

An experimental study of Hindi and English perfective interpretation

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ABSTRACT

It has been observed for several languages, including many South Asian languages, that some perfective forms do not entail completion of the events they describe. We explore this phenomenon in the current study, contributing experimental and cross-linguistic perspectives. We compare perfective interpretations in Hindi and in English. Using a variety of predicate types, we test the predictions of a semantic account of perfective interpretation, which predicts clear-cut differences between Hindi and English as well as clear patterns for certain types of predicates. Our results indicate that a semantic account is inadequate to capture speakers' interpretations of these perfectives, and suggest that a variety of factors, including contextual ones, may be at play. In addition to contributing empirical data to our understanding of this puzzling phenomenon, these results also indicate a role for experimental investigation into semantic phenomena.

1 Introduction

In a number of languages, perfective verbs can be used to describe events that do not terminate at their natural endpoints (Japanese: Ikegami 1985; Hindi: Kothari 2008, Singh 1998, Verma 1993; Karachay-Balkar: Tatevosov 2007; Malagasy: Travis 2000; Mandarin: Teng 1972; Punjabi: Raja 2003; Salish languages St'át'imcets and Skwxwú7mesh: Bar-el Davis & Matthewson 2005; Tagalog: Dell 1987; Tamil: Pederson 2007; Thai: Koenig & Muansuwan 2000). In Hindi, the simple perfective verb form (SV) in (1) can describe eating events with arbitrary endpoints (e.g., the cookie is only partially eaten).²

- (1) maya-ne biskuT-ko khaa-yaa par us-e puuraa nahiin khaa-yaa
 Maya-Erg cookie-Acc eat-Perf but it-acc full not eat-Perf
 'Maya ate a cookie but not completely.'

Note that the corresponding English sentence (*#Maya ate a cookie, but not completely*) is infelicitous.

SVs can also describe events with natural endpoints (e.g., the cookie is eaten completely). In fact, the default interpretation of the SV is that the event came to full completion, if the endstate is not canceled. This indicates that event culmination is an implicature for the SV, rather than an entailment.

¹Kothari was a student at Stanford University when this research was carried out.

²These are often called non-culminating accomplishments, but we avoid that term here because the present data question the phenomenon's limitation to only accomplishment predicates.

Hindi has a second perfective, the complex verb form (CV) shown in (2). The main verb appears in bare root form, and is followed by a light verb in the perfective. This construction only describes events terminating at their natural endpoints.³

- (2) maya-ne biskuT-ko khaa-li-yaa #(par us-e puuraa nahiin khaa-yaa)
 Maya-Erg cookie-Acc eat-take-Perf but it-acc full not eat-Perf
 ‘Maya ate a cookie but not completely.’

There is currently no consensus on the appropriate analysis of this phenomenon: How should we account for the availability of partially-completed interpretations, precisely when are they available and with what kinds of verbs, and what differs between the SV and CV? For Hindi specifically, we are aware of one major account, a semantic one, from Singh (1991, 1998), who proposes an aspectual distinction between the SV and CV. She invokes a new type of perfective, the neutral perfective, which is realized as the SV form. It imposes boundedness on events, but not necessarily at their natural telic endpoint. Singh assumes a homomorphism approach; parts of the affected theme object are mapped onto parts of the event such that the theme object is affected incrementally as the event proceeds (e.g., half of the cookie is eaten halfway through the eating event). For the neutral perfective, only part of the theme object need be affected. To produce the natural endpoint reading of the CV form, Singh introduces a totality operator *TOT*. When *TOT* is applied, the entirety of the object must be subjected to the event. This is the standard perfective type in English, but only arises with the presence of the light verb in Hindi. Under Singh’s account, the difference between Hindi and English therefore lies in whether the neutral perfective is available.

Because it relies on homomorphism, the neutral perfective accounts beautifully for the phenomenon of partial completion interpretations, but only in accomplishment predicates with incremental themes. This account makes several clear predictions: 1) only accomplishment predicates involving an incremental theme should show the SV/CV distinction; 2) the partial completion interpretation that arises with the SV should be one in which the theme is incrementally affected; 3) all predicates with incremental themes should behave uniformly in showing this distinction; 4) clear distinctions are expected between Hindi, which has the neutral perfective, and English, which does not.

Some doubt is cast on the first prediction by data from Hindi and other languages. Several examples of this phenomenon in non-accomplishment predicates have been raised in the literature for other languages (e.g., Ikegami 1985, Koenig & Muansuwan 2000, Teng 1972, Pederson 2007). Kothari (2008) provides examples from Hindi as well:

- (3) maya-ne kamiiz Taang-ii par vah Tangii nahiin
 Maya-Erg shirt hang-Perf but it-acc hung not
 ‘Maya hung the shirt, but it didn’t get hung.’
- (4) maya-ne saikil chala-yii par vah chalii nahiin
 Maya-Erg bicycle ride-Perf but it-acc moved/worked not
 ‘Maya rode the bicycle, but it didn’t work.’

If there is indeed no clear-cut difference between accomplishment and other types of predicates when it comes to the SV/CV distinction, we must consider other factors that may be relevant, e.g., contextual or pragmatic factors. We hope to lend some preliminary insight into what these factors may be in the current study.

This study explores patterns of interpretation of sentences describing partially- and fully-completed events. Our goals are to explore the range of events for which speakers accept change-of-state perfective predicates as descriptions of partially-completed events, both within-language (for different syntactic constructions), and across languages (comparing Hindi and English). Our results will shed light on whether the Hindi SV/CV distinction can be explained by Singh’s (1991, 1998)

³The CV construction is also associated with aspects of meaning beyond event completion, including affective readings and indications of surprise. See Hook (1976) for discussion.

semantic account only, or whether other factors, e.g., pragmatic and contextual ones, must also play a significant role. A full account of this phenomenon will likely include several interacting factors, including both semantic and pragmatic ones.

