	<0.01
Adverb Type	0.27	0.10	2.62	<0.01
Negation Position	0.36	0.10	3.5	<0.001
Continuation Type:Adverb Type	-0.06	0.10	-0.6	0.55
Continuation Type:Negation Position	-0.04	0.10	-0.4	0.69
Adverb Type:Negation Position	0.11	0.10	1.12	0.26
Continuation Type:Adverb Type:Negation Position	0.09	0.10	0.90	0.37

All three main effects were significant. There was a significant effect of Continuation Type (β = -0.30, $p < 0.01$), indicating that Mismatch Conditions, where the continuation included a locative adverbial, yielded significantly higher acceptability ratings. There was also a significant effect of Adverb Type (β = 0.27, $p < 0.01$), reflecting an overall difference between manner and time adverbials. Trials with manner adverbials in the first clause were rated significantly lower than those with time adverbials across conditions. Finally, acceptability ratings were significantly higher when negation appeared in the second clause (β = 0.36, $p < 0.001$). Crucially, none of the two-way or three-way interactions reached statistical significance. Figure 4.7 illustrates the results of the model:

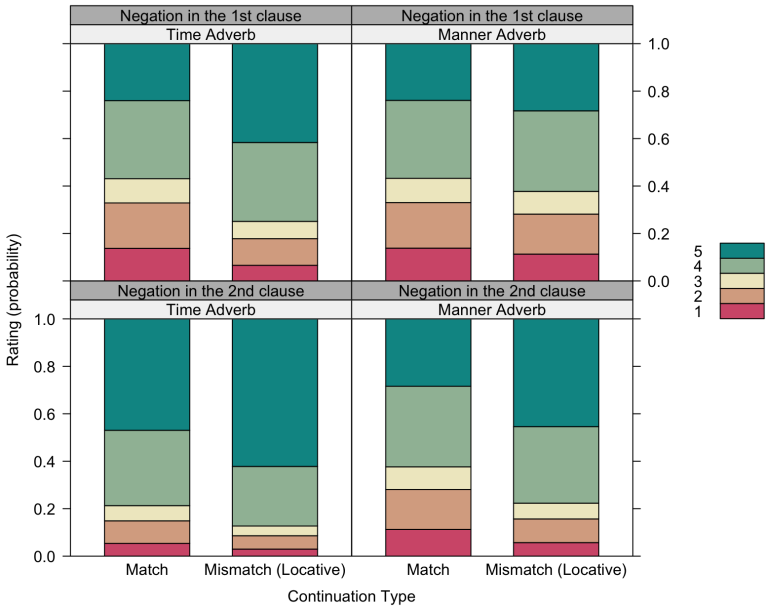


Figure 4.7: *Model-predicted acceptability ratings for Experiment II*

As for the random effects, participant-level variance was 1.44 (SD = 1.20), showing considerable individual differences in ratings, while scenario-level variance was smaller at 0.11 (SD = 0.33), indicating minimal effect of scenario content.

Effects of information structure on acceptability in contrastive contexts

Experiment II shows that information structure appears to influence the acceptability of contrastive continuations under negation. When a locative adverbial occurred in the immediate preverbal focus position of the first clause, the continuation with a locative adverbial, a Mismatch Condition, became more acceptable. This suggests that contrastive pressure is strongest when an adverbial occupies a structurally prominent position. However, the lack of significant interactions in the model indicates that this applies broadly across adverb types and negation positions, rather than being tightly conditioned by specific combinations.

A direct comparison of Experiment I and Experiment II provides support for the role of structural factors in modulating the overall acceptability of contrastive continuations. As can be seen in Figure 4.8, in Experiment I, when the target adverbial appears in the immediate preverbal position, trials with negation in the first clause show a strong preference for matching continuations, with mismatching continuations receiving substantially lower ratings. However, this preference diminishes when the target adverbial is no longer in the preverbal position in Experiment II. While matching structures still receive relatively high ratings, the penalty for mismatching continuations with the locative adverbial is reduced in Experiment II. This decrease in the match-mismatch difference appears descriptively more pronounced for manner adverbials.[12]

[12]It is important to note that the statistical model for Experiment II does not provide evidence that the effect of match vs. mismatch is differentially conditioned by adverb type or negation position. Thus, while the cross-experiment comparison is compatible with the idea that shifting the target adverbial from the preverbal position can lessen contrastive pressure, Experiment II suggests that the resulting pattern is better characterized as an overall shift in acceptability rather than a selective modulation of mismatch effects for particular adverb classes.

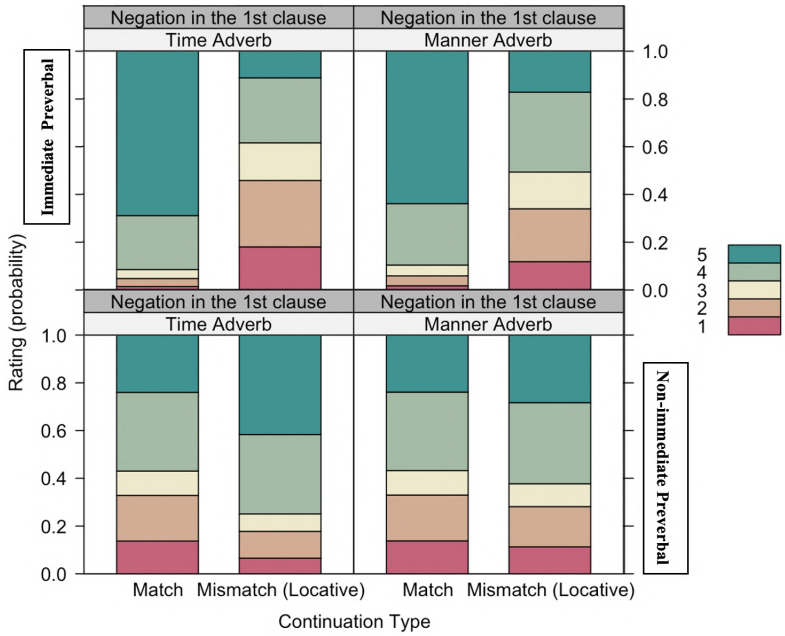


Figure 4.8: *Comparison of Experiment I (the first row) ("Adam odasında* ***güçlükle*** *uyumadı, [kolayca] uyudu" where the target adverbial occurred in the immediate preverbal position) and Experiment II (the second row) ("Adam* ***güçlükle*** *odasında uyumadı, [kolayca] uyudu" where the target adverbial occurred in the non-immediate preverbal position) when negation occurs in the first clause*

These results suggest that (i) the preverbal focus position strengthens the contrastive pressure, making mismatches more disruptive when the target adverbial is in focus, and (ii) manner adverbials, unlike time adverbials, do not impose the same degree of contrastive constraint. As a result, manner adverbials allow more flexible interpretations under mismatch.

In Figure 4.9, where negation occurs in the second clause, a similar but more attenuated pattern emerges. For both adverb types, matching continuations were rated highest where the target adverbial occurred in the immediate preverbal position, but the overall difference between Match and Mismatch Conditions is smaller than those in Figure 4.8:

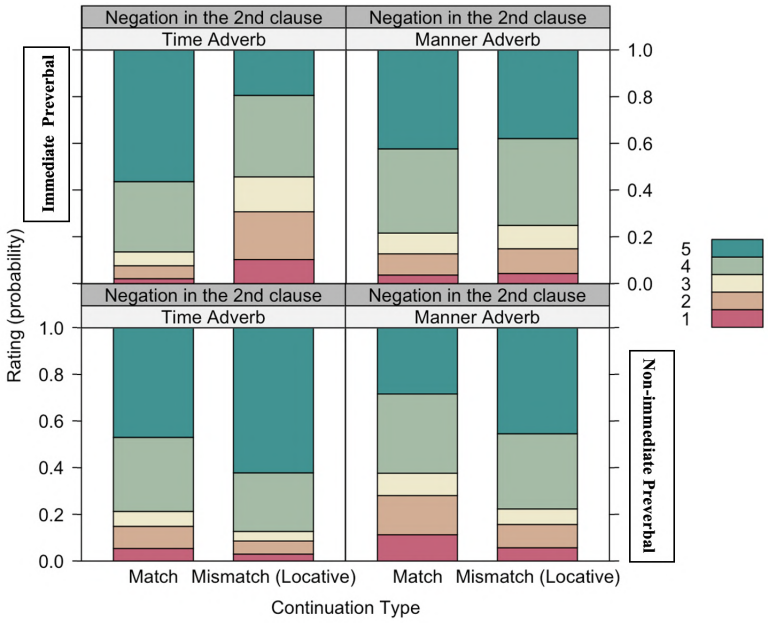


Figure 4.9: *Comparison of Experiment I (the first row) ("Adam odasında* ***güçlükle*** *uyudu, [kolayca] uyumadı" where the target adverbial occurred in the immediate preverbal position) and Experiment II (the second row) ("Adam* ***güçlükle*** *odasında uyudu, [kolayca] uyumadı" where the target adverbial occurred in the non-immediate preverbal position) when negation occurs in the second clause*

When the target adverbial is not in the immediate preverbal position, the ratings for mismatching continuations improve further, and the difference between the acceptability ratings of Match and Mismatch Conditions gets smaller. This pattern suggests that when negation occurs in the continuation clause, a wider range of continuations may be judged felicitous, perhaps because it functions more as a pragmatic correction than as an introduction of a broader contrastive focus-triggering operator.

The findings of these two experiments are discussed in the next section.

4.2.3 Discussion

This study investigated how event-internal adverbials, specifically manner and time adverbials, interact with negation and focus structure in Turkish. Across two acceptability judgment experiments, it examined how semantic type, syntactic position, and information structure shape the interpretation of contrastive continuations under negation. The central question was whether manner adverbials, given their semantic complexity and underspecified ontological status (Morzycki 2019), pattern differently from time adverbials under negation and in contrastive discourse configurations.

Experiment I demonstrated that the overall acceptability of a continuation was strongly determined

by whether the two clauses contained matching adverbial types. Moreover, this effect was modulated by the position of negation and adverbial type. Specifically, mismatch penalties were stronger when negation occurred in the first clause, suggesting that this configuration increases the expectation that the continuation will provide a semantically aligned corrective alternative. In addition, the interaction between Continuation Type and Adverb Type indicates that manner adverbials exhibit distinct interpretive behavior relative to time adverbials. Although, or perhaps because, manner adverbials are semantically complex event-internal modifiers (Morzycki 2019), they appeared more flexible in their interpretation in contrastive contexts involving negation, showing reduced penalties when contrasted with a mismatching adverbial. In contrast, time adverbials, despite being semantically more concrete, were more sensitive to mismatches when the continuation featured a locative adverbial.

These results suggest that semantic complexity does not necessarily lead to increased processing cost or interpretive infelicity under negation. Instead, pragmatic compatibility with contrastive alternatives may be a more reliable predictor of acceptability judgments than semantic complexity alone. In other words, what appears to matter more is how readily a given adverbial supports a coherent set of contrastive alternatives. This may reflect more rigid discourse expectations associated with temporal framing versus more open-ended alternative possibilities for manner adverbials. For instance, time adverbials impose more restrictive expectations on the discourse, such that a continuation containing a locative adverbial is less easily accommodated as a relevant alternative. Manner adverbials, by contrast, appear to permit a broader range of contrastive continuations, yielding a weaker mismatch penalty. Experiment I provides evidence that contrastive coherence is not uniformly sensitive to negation but depends on the semantic profile of the adverbial involved.

Experiment II extended these findings by manipulating constituent order to test whether the effects observed in Experiment I were partly tied to the immediately preverbal position, which is often taken to be the default focus position in Turkish (Erguvanlı-Taylan 1984), and to examine how this structural position influences the interpretation of continuations under negation. If the contrastive effects observed in Experiment I were partly driven by focus on the target adverbial, then displacing that adverbial from the immediately preverbal position should reduce the pressure for a matching continuation. The results are broadly consistent with this expectation. As predicted, mismatch conditions were rated more favorably when the target adverbial in the first clause was dislocated from the immediate preverbal position.[13] This suggests that constituent order, and with it information

[13]Nonetheless, an open question concerns why locative adverbials in the immediate preverbal position do not yield a stronger effect on acceptability or result in a larger difference between Match and Mismatch Conditions, as observed for time and manner adverbials in Experiment I. One possible explanation is the existence of a default modifier order in Turkish (as pointed out to me by Jonathan Bobaljik), which may reduce the contrastive impact of locative adverbials

structure, influences the strength of contrastive expectations under negation.

At the same time, Experiment II did not yield significant interaction effects between Adverb Type, Position of Negation, and Continuation Type. This is important for the interpretation of the results. Rather than showing a selective restructuring of contrastive interpretation for particular adverbial classes, Experiment II points more conservatively to a general shift in acceptability associated with word order. In other words, moving the target adverbial out of the preverbal position appears to weaken contrastive pressure overall, but this effect is not statistically differentiated across adverbial types or negation positions within the experiment itself. The lack of significant interaction effects between adverb type, position of negation, and continuation type in this experiment may indicate that, when strong focus cues are present via word order, these factors operate more independently.

The results also indicate that negation in the first clause introduces a stronger focus on the immediate preverbal constituent. This suggests that negation imposes a narrow focus on the preverbal constituent, resulting in greater penalties for mismatched adverbial continuations. This indicates a tight link between focus structure and the interpretive demands of negation. In contrast, affirmative polarity evokes a broad, rather than narrow, focus.

The two experiments support a unified interpretation. Experiment I establishes that time and manner adverbials differ in how they pattern under negation in contrastive contexts, with time adverbials showing a stronger mismatch penalty than manner adverbials. Experiment II shows that these judgments are also sensitive to constituent order, consistent with the idea that information structure modulates the availability or prominence of contrastive alternatives. Earlier work by Güven (2004) likewise suggests that Turkish adverbials do not behave uniformly under negation, relating the relevant contrasts to adverbial type, scope, and information structure. The present experimental results also reveal asymmetries across adverbial classes, but the pattern observed here differs from that described by Güven (2004). Rather than pointing to a stricter interpretive profile for manner adverbials, the experimental findings suggest that manner adverbials are comparatively more flexible than time adverbials in contrastive negative contexts. In other words, while constituent position and information structure clearly matter, the persistence of this asymmetry across configurations suggests that the interpretation of these adverbials under negation is also shaped by semantic class and by the alternative structures associated with different classes of adverbials.

in this position. To the best of my knowledge, this possibility has not yet been systematically investigated in the literature. An alternative explanation might be related to the syntactic properties of the locative adverbials used in the experimental design. All locative adverbials appeared in post-positional phrases, in contrast to the time adverbials, which did not. This structural difference may reflect a hierarchical distinction in syntactic representation, potentially constraining the ability of locative adverbials to participate in contrastive focus configurations in the same way as time and manner adverbials.

These findings bear on the broader question of whether event modifiers should be treated as uniform. The present results suggest that they should not. Even within the domain of event-internal adverbials, manner and time adverbials differ in how they support contrastive interpretation under negation. This finding is particularly important because work on focus and alternatives has more often concentrated on arguments than on adjuncts. The present study shows that adjuncts, too, are sensitive to information-structural and compositional constraints, and that their behavior under alternative-sensitive operators cannot be assumed to be uniform across semantic classes.

Moreover, the pattern observed for time adverbials, specifically, their degradation under mismatch conditions, raises questions about the inferential mechanisms underlying temporal contrast. While time and locative adverbials share a more uniform structure, their contrastive substitution may violate coherence expectations more readily than manner−locative substitutions, which may be more easily accommodated by discourse pragmatics. This suggests that temporal and manner modification make different contributions to discourse coherence under negation. Time adverbials, which serve to anchor events temporally, appear to set up comparatively rigid expectations about the kind of alternative that a continuation must provide. Manner adverbials, by contrast, appear to allow greater interpretive accommodation, perhaps because they do not constrain alternative structure in the same way. This asymmetry is compatible with the view that manner adverbials occupy a special place among event modifiers, whether because of their degree-based semantics, their looser ontological status, or the way in which they interact with event structure more generally.

The Turkish data also underscore the importance of constituent order in regulating the interpretation of contrastive structures. In a language where word order is closely tied to information structure, manipulations of constituent order provide a useful way of probing the role of focus even in written stimuli, where prosodic cues are absent. The present findings contribute not only to the semantics of event modification, but also to broader discussions of how negation, focus, and alternative structure interact in shaping acceptability.

Keeping this asymmetry in mind, the following section asks whether other expressions of manner pattern similarly. It examines whether ideophones, as a distinct strategy for expressing manner, show the same interaction with negation and contrastive structure as lexical manner adverbials, or whether they constitute a separate class.

4.3 It is not you, it is manner: The case of ideophones

The results of the previous experiments in this study have pointed to an asymmetry between manner adverbials and other event adverbials under negation in Turkish, especially in contrastive contexts. This observed asymmetry raises a question: do all manner expressions behave uniformly, or do certain subtypes, such as ideophones, exhibit distinct interaction patterns with negation? To address this, the present section focuses on ideophones, a subclass of manner adverbials that are both depictive and often iconic in form.

Manner, a fundamental component of event structure, can be encoded through several linguistic strategies, including lexical adverbs, verbal morphology (e.g., reduplication, converb), and ideophones. Ideophones are vivid, perceptually grounded expressions that iconically depict sensory experiences. They are closely linked to perceptual knowledge (see Dingemanse 2012). Broadly defined, ideophones are onomatopoeic or synesthetic expressions exhibiting marked morphological, phonological, and syntactic properties. They frequently serve emotive or depictive functions and are commonly associated with spoken, performative, or expressive registers (Voeltz & Kilian-Hatz 2001; among others).

An example of ideophones is illustrated in Siwu, a Kwa language spoken in Ghana in (20):

(20) Siwu (Dingemanse 2017; p. 367)

kà i-bara gelegele~gelegele
ING CL:I.SUB-make IDEO.shiny~RED
"It'll be gelegelegelegele [shiny]."

In (20), the ideophone "gelegele" conveys the shininess of an object. It modifies the predicate and contributes directly to the sensory depiction of the subject referent.