1.1 Previous Experimental Work

Previous experimental work has lent some insight into when speakers of Hindi-type and English-type languages permit partial completion interpretations. Pederson (2007) provides evidence that speakers of Tamil, which is similar to Hindi in having SV and CV constructions, are willing to accept SV sentences as descriptions of incomplete events. He showed native Tamil speakers video clips of scenes depicting either incomplete events (e.g., pushing on a door, only moving it a little) or fully-completed events (e.g., pushing the door to fully closed) and elicited yes/no responses to questions in SV form (e.g., *aTai-tt-aan-aa?* “did he close (it)?”). The percentage of “yes” responses varied by predicate, but the average across predicates was 39%. Pederson took this 39% acceptance rate to indicate that Tamil speakers do indeed allow SV sentences to refer to events that have not reached their endstate.

Wittek (2002) conducted a very similar task, with the same video events, in German. German, like English, does not have an SV/CV distinction, and change-of-state predicates generally entail full completion to the natural endpoint. She found, as predicted, that German speakers never accepted German perfectives as descriptions of incomplete events.

The results of these two experimental studies provide experimental support for the difference between Tamil and German. This unique approach lends important insight, and suggests a role for experimental study of this type of semantic phenomenon.

1.2 Comparison to the Current Study

We take a similar experimental approach in the current study, showing participants videos of events that arrive at different states of completion, and eliciting judgments for different sentence types. This allows us to make controlled comparisons across events, linguistic conditions, and languages.

However, we also make several changes to Wittek’s and Pederson’s approaches. First, instead of studying speakers’ interpretations only of simple perfective forms, in Experiment 1 we elicit Hindi speakers’ responses to both SV and CV sentences. This provides a natural baseline against which to compare responses. We also tested two constructions in English. Because English does not have an SV/CV distinction, in Experiment 2a we presented only simple perfective predicates, and in Experiment 2b we compared speakers’ interpretations of these simple perfectives with constructions incorporating the particle “up” (e.g., *ate up*).

Second, rather than testing fully-completed events against partially-completed events in which the theme object was only barely acted upon, as Pederson and Wittek did, we instead used partially-completed events in which the intended action arrived quite close to its natural endpoint, but terminated noticeably earlier. For example, in the partially-completed version of the door-closing event in the current study, the actor executed the same motion as she did with the fully-completed version, pushing the door until it was about 80% closed. We used these almost-completed events for our partial-completion condition for two reasons. First, we hypothesized that these events would be construed as intentional acts that one might perform. For example, closing a door to keep out noise, but allow the cats to roam freely, might only require closing it most of the way, while closing it to keep out the cats entirely requires closing it all the way. Closing the door only a little, on the other hand, may be construed either as an activity or a failed attempt. Using almost-completed events therefore allowed us to control somewhat for how participants perceived the actors’ intentions in the partially-completed and fully-completed conditions. Second, we surmised that these almost-completed actions would make the most stringent test case. If, despite their close perceptual and conceptual similarity, our partially- and fully-completed conditions yield differences across sentence types and/or across languages, then we have strong evidence that speakers attend closely to endstates. It is important to note, however, that scales of completion differ across verbs; in all cases we use our own intuition

to judge what kinds of events for a particular verb would best represent partial and full completion. (Stimuli are available from the first author on request.)

In addition to these important differences, our study shares an important feature with Pederson's and Wittke's studies. Like them, we chose a variety of predicate types in this study, including accomplishments with incremental themes (e.g., *eat*), as well as achievements (e.g., *pluck*). This is particularly important for our current goal of looking at patterns of interpretations across predicate types and across languages. A semantic approach to the SV/CV distinction relying on the presence of an incremental theme would predict systematic differences between our incremental theme and other predicates.

The events we used for two of our predicates differed along another dimension as well. For one of our *extinguish* events and both of our *wake* events, the videos for the fully-completed experimental condition proceeded as expected, with the event arriving at its natural endpoint. But in the partially-completed condition, the event also arrived at its natural endpoint, but then, the theme participant returned to its original state. In the *extinguish* video, the agent blew out a trick candle; it extinguished completely, but then re-lit two seconds later. For the two *wake* videos, the sleeping participant was woken by the agent, opening his eyes fully, but he closed them again and appeared asleep at the end of the video clip. We introduced this additional dimension of returning to the initial state in part because it was the most natural way to portray an incomplete or unsuccessful version for those predicates, but also because we wanted to discover whether the final state added any relevance for speakers' construals of completion. These trials allow us to investigate whether a partial completion interpretation for an SV sentence is necessarily one in which the theme object is incrementally affected. Alternatively, it could be the case that in addition to incremental partial completion, SV sentences are used in situations in which an action has not been completed to the satisfaction of the actor's perceived intention. If speakers allow SV, but not CV, sentences for these events involving a return to the initial state, then this is support for the latter hypothesis.

1.3 Goals of the Current Study

Here we report the results of two experiments investigating Hindi speakers' (Experiment 1) and English speakers' (Experiments 2a & 2b) interpretations of perfective forms describing partially- and fully-completed events. We had three goals. First, to verify the validity of our experimental approach, we wanted to ascertain whether Hindi speakers show the expected distinction between SV and CV sentences: If Hindi SV sentences can describe partially-completed events, Hindi speakers should accept SV more often than CV sentences as descriptions of these events. Second, we wanted to assess the range of predicates across which the Hindi partial-completion interpretation for SV sentences is available. Third, we wanted to explore English speakers' interpretations for the same events, to determine whether the pattern resembles that for Hindi, despite systematic cross-linguistic differences in how perfectives are realized syntactically.

2 Experiment 1: Hindi

We began by exploring Hindi speakers' judgments of SV and CV perfectives as descriptions of partially- and fully-completed events. Participants viewed events in which an actor performed an action on a theme participant, bringing about, either partially (mostly) or completely, a change of state. We presented participants with an SV or CV statement and elicited a true/false judgment as to whether the statement was an appropriate description of the event they had viewed.

2.1 Methods

2.1.1 Participants

Twenty-four adult native speakers of Hindi from Jodhpur, India, participated. All participants gave oral consent as approved by Stanford University's Institutional Review Board. Although many of the Hindi speakers were bilingual in Marwari, all were fluent speakers, readers, and writers of Hindi, who used Hindi daily.

2.1.2 Materials

Visual stimuli. For each of eight verbs (e.g., *eat*, see Table 1 for a complete list), we filmed two pairs of short video clips. Each pair featured different event participants (e.g., an actor eating a cookie, a different actor eating a chocolate bar). One video of each pair depicted a partially-completed event (e.g., eating half of the cookie) and the other depicted a fully-completed event (e.g., eating all of the cookie). The videos in each pair were edited to be the same length.

Each video ended with a still frame of the last frame of the clip, during which the audio was presented. This ensured that participants could view the final endstate of the action as they heard the sentence and gave their response.

Auditory stimuli. A native speaker recorded two sentences for each video, one describing the event using an SV form (e.g., *us-ne biskuT-ko⁴ khaa-yaa*, ‘‘She ate a cookie’’) and one using a CV form (e.g., *us-ne biskuT-ko khaa li-yaa*). See Table 2 for a complete list of sentences.

TABLE 1 Description of video scenes. In the partial-completion condition, these events did not reach their natural endpoint (e.g., For Scene 1 *close*, the woman closed the door 3/4 of the way.)

Predicate	Scene 1	Scene 2
close	Woman closes a door	Woman closes a drawer
cover	Hand covers a pot with its lid	Hand covers a basket with its lid
draw	Hand draws a flower	Hand draws a circle
eat	Woman eats a cookie	Woman eats a chocolate bar
extinguish	Woman blows out a candle (In the partial-completion condition, the candle re-lights.)	Woman runs a lit piece of newspaper under the faucet
fill	Hand fills a glass with milk	Hand fills a glass bowl with marbles
pluck	Hands pluck a small twig off a larger branch	Hands pluck a banana off a bunch
wake	Woman jostles a sleeping man lying on a couch (In the partial-completion condition, his eyes open briefly but he closes them again)	Woman jostles a sleeping man seated in a chair; In the partial-completion condition, his eyes open briefly but he closes them again

2.1.3 Design and Procedure

Each participant viewed one video from each pair for each verb. For a given verb, both videos depicted either the fully-completed event or the partially-completed event, but each participant saw both fully-completed events (for four predicates) and partially-completed events (for the other four). Participants were randomly assigned to an SV-first or CV-first condition: Those in the SV-first condition heard SV sentences for the first half of the videos they saw (i.e. the first instance of each predicate), and CV sentences for the second half, and vice versa for CV-first participants. There were no differences in performance between SV-first and CV-first participants, so we collapse across these in the analysis. Videos were presented in a different pseudo random order for each participant. At the end of each video, participants heard the target sentence and were asked whether it was a true or false description of the video they had just viewed.

2.1.4 Predictions

If participants are sensitive to the SV/CV distinction, they are expected to show different responses for partially-completed events depending on syntactic condition, with SVs accepted more often

⁴The direct object of the verb bore accusative case marking in all sentences except for the ‘‘draw’’ sentences—in cases where the object comes into existence over the course of the event, accusative case marking is awkward.

TABLE 2 List of sentences for Scene 1 events, Experiment 1.

Predicate	SV	CV	English Translation
close	us-ne darvazee-ko band ki-yaa	us-ne darvazee-ko band kar li-yaa	She closed the door.
cover	us-ne bartan-ko Dhakaa	us-ne bartan-ko Dhak li-yaa	She covered the pot.
draw	us-ne phuul banaa- yaa	us-ne phuul banaa li- yaa	She drew a flower.
eat	us-ne biskuT-ko khaa-yaa	us-ne biskuT-ko khaa li-yaa	She ate the cookie.
extinguish	us-ne mombatti-ko bujhaa-yaa	us-ne mombatti-ko bujhaa li-yaa	She extinguished the candle.
fill	us-ne duudh-se gilaas-ko bhar-aa	us-ne duudh-se gilaas-ko bhar li-yaa	She filled the glass with milk.
pluck	us-ne Daalii-ko toDaa	us-ne Daalii-ko toD li-yaa	She plucked the twig.
wake	us-ne us-ko jagaa-yaa	us-ne us-ko jagaa li- yaa	She woke him.

than CVs. Because CV perfectives entail completion of the events they describe, we expect a near 0% acceptance rate for CV sentences as descriptions of partially-completed events. Because SV perfectives are hypothesized to allow partial completion interpretations, these should have a much higher acceptance rate. Finally, because both SV and CV sentences are felicitous descriptions of fully-completed events, we expect a 100% acceptance rate for fully-completed events, regardless of syntactic condition.

Because we are also interested in participants' responses to a range of predicates, we make a further prediction about the predicates to which the SV/CV distinction should apply. Specifically, we test the predictions of Singh's semantic account. If partial completion interpretations arise via a homomorphism between the measuring out of the event and the theme object, then we expect only the accomplishment predicates with incremental themes (*cover*, *draw*, *eat*, *fill*) to show the above pattern. For other predicates, both SV and CV sentences should only be acceptable for fully-completed events. But if pragmatic factors play an important role, there may not be clear differences between accomplishment and other types of predicates.

2.2 Results and Discussion

We calculated the mean proportion of "true" responses for each participant. As predicted, for partially-completed events, responses differed by syntactic condition, with a lower acceptance rate for CV sentences (29%) than SV sentences (53%). For fully-completed events, participants accepted both SV and CV sentences (99.5%).

To assess these patterns statistically, we first transformed the proportion data using an empirical logit function, and fit the transformed data using a multi-level model treating Event Completion (2: partial vs. full) and Syntax (2: SV vs. CV) as fixed factors. The beta coefficients for the models are reported in Table 3.⁵ The analysis reveals that both Event Completion and Syntax are reliable predictors of participants' responses, as is their interaction. As predicted, these results indicate that speakers are indeed sensitive to the SV/CV distinction.

A glance at the results for individual predicates reveals a high degree of variability. In Table 4, for each predicate we tallied the percentage of "true" responses in each Event Completion and each Syntax condition. The results provide some insight into how different predicates behave.

Considering only the results for *partially-completed* events, we make three observations related

⁵Note that S.E. stands for "Standard Error".