Typologically, ideophones are attested across diverse language families, including Bantu, Austroasiatic, Dravidian, and Quechuan, as well as Basque, Japanese, and Korean, and perhaps exist to greater or lesser extent universally (Akita & Dingemanse 2019). An intriguing property of ideophones noted in the literature is a preference for affirmative and declarative contexts (see Dingemanse 2012 for a general discussion). Newman (1968) argues that in Tera, spoken in Bauchi and Bornu Provinces of Northern Nigeria, ideophonic adverbs are unacceptable under negation, interrogation, and imperative mood:

(21) Ideophonic adverbs in Tera (Newman 1968; pp. 110-111)

a. Ya fadî sharap.

he fall IDEO

"He fell headlong."

b. *Ya fadi sharap?

"Did he fall headlong?"

c. *Tashi farat!

get.up IDEO

"Get up in a flash!"

d. *Bai tashi farat ba.

NEG get.up IDEO NEG

"He didn't get up in a flash."

As Newman (1968) argues, lexical manner adverbs are acceptable in these environments, unlike ideophones. According to Kilian-Hatz (2006), this resistance is due to the expressive properties of ideophones: they simulate a sensory experience which distinguishes them from descriptive words. Since "the simulation of an event implicates that the event takes place in the imagination," ideophones carry an affirmative force that clashes with the informational structure required by negation or interrogation (Kilian-Hatz 2006; p. 510). A similar view that the dispreference for ideophones under negation is due to a semantic clash between negation and the perceptual properties of ideophones is proposed by Kita (1997) for ideophones in Japanese (tying together their perceptual and gestural qualities) and by Davidson (2023) for gestures in English and for depicting classifiers in ASL, which she takes to be an equivalent in sign languages.

Turkish, the language under investigation in this chapter, also employs ideophones in forming descriptive manner adverbials (Schroeder 2008; p. 347), and this usage represents their prototypical function (Jendraschek 2001; p. 95). Turkish ideophones, built on iconic roots, are consistently verb-oriented, modifying verbal events in terms of sound, form, or motion, and typically carry an emphatic nuance (Schroeder 2008; p. 347):

(22) Turkish (Schroeder 2008; p. 348)

Yemeğ-i *lop lop* ağz-ın-a at-tı.
food-ACC IDEO mouth-POSS-DAT throw-PST.3SG
"He threw the food into his mouth."

The ideophone "lop lop" in (22) conveys the meaning that the food is eaten "in small chunks and very quickly" (Schroeder 2008; p. 348).

In Turkish, iconic roots can be integrated into the grammar in a variety of ways, including affixation (deriving converbials) and reduplication (Baturay 2010). These roots can function as adverbs; moreover, with the additional morphological operations, they can also serve as verbs. To illustrate their broad grammatical distribution, a representative but non-exhaustive list of derived forms for one ideophone is provided below (building on the analysis of Mutlu (2015)):[14]

Table 4.3: *Uses of the iconic/depictive root "güm" (the sound of thudding)*

güm	iconic root	cannot occur in this form
güm diye	complementizer	quotative use
güm güm	reduplication	adverbial
gümle [güm-lA]	verbalizer suffix	verb
gümleyerek [gümle-YArAk]	affixation	converbial
gümbür [güm-B-IR][15]	dummy consonant and 'extender'	cannot occur in this form
gümbür gümbür	reduplication	adverbial
gümbürde [gümbür-de]	verbalizer suffix	verb
gümbürdeyerek [gümbürde-YArAk]	affixation	converbial

Building on the previous studies on manner adverbials presented in this chapter, the final set of experiments investigates how negation interacts with ideophonic adverbials in Turkish. Prior experimental work on ideophones in German (Barnes et al. 2022) suggests that ideophones differ from non-ideophones in their pragmatic distribution, and, like gestural content, they are more likely to be interpreted as not-at-issue. As indicated by Barnes et al. (2022), German is not a prototypical ideophonic language. Turkish, a language with a comparatively rich and productive ideophone inventory in contrast to German, is employed here for investigating these issues in light of the above studies on manner adverbials in Turkish more generally. First, the ideophone judgments collected as part of Experiments I and II in contrastive contexts are analyzed. The chapter then turns to an additional acceptability judgment experiment, Experiment III, which directly compares ideophones with non-ideophonic manner adverbials in Turkish and uses the morphosyntactic resources of the language to test how the degree of grammatical integration modulates acceptability under negation. Across these investigations, the central questions are: (i) whether manner adverbials involving iconic or depictive roots exhibit distinct acceptability patterns under negation compared to lexical manner and time adverbials, and (ii) whether any such differences are attributable specifically to ideophones,

[14] Mutlu (2015) argues that Turkish ideophones exhibit more restrictive phonotactics, in contrast to Dingemanse (2012) and others, who claim that ideophones display more flexible phonotactic properties than the rest of the language.

[15] This suffix exhibits a morphophonological alternation, surfacing as -Il or -Ir depending on the preceding consonant in the stem. For instance, the stem "*fır*" appears as "*fır-ıl*" rather than "*fır-ır*," as sequences involving multiple rhotics are avoided. This pattern can be analyzed as a case of liquid dissimilation driven by the Obligatory Contour Principle (OCP), which prohibits adjacent or nearby identical or highly similar segments (Yip 1988; among others); accordingly, forms are structured so as to avoid multiple rhotics within a local domain.

or instead reflect more general properties of manner semantics.

4.3.1 Back to contrastive contexts: Experiment I and Experiment II

As noted above, both Experiment I and Experiment II included typical filler trials as well as a small number of "filler" items that had the same shape as the experimental trials but used ideophones in place of the target adverbial, with semantic properties similar to those of manner adverbials while depicting more vivid and sensory imagery. Those trials are analyzed here. Based on prior literature, the prediction was that due to their expressive nature, the ideophones would be less compatible with negation overall than lexical manner adverbials.

(23) Subject | Locative | Target Adverb Type | Verb
Adam, odasında **horul horul** uyudu.

adam oda-sın-da horul horul uyu-du
man.NOM room-POSS-LOC IDEO sleep-PST.3SG

"The man slept in his room **huffing and puffing**."

Each clause was followed by either a semantically matching or mismatching continuation:

(24) a. *Match Condition*

Adam, odasında **horul horul** uyudu, **sessizce** uyumadı.

adam oda-sın-da horul horul uyu-du sessizce uyu-ma-dı
man.NOM room-POSS-LOC IDEO sleep-PST.3SG silent-ly sleep-NEG-PST.3SG

"The man slept in his room **huffing and puffing**; he did not sleep **silently**."

b. *Mismatch Condition*

Adam, odasında **horul horul** uyudu, **salonda** uyumadı.

adam oda-sın-da horul horul uyu-du salon-da
man.NOM room-POSS-LOC IDEO sleep-PST.3SG living.room-LOC
uyu-ma-dı
sleep-NEG-PST.3SG

"The man slept in his room **huffing and puffing**; he did not sleep **in the living room**."

One caveat of the design is that Match condition included lexical adverbials from the same semantic class, namely manner, rather than contrasting reduplicated ideophones. This methodological choice was motivated by the difficulty of identifying context-relevant ideophones that would provide an appropriate contrast. The preliminary sentence-fragment completion task conducted prior to Experiments I and II also supported this choice, where participants tended to complete fragments with lexical manner

adverbials when the first clause contained an ideophone. This pattern suggests that they did not require ideophonic alternatives in the continuation, but treated non-ideophonic manner expressions as plausible continuations. At the same time, this preference may reflect the expressive and depictive status of ideophones where a second ideophone would introduce another depictive token and may therefore be pragmatically marked in a corrective context. For this reason, the final design used lexical manner adverbials in the continuation to test whether ideophones can be related to non-ideophonic manner expressions in the construction of alternatives, while avoiding the additional markedness potentially introduced by ideophone-ideophone continuations.[16]

Finally, the position of negation was manipulated to assess its interaction with adverbial types:

(25) a. *Negation in the first clause*

Adam, odasında horul horul **uyumadı**, sessizce uyudu.

adam	oda-sın-da	horul horul	uyu-ma-dı	sessiz-ce	uyu-du
man.NOM	room-POSS-LOC	IDEO	sleep-NEG-PST.3SG	silent-ly	sleep-PST.3SG

"The man **did not sleep** in his room huffing and puffing; he slept silently."

b. *Negation in the second clause*

Adam, odasında horul horul uyudu, sessizce **uyumadı**.

adam	oda-sın-da	horul horul	uyu-du	sessizce	uyu-ma-dı
man.NOM	room-POSS-LOC	IDEO	sleep-PST.3SG	sessiz-ce	sleep-NEG-PST.3SG

"The man slept in his room huffing and puffing; he **did not sleep** silently."

Three variables of Experiment I were reanalyzed: Adverb Type (Time, Manner, Ideophone), Position of Negation (First vs. Second clause), and Continuation Type (Match Condition vs. Mismatch Condition). To evaluate the effects of the variables on acceptability ratings, a clmm was fitted (*Rating ~ Continuation Type * Adverb Type * Position of Negation + (1|Response_ID) + (1|Scenario), data*).

Consistent with the first analysis of Experiment I, the model revealed a significant main effect of Continuation Type ($p < 0.001$), indicating that participants' ratings were reliably influenced by whether the continuation was matching or mismatching. By contrast, neither Adverb Type nor Position of Negation showed a significant main effect on acceptability. In addition, no significant three-way interaction among the variables was observed as presented in Table 4.4:

[16]Whether ideophones contrast equally naturally with other ideophones remains an open question for future work.

Table 4.4: *Summary of fixed effects from the cumulative link mixed model for Experiment I, ideophones included*

Coefficients	Estimate	Standard Error	z value	p value
Continuation Type	0.60	0.08	7.23	<0.001
AdverbType1	-0.14	0.11	-1.20	0.23
AdverbType2	0.07	0.12	0.60	0.55
Negation Position	0.09	0.08	1.14	0.25
Continuation Type:AdverbType1	0.47	0.11	4.12	<0.001
Continuation Type:AdverbType2	-0.05	0.11	-0.45	0.65
Continuation Type:Negation Position	-0.37	0.08	-4.5	<0.001
AdverbType1:Negation Position	-0.07	0.11	-0.58	0.55
AdverbType2:Negation Position	-0.01	0.11	-0.08	0.93
Continuation Type:AdverbType1:Negation Position	0.09	0.11	0.84	0.4
Continuation Type:AdverbType2:Negation Position	-0.08	0.11	-0.73	0.46

The analysis further revealed a significant two-way interaction between Position of Negation and Continuation Type (β = 0.37, $p < 0.001$), indicating that the mismatch penalty was greater when negation occurred in the first clause than in the second clause. The two-way interaction between Continuation Type and Time Adverb (β = 0.47, $p < 0.001$) motivated further pairwise comparisons.[17]

Pairwise comparisons using estimated marginal means were conducted to compare Adverb Type within each Continuation Type using the `emmeans` package in R (Lenth & Piaskowski 2025). In Match Condition, time adverbs were rated significantly higher than reduplicated ideophonic forms ($\beta = 0.31$, $p < 0.05$), while no significant differences were observed between time and manner adverbs ($\beta = 0.68$, $p = 0.29$) or between manner adverbs and reduplication ($\beta = 0.36$, $p = 0.21$).

In Mismatch Condition, a markedly different pattern emerged. Time adverbs were rated significantly lower than both manner adverbs (β = -0.73, $p < 0.01$) and reduplication (β = -1.09, $p < 0.001$), whereas no significant difference was found between manner adverbs and reduplication (β = -0.36, $p = 0.18$). These results indicate that differences among adverbial types emerge specifically under mismatching continuations, where time adverbs show a pronounced mismatch penalty, whereas manner adverbs and reduplication pattern similarly and exhibit greater robustness in contrastive contexts.

[17]Since Adverb Type was sum-coded in the models, reduplication is not associated with an independent main-effect coefficient but is represented implicitly via deviations from the grand mean. "AdverbType1" and "AdverbType2" in Table 4.4 represent contrasts for time and manner adverbs, respectively. Moreover, separate follow-up analyses restricting the data to (i) time adverbs and reduplication and (ii) manner adverbs and reduplication were conducted, which indicated that reduplication patterns differently from time adverbs but aligns closely with manner adverbs. In particular, reduplication does not show a significant increase in the Match-Mismatch Condition, whereas time adverbs exhibit a robust mismatch penalty, as reflected in the significant interaction between Continuation Type and Adverb Type (β = 0.43, $p < 0.001$). No corresponding fixed effects or interaction terms distinguish reduplication from manner adverbs (β = 0.18, $p > 0.05$), suggesting that reduplication behaves as a manner-like modifier rather than as a time modifier in contrastive contexts.

Experiment II was reanalyzed in the same way, this time including ideophones as a level of Adverb Type. Unlike Experiment I, a locative adverbial, instead of the target adverbial, occurred in the immediate preverbal position in the first sentence.

(26) a. *Previous study*

Adam, odasında **horul horul** uyudu, sessizce uyumadı.

adam oda-sın-da horul horul uyu-du sessiz-ce uyu-ma-dı
man.NOM room-POSS-LOC IDEO sleep-PST.3SG silent-ly sleep-NEG-PST.3SG

"The man slept in his room **huffing and puffing**; he did not sleep silently."

b. *The current study*

Adam, **horul horul** odasında uyudu, sessizce uyumadı.

adam horul horul oda-sın-da uyu-du sessiz-ce uyu-ma-dı
man.NOM huffing room-POSS-LOC sleep-PST.3SG silent-ly sleep-NEG-PST.3SG

"The man slept in his room **huffing and puffing**; he did not sleep silently."

A clmm was fitted (*Rating ∼ Position of Negation * Continuation Type * Adverb Type + (1|Response_ID) + (1|Scenario), data*). In line with the first analysis of Experiment II, the model revealed significant main effects on acceptability for Position of Negation ($p < 0.001$), Continuation Type ($p < 0.001$), and Adverb Type ($p < 0.01$). No significant two or three-way interaction among the factors was observed:

Table 4.5: *Summary of fixed effects from the cumulative link mixed model for Experiment II, ideophones included*

Coefficients	Estimate	Standard Error	z value	p value
Continuation Type	0.44	0.08	5.44	<0.001
AdverbType1	-0.38	0.12	-3.17	<0.01
AdverbType2	0.19	0.11	1.66	0.1
Negation Position	-0.31	0.08	-3.87	<0.001
Continuation Type:AdverbType1	-0.05	0.12	-0.40	0.69
Continuation Type:AdverbType2	-0.17	0.11	-1.51	0.13
Continuation Type:Negation Position	0.11	0.08	1.3	0.18
AdverbType1:Negation Position	-0.18	0.12	-1.57	0.12
AdverbType2:Negation Position	0.05	0.11	0.48	0.63
Continuation Type:AdverbType1:Negation Position	-0.15	0.12	-1.26	0.21
Continuation Type:AdverbType2:Negation Position	0.04	0.11	0.34	0.73

Pairwise comparisons revealed no significant differences between manner adverbs and ideophones ($p =$

0.98) while each adverb type showed a significant difference from time adverbs ($p < 0.01$).

Within this experimental design (Experiment I and II), ideophones did not significantly diverge from manner adverbials in terms of acceptability. Rather, they patterned closely with manner adverbs and stood in contrast to time adverbs, particularly in the immediate preverbal position. This finding suggests that participants' judgments were influenced primarily by the semantic properties of the adverbial rather than by the depictive or iconic qualities typically associated with ideophonic forms.

Prior literature has suggested that ideophones differ from other event modifiers in leading to reduced acceptability under negation; I conclude instead that any claim about ideophones should be generalized to manner adverbials as a class, since both lexical and ideophonic manner adverbials pattern together separately from time adverbials, at least for ideophones in Turkish. However, this study involved contrastive focus, and perhaps this may have introduced spurious factors or additional complexity beyond what was considered in most prior literature which had considered the relative unacceptability of ideophones under negation in single clauses without obvious contrastive focus. Thus, a follow-up acceptability judgment task was conducted in which target sentences were presented outside of this particular contrastive context.

4.3.2 Experiment III: Adverbials under negation without discourse context

To investigate the interaction between adverbial type and negation in the absence of discourse cues, an acceptability judgment task was conducted in which participants rated the naturalness of sentences. Unlike Experiment I and Experiment II, the experimental trials consisted of single mono-clausal sentences, with no contrastive continuations.

In addition to isolating the semantic-pragmatic contribution of adverbials under negation, this study further investigated whether different levels of morphological integration affect the purported interaction between depiction via ideophones and negation. Prior work has suggested that the compatibility of ideophones with embedding environments may vary with their degree of morphosyntactic integration. In Siwu, less integrated constructions are typically not negated, whereas more integrated forms may occur in negative clauses Dingemanse (2017). Similarly, Dingemanse & Akita (2017) argue that greater integration correlates with reduced expressiveness and increased compositional embedding. Their analyses suggest that integration should modulate compatibility with clause-internal operators. Experiment III directly tests this prediction by comparing ideophones that differ in morphological integration in mono-clausal sentences without discourse context.

As discussed in the previous section, Turkish ideophones offer a useful testing ground for this

hypothesis, given their productive use in both reduplicated and morphologically derived forms. The prediction is, then, that either (i) there would be no systematic difference in acceptability among the adverbial types under negation, consistent with the pattern which emerged in our first two experiments in which manner adverbials (lexical and ideophone) pattern together separately from time adverbials or (ii) acceptability would vary as a function of both the iconic root status and the degree of morphological integration, consistent with prior (non-quantitative) observations in the ideophone literature on the relative unacceptability of expressive ideophones under negation.

Design and stimuli

Benefiting from the rich morphological organization of Turkish, the design included two possibilities of grammatical integration. The first group involves a reduplication process as well as receiving the derivational suffix -IR, similar to the continuation task in the previous section:

(27) fısır fısır[18] (roughly *"in a whispering sound"*)

Affixation:	fıs + -IR	No category
Reduplication:	fısır fısır	Adverbial

As shown in (27), the affixation alone does not produce a form that belongs to any distinct syntactic category; instead, further morphological derivation is required. Reduplication yields a manner adverb that roughly means "speaking in a whispering sound." This group of ideophones was labeled "low morphological integration."