TABLE 3 Experiment 1 (Hindi): Estimates of fixed effects from best-fitting multi-level model of proportion of “true” responses (empirical logit transformed)

Effect	Estimate	S.E.	<i>t</i> -value
Intercept	1.22	0.15	8.36*
Event Completion	-3.16	0.23	-13.93*
Syntax	0.62	0.23	2.74*
Event x Syntax Interaction	1.40	0.45	3.09*

$p < 0.05$ (on normal distribution)

TABLE 4 Experiment 1 (Hindi): Percent “true” responses, by condition and trial

Predicate	Partial Completion		Full Completion	
	SV	CV	SV	CV
<i>Incremental Theme</i>				
cover	67	33	100	100
draw	38	42	100	100
eat	83	33	100	100
fill	75	58	100	100
<i>Non Incremental Theme</i>				
close	25	33	100	100
extinguish				
<i>Newspaper</i> (partial)	20	14	99	100
<i>Candle</i> (return to initial state)	57	40	100	100
pluck	17	0	100	100
wake (return to initial state)	83	17	100	100

to our predictions. First, a semantic account predicts that the SV/CV distinction should arise only for accomplishment predicates with incremental themes. Therefore, a strong prediction under a semantic account would be that these predicates (*draw*, *cover*, *eat*, *fill*) show the distinction and other predicates (*close*, *extinguish*, *pluck*, *wake*) do not. This prediction was not borne out. All of the non-incremental-theme predicates showed a difference between SV and CV judgments in the expected direction. To address this statistically, we divided the predicates into incremental theme and non-incremental theme, and fit a second multi-level model on only the data for partially-completed events, including presence/absence of incremental theme and syntax as fixed factors. If only incremental theme predicates show a distinction, then we predict a significant interaction between incremental theme and syntax; that is, syntax affects responses, but only for incremental theme predicates.

The beta coefficients for the model are reported in Table 5. The analysis reveals that Incremental Theme is a reliable predictor, while Syntax is marginally reliable ($p = 0.1$), but their interaction is not. What this means is that although incremental theme predicates yield a higher overall proportion of “true” responses, the lack of an interaction with Incremental Theme reveals that the difference in responses to SV versus CV sentences is not greater for incremental theme predicates than it is for non-incremental theme predicates. In fact, the effect size of the difference between SV and CV is similar for both non-incremental-theme and incremental theme predicates (Cohen’s $d = 0.58$ for non-incremental-theme predicates and 0.54 for incremental theme predicates), indicating that the effect of syntactic construction is similar for both predicate types.

Interestingly, the predicate whose results most clearly fit the expected pattern was *wake*, with a high acceptance rate for SV sentences (83%), and a low acceptance rate for CV sentences (17%). This finding for *wake* is particularly striking given the unusual events we presented in the partially-completed condition. In the partially-completed *wake* events, the event reached its complete natural

TABLE 5 Experiment 1 (Hindi): Estimates of fixed effects from best-fitting multi-level model of proportion of “true” responses (empirical logit transformed) for partially-completed events only, with Incremental Theme and Syntax as fixed factors

Effect	Estimate	S.E.	<i>t</i> -value
Intercept	0.12	0.13	0.90
Syntax	0.36	0.23	1.61†
Incremental Theme	0.49	0.16	3.05*
Syntax x Incremental Theme Interaction	0.23	0.32	0.73

* $p < 0.05$ (on normal distribution)

† $p = 0.1$ (on normal distribution)

endpoint, but then retracted to an earlier state: A man was jostled into waking, opening his eyes, but then closing them again and returning to a sleep state. Not only does *wake* not have an incremental theme or a process component (cf. Butt and Ramchand 2005), but in this particular event, the actor both reaches the final state (waking), and ends the event in a state of sleep. This event is not therefore a typical partial-completion event, and questions a semantic account’s reliance on an incremental progression toward completion. The results for *wake* suggest that in addition to event termination at an arbitrary endpoint, the SV/CV distinction is also relevant for events that do reach a natural endpoint, but later return to the initial state. For CVs, the theme participant must be in the relevant endstate at the time of evaluation (here, when the video ends), even if the change of state did proceed to completion at some prior point. For SVs, the endstate need not be present at the time of evaluation.

Finally, note that there is quite a bit of variability among predicates in acceptance of SVs and CVs for partially-completed events. Clearly, participants’ judgments were not clear-cut, with CVs never allowing partial completion interpretations and SVs often or always allowing them. For example, while the results for *eat* and *wake* are closest to the expected pattern, *fill* yielded a very high acceptance rate for both SVs (75%) and CVs (58%), and *pluck* yielded a very low acceptance rate for both (17%, 0%, respectively). This indicates considerable gradience in speakers’ judgments of these sentence-event pairings.

Taken together, these findings do provide some support for Singh’s account. Overall, accomplishment predicates with incremental themes did show the SV/CV distinction, while some achievements like *pluck* showed very low acceptance rates. However, the findings also suggest that a strong semantic account cannot be the whole story. The evidence for gradience in speakers’ judgments, similar effect sizes, and the unexpected responses to some predicates, like *wake*, suggest that other factors are also at play. We return to these ideas in the General Discussion (section 5). In Experiment 2, we ask how English speakers respond to these same events and predicates, despite there being no SV/CV distinction in English.

3 Experiment 2a: English

Experiment 2 explores English speakers’ interpretations for the same events and translation-equivalent predicates. Unlike in Hindi, English perfective change-of-state verbs are understood to entail the achievement of their endstate. Although they resemble the Hindi SV in form, in meaning they are expected to match the Hindi CV. Therefore, English speakers should show a low acceptance rate for simple perfective sentences as descriptions of partially-completed events, parallel to Hindi speakers’ low acceptance for CV sentences.

3.1 Methods

3.1.1 Participants

Twenty-four native English speaking Northwestern University undergraduates participated for course credit. All participants signed an informed consent form approved by Northwestern University’s

Institutional Review Board.

3.1.2 Stimuli

Visual stimuli were identical to Experiment 1. Auditory stimuli were similar to Experiment 1, but only one sentence, a simple transitive, was recorded per video (e.g., “She ate a cookie”). We also made a slight variation from Experiment 1 for the *pluck* predicate: We chose the English verb *break* because it is more colloquial than *pluck*, but to ensure that participants interpreted the events correctly, as a removal of the object from its stem, rather than damage to the object itself, we added the particle “off” (e.g., “She broke off the banana”). For the other sentences, see the English translation column of Table 2.