The second group is based on the same iconic roots as the first, but these roots undergo additional morphological processes:

(28) fısıldayarak (roughly *"by whispering"*)

Affixation:	fıs + -IR	No category
Affixation:	fısır + dA	Verb
Affixation:	fısılda + ArAk	Converbial

As with the low morphological integration examples in (27), the second group receives the derivational suffix *-IR*, which extends the root for subsequent morphological modification and derives a bound

[18] Ideally, an iconic root (*fıs* "a very low noise or sound") that undergoes a reduplication process without any other morphological processes (*fıs fıs* "in whispers") would help us have a better comparison due to the minimum morphological manipulation on the iconic root. However, these have limited use and experimental design required a greater number of experimental sentences than these would allow.

"secondary onomatopoeic root" that cannot occur on its own (Zülfikar 1995; p. 126).[19] The extended root is verbalized and then marked with a converbial suffix, yielding a manner adverb. This group of ideophones was classified as exhibiting "high morphological integration". Reduplicated ideophones were treated as exhibiting low morphological integration in contrast to their converbial counterparts, which are derived as verbal predicates and realized as adverbial forms. In addition to these two ideophone categories, lexical adverbials without iconic roots were included as a third target adverbial. Lexical manner adverbials and highly integrated ideophones were predicted to receive similar acceptability ratings, whereas low-integration ideophones would be less acceptable under negation.

These three adverbial types all conveyed manner-related information. In what follows, "manner-related adverbials" refers to lexical manner adverbs as well as ideophonic reduplicated and converbial forms. Based on the findings of the earlier studies in this chapter, time adverbs were included as a fourth level of the independent variable to allow comparison across semantic classes.

The final experimental factor was clause polarity (affirmative vs. negative), as in Experiment I and Experiment II. Affirmative sentences were expected to receive higher acceptability ratings across all conditions due to the complex nature of negation (Kaup et al. 2007; among others). For negative sentences, two possibilities were anticipated: (i) no significant difference across conditions, or (ii) significant differences that would reflect the influence of morphological integration and iconic root status in Turkish ideophones.

To evaluate whether negation specifically impairs ideophonic continuations, two parallel stimulus sets were designed: one combining verbs with ideophonic adverbs to instantiate iconicity and another combining motion verbs with manner adverbs as a non-iconic control. The experiment was designed and implemented using Qualtrics and followed a 2×4×2 factorial design, resulting in a total of 16 conditions, as outlined in Table 4.6:

[19] It would in principle be possible to analyze this form as involving a single suffix *-IldA* attaching directly to the stem. However, following Zülfikar (1995), I treat this morpheme as decomposable. This is supported by forms such as *fok-ur-da* ("to boil with bubbles") or *hış-ır-da* ("to rustle"), which suggest that *-IldA* need not be analyzed as a unitary suffix. The surface form *fısıl-da*, then, requires additional morphophonological processes that apply when these morphemes co-occur. A full account of these processes lies beyond the scope of this paper.

	Polarity	Condition
Iconic roots	Affirmative	Reduplication
	Negative	Converbial
		Lexical manner adverbial
		Lexical time adverbial
Non-iconic roots	Affirmative	Reduplication
	Negative	Converbial
		Lexical manner adverbial
		Lexical time adverbial

Table 4.6: *Conditions tested in Experiment III*

Prior to the main experiment, a preliminary study was conducted to identify adverbials suitable for inclusion in the design. Participants were presented with affirmative sentences containing candidate adverbials and asked to rate their acceptability using a horizontal slider scale (from 0 to 100). Based on these ratings, a subset of adverbials was selected for the main study based on their (high) acceptability in affirmative sentences. A total of 64 experimental sentences was constructed (see Appendix C for the complete list), as illustrated below:

(29) a. Iconic roots

The child drank/did not drink the milk in the morning/with a gurgling sound/gurgling/slowly.

Conditions	**Subject**	**Object/Adjunct**	**Adverb**	**Verb**
Lexical Time	Çocuk	sütü	sabah	içti (Affirmative)
Reduplication			lıkır lıkır	iç**me**di (Negative)
Converbial			lıkırdatarak	
Lexical Manner			yavaşça	

b. Non-iconic roots

The girl came/did not come to the school at seven o'clock/by running/running/fast.

Conditions	**Subject**	**Object/Adjunct**	**Adverb**	**Verb**
Lexical Time	Kız	okula	saat yedide	geldi (Affirmative)
Reduplication			koşa koşa	gel**me**di (Negative)
Converbial			koşarak	
Lexical Manner			hızlıca	

All sentences had a subject, an adverb, a verb, and an additional argument, which can be an object argument, goal, source, or locative. The task included both grammatical and ungrammatical catch trials to ensure participant attentiveness and data reliability.

Procedure and participants

A within-subjects experimental design was employed to address the research questions while ensuring a balanced distribution of conditions across participants. A Latin square design was used to guarantee that each condition appeared equally across participant groups. Participants were divided into eight distinct groups, with each group exposed to a unique sequence of experimental conditions.

Each list contained 16 experimental trials and 8 catch trials which were included to assess participant attentiveness. 4 of the catch trials were grammatical (2 affirmative, 2 negative) while 4 were ungrammatical (2 affirmative, 2 negative). Ungrammatical catch trials were expected to receive lower ratings, while grammatical ones were expected to receive higher ratings. The ungrammatical sentences were constructed to violate semantic or syntactic constraints, whereas the grammatical catch trials consisted of well-formed transitive and ditransitive sentences without any adverbials. All lists were fully randomized for order of presentation, and participants were randomly assigned to one of the eight lists. Given that these sentences were presented in isolation (unlike the paired examples in the previous experiments in this chapter), a more sensitive slider bar (from 0 to 100) instead of a 5-point Likert scale was used in this study.

Participants received instructions in Turkish, with the prompt translated as follows:

"In everyday life, we tend to provide as many details as possible when telling others about the events we have witnessed. For instance, to describe the weather to a friend who has stayed home all day, you might say, 'It rained a lot today [Bugün çok yağmur yağdı].' You can also use the expression, 'It rained all day with a splashing sound [Bütün gün şarıl şarıl yağmur yağdı],' to depict the event. The sentence 'It rained all day nonstop [Bütün gün durmadan yağmur yağdı]' also allows you to convey additional information about the rain."

Following the general instructions, a scenario was presented to provide participants with a meaningful context for evaluating the sentences:

"You work at an international company and share your home with a foreign colleague. According to the recently adopted company policy, all employees are required to use Turkish at an advanced level. Therefore, your roommate needs to improve their Turkish, and you want to help them.
While all this is happening, you got extremely sick last week and could not go outside. Your only connection to the outside world is your roommate. You have become so disconnected from real life that you want to know about even the smallest events happening outside. Of course, your roommate, who loves chatting and needs to improve their Turkish, is eager to help you. Your friend's Turkish is quite good, but they can occasionally form odd sentences. Can you evaluate the sentences your roommate uses to describe what is happening during the day? How natural do you think these sentences are? Remember, if any sentence sounds odd, you should warn your friend."

Before proceeding to the trial sentences, participants were given clear instructions on how to use the slider scale. The left end of the slider bar was labeled "Not natural at all; I do not think anyone, including myself, would use this sentence," and the right end was labeled "Very natural; I think anyone, including myself, would use this sentence easily":

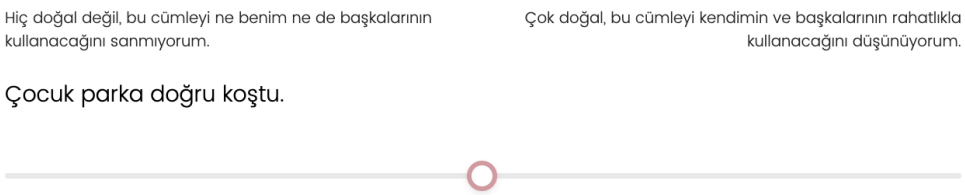


Figure 4.10: *A warm-up trial from Experiment III. The target sentence translates as "The child ran toward the park." The rating scale ranges from "It is not natural at all; I do not think either I or anyone else would use this sentence" (leftmost label) to "It is very natural; I think anyone, including myself, would use this sentence with ease" (rightmost label).*

After completing the warm-up trials, participants proceeded to the experimental trials:

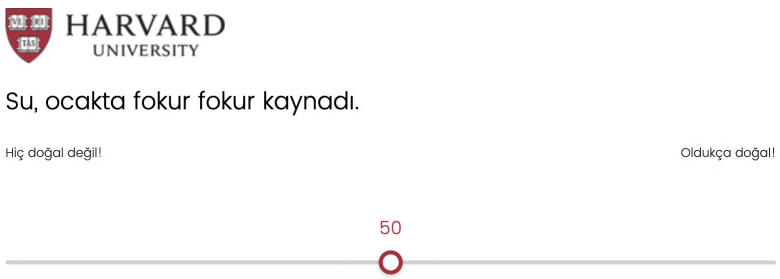


Figure 4.11: *Sample trial from Experiment III. The sentence approximately means "The water boiled on the stove, bubbling noisily." The rating scale ranges from "It is not natural at all" (leftmost label) to "It is very natural" (rightmost label).*

A total of 120 participants were recruited via besample (M_{age} = 33.7, range = 18–74), all of whom reported residing in Türkiye at the time of participation. The task took approximately 8–10 minutes to complete, and participants were compensated $0.55 USD in accordance with the platform's recommended rates.

Results

This study investigates whether ideophones in Turkish pattern with lexical manner adverbials and diverge from time adverbials, as observed in Experiments I and II. In addition, it examines how properties specific to ideophones, namely the iconic root and the degree of morphological integration, influence the acceptability of adverbials under negation. Lexical manner adverbs serve as a baseline for comparison, while time adverbs are included to assess the contribution of semantic type independently of iconicity and morphological integration.

Four participants were excluded from the analysis since they self-reported not being native speakers of Turkish. Before conducting the statistical analyses, responses to the catch trials were examined to evaluate participants' attentiveness. Participants who rated affirmative ungrammatical catch trials above 50, or affirmative grammatical catch trials below 50, were flagged. Those flagged on two or more catch trials were excluded from further analysis. Based on this criterion, data from two participants were removed, yielding a final sample of 114 participants whose responses met the attention threshold and were retained for analysis. Figure 4.12 presents the results from 114 participants:

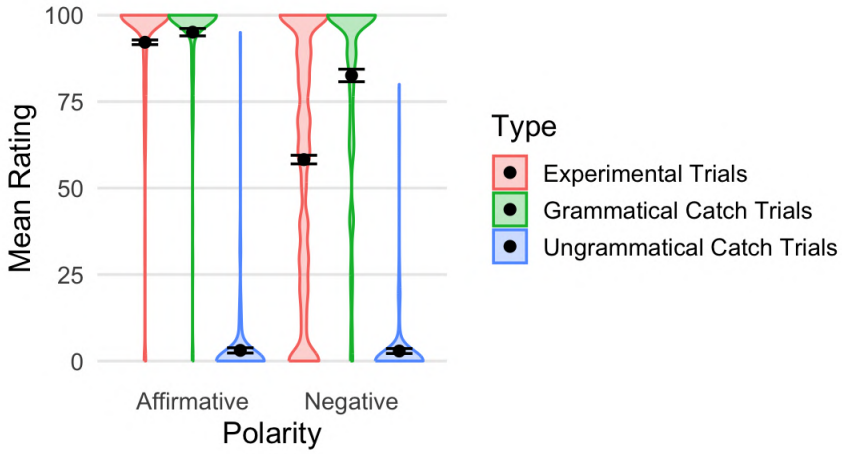


Figure 4.12: *Mean ratings for grammatical and ungrammatical catch trials, and experimental trials, where black dots indicate medians; error bars represent variability across participants.*

Ungrammatical trials were overwhelmingly rated as unnatural, while grammatical catch trials received relatively high ratings confirming that participants were generally attentive and responsive to the experimental manipulations.

As a first step, the analysis focused on how ideophone-derived adverbials behave under negation. A linear mixed-effects model was fitted using the `lme4` package in R (Bates et al. 2015) to investigate the effects of clause polarity and adverb type on acceptability ratings. The model included fixed effects for Polarity, Adverb Type, and their interaction, along with random intercepts for Response_ID and Scenario to account for repeated measures and item-level variability (*Rating* ∼ *Polarity * Adverb Type + (1|Response_ID) + (1|Scenario), data*). The results are summarized in Table C.10:

Table 4.7: *Summary of fixed effects from linear mixed-effects model for Experiment III targeting only ideophone group*

Coefficients	Estimate	Standard Error	z value	p value
Intercept[20]	95.83	3.09	30.92	<0.001
AdverbType_Converbial	-7.22	3.12	-2.30	<0.05
AdverbType_Reduplication	-3.59	3.13	-1.14	0.25
AdverbType_Time Adverb	-0.96	3.13	-0.30	0.76
Polarity_Negative	-39.16	3.13	-12.50	<0.001
AdverbType_Converbial:Polarity_Negative	2.05	4.43	0.46	0.64
AdverbType_Reduplication:Polarity_Negative	2.23	4.43	0.50	0.6
AdverbType_Time Adverb:Polarity_Negative	14.43	4.43	3.25	<0.01

[20]In the analysis, treatment contrasts were used, with manner adverbs and affirmative polarity serving as reference

The intercept represents the estimated mean rating for manner adverbs in affirmative contexts. Relative to this baseline, converbial adverbs received significantly lower ratings ($p < 0.05$)[21], whereas reduplication ($p = 0.25$) and time adverbs ($p = 0.76$) did not differ significantly from manner adverbs in affirmative sentences. Moreover, the results revealed a robust main effect of negative polarity ($p < 0.001$), indicating a decrease in acceptability under negation.

Crucially, the effect of polarity was modulated by adverbial type. The interaction between negative polarity and time adverbs was significant and positive ($\beta = 14.43$, $p < 0.01$), whereas no corresponding interaction reached significance for the other adverbial types. The significant positive interaction between negative polarity and time adverbs indicates that the effect of negation was attenuated for time adverbs relative to manner adverbs. Moreover, these results indicate that manner-related adverbials did not differ significantly from one another under negation, irrespective of their iconic roots or degree of morphological integration, while remaining distinct from time adverbials. A visualization of the results is presented in Figure 4.13, where the box-plots display model-predicted acceptability ratings for each condition, based on the fitted linear mixed-effects model:

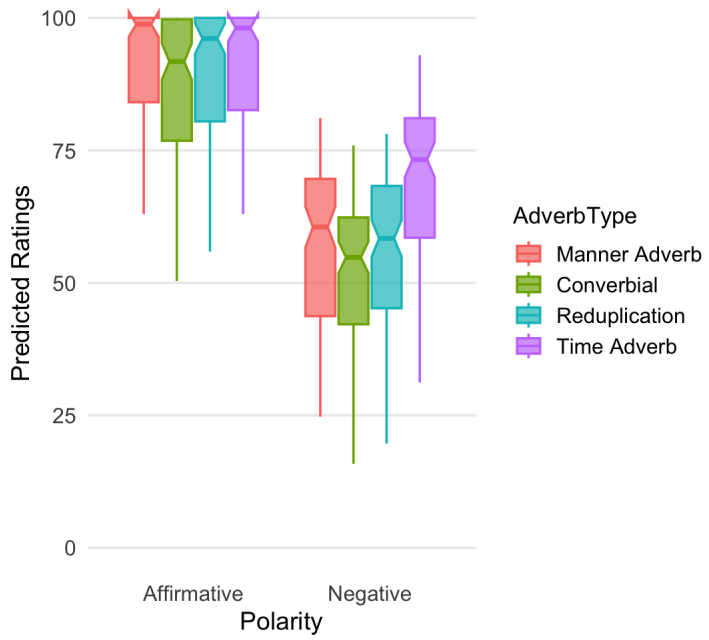


Figure 4.13: *Predicted acceptability ratings from the model for Experiment III*

levels, in order to allow direct comparisons between theoretically motivated baseline conditions and their alternatives. This coding choice facilitates interpretation of model coefficients as deviations from a meaningful semantic baseline.

[21]The degraded acceptability of this form might indicate that Turkish speakers do not find the use of the converbial form as natural as the other forms in this context.

To evaluate differences among adverb types within each polarity condition, model-based means were computed using the `emmeans` package in R. Pairwise comparisons were conducted with Tukey adjustment to control the family-wise error rate across all pairwise comparisons.

Table 4.8: *Pairwise comparisons of the variables in Experiment III*

Pairs	Estimate	p value
Affirmative Polarity		
Manner Adverb - Converbial	7.22	0.09
Manner Adverb - Reduplication	3.59	0.65
Converbial - Reduplication	-3.62	0.65
Manner Adverb - Time Adverb	0.96	0.99
Converbial - Time Adverb	-6.25	0.19
Reduplication - Time Adverb	-2.63	0.83
Negative Polarity		
Manner Adverb - Converbial	5.16	0.35
Manner Adverb - Reduplication	1.35	0.97
Converbial - Reduplication	-3.80	0.61
Manner Adverb - Time Adverb	-13.47	<0.001
Converbial - Time Adverb	-18.64	<0.001
Reduplication - Time Adverb	-14.83	<0.001

This comparison revealed that adverb types do not differ from each other in affirmative sentences. However, under negation, time adverbials differed significantly from each of the manner-related adverbials. The three manner-related types, regardless of their iconic or depictive status, did not differ significantly from one another. These findings show that semantic class, rather than depictive or iconic properties, plays a central role in acceptability judgments under negation.

To further examine this pattern, a separate analysis was conducted on the full dataset, including both ideophonic and non-ideophonic groups. The non-ideophone group consisted of motion verbs modified by derived manner adverbials, specifically converbial and reduplicated forms. A linear mixed-effects model was fitted to assess the effects of these factors on acceptability ratings. The model included fixed effects for Polarity (Affirmative vs. Negative), Adverb Type (Manner, Converbial, Reduplication, Time), and Type (Ideophone vs Non-ideophone), as well as their interactions (*Rating ~ Polarity * Adverb Type * Type + (1|Response_ID) + (1|Scenario), data*).