3.1.3 Design and Procedure

The procedure was identical to Experiment 1, except that there was only one syntactic condition (i.e. participants heard the same sentence type throughout). Completion condition varied within-subject, as in Experiment 1.

3.2 Predictions

If English simple perfective forms are akin to the Hindi CV in meaning, then they should pattern like them. We expect acceptance rates similar to those for the Hindi CV (that is, near 100% acceptance for fully-completed events, and close to 33% acceptance for partially-completed events).

With respect to predictions for different predicate types, because English does not have the neutral perfective, Singh’s account does not make any specific predictions for predicates with and without incremental themes. If, however, the pattern of acceptance resembles that found for Hindi, it may suggest that speakers of both languages are sensitive to real-world and contextual factors. That is, if English speakers ever do allow partial completion interpretations, they should do so for the very same predicates/events for which Hindi speakers do. After all, real-world and discourse contexts are held constant across experiments.

3.3 Results and Discussion

Responses were coded as in Experiment 1. For fully-completed events, the sentence descriptions were accepted 97.3% of the time, while for partially-completed events, they were accepted 46.9% of the time. A multi-level model with Event Completion (2: partial vs. full) as fixed factor revealed that Event Completion is a reliable predictor (beta coefficients in Table 6) for English as well.

TABLE 6 Experiment 2a (English): Estimates of fixed effects from best-fitting multi-level model of proportion of “true” responses (empirical logit transformed)

Effect	Estimate	S.E.	<i>t</i> -value
Intercept	2.15	0.16	13.50*
Event Completion	-3.23	0.28	-11.59*

* $p < 0.05$ (on normal distribution)

A glance at the results for individual predicates reveals a similar pattern as that found for the Hindi data in Experiment 1 (Table 7).⁶ While in the fully-completed condition, all predicates had a near 100% acceptance, in the partially-completed condition there was a high degree of variability; acceptance rates ranged from 0% (for *break off*) to 95% (for *fill*). This range of acceptance is surprising given that change-of-state predicates in English are typically thought to entail completion of the events they describe. We interpret this as evidence that factors such as contextual information and real-world knowledge play an important role in speakers’ acceptance of change-of-state predicates for partially-completed events. If extralinguistic factors are relevant, then given that Hindi and English speakers were presented with identical visual events, we expect patterns of acceptance to be

⁶We did not analyze incremental theme vs. non-incremental theme predicates for this experiment because there was only one syntax condition.

similar across languages. That is, the same event-predicate pairs that yielded high acceptance rates from Hindi speakers should yield high acceptance rates from English speakers. This prediction was largely borne out. Considering only partially-completed events, notice that *break off* had the lowest acceptance rate in both Hindi and English, with *fill* and *eat* having among the highest acceptance rates.

TABLE 7 Experiment 2a (English): Percent “true” responses, by condition and trial

Predicate	Partial Completion	Full Completion
<i>Incremental Theme</i>		
cover	54	96
draw	64	87
eat	67	96
fill	95	100
<i>Non Incremental Theme</i>		
close	13	100
extinguish		
<i>Newspaper</i> (partial)	8	100
<i>Candle</i> (return to initial state)	17	100
break off	0	100
wake (return to initial state)	75	100

Interestingly, acceptance rates were similar to those for Hindi SV sentences, rather than CV sentences. For both the English sentences and Hindi SVs, several predicates received over 50% acceptance rates. For Hindi CV sentences, only *fill* did. In this experimental task, at least, English-speaking participants were quite willing to accept these change-of-state predicates as descriptions of partially-completed events. These results cast doubt on a theory in which English perfective verbs entail event completion, while Hindi SVs do not.

However, there is an important caveat in interpreting these results. While in Experiment 1 participants were exposed to a within-subjects design, hearing both SV and CV sentences, in the current experiment participants only heard one kind of sentence: an English simple perfective. Would English speakers have responded differently if they had had the opportunity to contrast simple perfectives with another construction, as Hindi speakers did in Experiment 1? If the English perfective entails completion, then contrasting it with another construction should make no difference, but if contextual factors are relevant in determining whether a partial completion interpretation is available, then a contrast may indeed skew participants’ judgments.

To explore this possibility, in Experiment 2b we devised a condition somewhat comparable to the Hindi CV: a particle construction using *up* (e.g., *fill up*). Although in English simple perfectives like *fill* are generally understood to entail completion, we suspected that the particle construction would draw even more emphasis, and therefore attention, to event completion. If English speakers notice the contrast between these completion-focused constructions and the simple perfectives, they may be even more willing to accept partially-completed events for the simple perfective, reserving their “false” judgments for the completion-focused particle construction.

4 Experiment 2b: English with *up*

Although English does not have an SV/CV distinction, particles like *up* can emphasize completion and result states. *Fill up*, for example, seems to emphasize the endstate, *fullness*, more than *fill*. In this experiment, we compared interpretations of verb-particle constructions with the simple verbs from Experiment 2. Of course, the difference between *fill* and *fill up* is not directly parallel to the difference between a Hindi SV and CV. But nevertheless, our goal in Experiment 2b was to determine if a similar pattern obtained between these two constructions as in the pattern of responses to Hindi

SV and CV sentences from Experiment 1.

We selected a subset of the predicates from the previous experiments that can take the particle *up*, yielding a construction that emphasized the result state without significantly changing the event the verb referred to: *cover (up)*, *eat (up)*, *fill (up)*, and *wake (up)*. Although to us, *cover up* typically means fully obscuring the covered object, rather than full placement of a lid on a container as in our videos, we included this predicate here because pilot work indicated that at least some speakers would use *cover up* to label the full completion event in our video.

4.1 Methods

We followed the methods used in Experiments 1 & 2a.

4.1.1 Participants

A different group of twelve native English-speaking Northwestern University undergraduates participated for course credit.

4.1.2 Materials

Visual stimuli were identical to Experiments 1 & 2a. There were two auditory conditions. Auditory stimuli for the simple verb condition were identical to Experiment 2a for the four predicates *cover*, *eat*, *fill*, and *wake*. The second condition incorporated the particle *up* (e.g., *She ate up the cookie.*).

4.1.3 Design and Procedure

Identical to Experiment 1, except that participants viewed just eight videos, two for each of the four predicates.

4.2 Predictions

If English simple transitives entail full completion, like Hindi CVs, adding the particle *up* may *emphasize* completion, but not significantly alter speakers' interpretations. They should be no more likely to accept simple transitives as descriptions of partially-completed events than they are of sentences with *up*.

In contrast, if *up* can play a similar role to the light verb in the Hindi CV construction, we expect a similar pattern of results as obtained for the SV/CV distinction in Experiment 1. That is, we expect sentences with *up* to have a lower acceptance rate for partially-completed events than simple transitive sentences without *up*. Further, if English speakers contrast the particle and simple verb sentences, they may be more inclined to use the simple verb sentences to take over the function of describing partially-completed events. This will result in even higher acceptance rate for the simple verb sentences than these same sentences yielded in Experiment 2a.

4.3 Results and Discussion

We entered the mean proportion of "true" responses for each participant into a multi-level model with Event Completion and Syntax as fixed factors (beta coefficients in Table 8). The analysis reveals that both Event Completion (2: partial vs. full) and Syntax (2: SV vs. CV, that is no particle vs. particle) are reliable predictors, while their interaction is marginally reliable ($p = 0.054$). However, these effects are likely mostly driven by differences between syntactic conditions in the partially-completed condition for *eat*. See Table 9.

Strikingly, the acceptance rate for the simple transitives in Experiment 2b was higher than it had been for those predicates in Experiment 2a (collapsing across those predicates appearing in both Experiments 2a and 2b, $t(70) = 2.00$, $p < .05$). This is suggestive evidence that contrasting the simple transitives with the *up* sentences caused speakers to accept partial-completion interpretations for simple transitives with even greater frequency. By drawing English speakers' attention to the availability in English of a construction that highlights completion, we were able to increase acceptance rates for partially-completed events for simple transitives. Further data will be necessary to lend clear support to this hypothesis.

TABLE 8 Experiment 2b (English): Estimates of fixed effects from best-fitting multi-level model of proportion of “true” responses (empirical logit transformed)

Effect	Estimate	S.E.	<i>t</i> -value
Intercept	1.37	0.10	13.96*
Syntax	0.51	0.20	2.60*
Event Completion	-0.54	0.20	-2.74*
Syntax x Event Completion interaction	0.76	0.39	1.93

* $p < 0.05$ (on normal distribution)

TABLE 9 Experiment 2b (English): Percent “true” responses, by condition and trial

Predicate	Partial Completion		Full Completion	
	Simple Verb	Particle (<i>up</i>)	Simple Verb	Particle (<i>up</i>)
cover	83	67	83	67
eat	83	17	100	100
fill	100	83	100	100
wake (return to initial state)	100	83	100	100

5 General Discussion

We have presented the results of two experimental studies exploring Hindi and English speakers’ interpretations of perfective verbs describing change-of-state events. We considered two types of events: events arriving at full completion, with the change of state fully achieved, and events for which the change of state was not fully achieved. Our goal was to discover whether speakers accepted perfective verbs as descriptions of these latter partially-completed events, and whether acceptance varied across syntactic construction, semantic class of predicate, or across language.

To address these issues, we contrasted two perfective forms in each language. In Hindi, we contrasted the SV and the CV. SV sentences are thought to be compatible with both fully- and partially-completed events, and CV sentences only with fully-completed events. Because English does not have a CV construction, in Experiment 2a we elicited speakers’ judgments of transitive sentences containing simple perfective verbs. Although similar in form to the Hindi SV, they are thought to describe fully-completed events, like the Hindi CV. In Experiment 2b, we contrasted judgments of these simple perfective verbs with constructions involving the particle *up* (e.g., *fill up*) in order to introduce a contrast similar to Hindi’s SV/CV distinction.

The experiments tested three main predictions. First, we predicted that if Hindi SV sentences can describe partially-completed events, Hindi speakers would accept SV sentences more often than CV sentences as descriptions of these events. Both SV and CV sentences were predicted to be acceptable for fully-completed events. We tested this prediction in Experiment 1. Hindi speakers, as expected, showed different patterns for SV and CV constructions, accepting SV sentences significantly more often for partially-completed events than CV sentences. These results support previous experimental work (Pederson 2007, Wittek 2002), but extend the findings with an experimental design which fully crosses event completion and syntactic construction within a single language.

Surprisingly, despite being accepted significantly more often than CV sentences, SV sentences were accepted just half the time, a much lower rate than expected if SVs do not entail event completion. But these results are consistent with the observation that the default interpretation for SVs is still full completion (Kothari 2008), and partial completion interpretations arise only when favored by context. We suggest that because full completion interpretations entail partial completion interpretations, the full completion interpretation is stronger, and therefore speakers may prefer it unless context strongly drives a partial completion interpretation (as in the case of explicit cancellation) (e.g., Kearns 2007).

The acceptance rate for CVs, too, was surprising; it was much higher than the near 0% acceptance we expected. We suspect that some of our partially-completed events were construed as *functionally* complete, despite not being 100% complete, and that this rendered them acceptable for both SV and CV sentences. This is most transparently true for *fill*, for which our partially-completed event depicted a glass that was approximately three-quarters full. We return to this point below.

Our second prediction stems from Singh's (1990) account of the Hindi SV/CV distinction, which predicts that partial completion interpretations for SVs arise only for accomplishment predicates with incremental themes. The findings here were surprising as well. While accomplishment predicates with incremental themes did show a difference between SV and CV constructions, so did other predicates, with a comparable effect size. Our experimental results therefore offer partial support for Singh's account, but are inconsistent with the prediction that only accomplishment predicates featuring incremental theme objects should allow partial-completion interpretations for SV sentences. The findings are particularly surprising given that the non-accomplishment predicates we tested were primarily achievements, which one would expect to be incompatible with partial completion readings of any kind. We hope that extending the experimental paradigm to a larger set of accomplishment and achievement predicates will shed light on whether there are any semantic features shared by predicates that show the SV/CV distinction, beyond Vendlerian classes.