The results revealed a significant negative main effect of Polarity on acceptability (β = -39.14, $p < 0.001$). In addition, there was a significant two-way interaction between Polarity and Time Adverb, indicating that time adverbials showed a relative increase in acceptability under negation

($\beta = 14.26$, $p < 0.01$). The type of the iconic root did not show a significant main effect, nor did it interact significantly with any other variables. Moreover, no comparable effects were observed for other manner-related adverbial types.[22] The results are visualized in Figure 4.14:

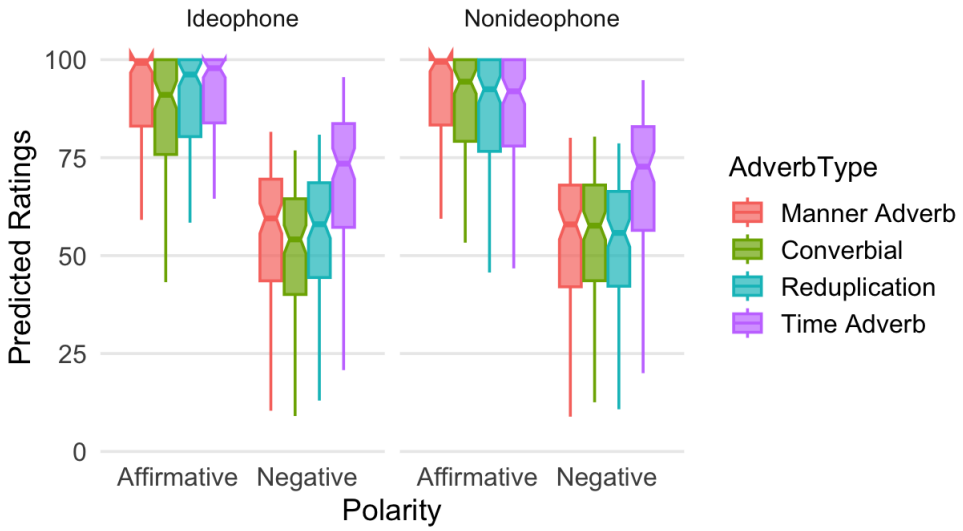


Figure 4.14: *Predicted ratings from the linear mixed-effects model in Experiment III including non-ideophones*

These results showed that regardless of the presence of an iconic root, the manner-related adverbs were rated significantly lower than time adverbs under negation while such a difference was not present in affirmative conditions.[23]

Ideophones pattern with lexical manner adverbs

Experiment III examined different manner adverbials across affirmative and negative polarities, building on Experiments I and II, which suggested that manner adverbials differ from other event-internal adverbials in their sensitivity to information-structural constraints. This experiment focused on ideophones, which are characterized by their iconic and depictive properties, and investigated how these interact with negation in Turkish. This was motivated by prior literature suggesting that expressive or depictive elements may be restricted under negation.

The results showed that manner-related adverbials, including ideophones, do not differ significantly from one another under negation, regardless of their iconic status or degree of morphological integration.

[22] Detailed results are presented in Appendix C.

[23] Pairwise comparisons from the model targeting only the non-ideophone group yielded similar results: time adverbials differed significantly from the other manner-related adverbials under negation, while no significant differences were observed among the manner-related types themselves.

At the same time, they pattern differently from time adverbials, which show a distinct response to negation. These findings indicate that ideophones align with lexical manner adverbs in their behavior under negation, rather than forming a separate class.

4.3.3 Discussion

The findings of these experiments provide converging evidence for the claim that it is a modifier's semantic class, rather than its form or iconic content, that determines how it patterns under negation. While previous literature has argued that ideophones may be restricted in certain syntactic contexts because of their expressive or depictive nature (Newman 1968; Dingemanse 2012; Dingemanse & Akita 2017; Kita 1997; Davidson 2023; among others), the present results suggest that in Turkish, ideophones behave in line with other lexical manner adverbs, and not with time adverbs, in their acceptability in negated structures. Across both experiments, ideophonic adverbials consistently patterned with lexical manner adverbs, contrasting clearly with the behavior of time adverbials.

Crucially, the data show no significant difference between ideophones with different morphological integration. Furthermore, in contexts involving motion verbs, which did not include ideophones, the same degradation in acceptability was observed for manner adverbials under negation. This suggests that the reduced acceptability of manner adverbials is not tied to iconicity or morphological form, but rather reflects the way manner semantics interacts with negation and contrast in Turkish. These patterns reinforce the conclusion that semantic class is the central factor governing adverbial behavior in negative environments.

In sum, while ideophones in Turkish include iconic roots, their syntactic behavior under negation is best explained in terms of their semantic classification as manner adverbials. More specifically, the study shows that manner adverbials as a class may pose challenges for interpretation in negated contexts, regardless of whether they are ideophonic or not. These findings highlight the need for semantically grounded accounts of adverbial distribution and open up broader questions about how negation interacts with this adverb class across languages.

At this point, it is important to highlight a broader typological consideration. Ideophones are often characterized as appearing in prosodically marked, phonologically exceptional, and syntactically peripheral positions, and are frequently accompanied by gestures or other non-verbal cues. For example, in Siwu, ideophones typically appear clause-finally. Moreover, they are pronounced with expressive vowel lengthening and high pitch, and are closely coordinated with gestural expression (Dingemanse 2012). The present study relied exclusively on written stimuli, which necessarily eliminated access

to prosodic and gestural dimensions. This is an important caveat: the lack of multimodal input may suppress the full expressive potential of ideophones, possibly encouraging a more integrated, lexicalized interpretation. Under these conditions, ideophones may have patterned like ordinary manner adverbials, suggesting that their distinctive behavior might depend on the availability of paralinguistic cues. The extent to which ideophones retain their expressive function when stripped of these cues remains an open question.

4.4 General discussion

This chapter investigated how event adverbials interact with negation, contrastive structure, and focus in Turkish. Building on the previous chapter, which identified asymmetries between path and manner information, the central goal here was to determine whether such asymmetries reflect a more general property of manner as a semantic class. The chapter asked (i) whether manner and time adverbials exhibit distinct interpretive profiles under negation, (ii) whether this interaction is modulated by information structure, and (iii) whether ideophones, as a subtype of manner adverbials, introduce additional constraints due to their iconic or morphosyntactic properties. Across two experimental paradigms, a structurally rich two-clause continuation task and a simpler one-clause acceptability judgment task, the results converge on a single conclusion: the behavior of event modifiers under negation is not uniform, but is systematically constrained by their semantic class, which in turn constrains the structure of alternatives available for interpretation. In particular, manner adverbials, including ideophones, exhibit greater flexibility in alternative construction than time adverbials, whose interpretation is associated with more tightly constrained alternative sets.

The sentences tested in these studies were syntactically well-formed across all conditions. The observed differences in acceptability cannot be attributed to grammaticality. Instead, they reflect pragmatic effects and the interaction of polarity with adverbial semantics. In other words, the data suggest that contrastive coherence under negation is sensitive to semantic class rather than to structural well-formedness alone. The first two experiments revealed a robust asymmetry between manner and time adverbials in Turkish. This asymmetry calls for an explanation in terms of how different adverbial types structure their sets of alternatives.

I claim that this asymmetry reflects a more general constraint on alternative generation: semantic classes differ in how tightly they delimit the space of relevant alternatives. Time adverbials, which locate events along a structured temporal dimension, induce relatively restricted and homogeneous alternative

sets. Manner adverbials, by contrast, are associated with a more abstract and multidimensional domain, allowing for a broader and less constrained range of alternatives. As a result, contrastive coherence under negation is more easily satisfied for manner modification than for temporal modification, yielding the observed asymmetries in acceptability.

The asymmetry observed in Experiment I reflects the role of contrastive coherence under negation. Acceptability in contrastive contexts was primarily determined by whether the relation between the two clauses formed a discourse-pragmatically coherent contrast. Specifically, biclausal trials were rated more acceptable when the two clauses had matching adverbial types, and this effect was even more pronounced when negation occurred in the first clause and anticipated a contrastive structure. This pattern can be captured within alternative semantics (Rooth 1992): the immediate preverbal position in the scope of negation induces a contrastive focus structure that requires a natural set of semantic alternatives. When negation appears in the first clause, it strengthens the expectation that the continuation will instantiate a well-formed alternative, resulting in greater penalties for mismatched continuations. By contrast, when the first clause is affirmative, a broader focus interpretation becomes available, allowing for a wider range of possible continuations.

Beyond this general preference for matching semantic classes, Experiment I revealed a more specific asymmetry between time and manner adverbials in mismatch conditions. Manner adverbials, despite their semantic complexity, were rated relatively consistently across conditions, whereas time adverbials showed a sharper decline in acceptability when contrasted with a locative alternative. This difference could follow from how these adverbial types constrain their sets of focus alternatives. Manner adverbials, given their semantic flexibility and ontological underspecification, vary along multiple dimensions and license a wider range of possible alternatives. As a result, they are less likely to induce narrowly constrained contrastive structures and are more tolerant of mismatch. Time adverbials, by contrast, evoke more structured and homogeneous domains, and impose stricter constraints on what counts as a plausible alternative. In this respect, the contrast between manner and time adverbials can be understood in terms of the structure of their alternative sets: manner adverbials license broader and more flexible alternatives, whereas time adverbials evoke more restricted and semantically homogeneous sets. For instance, times would be alternatives to other times just as quantifiers are natural alternatives to other quantifiers (e.g., *some, all* for scalar implicatures) or other constrained sets like colors (e.g., *red, blue, green* etc.).

The proposal that manner adverbials are less constrained in their focus alternatives is consistent with the manipulation of information structure between Experiment I and Experiment II, where the

position of the target adverbial was varied. When target adverbials appeared in the preverbal focus position, time−locative mismatches were judged less natural. However, when adverbials were dislocated from this default focus position, the mismatch penalty was mitigated, consistent with the idea that focus constrains the set of plausible alternatives that can be felicitously contrasted (Rooth 1992; Han & Romero 2001; among others). These effects were weaker for manner adverbials. Manner adverbials, by virtue of their flexibility in dimensions for contrasting alternatives, appear less strongly penalized in the mismatching contrastive contexts in these studies. Time adverbials, conversely, may trigger stricter presuppositional or coherence constraints by more heavily constraining their pragmatic alternatives.

The results of Experiments I and II suggest that event adverbials are not uniform in their behavior under negation. Instead, their interpretation in contrastive contexts depends on both structural factors (negation position, focus position) and the semantic-pragmatic profile of the adverbial (manner vs. time). These findings call into question the adequacy of treating all adverbials as compositionally uniform adjuncts that simply conjoin additional predicates to an event variable. Moreover, while much of the literature on focus and alternative structure has concentrated on arguments, this finding shows that adverbials, often considered adjuncts, can exhibit sensitivity to information-structural and compositional constraints. In this respect, adverbials behave more like arguments than traditional adjunct analyses would predict, particularly in the case of time adverbials. Moreover, these findings place the present results between prior pragmatic accounts. While some work suggests that information structure plays a role in the interpretation of adverbials under negation (Stevens et al. 2017), other studies report no reliable structural effects (Stolterfoht 2026). The present results indicate that structural position modulates overall acceptability without yielding strong interaction effects, suggesting a more limited but non-trivial role for information structure.

This chapter further expanded these findings by probing whether iconicity or morphosyntactic integration affects adverbial behavior, focusing on Turkish ideophones. Despite their expressive morphology and typologically marked status, ideophonic adverbials patterned consistently with lexical manner adverbs and diverged from time adverbials across both experiments. Crucially, no significant differences emerged between reduplicated and morphologically more integrated ideophones with respect to their compatibility with negation. This finding suggests that the inverse relation between expressiveness and grammatical integration (Dingemanse & Akita 2017) does not straightforwardly extend to the interaction between ideophones and negation in Turkish. In other words, degree of grammatical integration alone does not determine their operator-sensitive behavior.

These results suggest that in Turkish, iconic content is not syntactically disruptive, and that

ideophones function, for interpretive purposes, as a subclass of manner adverbials. However, the use of written stimuli, which precluded access to prosodic and gestural cues, raises an important methodological caveat. The suppression of expressive channels may have favored more integrated, lexicalized readings of ideophones, making them functionally similar to their non-iconic counterparts. This highlights the importance of multimodal experimental designs for future research. It is also important to bear in mind that ideophones are a heterogeneous class across languages, and it is possible that the ideophones studied here in Turkish may be more syntactically integrated than some in other languages. This points to the need for future studies that pursue not only more multimodal research, but also more cross-linguistic multimodal research.

More broadly, this chapter provides experimental evidence that semantic class plays a decisive role in constraining alternative generation in event modification. The two paradigms probed different diagnostics of alternative structure. The biclausal tasks tested how adverbials participate in contrastive alignment across clauses, whereas the mono-clausal task tested how polarity interacts with adverbial semantics in isolation. Although the two experimental paradigms differed in task and design, their converging results offer a coherent empirical foundation for further investigation. They provide sufficient empirical power to detect systematic differences between time adverbials and manner-related adverbials, while revealing no significant distinctions among the different types of manner-related adverbials themselves. The findings reinforce the claim that manner adverbials form a distinct class, with ideophonic elements consistently patterning alongside them. These findings contribute to a growing body of work showing that semantic and discourse-related properties are critical for understanding the distribution and interpretation of adverbials, particularly in the presence of focus-sensitive operators like negation. They also raise important questions for future research, including how these patterns generalize across languages and whether different types of adverbials show similar interactions with focus and polarity.

Finally, several directions for future research follow from these results. From a methodological perspective, future work should employ online measures such as self-paced reading, eye-tracking, or EEG to see how these effects manifest in real-time processing and to determine whether the effects observed reflect processing costs, structural preferences, or discourse-level reasoning. Additionally, prosody-focused experiments in which intonation on the adverbials is manipulated might lead to different acceptability patterns for mismatches. This would directly probe the role of focus and would test the role of overt focus marking. The current offline tasks allowed participants time to reflect on the sentences, possibly engaging in some repair or reanalysis strategies. In an online setting, more

immediate effects of confusion or surprise could be detected more easily.

Moreover, targeted follow-up questions in a task could further clarify which alternative sets participants actually considered during comprehension. Such measures could help distinguish between cases in which participants actively accommodated an implicit alternative and cases in which they simply judged the sentence to be odd. All these future directions would help disentangle whether the observed effects are due to instantaneous processing constraints, deliberate pragmatic reasoning, or a combination of the two.

In sum, the findings show that the interpretation of event adverbials in Turkish is shaped by the interaction of semantic type, focus structure, and pragmatic reasoning, rather than by morphosyntactic form or iconicity alone. Manner adverbials, including ideophones, form a relatively flexible class under negation, whereas time adverbials impose more rigid discourse constraints. By showing that alternative generation in event modification is systematically constrained by semantic class, this chapter contributes to ongoing debates in adverbial semantics, focus theory, and the pragmatics of negation.

Chapter 5

Conclusion

This dissertation began with a simple question: do different components of event descriptions behave uniformly across grammatical systems and modalities? The evidence presented across the preceding chapters suggests that they do not. Across the empirical domains investigated in this work, the results consistently reveal an asymmetry between manner and other event-related modifiers. This pattern holds across languages, modalities, and experimental paradigms alike, indicating that it cannot be reduced to modality, depiction, or syntactic configuration alone. Rather, it points to a property of event representation itself. Manner emerges as a privileged dimension of event representation, whose interaction with alternatives differs systematically from that of other event-related modifiers.

The dissertation approached this question by bringing together evidence from multiple modalities and grammatical systems. This comparative perspective was motivated by the observation that manner can be expressed through a wide range of linguistic and multimodal strategies, including lexical adverbs, ideophones, classifier constructions, and co-speech gestures. If the interaction between manner and operators such as negation reflects a property of event representation, then examining how manner is encoded across these different systems can help clarify the source of the observed asymmetries. The linguistic domains investigated in this dissertation reveal a consistent pattern in which manner expressions diverge from other event-related modifiers in alternative-sensitive environments.

Chapter 2 examined classifier constructions in Turkish Sign Language (TİD), developing a morphosyntactic analysis. The chapter proposed that classifier constructions are derived from an underspecified root $\sqrt{\kappa}$, which licenses depictive realization within grammatical structure. This analysis shows that depictive content is not external to the grammar, but is structurally integrated and constrained by it. Furthermore, the chapter proposed that two-handed classifier constructions in transitive clauses

arise as structurally motivated realizations in which distinct arguments of a single event are encoded simultaneously on separate articulators. Beyond its morphosyntactic analysis, the chapter establishes an empirical pattern that motivates the broader investigation of this dissertation. In TİD classifier constructions, path-only expressions remain acceptable under negation, whereas constructions encoding manner movement show degraded acceptability. Because this contrast arises within a single grammatical construction where modality and depiction are otherwise held constant, it identifies manner encoding as the critical variable. This result is not merely an empirical observation but a theoretical pivot: it demonstrates that the asymmetry cannot be attributed to depiction or modality, and instead must be tied to how manner is represented within event structure.

Chapter 3 extended the investigation beyond sign languages to examine the relationship between path and manner information in spoken language and gesture. Through a series of acceptability judgment experiments involving multimodal stimuli and written English, the study evaluated how speakers interpret path and manner information under affirmative and negative conditions. The experimental results for co-speech gesture replicated previous findings that gestural contributions tend to degrade under negation. Crucially, however, gesture did not reproduce the path-manner asymmetry observed in classifier constructions. This divergence demonstrates that the TİD pattern cannot be reduced to depiction alone. Instead, the asymmetry emerges most clearly when manner information is grammatically integrated into linguistic structure, as in TİD classifier constructions and written English modifiers.

Experiments in written English further showed that path and manner modifiers do not contribute equally to sentence interpretation. Participants exhibited systematic differences in how these modifiers influenced acceptability judgments. These results indicate that the asymmetry is not confined to sign language or to overtly depictive representations, but extends to purely linguistic domains as well.

Chapter 4 turned to Turkish to investigate how different types of event adverbials behave under negation and contrastive focus. Controlled acceptability judgment experiments manipulating adverbial type, negation placement, and constituent order revealed systematic differences between manner adverbials and temporal adverbials. In particular, manner expressions displayed a distinct interpretive profile in comparison with temporal modifiers in contrastive negative environments. The chapter further examined ideophones, a subtype of manner expression often characterized by depictive and expressive content. Contrary to claims that ideophones form a distinct grammatical class due to their depictive properties, the results showed that Turkish ideophones pattern with lexical manner adverbs in their interaction with negation. Their interpretive behavior is therefore best explained by their

semantic class rather than their iconic or expressive form.

The findings from these three domains point to a common pattern in which expressions encoding manner diverge from other event-related modifiers in environments that probe alternative structure. This cross-domain consistency has implications for the theoretical status of manner within event semantics. A central proposal emerging from this dissertation is that manner participates in the alternative structure of event descriptions differently from other modifiers. The key question that follows is why manner gives rise to this distinct alternative structure.

A useful way to further illuminate the observed asymmetry is to consider how event modifiers participate differently in the construction of alternatives. Independent support for this perspective comes from recent experimental work on alternative competition in intensional semantics. Zhang & Davidson (2024) show that certain interpretations remain grammatically available but exhibit unstable acceptability when competing alternatives become salient in the discourse. Their findings demonstrate that interpretive variability can arise when listeners must choose among multiple competing alternatives during interpretation. A similar mechanism may be at work in the present experiments. Temporal and locative modifiers typically draw from domains that are already discretized, such as temporal intervals or spatial locations. Manner expressions, by contrast, often evoke heterogeneous sets of alternatives, corresponding to different perceptually grounded ways in which an event can unfold. If the alternatives associated with manner are less tightly structured, evaluating them under negation may involve greater uncertainty. From this perspective, the degraded acceptability judgments observed for manner expressions in mono-clausal structures might reflect not a failure of compositional semantics, but the interaction between event structure and the organization of alternatives in interpretation.

A related line of work further suggests that adverbial modification itself may interact with pragmatic inference mechanisms in complex ways. Chemla (2009) shows experimentally that inferences associated with adverbial modification occupy an intermediate position between presuppositions and scalar implicatures. While presuppositions tend to project robustly across operators and scalar implicatures are more optional and context-sensitive, adverbial inferences display properties of both systems. The present findings further showed that adverbials do not exhibit uniform behavior, but rather that this domain is internally heterogeneous. In particular, different classes of adverbials give rise to distinct types of alternative structures.

For instance, in a sentence such as "*John walked quickly*," the manner expression "quickly" evokes a wide range of alternatives, including "slowly", as well as "carefully", "clumsily", or "with difficulty", reflecting qualitatively different ways in which the same event can be realized. By contrast, a time

expression in a sentence such as "*John walked in the morning*" evokes alternatives like "in the afternoon", "in the evening", or "at night", which belong to a single temporal scale. The crucial contrast lies not in the number of available alternatives, but in their underlying dimensional organization. In other words, manner alternatives span multiple, heterogeneous dimensions, whereas temporal alternatives are structured along a single, ordered dimension. This suggests that different types of adverbial modification give rise to qualitatively distinct alternative structures.

A particularly relevant case is provided by Stevens et al. (2017), who investigate projection in constructions with manner adverbs. They show that in sentences such as *"Masha didn't run quickly"*, the inference that "Masha ran" depends on the information structure of the utterance. When the adverb receives prosodic prominence, the utterance addresses a Question Under Discussion such as *How did Masha run?*, whose alternatives all entail that "Masha ran"; under those conditions, this inference is likely to project. When the subject is focused instead, the alternatives concern different possible agents, and the inference that "Masha ran" need not follow. Their analysis highlights how projection is mediated by the structure of alternatives available in the discourse, and more generally supports a view in which projection is sensitive not only to which alternatives are made salient, but also to how those alternatives are organized.

The findings of this dissertation extend this perspective by showing that the relevant alternative sets are not determined by information structure alone, but are also systematically constrained by the semantic class of the modifier. In the case of manner adverbs, the alternatives introduced under focus can vary along multiple, heterogeneous dimensions, corresponding to different ways in which an event can be realized. By contrast, time adverbials tend to evoke alternatives drawn from a more tightly structured and ordered domain. As a result, while manner adverbs may give rise to more flexible and context-dependent projection patterns, temporal adverbials are expected to exhibit more stable behavior across contexts. These findings suggest that the gradient nature of projection arises not only from variability in focus and prosody, but also from systematic differences in the structure of alternatives associated with different types of adverbial modification. This implies that analyses of alternatives must be sensitive not only to focus and contextual restriction, but also to the internal organization of the dimension of the event being modified.

These findings have broader implications for how alternative structure is modeled in semantic theory. Standard approaches to focus and alternatives often assume that the relevant alternative sets are determined primarily by syntactic focus marking and contextual restriction. The results of this dissertation suggest that this view is incomplete. In addition to information structure, the

internal semantic organization of the modified domain plays a crucial role in determining what counts as a plausible alternative. Event modification introduces variation not only in content, but in the dimensional structure of alternatives themselves. This implies that analyses of alternatives must be sensitive to semantic classification, and cannot treat all modifiers as contributing to a uniform set of alternatives.

Beyond its theoretical findings, this dissertation also contributes methodologically by developing a comparative framework that integrates evidence across modalities, grammatical systems, and empirical methods. Much work in formal semantics relies on data from a single language and modality, most often spoken language. The present study adopts a broader perspective by examining event representation across sign language, spoken language, and gesture. This cross-modal design makes it possible to disentangle factors that are often confounded in studies of event modification, including modality, depictive representation, and semantic class.

A further methodological contribution lies in the integration of formal semantic analysis with experimental methods. The experimental studies conducted in this dissertation do not simply test grammaticality judgments. Rather, they probe subtle differences in how speakers evaluate alternative interpretations under negation and contrastive contexts. Acceptability judgments, multimodal stimuli, and controlled manipulations of event structure make it possible to investigate interpretive patterns that are difficult to detect through introspection alone. In doing so, this study contributes to a growing body of work that combines formal semantic theory with experimental approaches to interpretation.

The dissertation also shows that different experimental paradigms reveal different aspects of the contribution of manner. In mono-clausal negation contexts, manner expressions show greater degradation than temporal modifiers. In biclausal contrastive contexts, by contrast, manner appears relatively more flexible. These differences do not reflect contradictory results, but rather differences in what each experimental design probes. Mono-clausal designs foreground compatibility with negation, whereas contrastive biclausal designs highlight the availability and organization of alternatives by explicitly introducing competing descriptions of the same event across clauses, often through parallel or contrastive structure. Together, these findings indicate that the interpretive profile of manner cannot be captured by a single binary notion of compatibility with negation, but must instead be understood relative to the alternative structures made salient in the task.

More broadly, the experimental component of this dissertation implements a triangulated research design in which a single hypothesis is systematically evaluated across multiple paradigms, each isolating a distinct dimension of the phenomenon under investigation. The written English experiments

establish baseline interpretive patterns within a purely linguistic system, providing a controlled point of departure. The gesture experiments introduce a multimodal perspective, making it possible to disentangle grammatical contributions from depictive enrichment. The Turkish experiments, in turn, use a language in which word order closely interacts with information structure and manner can be expressed both through lexical adverbs and ideophones, allowing for a fine-grained examination of how adverbial type, negation, and focus jointly shape alternative structure. These paradigms create a converging body of evidence in which each method provides distinct inferential leverage. By integrating cross-linguistic and cross-modal experimental perspectives, the dissertation presents a unified methodological framework for investigating event representation. This framework makes it possible to disentangle semantic class effects from modality, depiction, and structural configuration, and to evaluate how different representational resources, including ideophonic and non-ideophonic expressions, contribute to the organization of alternatives across interpretive contexts. In other words, the same question is examined across different modalities, languages, and interpretive tasks.

Nevertheless, this dissertation has several limitations that point to directions for further research. First, the explanatory proposal advanced here remains preliminary with respect to the formal structure of manner alternatives. The dissertation argues that manner modifiers interact differently with alternative-sensitive environments because the alternatives they evoke may be less discretely organized than those associated with temporal or locative modification. However, the present work does not offer a fully articulated formal account of the semantic space associated with manner expressions. Future research should investigate the internal organization of manner alternatives more explicitly, including whether they form scalar, multidimensional, or contextually structured sets, and how these alternatives are generated within compositional semantics.

A further limitation of the present study concerns its typological scope. While the dissertation draws on evidence from Turkish Sign Language, English, and Turkish, thereby enabling controlled comparisons across modalities and grammatical systems, the empirical base remains restricted to a relatively small number of languages. Although these languages were selected to maximize contrast along dimensions such as modality, morphosyntactic structure, and strategies of event encoding, the extent to which the observed asymmetries generalize cross-linguistically remains an open question.

In particular, languages differ substantially in how they encode motion events, manner, and event modification more broadly. For instance, verb-framed and satellite-framed languages exhibit distinct distributions of path and manner information, which affect gesture production patterns, and languages vary in the availability and grammatical integration of ideophones. If the asymmetry

identified in this dissertation reflects a general property of event representation, then it should be detectable across languages with diverse typological profiles, albeit potentially manifested through different morphosyntactic strategies. Therefore, a systematic cross-linguistic investigation is necessary to determine whether the distinction between manner and non-manner modification constitutes a universal constraint on alternative structure.

Moreover, the investigation of Turkish Sign Language would benefit from a parallel experimental paradigm that mirrors the designs implemented for spoken language. While the current analysis relies primarily on elicited data, including both controlled stimuli and one-to-one elicitation, a fully parallel experimental investigation of TİD, employing controlled stimuli and judgment or comprehension tasks, would provide a more rigorous and directly comparable foundation for cross-modal analysis. Such an extension would make it possible to disentangle more precisely the contributions of modality, grammatical integration, and semantic class, and would strengthen the empirical foundation for claims about the modality-independence of the manner asymmetry.

In addition, the experimental component of the dissertation relies primarily on offline judgment tasks. While such methods are effective for detecting interpretive contrasts, they do not make it possible to disentangle semantic constraints from pragmatic reasoning or processing effects. Future work employing online methodologies, such as eye-tracking, self-paced reading, or prosodically controlled auditory stimuli, may help clarify the mechanisms underlying the patterns observed here. Finally, including follow-up comprehension questions in the experiments would further strengthen the design, as the current data do not directly assess participants' interpretations.

These limitations point toward a broader research agenda. The results of this dissertation suggest that the interaction between event structure and alternative-sensitive operators provides a promising avenue for understanding how different dimensions of events are represented and interpreted across linguistic systems. Future work that integrates cross-linguistic comparison, formal semantic modeling, and experimental methods will be essential for developing a more complete account of how event modifiers contribute to the architecture of meaning.

The present findings raise broader questions about verbs at the lexical level and their internal structure, in particular with respect to manner verbs. Within decompositional approaches to event structure, manner is typically analyzed as arising from a root that modifies an underlying activity component (e.g., [ACT]) (Beavers & Koontz-Garboden 2012; among others). While this line of work provides a framework for distinguishing components of meaning, it leaves open whether verbs vary in the degree to which manner information is specified, and whether such variation has consequences

for their interaction with logical operators. In particular, verbs within the same semantic class may differ in how richly manner is encoded. For example, verbs such as *walk*, *stroll*, *limp*, and *run* can be understood as belonging to a shared semantic domain while differing in the specificity of their manner component. More specifically, verbs such as *limp* encode more fine-grained manner information than more general verbs such as *walk*, potentially giving rise to differences in their interpretation under negation. One way to conceptualize this distinction is to draw a parallel with nominal categories that exhibit basic and subordinate level contrasts (e.g., *dog* vs. *Dalmatian*). This perspective is compatible with findings from action categorization, where representations at different levels (e.g., basic vs. subordinate) vary in the amount and structure of information they encode, with consequences for processing and interpretation (Zhuang & Lingnau 2022). By analogy, verbs may form a graded system with respect to manner specification, and such differences may influence how they are used and interpreted in context. In particular, the apparent resistance of certain meanings to negation may reflect constraints on their felicitous use, similar to distributional differences observed between more general and more specific expressions. Investigating whether verbs with richer manner specification exhibit distinct patterns under negation would help clarify whether the observed asymmetries arise from differences in semantic representation, pragmatic constraints, or an interaction between the two. More broadly, this line of research may contribute to a more nuanced understanding of how manner is encoded and how it is reflected in interpretation.

In sum, this dissertation shows that alternative-sensitive environments such as negation and contrast can reveal hidden structure within semantic representation. By examining how different dimensions of event descriptions interact with these environments, the present study argues for a more articulated view of event structure and its interpretation, one in which the internal organization of events matters not only for lexicalization and composition, but also for the construction and evaluation of alternatives. In this sense, this work contributes to a broader research program aimed at understanding how language, across modalities, structures the events that make up human experience.

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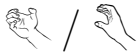
Appendix A

Chapter 2

Elicitation materials used in Chapter 2

The vignettes used in the elicitation task can be accessed here.

Table A.1: *Widely used classifier handshapes in TİD (building on Dikyuva et al. (2017), Kubus (2008), Gökgöz (2024), and the data presented in this dissertation)*[1]

Role	Handshape	Referent	Classifier type
Theme		Long-thin entities; humans	WECL
		Two-legged entities; humans	WECL[2]
		Honorific human being; bottle; drinks	WECL
		Animals	WECL
		Trees; plural humans	WECL
		Flat entities (e.g. book); vehicles	WECL
		Airplanes	WECL
		Cylindrical entities	WECL
		Small spherical entities	WECL
		Round entities (e.g. apple, ball, etc.)	WECL
		Round flat entities (e.g. plate, CD, etc.)	WECL
		Piles	WECL
Agent		Two-legged entities; humans	BPCL
		Two-legged entities; humans[3]	BPCL
		Active limb of agent argument (e.g. foot, tongue)	BPCL
		Active body part of agent argument (e.g. head)	BPCL
Agent + Theme		Handling of small round objects	HCL
		Handling of round objects (e.g. bottle, apple)	HCL
		Handling of objects (e.g. bag, baggage) and vehicles	HCL
		Handling of flat objects (e.g. book)	HCL

[1]This table presents a comprehensive, though not exhaustive, list of classifiers attested in TİD. Constructions involving ExtCL are not included.

[2]Wolford (2009) proposes that if there is internal movement of the handshape, is a BPCL, whereas movement of the entire handshape yields a WECL (p. 34).

[3]Both and function as BPCLs for two-legged animate entities, but their distribution appears to be sensitive to the manner of the event. They do not differ in classifier type or broad referential class, but they differ in how the body part is configured in relation to the event being depicted. In this sense, the contrast is best understood as a manner-sensitive distinction within the class of BPCLs.

Appendix B

Chapter 3

Table B.1: *Conditions tested in Experiment I*

Modification Type	Event Type	Polarity
Conflated Modification	Conflated Event	Affirmative
Manner Modification	Manner Event	Affirmative
Path Modification	Path Event	Affirmative
Conflated Modification	Conflated Event	Negative
Manner Modification	Manner Event	Negative
Path Modification	Path Event	Negative
Conflated Modification	No Motion	Affirmative
Manner Modification	No Motion	Affirmative
Path Modification	No Motion	Affirmative
Conflated Modification	No Motion	Negative
Manner Modification	No Motion	Negative
Path Modification	No Motion	Negative
Conflated Modification	Manner Event	Affirmative
Conflated Modification	Path Event	Affirmative
Conflated Modification	Manner Event	Negative
Conflated Modification	Path Event	Negative
Manner Modification	Conflated Event	Affirmative
Manner Modification	Path Event	Affirmative
Manner Modification	Conflated Event	Negative
Manner Modification	Path Event	Negative
Path Modification	Conflated Event	Affirmative
Path Modification	Manner Event	Affirmative
Path Modification	Conflated Event	Negative
Path Modification	Manner Event	Negative

Table B.2: *Sentences used in Experiment I*

Sentence	Modification Type	Polarity
The leaf is falling **in a downward direction**	**Path Modification**	Affirmative
The leaf is not falling **in a downward direction**	**Path Modification**	Negative
The leaf is falling **in a circular pattern**	**Manner Modification**	Affirmative
The leaf is not falling **in a circular pattern**	**Manner Modification**	Negative
The car is going **in a forward direction**	**Path Modification**	Affirmative
The car is not going **in a forward direction**	**Path Modification**	Negative
The car is going **in a zigzagging pattern**	**Manner Modification**	Affirmative
The car is not going **in a zigzagging pattern**	**Manner Modification**	Negative
The paper is flying **in an upward direction**	**Path Modification**	Affirmative
The paper is not flying **in an upward direction**	**Path Modification**	Negative
The paper is flying **in a circular pattern**	**Manner Modification**	Affirmative
The paper is not flying **in a circular pattern**	**Manner Modification**	Negative
The plank is floating **in a backward direction**	**Path Modification**	Affirmative
The plank is not floating **in a backward direction**	**Path Modification**	Negative
The plank is floating **in a curving pattern**	**Manner Modification**	Affirmative
The plank is not floating **in a curving pattern**	**Manner Modification**	Negative
The chair is moving **in a forward direction**	**Path Modification**	Affirmative
The chair is not moving **in a forward direction**	**Path Modification**	Negative
The chair is moving **in a circular pattern**	**Manner Modification**	Affirmative
The chair is not moving **in a circular pattern**	**Manner Modification**	Negative
The leaf is falling **in a circular pattern in a downward direction**	**Conflated Modification**	Affirmative
The leaf is not falling **in a circular pattern in a downward direction**	**Conflated Modification**	Negative
The car is going **in a zigzagging pattern in a forward direction**	**Conflated Modification**	Affirmative
The car is not going **in a zigzagging pattern in a forward direction**	**Conflated Modification**	Negative
The paper is flying **in a circular pattern in an upward direction**	**Conflated Modification**	Affirmative
The paper is not flying **in a circular pattern in an upward direction**	**Conflated Modification**	Negative
The plank is floating **in a curving pattern in a backward direction**	**Conflated Modification**	Affirmative
The plank is not floating **in a curving pattern in a backward direction**	**Conflated Modification**	Negative
The chair is moving **in a circular pattern in a forward direction**	**Conflated Modification**	Affirmative
The chair is not moving **in a circular pattern in a forward direction**	**Conflated Modification**	Negative