It is worth commenting on the findings for *wake*, because these lend new insight into partially-completed event construals. Recall that the partially-completed videos for *wake* depicted a full completion of the event followed by a return to the initial state. In Hindi, these predicates showed a difference between SV and CV sentences for partially-completed events. Not only that, but the acceptance rates for this achievement predicate, in both constructions, were close to what we had initially predicted for accomplishment predicates with incremental themes: CV sentences received a very low acceptance rate (17%), and SV sentences a very high acceptance rate (83%), making it a paradigm example of the SV/CV distinction.

These results suggest that for SVs, at the time of evaluation (here, the end of the video), the endstate needn't be apparently achieved at all, as long as some change took place earlier in the event. (We suspect if the sleeping actor had not woken at all, speakers would have been much less likely to accept the SV sentence.) SV sentences can therefore be used in situations in which an action has not been completed to the satisfaction of the actor's perceived intention. But for CVs, the intended endstate must be evident at the time of evaluation. Even if the endstate was completely brought about at some earlier point during the video, speakers did not construe the CV sentence as felicitous. In judging the CV, the speaker must judge whether the actor fulfilled those intentions to an appropriate degree.⁷ We do not suggest that the meaning distinction between SV and CV is reduced to one between "try to" and "succeed at", because SV sentences can describe partially-completed events that were brought about accidentally (Pederson 2007). However, perceived intention is at least one possible route to felicity of an SV sentence as a description of a partially-completed event. Although the current study only presented this event type for two predicates, we believe the findings are suggestive and warrant more detailed investigation.

Semantic class alone, then, is not adequate to explain Hindi speakers' interpretations of SV and CV sentences. While the current study does not test the predictions of a specific alternate account, we believe the results suggest promising avenues for future research. One factor that we believe to play an important role in speakers' interpretations is real-world context. Whether an event is construed to be complete is related to a contextual standard, which can differ both by the type of object (e.g., the level of a full wine glass typically does not reach as high as the level of a full water glass) and the context of use (e.g., filling a water glass to drink typically does not reach the rim of the glass, while filling a water glass in order to measure out a quantity of water may), with the relevant scale differing across verbs. (This is of course true for English as well; consider well-known examples like *John read War and Peace last night.* vs. *John read Dick and Jane last night.*) Context,

⁷The Russian perfective/imperfective distinction yields parallel interpretations here. Thanks to an anonymous reviewer for this insight.

in combination with other factors, is likely to be an important determinant of whether a predicate yields an SV/CV distinction.

An alternate hypothesis, which we also leave to future research, but which is consistent with the results of the present study, is Copley and Harley's (2010) suggestion that a force-dynamic treatment of events can account for the availability of partial-completion interpretations in languages like Hindi. They propose that a force, or input of energy, comprises the semantic weight of predicates like the ones we studied here, rather than a change of state. The CV carries a presupposition that the force was effective in bringing about the result state, while the SV does not. On this account, the actor's intention need not be relevant; all that is required is that a force applies toward the result. This kind of account accommodates contextual factors as well. The likelihood of efficacy of the net force applied in any given situation should depend on a number of real-world factors, including the scale in question and whether other factors (forces) are intervening.

Our third prediction relates to expected differences between Hindi and English. because English perfectives are traditionally assumed to entail completion, much like Hindi CV sentences, speakers' interpretations of the English sentences in Experiment 2a should pattern like the Hindi CVs in Experiment 1. But in fact, English sentences patterned more like Hindi SV perfectives than CV perfectives, with a 47% acceptance rate. These patterns do not, of course, indicate that English perfectives and Hindi SVs are identical with respect to the behavior of these predicates. It is still the case that for Hindi SVs, the cancellation of the endstate, as in (1), yields a much more felicitous utterance than its English translation. Why then did the English sentences yield such a high acceptance rate?

Further investigation is needed to understand this finding, but we speculate that it is related to our striking finding that in Experiment 2b, when speakers heard both simple transitives and *up* sentences, they gave an *even higher* acceptance rate for the simple transitives than they had for these very same sentences in Experiment 2a. This suggests that participants in Experiment 2b were comparing the sentences with and without *up* to determine which they felt was a better description of each event.⁸ Once speakers' attention was drawn to the fact that there are constructions that emphasize event completion, the simple verb took on the function of describing events that have reached only partial completion. Future research will have to explore whether other constructions, too, yield this kind of contrastive effect, and how this interacts with other factors such as perceived intention.

Finally, we note that both Hindi and English showed similar patterns across the different predicate types. A glance at the acceptance rates for each predicate (Tables 4 and 7) supports this prediction, when the verbs are compared to Hindi SV sentences. For Hindi SVs, *pluck*, *close*, *draw*, and *extinguish* all had acceptance rates under 50%; for English, *pluck/break off*, *close*, and *extinguish* fell under this mark. In both languages, *cover*, *fill*, *wake*, and *eat* all fell above the 50% mark. Hindi CVs do show a similar pattern, with *pluck*, *wake*, and *extinguish* showing the lowest acceptance rates, but for CVs all eight predicates fell under the 50% mark. These striking similarities between Hindi and English suggest that Hindi and English simple verbs do not, at base, have distinctively different semantic properties; speakers of both languages allowed partial-completion interpretations for simple verbs approximately 50% of the time, and showed similar responses to different predicates. Our experimental results suggest that the differences between English and Hindi are more complex and subtle than expected if a stark aspectual difference exists between the two languages: English speakers showed an almost identical pattern to Hindi speakers, albeit somewhat attenuated. Again, contextual factors may explain this concordance across languages; after all, the events we showed and the experimental context were held constant across language groups.

These findings for English are surprising on a purely semantic account, which would have predicted that English perfectives without *up* would yield interpretations more like the Hindi CV, not the SV, and that the addition of *up* would not have had effects with respect to event completion construals

⁸They were likely comparing the constructions implicitly. Fewer than half the participants indicated that they had noticed the contrast between the sentence types when questioned during debriefing.