Table B.3: *Sentences used in the follow-up written English study, please see the trials in Conflated Modification.*

Sentence	Modification Type	Polarity
The leaf is falling **in a downward direction**	**Path Modification**	Affirmative
The leaf is not falling **in a downward direction**	**Path Modification**	Negative
The leaf is falling **in a circular pattern**	**Manner Modification**	Affirmative
The leaf is not falling **in a circular pattern**	**Manner Modification**	Negative
The car is going **in a forward direction**	**Path Modification**	Affirmative
The car is not going **in a forward direction**	**Path Modification**	Negative
The car is going **in a zigzagging pattern**	**Manner Modification**	Affirmative
The car is not going **in a zigzagging pattern**	**Manner Modification**	Negative
The paper is flying **in an upward direction**	**Path Modification**	Affirmative
The paper is not flying **in an upward direction**	**Path Modification**	Negative
The paper is flying **in a circular pattern**	**Manner Modification**	Affirmative
The paper is not flying **in a circular pattern**	**Manner Modification**	Negative
The plank is floating **in a backward direction**	**Path Modification**	Affirmative
The plank is not floating **in a backward direction**	**Path Modification**	Negative
The plank is floating **in a curving pattern**	**Manner Modification**	Affirmative
The plank is not floating **in a curving pattern**	**Manner Modification**	Negative
The chair is moving **in a forward direction**	**Path Modification**	Affirmative
The chair is not moving **in a forward direction**	**Path Modification**	Negative
The chair is moving **in a circular pattern**	**Manner Modification**	Affirmative
The chair is not moving **in a circular pattern**	**Manner Modification**	Negative
The leaf is falling **in a downward direction in a circular pattern**	**Conflated Modification**	Affirmative
The leaf is not falling **in a downward direction in a circular pattern**	**Conflated Modification**	Negative
The car is going **in a forward direction in a zigzagging pattern**	**Conflated Modification**	Affirmative
The car is not going **in a forward direction in a zigzagging pattern**	**Conflated Modification**	Negative
The paper is flying **in an upward direction in a circular pattern**	**Conflated Modification**	Affirmative
The paper is not flying **in an upward direction in a circular pattern**	**Conflated Modification**	Negative
The plank is floating **in a backward direction in a curving pattern**	**Conflated Modification**	Affirmative
The plank is not floating **in a backward direction in a curving pattern**	**Conflated Modification**	Negative
The chair is moving **in a forward direction in a circular pattern**	**Conflated Modification**	Affirmative
The chair is not moving **in a forward direction in a circular pattern**	**Conflated Modification**	Negative

Table B.4: *Model results for affirmative cases (Experiment II)*

Coefficients	Estimate	Standard Error	z value	p value
Intercept	0.81	0.18	4.51	<0.001
Path Modification	-0.11	0.22	-0.50	0.6
Manner Modification	0.28	0.21	1.29	0.2
Path Event	-2.19	0.23	-9.40	<0.001
Manner Event	-0.59	0.26	-2.24	0.02
Path Modification:Path Event	2.87	0.32	8.76	<0.001
Manner Modification:Path Event	0.05	0.33	0.16	0.8
Path Modification:Manner Event	-0.31	0.33	-0.93	0.3
Manner Modification:Manner Event	0.98	0.32	3.00	<0.01

Table B.5: *Model results for negative cases (Experiment II)*

Coefficients	Estimate	Standard Error	z value	p value
Intercept	-1.23	0.18	-6.51	<0.001
Path Modification	0.34	0.23	1.42	0.2
Manner Modification	0.05	0.25	0.20	0.8
Path Event	1.51	0.25	6.03	<0.001
Manner Event	0.32	0.25	1.28	0.2
Path Modification:Path Event	-1.98	0.34	-5.69	<0.001
Manner Modification:Path Event	0.39	0.35	1.11	0.3
Path Modification:Manner Event	0.65	0.33	1.97	0.04
Manner Modification:Manner Event	-0.49	0.33	-1.46	0.1

Table B.6: *Results of the between-subjects analysis of Experiments I and II*

Coefficients	Estimate	Standard Error	z value	p value
Intercept	0.95	0.15	6.11	<0.001
Order - 'in Manner in Path'	-0.25	0.22	-1.14	0.3
Path Event	-2.03	0.21	-9.54	<0.001
Manner Event	-0.63	0.22	-2.83	<0.01
Negative	-2.02	0.22	-9.05	< 0.001
Order - 'in Manner in Path':Path Event	0.27	0.30	0.87	0.4
Order - 'in Manner in Path':Manner Event	0.07	0.33	0.20	0.8
Order - 'in Manner in Path':Negative	0.21	0.32	0.68	0.5
Path Event:Negative	2.74	0.31	8.64	<0.001
Manner Event:Negative	0.87	0.31	2.79	<0.01
Order - 'in Manner in Path':Path Event:Negative	0.37	0.45	0.80	0.4
Order - 'in Manner in Path':Manner Event:Negative	-0.07	0.46	-0.15	0.8

Table B.7: *Conditions tested in Experiment III*

Co-speech Gesture Type	Event Type	Polarity
Conflated Gesture	Conflated Event	Affirmative
Manner Gesture	Manner Event	Affirmative
Path Gesture	Path Event	Affirmative
Conflated Gesture	Conflated Event	Negative
Manner Gesture	Manner Event	Negative
Path Gesture	Path Event	Negative
Conflated Gesture	No Motion	Affirmative
Manner Gesture	No Motion	Affirmative
Path Gesture	No Motion	Affirmative
Conflated Gesture	No Motion	Negative
Manner Gesture	No Motion	Negative
Path Gesture	No Motion	Negative
Conflated Gesture	Manner Event	Affirmative
Conflated Gesture	Path Event	Affirmative
Conflated Gesture	Manner Event	Negative
Conflated Gesture	Path Event	Negative
Manner Gesture	Conflated Event	Affirmative
Manner Gesture	Path Event	Affirmative
Manner Gesture	Conflated Event	Negative
Manner Gesture	Path Event	Negative
Path Gesture	Conflated Event	Affirmative
Path Gesture	Manner Event	Affirmative
Path Gesture	Conflated Event	Negative
Path Gesture	Manner Event	Negative

Table B.8: *Mean ratings across experimental conditions in Experiment III*

Trial	Gesture Type	Event Type	Polarity	Mean	SD	Count
1	Conflated Gesture	Conflated Event	Affirmative	81.9	21.5	67
2	Manner Gesture	Manner Event	Affirmative	89.8	13.8	75
3	Path Gesture	Path Event	Affirmative	81.5	23.7	67
4	Conflated Gesture	Conflated Event	Negative	12.5	22.0	75
5	Manner Gesture	Manner Event	Negative	8.0	19.2	67
6	Path Gesture	Path Event	Negative	4.8	12.3	75
7	Conflated Gesture	No Motion	Affirmative	5.22	17.6	67
8	Manner Gesture	No Motion	Affirmative	4.91	17.0	67
9	Path Gesture	No Motion	Affirmative	8.76	20.5	75
10	Conflated Gesture	No Motion	Negative	77.3	29.4	75
11	Manner Gesture	No Motion	Negative	78.7	26.0	75
12	Path Gesture	No Motion	Negative	74.5	32.0	67
13	Conflated Gesture	Manner Event	Affirmative	82.3	20.7	75
14	Conflated Gesture	Path Event	Affirmative	71.8	30.1	67
15	Conflated Gesture	Manner Event	Negative	16.4	27.0	67
16	Conflated Gesture	Path Event	Negative	6.16	13.8	75
17	Manner Gesture	Conflated Event	Affirmative	89.3	17.0	67
18	Manner Gesture	Path Event	Affirmative	88.1	16.9	75
19	Manner Gesture	Conflated Event	Negative	11.6	24.1	67
20	Manner Gesture	Path Event	Negative	6.2	15.5	75
21	Path Gesture	Conflated Event	Affirmative	83.3	18.7	67
22	Path Gesture	Manner Event	Affirmative	78.9	26.0	75
23	Path Gesture	Conflated Event	Negative	5.13	12.7	75
24	Path Gesture	Manner Event	Negative	11.6	23.3	67

Appendix C

Chapter 4

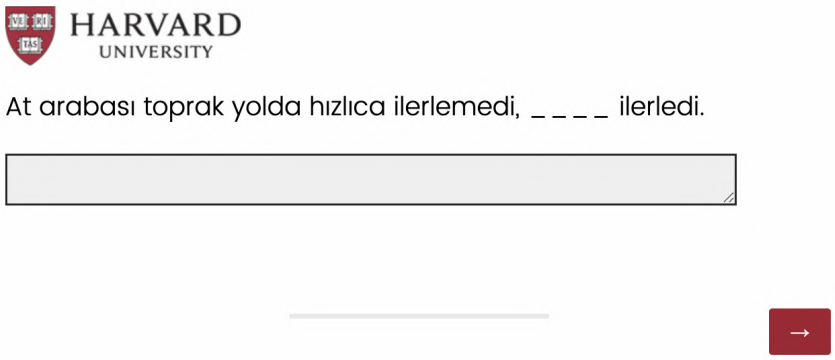


Figure C.1: *A sample stimulus used in the preliminary task for Experiments I and II, meaning "The horse cart did not move [fast] [on the dirt road], (it) moved _____."*

Table C.1: *Stimuli used in the preliminary study, in which participants were asked to complete the continuation clause. Adverb types are color-coded as follows: Reduplicated iconic root, Lexical manner adverb, and Temporal adverb. (Continued on the next page.)*

	First Clause	Continuation
Negation in first clause	Adam odasında ***horul horul*** uyumadı	_____ uyudu
	The man did not sleep in his room ***huffing and puffing***	he slept _____
	Adam odasında ***güçlükle*** uyumadı	_____ uyudu
	The man did not sleep in his room ***with difficulty***	he slept _____
	Adam odasında ***sabah*** uyumadı	_____ uyudu
	The man did not sleep in his room ***in the morning***	he slept _____
	At arabası toprak yolda ***tıngır tıngır*** ilerlemedi	_____ ilerledi
	The horse cart did not move on the dirt road ***rattling***	it moved _____
	At arabası toprak yolda ***hızla*** ilerlemedi	_____ ilerledi
	The horse cart did not move on the dirt road ***fast***	it moved _____
	At arabası toprak yolda ***akşam vakti*** ilerlemedi	_____ ilerledi
	The horse cart did not move on the dirt road ***in the evening***	it moved _____
	Su ocakta ***fokur fokur*** kaynamadı	_____ kaynadı
	The water did not boil on the stove ***bubbling***	it boiled _____
	Su ocakta ***çabucak*** kaynamadı	_____ kaynadı
	The water did not boil on the stove ***quickly***	it boiled _____
	Su ocakta ***biraz önce*** kaynamadı	_____ kaynadı
	The water did not boil on the stove ***a little while ago***	it boiled _____
	Oğlan okulda ***zırıl zırıl*** ağlamadı	_____ ağladı
	The boy did not cry in the school ***sobbing***	he cried _____
	Oğlan okulda ***sessizce*** ağlamadı	_____ ağladı
	The boy did not cry in the school ***silently***	he cried _____
	Oğlan okulda ***dün*** ağlamadı	_____ ağladı
	The boy did not cry in the school ***yesterday***	he cried _____
	Öğrenci sınıfta ***fısır fısır*** konuşmadı	_____ konuştu
	The student did not talk in the classroom ***murmuring***	she talked _____
	Öğrenci sınıfta ***sessizce*** konuşmadı	_____ konuştu
	The student did not talk in the classroom ***silently***	she talked _____
	Öğrenci sınıfta ***dersten önce*** konuşmadı	_____ konuştu
	The student did not talk in the classroom ***before the lecture***	she talked _____
	Tekne denizin ortasında ***cayır cayır*** yanmadı	_____ yandı
	The boat did not burn in the middle of the sea ***fiercely***	it burned _____
	Tekne denizin ortasında ***aniden*** yanmadı	_____ yandı
	The boat did not burn in the middle of the sea ***suddenly***	it burned _____
	Tekne denizin ortasında ***iki gün önce*** yanmadı	_____ yandı
	The boat did not burn in the middle of the sea ***two days ago***	it burned _____

	First Clause	Continuation
Negation in continuation	Adam odasında ***horul horul*** uyudu	_____ uyumadı
	The man slept in his room ***huffing and puffing***	he did not sleep _____
	Adam odasında ***güçlükle*** uyudu	_____ uyumadı
	The man slept in his room ***with difficulty***	he did not sleep _____
	Adam odasında ***sabah*** uyudu	_____ uyumadı
	The man slept in his room ***in the morning***	he did not sleep _____
	At arabası toprak yolda ***tıngır tıngır*** ilerledi	_____ ilerlemedi
	The horse cart moved on the dirt road ***rattling***	it did not move _____
	At arabası toprak yolda ***hızla*** ilerledi	_____ ilerlemedi
	The horse cart moved on the dirt road ***fast***	it did not move _____
	At arabası toprak yolda ***akşam vakti*** ilerledi	_____ ilerlemedi
	The horse cart moved on the dirt road ***in the evening***	it did not move _____
	Su ocakta ***fokur fokur*** kaynadı	_____ kaynamadı
	The water boiled on the stove ***bubbling***	it did not boil _____
	Su ocakta ***çabucak*** kaynadı	_____ kaynamadı
	The water boiled on the stove ***quickly***	it did not boil _____
	Su ocakta ***biraz önce*** kaynadı	_____ kaynamadı
	The water boiled on the stove ***a little while ago***	it did not boil _____
	Oğlan okulda ***zırıl zırıl*** ağladı	_____ ağlamadı
	The boy cried in the school ***sobbing***	he did not cry _____
	Oğlan okulda ***sessizce*** ağladı	_____ ağlamadı
	The boy cried in the school ***silently***	he did not cry _____
	Oğlan okulda ***dün*** ağladı	_____ ağlamadı
	The boy cried in the school ***yesterday***	he did not cry _____
	Öğrenci sınıfta ***fısır fısır*** konuştu	_____ konuşmadı
	The student talked in the classroom ***murmuring***	she did not talk _____
	Öğrenci sınıfta ***sessizce*** konuştu	_____ konuşmadı
	The student talked in the classroom ***silently***	she did not talk _____
	Öğrenci sınıfta ***dersten önce*** konuştu	_____ konuşmadı
	The student talked in the classroom ***before the lecture***	she did not talk _____
	Tekne denizin ortasında ***cayır cayır*** yandı	_____ yanmadı
	The boat burned in the middle of the sea ***fiercely***	it did not burn _____
	Tekne denizin ortasında ***aniden*** yandı	_____ yanmadı
	The boat burned in the middle of the sea ***suddenly***	it did not burn _____
	Tekne denizin ortasında ***iki gün önce*** yandı	_____ yanmadı
	The boat burned in the middle of the sea ***two days ago***	it did not burn _____

Önceden de belirttiğimiz gibi her bir cümleyi iki devam cümlesi takip edecek. Sizden isteğimiz, ana cümleyi okuduktan sonra bu devam cümlelerinin ne kadar doğal olduğunu bizimle paylaşmanız.

Bazı durumlarda her iki cümle de size çok doğal gelebilir, bu durumlarda her iki cümle için de ibreyi yukarı kaydırın.

Bazı durumlarda ise, her iki cümle de hiç doğal olmayabilir. Aynı şekilde, ibreyi her iki cümle için aşağıya kaydırın.

Bazen bir cümle size diğerinden daha doğal gelebilir, bu durumlarda daha doğal bulduğunuz cümlenin ibresini yukarıya, diğer cümlenin ibresini ise aşağıya kaydırın. Unutmayın, ibre sadece 'tamamen doğal' ve 'kesinlikle doğal değil' kategorilerinden oluşmuyor:

5: Çok doğal!
4: Doğal ama yine de biraz garip
3: Ne doğal ne de garip/ Kararsızım
2: Doğal değil ama yine de çok kötü değil
1: Hiç doğal değil!