(although *up* may nevertheless have had emphatic or other effects). Taken together with the results from Hindi alone from Experiment 1, the results for English suggest that Singh's semantic account alone is inadequate. Although we do not suggest that there are no differences the languages, we find the similarities compelling.

Hindi as well as English perfectives do, then, describe situations with clear starting and ending points. But contrary to traditional analyses (e.g., Smith 1997), perfectives are compatible with assertions that the situation terminated before the event's natural completion point. That is, the closing bound of the event does not coincide with the bound determined by the telic point. The findings for *wake* suggest, too, that in at least some cases the event may reach that closing bound, but revert completely to the starting point, and still be described with an SV perfective.

Limitations of the current study This exploratory study is, to our knowledge, the first to use experimental data to investigate the factors underlying the interpretation of different kinds of perfective forms both within and across languages. Our findings shed light on these factors; we hope that future work will take these findings as a baseline and investigate these factors in more depth.

While the present results clearly demonstrate that incremental theme verbs are not the only ones that show a distinction between the SV and CV constructions, they do not clearly point in favor of a specific alternative hypothesis. There are likely many interacting factors to tease apart, both semantic and pragmatic. Future work must explore this phenomenon with a greater number of verbs, with systematic manipulation of event type and theme type, and a wider range of semantic categories. However, we do hope that the results shed some light on promising future directions; for example, our results suggest that the actor's perceived intentions can at least in some cases determine felicity of an SV sentence for a partially-completed event, and that real-world context needs to be both carefully manipulated, to understand its role, as well as carefully controlled, to understand the role of other factors when context is held constant.

The fact that context plays such an important role in interpreting sentences like these is both a limitation and a strength of the current study. It is a limitation because by playing videos, we gave speakers a context, and a specific event to imagine. As a result, we cannot be sure whether speakers would have provided different answers if the event had reached slightly closer to or farther from completion. For example, would speakers have been even more likely to accept Hindi SV sentences for *eat* if slightly more of the cookie had been eaten in the depicted event? Future work should probe these boundaries more closely.

But our provision of video events is also a strength of this study. Providing a specific event ensures that all speakers pictured the same events, and were evaluating the sentences with respect to those particular events that we provided. For example, we were able to elicit judgments on multiple contexts, with all other aspects of the situation held constant, such that each participant was given the same mental image of the event being described. We were also able, with the use of videos, to easily bring to mind unusual contexts, such as events involving a return to the initial state (e.g., blowing out a trick candle which re-lights). In general, the SV/CV distinction is a subtle one; because the default interpretation for a Hindi or English perfective is full event completion, even for SV sentences, it is difficult to encourage participants to consider partially-completed events. Providing them with a visual context of what such a partially-completed event looks like helps immeasurably. These results suggest that experimental studies can provide a unique kind of data, and should be pursued in tandem with other methods. We therefore hope that in addition to presenting important empirical data about the interpretation of Hindi and English perfectives, the current study also calls attention to the value of experimental studies.

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References

- Bar-El, Leora, Henry Davis, and Lisa Matthewson. 2005. On non-culminating accomplishments. In *Proceedings of the 35th Annual Meeting of the North East Linguistics Society*, vol. 1, pages 87–102.
- Butt, Miriam and Gillian Ramchand. 2005. Complex aspectual structure in Hindi/Urdu. In N. Erteschik-Shir and T. Rapoport, eds., *The Syntax of Aspect*, pages 117–153. Oxford University Press.
- Copley, Bridget and Heidi Harley. 2010. An ontology for a force-dynamic treatment of events. In B. Copley and F. Martin, eds., *Forces in Grammatical Structures*. To Appear.
- Dell, François. 1987. An aspectual distinction in Tagalog. *Oceanic Linguistics* 22-23:175–207.
- Hook, Peter Edwin. 1976. The Hindi compound verb: What it is and what it does. In K. Singh, ed., *Readings in Hindi-Urdu Linguistics*, pages 129–146. Delhi: National Publishing House.
- Ikegami, Y. 1985. 'Activity'-'Accomplishment'-'Achievement'-A language that can't say 'I burned it but it did not burn' and one that can. In A. Makkai and A. K. Melby, eds., *Linguistics and Philosophy: Essays in Honor of Rulon S. Wells*, pages 265–304. Amsterdam: John Benjamins.
- Kearns, Kate. 2007. Telic senses of deadjectival verbs. *Lingua* 117:26–66.
- Koenig, Jean-Pierre and Nuttanart Muansuwan. 2000. How to end without ever finishing: Thai semi-perfective markers. *Journal of Semantics* 17:147–194.
- Kothari, Anubha. 2008. Event culmination as implicature in Hindi perfectives. Ms., Stanford University.
- Pederson, Eric. 2007. Event realization in Tamil. In P. Brown and M. Bowerman, eds., *Cross-linguistic Perspectives on Argument Structure: Implications for Learnability*, pages 331–355. New York: Lawrence Erlbaum.
- Raja, Nasim A. 2003. Aspectual complex predicates in Punjabi. In R. Singh, ed., *The Yearbook of South Asian Languages and Linguistics*, pages 99–129. Berlin: Walter de Gruyter.
- Singh, Mona. 1991. The Perfective Paradox: Or, how to eat your cake and have it too. In *Proceedings of the 17th Annual Meeting of the Berkeley Linguistics Society*, pages 469–479.
- Singh, Mona. 1998. On the semantics of the perfective aspect. *Natural Language Semantics* 6:171–199.
- Smith, Carlota. 1997. *The Parameter of Aspect*. Dordrecht: Kluwer Academic Publishers.
- Teng, Shouxin. 1972. *A Semantic Study of the Transitivity Relations*. Ph.D. thesis, University of California, Berkeley.
- Travis, Lisa. 2000. Event structure in syntax. In C. Tenny and J. Pustejovsky, eds., *Events as Grammatical Objects: The Converging Perspectives of Lexical Semantics and Syntax*, pages 145–185. Stanford: CSLI Publications.
- Verma, Mahindra K., ed. 1993. *Complex Predicates in South Asian Languages*. New Delhi: Manohar.
- Wittek, Angelika. 2002. *Learning the Meaning of Change-of-State Verbs: A Case Study of German Child Language*. Berlin: Mouton de Gruyter.