Figure C.2: *The original prompt in Turkish for Experiments I and II*

Table C.2: *Experimental trials in Experiment I. Adverb types are color-coded as follows:* *Reduplicated iconic root*, *Lexical manner adverb*, *and* *Temporal adverb*. *(Continued on the next page.)*

	First Clause	Continuation with *Target* Adverbial	Continuation with Locative Adverbial
Negation in continuation	Adam odasında ***horul horul*** uyudu	sessizce uyumadı	salonda uyumadı
	The man slept in his room ***huffing and puffing***	he did not sleep silently	he did not sleep in the living room
	Adam odasında ***güçlükle*** uyudu	kolayca uyumadı	salonda uyumadı
	The man slept in his room ***with difficulty***	he did not sleep easily	he did not sleep in the living room
	Adam odasında ***sabah*** uyudu	gece uyumadı	salonda uyumadı
	The man slept in his room ***in the morning***	he did not sleep at night	he did not sleep in the living room
	At arabası toprak yolda ***tıngır tıngır*** ilerledi	sessizce ilerlemedi	asfalt yolda ilerlemedi
	The horse cart moved on the dirt road ***rattling***	it did not move silently	it did not move on the paved road
	At arabası toprak yolda ***hızla*** ilerledi	yavaşça ilerlemedi	asfalt yolda ilerlemedi
	The horse cart moved on the dirt road ***fast***	it did not move slowly	it did not move on the paved road
	At arabası toprak yolda ***akşam vakti*** ilerledi	gündüz ilerlemedi	asfalt yolda ilerlemedi
	The horse cart moved on the dirt road ***in the evening***	it did not move in the daytime	it did not move on the paved road
	Su ocakta ***fokur fokur*** kaynadı	sessizce kaynamadı	sobada kaynamadı
	The water boiled on the stove ***bubbling***	it did not boil silently	it did not boil on the burner
	Su ocakta ***çabucak*** kaynadı	yavaşça kaynamadı	sobada kaynamadı
	The water boiled on the stove ***quickly***	it did not boil slowly	it did not boil on the burner
	Su ocakta ***biraz önce*** kaynadı	şimdi kaynamadı	sobada kaynamadı
	The water boiled on the stove ***a little while ago***	it did not boil now	it did not boil on the burner
	Oğlan okulda ***zırıl zırıl*** ağladı	sessizce ağlamadı	evde ağlamadı
	The boy cried in the school ***sobbing***	he did not cry silently	he did not cry at home
	Oğlan okulda ***sessizce*** ağladı	yüksek sesle ağlamadı	evde ağlamadı
	The boy cried in the school ***silently***	he did not cry loudly	he did not cry at home
	Oğlan okulda ***dün*** ağladı	bugün ağlamadı	evde ağlamadı
	The boy cried in the school ***yesterday***	he did not cry today	he did not cry at home
	Öğrenci sınıfta ***fısır fısır*** konuştu	yüksek sesle konuşmadı	kantinde konuşmadı
	The student talked in the classroom ***murmuring***	she did not talk loudly	she did not talk in the cafeteria
	Öğrenci sınıfta ***sessizce*** konuştu	yüksek sesle konuşmadı	kantinde konuşmadı
	The student talked in the classroom ***silently***	she did not talk loudly	she did not talk in the cafeteria
	Öğrenci sınıfta ***dersten önce*** konuştu	ders sırasında konuşmadı	kantinde konuşmadı
	The student talked in the classroom ***before the lecture***	she did not talk during the lecture	she did not talk in the cafeteria
	Tekne denizin ortasında ***cayır cayır*** yandı	hafifçe yanmadı	limanda yanmadı
	The boat burned in the middle of the sea ***fiercely***	it did not burn lightly	it did not burn in the port
	Tekne denizin ortasında ***aniden*** yandı	yavaşça yanmadı	limanda yanmadı
	The boat burned in the middle of the sea ***suddenly***	it did not burn slowly	it did not burn in the port
	Tekne denizin ortasında ***iki gün önce*** yandı	dün yanmadı	limanda yanmadı
	The boat burned in the middle of the sea ***two days ago***	it did not burn yesterday	it did not burn in the port

	First Clause	Continuation w/ *Target* Adverbial	Continuation w/ Locative Adverbial
Negation in first clause	Adam odasında ***horul horul*** uyumadı	sessizce uyudu	salonda uyudu
	The man did not sleep in his room ***huffing and puffing***	he slept silently	he slept in the living room
	Adam odasında ***güçlükle*** uyumadı	kolayca uyudu	salonda uyudu
	The man did not sleep in his room ***with difficulty***	he slept easily	he slept in the living room
	Adam odasında **sabah** uyumadı	gece uyudu	salonda uyudu
	The man did not sleep in his room ***in the morning***	he slept at night	he slept in the living room
	At arabası toprak yolda ***tıngır tıngır*** ilerlemedi	sessizce ilerledi	asfalt yolda ilerledi
	The horse cart did not move on the dirt road ***rattling***	it moved silently	it moved on the paved road
	At arabası toprak yolda ***hızla*** ilerlemedi	yavaşça ilerledi	asfalt yolda ilerledi
	The horse cart did not move on the dirt road ***fast***	it moved slowly	it moved on the paved road
	At arabası toprak yolda ***akşam vakti*** ilerlemedi	gündüz ilerledi	asfalt yolda ilerledi
	The horse cart did not move on the dirt road ***in the evening***	it moved in the daytime	it moved on the paved road
	Su ocakta ***fokur fokur*** kaynamadı	sessizce kaynadı	sobada kaynadı
	The water did not boil on the stove ***bubbling***	it boiled silently	it boiled on the burner
	Su ocakta ***çabucak*** kaynamadı	yavaşça kaynadı	sobada kaynadı
	The water did not boil on the stove ***quickly***	it boiled slowly	it boiled on the burner
	Su ocakta ***biraz önce*** kaynamadı	şimdi kaynadı	sobada kaynadı
	The water did not boil on the stove ***a little while ago***	it boiled now	it boiled on the burner
	Oğlan okulda ***zırıl zırıl*** ağlamadı	sessizce ağladı	evde ağladı
	The boy did not cry in the school ***sobbing***	he cried silently	he cried at home
	Oğlan okulda ***sessizce*** ağlamadı	yüksek sesle ağladı	evde ağladı
	The boy did not cry in the school ***silently***	he cried loudly	he cried at home
	Oğlan okulda ***dün*** ağlamadı	bugün ağladı	evde ağladı
	The boy did not cry in the school ***yesterday***	he cried today	he cried at home
	Öğrenci sınıfta ***fısır fısır*** konuşmadı	yüksek sesle konuştu	kantinde konuştu
	The student did not talk in the classroom ***murmuring***	she talked loudly	she talked in the cafeteria
	Öğrenci sınıfta ***sessizce*** konuşmadı	yüksek sesle konuştu	kantinde konuştu
	The student did not talk in the classroom ***silently***	she talked loudly	she talked in the cafeteria
	Öğrenci sınıfta ***dersten önce*** konuşmadı	ders sırasında konuştu	kantinde konuştu
	The student did not talk in the classroom ***before the lecture***	she talked during the lecture	she talked in the cafeteria
	Tekne denizin ortasında ***cayır cayır*** yanmadı	hafifçe yandı	limanda yandı
	The boat did not burn in the middle of the sea ***fiercely***	it burned lightly	it burned in the port
	Tekne denizin ortasında ***aniden*** yanmadı	yavaşça yandı	limanda yandı
	The boat did not burn in the middle of the sea ***suddenly***	it burned slowly	it burned in the port
	Tekne denizin ortasında ***iki gün önce*** yanmadı	dün yandı	limanda yandı
	The boat did not burn in the middle of the sea ***two days ago***	it burned yesterday	it burned in the port

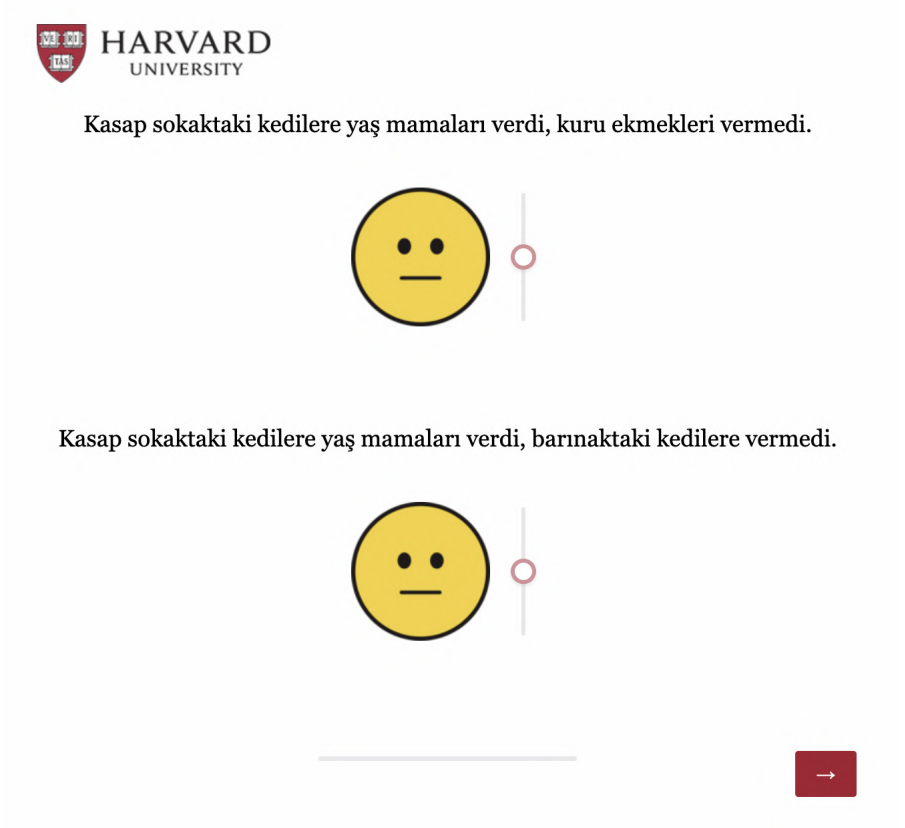


Figure C.3: *A sample filler trial in Experiment I, where the first trial means "The butcher gave the wet food to the cats on the street, he did not give the stale bread." and the second trial means "The butcher gave the wet food to the cats on the street, he did not give (them) to the cats in the shelter."*

Table C.3: *Filler trials in Experiment I, where* RED *indicates the direct objects and* BLUE *indicates the indirect objects.*

	First Clause	Continuation with Direct Object	Continuation with Indirect Object
Negation in continuation	Sekreter kolilere eski evrakları koydu	önemli raporları koymadı	çekmeceye koymadı
	The secretary put the old files into the boxes	*he did not put the important reports*	*he did not put into the drawer*
	Adam kuzenine davetiyeleri gönderdi	mektupları göndermedi	teyzesine göndermedi
	The man sent the invitations to his cousin	*he did not send the letters*	*he did not send to his aunt*
	Kasap sokaktaki kedilere yaş mamaları verdi	kuru ekmekleri vermedi	barınaktaki kedilere vermedi
	The butcher gave the wet food to the cats on the street	*she did not give the stale bread*	*she did not give to the cats in the shelter*
	Bakkal raflara deterjanları yerleştirdi	sıvı yağları yerleştirmedi	tezgahın altına yerleştirmedi
	The grocer placed the detergents on the shelves	*she did not place the oils*	*she did not place under the counter*
Negation in first clause	Sekreter kolilere eski evrakları koymadı	önemli raporları koydu	çekmeceye koydu
	The secretary did not put the old files into the boxes	*he put the important reports*	*he put into the drawer*
	Adam kuzenine davetiyeleri göndermedi	mektupları gönderdi	teyzesine gönderdi
	The man did not send the invitations to his cousin	*he sent the letters*	*he sent to his aunt*
	Kasap sokaktaki kedilere yaş mamaları vermedi	kuru ekmekleri verdi	barınaktaki kedilere verdi
	The butcher did not give the wet food to the cats on the street	*she gave the stale bread*	*she gave to the cats in the shelter*
	Bakkal raflara deterjanları yerleştirmedi	sıvı yağları yerleştirdi	tezgahın altına yerleştirdi
	The grocer did not place the detergents on the shelves	*she placed the oils*	*she placed under the counter*

Filler Trials

This appendix briefly reports the results of the filler trials included in Experiments I and II. These items probed participants' sensitivity to independently motivated word-order contrasts in Turkish ditransitive constructions, providing a point of comparison for the experimental manipulations.

Previous work has argued that the default word order in Turkish ditransitive clauses is Subject−Direct Object−Indirect Object−Verb (Erguvanlı-Taylan 1984), as illustrated in (1):

(1) Murat parayı bu adama verdi.
Murat para-yı bu adam-a ver-di
Murat-NOM money-ACC this man-DAT give-PST.3SG
"Murat gave the money to this man."

Erguvanlı-Taylan (1984) argues that (1) is pragmatically neutral (p. 34) whereas alternative permutations are more marked and associated with discourse-related effects:

(2) a. Murat bu adama parayı verdi. (S−IO−DO−V)
b. Parayı Murat bu adama verdi. (DO−S−IO−V)
c. Parayı bu adama Murat verdi. (DO−IO−S−V)
d. Bu adama Murat parayı verdi. (IO−S−DO−V)
e. Bu adama parayı Murat verdi. (IO−DO−S−V)

The filler items in Experiments I and II manipulated the order of the direct and indirect objects in the first clause. In addition, the continuation clause varied in argument type (Direct vs. Indirect Object) and in the position of negation, allowing comparison with the structural configurations tested in the experimental items.

To assess these effects, filler trials from Experiments I and II were analyzed jointly using a cumulative link mixed model (CLMM). The model included Word Order, Argument Type, and Position of Negation as between-participants factors. Data from 99 participants were included in this analysis.

Table C.4: *Summary of the fixed effects from the cumulative link mixed model for Experiments I and II*

Coefficients	Estimate	Standard Error	z value	p value
Word Order	-0.06	0.18	-0.31	0.76
Argument Type	-0.16	0.08	-1.93	0.06
Position of Negation	-0.06	0.09	-0.71	0.5
Word Order:Argument Type	0.74	0.09	8.45	<0.001
Word Order:Position of Negation	0.06	0.08	0.73	0.5
Argument Type:Position of Negation	0.34	0.08	4.13	<0.001
Word Order:Argument Type:Position of Negation	-0.24	0.08	-2.89	<0.01

The model revealed no significant main effects of the individual predictors. However, several interaction effects were significant. Word Order interacted significantly with Argument Type in the continuation (Direct vs. Indirect Object), indicating that the acceptability of the continuation depended on the relationship between object order in the first clause and the argument type realized in the continuation. In addition, Argument Type interacted significantly with Position of Negation, and the three-way interaction among Word Order, Argument Type, and Position of Negation was also significant.

These results show that participants were sensitive to the structural manipulation used in the filler items, and that their ratings were shaped not by any single factor in isolation, but by the interaction among constituent order, continuation type, and polarity configuration. Figure C.4 presents the model-predicted ratings for the filler trials.

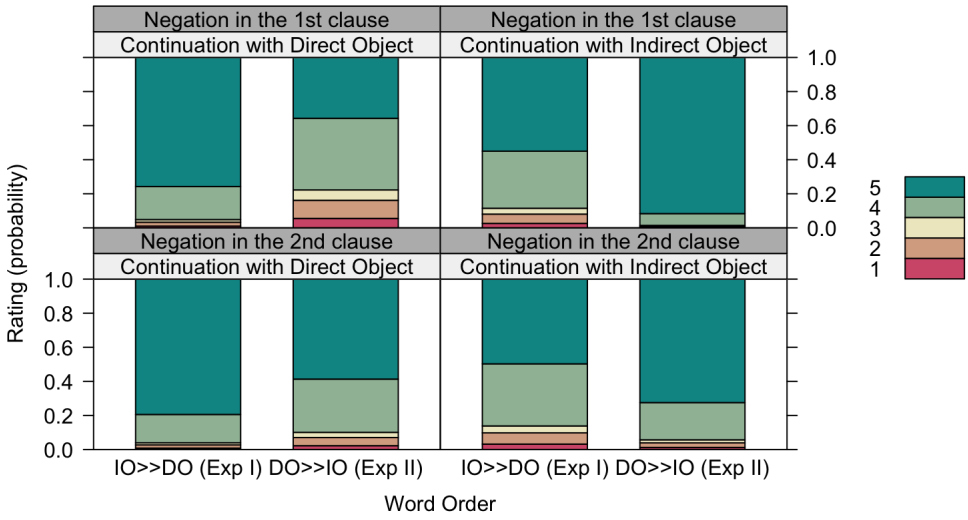


Figure C.4: *Model-predicted acceptability ratings for the filler trials in Experiments I and II*

These findings are consistent with previous experimental work on Turkish, which shows that participants are sensitive to structurally defined expectations and their interaction with information-structural cues, rather than to single factors in isolation (Kurt & Dinçtopal Deniz 2023).

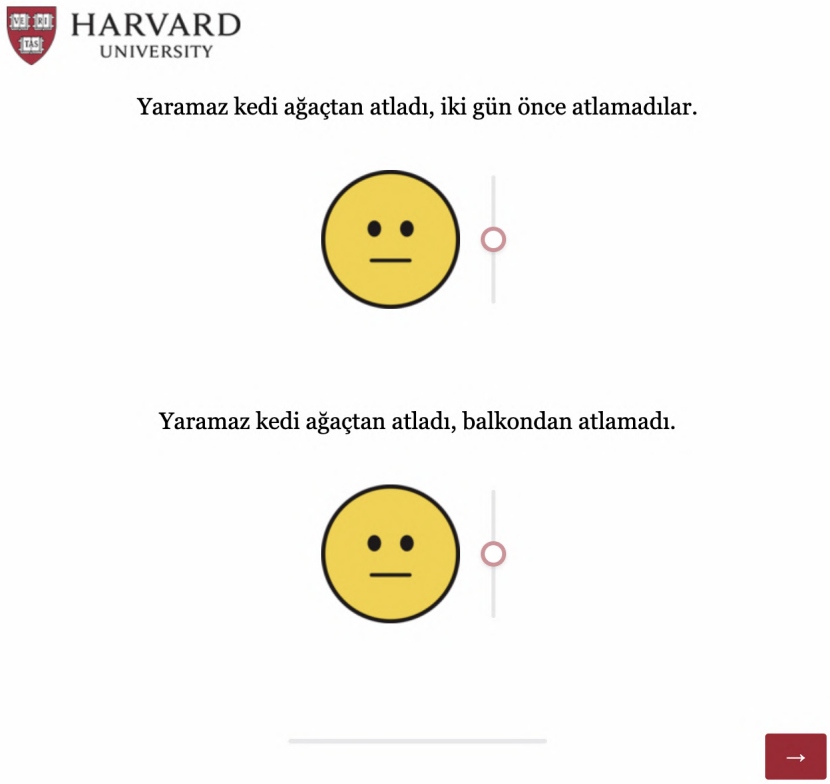


Figure C.5: *A sample catch trial in Experiments I and II, where the first trial was designed to elicit lower ratings due to the semantic and syntactic anomalies ("The mischievous cat jumped from the tree, they(pl.) did not jump two days ago.") while the second trial was designed to elicit relatively higher ratings ("The mischievous cat jumped from the tree, she did not jump from the balcony.")*

Table C.5: *Catch trials in Experiments I and II, where* RED *indicates the infelicitous/ungrammatical continuation and* BLUE *indicates the felicitous/grammatical continuation.*

	First Clause	Continuation	Continuation
Negation in continuation	Çocuk ıspanağı yedi	köfteyi yemedi	kızartmayı yemedi
	The child ate the spinach	*she did not eat the meatball*	*she did not eat the fries*
	Masa rüyadan götürdü	dün götürmeyik	fazla götürmeyik
	The table brought from the dream	*it bring.not.[nonce suffix] yesterday*	*it bring.not.[nonce suffix] much*
	Yaramaz kedi ağaçtan atladı	balkondan atlamadı	iki gün önce atlamadılar
	The mischievous cat jumped from the tree	*she did not jump from the balcony*	*they(pl.) did not jump two days ago*
	Otobüs Ankara'da durdu	yarın durmadı	Eskişehir'de durmadı
	The bus stopped in Ankara	*it did not stop tomorrow*	*it did not stop in Eskişehir*
Negation in first clause	Çocuk ıspanağı yemedi	köfteyi yedi	kızartmayı yedi
	The child did not eat the spinach	*she ate the meatball*	*she ate the fries*
	Masa rüyadan götürmedi	dün götürdüyük	fazla götürdüyük
	The table did not bring from the dream	*it bring.[nonce suffix] yesterday*	*it bring.[nonce suffix] much*
	Yaramaz kedi ağaçtan atlamadı	balkondan atladı	iki gün önce atladılar
	The mischievous cat did not jump from the tree	*she jumped from the balcony*	*they(pl.) jumped two days ago*
	Otobüs Ankara'da durmadı	yarın durdu	Eskişehir'de durdu
	The bus did not stop in Ankara	*it stopped tomorrow*	*it stopped in Eskişehir*

Table C.6: *Experimental trials in Experiment II. Adverb types are color-coded as follows:* *Reduplicated iconic root*, *Lexical manner adverb*, *and* *Temporal adverb*. *(Continued on the next page.)*[1]

	First Clause	Continuation with *Target* Adverbial	Continuation with Locative Adverbial
Negation in continuation	Adam ***horul horul*** odasında uyudu	sessizce uyumadı	salonda uyumadı
	Adam ***güçlükle*** odasında uyudu	kolayca uyumadı	salonda uyumadı
	Adam ***sabah*** odasında uyudu	gece uyumadı	salonda uyumadı
	At arabası ***tıngır tıngır*** toprak yolda ilerledi	sessizce ilerlemedi	asfalt yolda ilerlemedi
	At arabası ***hızla*** toprak yolda ilerledi	yavaşça ilerlemedi	asfalt yolda ilerlemedi
	At arabası ***akşam vakti*** toprak yolda ilerledi	gündüz ilerlemedi	asfalt yolda ilerlemedi
	Su ***fokur fokur*** ocakta kaynadı	sessizce kaynamadı	sobada kaynamadı
	Su ***çabucak*** ocakta kaynadı	yavaşça kaynamadı	sobada kaynamadı
	Su ***biraz önce*** ocakta kaynadı	şimdi kaynamadı	sobada kaynamadı
	Oğlan ***zırıl zırıl*** okulda ağladı	sessizce ağlamadı	evde ağlamadı
	Oğlan ***sessizce*** okulda ağladı	yüksek sesle ağlamadı	evde ağlamadı
	Oğlan ***dün*** okulda ağladı	bugün ağlamadı	evde ağlamadı
	Öğrenci ***fısır fısır*** sınıfta konuştu	yüksek sesle konuşmadı	kantinde konuşmadı
	Öğrenci ***sessizce*** sınıfta konuştu	yüksek sesle konuşmadı	kantinde konuşmadı
	Öğrenci ***dersten önce*** sınıfta konuştu	ders sırasında konuşmadı	kantinde konuşmadı
	Tekne ***cayır cayır*** denizin ortasında yandı	hafifçe yanmadı	limanda yanmadı
	Tekne ***aniden*** denizin ortasında yandı	yavaşça yanmadı	limanda yanmadı
	Tekne ***iki gün önce*** denizin ortasında yandı	dün yanmadı	limanda yanmadı

	First Clause	Continuation with *Target* Adverbial	Continuation with Locative Adverbial
Negation in first clause	Adam ***horul horul*** odasında uyumadı	sessizce uyudu	salonda uyudu
	Adam ***güçlükle*** odasında uyumadı	kolayca uyudu	salonda uyudu
	Adam ***sabah*** odasında uyumadı	gece uyudu	salonda uyudu
	At arabası ***tıngır tıngır*** toprak yolda ilerlemedi	sessizce ilerledi	asfalt yolda ilerledi
	At arabası ***hızla*** toprak yolda ilerlemedi	yavaşça ilerledi	asfalt yolda ilerledi
	At arabası ***akşam vakti*** toprak yolda ilerlemedi	gündüz ilerledi	asfalt yolda ilerledi
	Su ***fokur fokur*** ocakta kaynamadı	sessizce kaynadı	sobada kaynadı
	Su ***çabucak*** ocakta kaynamadı	yavaşça kaynadı	sobada kaynadı
	Su ***biraz önce*** ocakta kaynamadı	şimdi kaynadı	sobada kaynadı
	Oğlan ***zırıl zırıl*** okulda ağlamadı	sessizce ağladı	evde ağladı
	Oğlan ***sessizce*** okulda ağlamadı	yüksek sesle ağladı	evde ağladı
	Oğlan ***dün*** okulda ağlamadı	bugün ağladı	evde ağladı
	Öğrenci ***fısır fısır*** sınıfta konuşmadı	yüksek sesle konuştu	kantinde konuştu
	Öğrenci ***sessizce*** sınıfta konuşmadı	yüksek sesle konuştu	kantinde konuştu
	Öğrenci ***dersten önce*** sınıfta konuşmadı	ders sırasında konuştu	kantinde konuştu
	Tekne ***cayır cayır*** denizin ortasında yanmadı	hafifçe yandı	limanda yandı
	Tekne ***aniden*** denizin ortasında yanmadı	yavaşça yandı	limanda yandı
	Tekne ***iki gün önce*** denizin ortasında yanmadı	dün yandı	limanda yandı

Table C.7: *Filler trials in Experiment II, where* RED *indicates the direct objects and* BLUE *indicates the indirect objects.*

	First Clause	Continuation with Direct Object	Continuation with Indirect Object
Negation in continuation	Sekreter eski evrakları kolilere koydu	önemli raporları koymadı	çekmeceye koymadı
	The secretary put the old files into the boxes	*he did not put the important reports*	*he did not put into the drawer*
	Adam davetiyeleri kuzenine gönderdi	mektupları göndermedi	teyzesine göndermedi
	The man sent the invitations to his cousin	*he did not send the letters*	*he did not send to his aunt*
	Kasap yaş mamaları sokaktaki kedilere verdi	kuru ekmekleri vermedi	barınaktaki kedilere vermedi
	The butcher gave the wet food to the cats on the street	*she did not give the stale bread*	*she did not give to the cats in the shelter*
	Bakkal deterjanları raflara yerleştirdi	sıvı yağları yerleştirmedi	tezgahın altına yerleştirmedi
	The grocer placed the detergents on the shelves	*she did not place the oils*	*she did not place under the counter*
Negation in first clause	Sekreter eski evrakları kolilere koymadı	önemli raporları koydu	çekmeceye koydu
	The secretary did not put the old files into the boxes	*he put the important reports*	*he put into the drawer*
	Adam davetiyeleri kuzenine göndermedi	mektupları gönderdi	teyzesine gönderdi
	The man did not send the invitations to his cousin	*he sent the letters*	*he sent to his aunt*
	Kasap yaş mamaları sokaktaki kedilere vermedi	kuru ekmekleri verdi	barınaktaki kedilere verdi
	The butcher did not give the wet food to the cats on the street	*she gave the stale bread*	*she gave to the cats in the shelter*
	Bakkal deterjanları raflara yerleştirmedi	sıvı yağları yerleştirdi	tezgahın altına yerleştirdi
	The grocer did not place the detergents on the shelves	*she placed the oils*	*she placed under the counter*

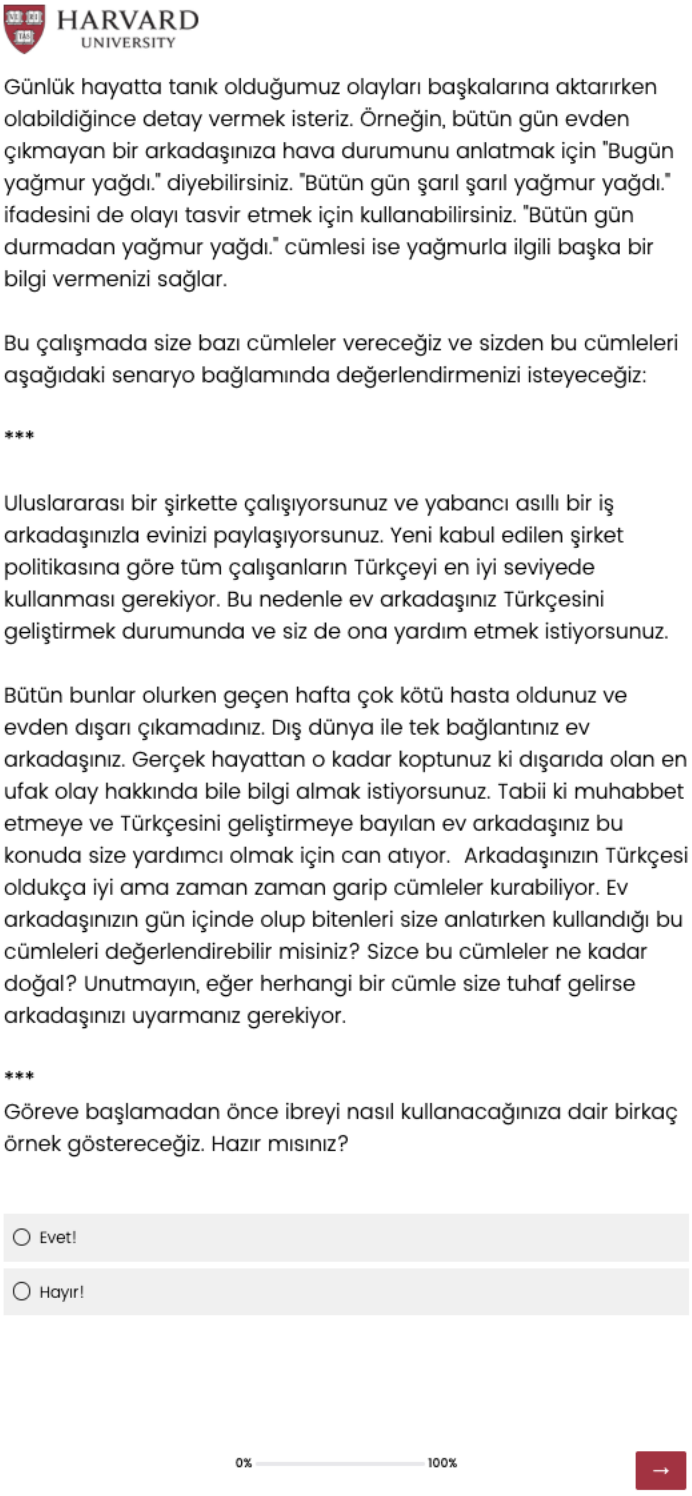


Figure C.6: *The original prompt in Turkish for Experiment III*

Table C.8: *Experimental trials in Experiment III where columns indicate Adverbial Type manipulation, and columns indicate Polarity manipulation.*

	Subject	Arg/Adjunct	Target				Verb	
			Converbial	Reduplication	Manner Adverbial	Time Adverbial	Affirmative	Negative
Iconic roots (Ideophones)	Çocuk	sütü	lıkırdatarak	lıkır lıkır	yavaşça	sabah	içti	içmedi
	child	*milk*	*gurgling*	*gurgling*	*slowly*	*morning*	drink	drink-NOT
	Görevli	balkonu	foşurdatarak	foşur foşur	iyice	dün sabah	yıkadı	yıkamadı
	officer	*balcony*	*splashing*	*splashing*	*well*	*yesterday morning*	wash	wash-NOT
	Adam	odasında	horuldayarak	horul horul	zorlukla	bütün gün	uyudu	uyumadı
	man	*his room*	*huffing*	*huffing*	*with difficulty*	*all day*	sleep	sleep-NOT
	Öğrenci	sınıfta	fısırdayarak	fısır fısır	sessizce	ders boyunca	konuştu	konuşmadı
	student	*class*	*murmuring*	*murmuring*	*silently*	*during the lecture*	talk	talk-NOT
	At arabası	toprak yolda	tıngıdayarak	tıngır tıngır	hızla	tüm gün	ilerledi	ilerlemedi
	horse cart	*on the dirt road*	*rattling*	*rattling*	*fast*	*all day*	move	move-NOT
	Oğlan	evde	zırıldayarak	zırıl zırıl	sessizce	tüm gün	ağladı	ağlamadı
	boy	*home*	*bawling*	*bawling*	*silently*	*all day*	cry	cry-NOT
	Su	ocakta	fokurdayarak	fokur fokur	hızlıca	tüm gece	kaynadı	kaynamadı
	water	*stove*	*bubbling*	*bubbling*	*fast*	*all night*	boil	boil-NOT
	Hemşire	hastanın esprisine	kıkırdayarak	kıkır kıkır	sessizce	bütün gün	güldü	gülmedi
	nurse	*joke by the patient*	*by giggling*	*giggling*	*silently*	*all day*	laugh	laugh-NOT
Verbal roots (Nonideophones)	Sarhoş	ağaçtan	yuvarlanarak	yuvarlana yuvarlana	aniden	dün gece	düştü	düşmedi
	drunk (one)	*tree*	*rolling*	*rolling*	*suddenly*	*last night*	fall	fall-NOT
	Kadın	dükkana	yürüyerek	yürüye yürüye	zorla	akşam	gitti	gitmedi
	woman	*store*	*walking*	*walking*	*with difficulty*	*evening*	go	go-NOT
	Postacı	evin merdivenlerini	dolanarak	dolana dolana	güçlükle	bu sabah	çıktı	çıkmadı
	postman	*stairs of the house*	*winding*	*winding*	*with difficulty*	*this morning*	ascend	ascend-NOT
	Hasta	koridorda	sekerek	seke seke	dikkatlice	bütün gün	yürüdü	yürümedi
	patient	*hall*	*hobbling*	*hobbling*	*carefully*	*all day*	walk	walk-NOT
	Kuş	gökyüzünde	dönerek	döne döne	keyifle	tüm gün	uçtu	uçmadı
	bird	*sky*	*coiling*	*coiling*	*joyfully*	*all day*	fly	fly-NOT
	Atlet	bitiş çizgisine	zıplayarak	zıplaya zıplaya	zorlukla	vaktinde	ulaştı	ulaşmadı
	athlete	*finish line*	*jumping*	*jumping*	*with difficulty*	*on time*	arrive	arrive-NOT
	Kız	okula	koşarak	koşa koşa	hızlıca	saat yedide	geldi	gelmedi
	girl	*school*	*running*	*running*	*fast*	*seven o'clock*	come	come-NOT
	İşçi	binaya	aksayarak	aksaya aksaya	yavaşça	saat onda	girdi	girmedi
	worker	*building*	*limping*	*limping*	*slowly*	*ten o'clock*	enter	enter-NOT

Table C.9: *Catch trials in Experiment III*

	Catch Trials	Affirmative	Negative
Grammatical	Sekreter, evrakları büyük kolilere	koydu	koymadı
	secretary documents big boxes	*put*	*put-NOT*
	Bakkal, yeni ürünleri raflara	yerleştirdi	yerleştirmedi
	grocer new products shelves	*put*	*put-NOT*
	Kasap, sokak kedilerine mama	verdi	vermedi
	butcher stray cats food	*give*	*give-NOT*
	Patron, çalışanlarının hediye ettiği kazağı	giyindi	giyinmedi
	boss the pullover that the employees gave	*wear*	*wear-NOT*
Ungrammatical	Masa, rüyadan zangırdayarak	götürdü	götürmedi
	table dream nonce.word	*bring*	*bring-NOT*
	Çiçek, ofisle haldır haldır	bozukuyor	bozukmuyor
	flower office fast and noisily	*nonce.word*	*nonce.word-NOT*
	Sepet, camla pırıldatarak	yedi	yemedi
	basket glass shimmering	*eat*	*eat-NOT*
	İnek, kelebekte savrula savrula	indi	inmedi
	cow butterfly drifting	*descend*	*descend-NOT*

Table C.10: *Summary of the fixed effects from the linear mixed-effects model for Experiment III, including both ideophonic and non-ideophonic groups*

Coefficients	Estimate	Standard Error	t value	p value
Intercept[2]	95.86	3.01	31.83	<0.001
AdverbType_Converbial	-7.29	3.20	-2.27	<0.05
AdverbType_Reduplication	-3.62	3.20	-1.12	0.25
AdverbType_Time	-1.00	3.20	-0.31	0.75
Type_NonIdeophone	0.28	3.20	0.08	0.93
Polarity_Negative	-39.14	3.20	-12.21	<0.001
AdverbType_Converbial:Type_NonIdeophone	3.07	4.53	0.68	0.49
AdverbType_Reduplication:Type_NonIdeophone	-4.03	4.53	-0.89	0.37
AdverbType_Time:Type_NonIdeophone	-6.17	4.53	-1.36	0.17
AdverbType_Converbial:Polarity_Negative	2.20	4.53	0.48	0.62
AdverbType_Reduplication:Polarity_Negative	2.19	4.53	0.48	0.62
AdverbType_Time:Polarity_Negative	14.26	4.53	3.14	<0.01
Type_NonIdeophone:Polarity_Negative	-1.79	4.53	-0.39	0.69
AdverbType_Converbial:Type_NonIdeophone:Polarity_Negative	1.94	6.40	0.30	0.76
AdverbType_Reduplication:Type_NonIdeophone:Polarity_Negative	3.33	6.40	0.52	0.60
AdverbType_Time:Type_NonIdeophone:Polarity_Negative	6.92	6.40	1.08	0.28

[2]In the analysis, treatment contrasts were used, with Manner adverbs and affirmative polarity serving as reference levels, in order to allow direct comparisons between theoretically motivated baseline conditions and their alternatives. This coding choice facilitates interpretation of model coefficients as deviations from a meaningful semantic baseline.