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Imagining Accomplishments from Differing Visual and Temporal Perspectives

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IMAGINING ACCOMPLISHMENTS FROM DIFFERENT VISUAL AND TEMPORAL PERSPECTIVES

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Abstract

The current research examined the relationship between grammatical aspect (GA) (imperfective vs. past perfect) and accomplishment verbs in event representation in Experiment 1, and then investigated the influence of visual perspective taking on this representation process in Experiment 2. Electroencephalography (EEG) was recorded with slow cortical potentials (SCPs) acting as a measure of cognitive processing during the imagination period, and behavioural measure questionnaires provided ratings of vividness, temporal component, and importance of the imagined events.

It was hypothesized for Experiment 1 that imagining imperfective events would result in more negative SCP amplitudes than when imagining events with past perfect aspect, a finding that would indicate that accomplishments phrased in the imperfective aspect require more cognitive effort to process than those in the past perfect aspect. This prediction is based on the notion that past perfect aspect focuses on the completed nature of an event and accomplishment verbs are verbs with natural end points. As such, there is greater temporal consistency between the semantics of the verb (natural end point) when GA highlights the end of the event. The results of Experiment 1 did show that SCP amplitudes for imperfective accomplishments were more negative than for past perfect accomplishments across the head topographically. Behavioural findings also demonstrated that people more often imagined in the end stage of the events when past perfect aspect was used. Furthermore, imperfective trials were imagined more often in the middle temporal component, which was predicted due to the ongoing nature of the imperfective phrasing.

In Experiment 2, it was hypothesized that imagining accomplishment verbs from a first-person perspective would elicit less negative SCP amplitudes than imagining from a third-person

perspective, but with a reduced difference between perspectives seen in previous work as accomplishments contain well-defined endpoints. It was also hypothesized that there would not be differences in amplitudes between first- and third-person perspective as a function of GA. The results of Experiment 2 were, again, similar topographically across the head and showed that the SCP amplitudes of third-person perspective were less negative than first-person perspective. This indicated that it was easier to imagine accomplishments from the third-person perspective. The behavioural measures found that for the imperfective (over past perfect) aspect the vividness of people/entities, objects, and location were all higher. Vividness of people/entities was higher for third-person over first-person perspective, but object vividness was higher from a first- over third-person. It was also seen that events imagined from the first-person perspective were rated as more important than those imagined from the third-person perspective. As in Experiment 1, Experiment 2 found that the middle temporal component was imagined most often for imperfective sentence cues and end temporal component was represented more frequently for past perfect sentence cues. These results extend research on visual perspective taking by providing insight into the behavioural and neural correlates of the interaction between visual perspective and temporal information (semantic and grammatical) associated with verbs.

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Imagining Accomplishments from Differing Visual and Temporal Perspectives

Many factors have an impact when a person imagines an event, including various linguistic elements. One such element is called grammatical aspect (GA), which is the expression of the temporal structure of an event denoted by the morphological properties of verbs (Comrie, 1976; Dowty, 1979). It has been found to play an important role in cognitive processing, including the manner in which one constructs imagined events (Hong, Ferretti, Craven, & Hepburn, 2014; Siklos-Whillans, Ferretti, Hong, & Hall, 2014). Past research has also shown that the visual perspective taken in imagined events can impact the level of processing difficulty (Hong et al., 2014; Macrae, Raj, Best, Christian, & Miles, 2012; Siklos-Whillans et al., 2014). The current research examined the relationship between GA, imperfective (ongoing, i.e. I was wrapping the gift) versus past perfect (completed, i.e. I had wrapped the gift), and accomplishment verbs in event imagining, and investigated the influence of visual perspective taking on this imagining process. There has yet to be any research done on the effect of forcing a specified visual perspective has on accomplishment verbs. As such, this thesis aimed to determine what affect a forced perspective task would have on event representation of accomplishment verbs in conjunction with differing GAs. The main prediction was that it should be easier to imagine past perfect than imperfective accomplishment events because accomplishments include a natural end point, which is temporally consistent with the completed reference of past perfect aspect.

Experiment 1 examines the cognitive effort associated with imagining accomplishment events from differing GAs. Experiment 2 utilized a forced perspective task to further analyze the relationship between GA and visual perspective in imagined events. Experiment 1 is described first, including an overview of past research on GA and imagined events. Following this,

Experiment 2 is discussed, preceded by a more in depth review of past visual perception investigations.

Grammatical Aspect

There are three forms of GA: the imperfective, the perfective, and the past perfect. The imperfective aspect refers to an event as being ongoing (e.g., I was walking) without making reference to its completion state. The perfective aspect refers to an event that references the entire event as completed (e.g., I walked). The past perfect aspect, like the perfective aspect, references events as completed but also places emphasis on the continued importance of the results of the event. This aspect is marked by the past participle to have (e.g., I had walked).

Past research has shown that GA influences the perception of other's intentions. For example, Hart and Albarracín (2011) ran three experiments to test this effect of GA in reading. The first experiment tested whether reading about a currently ongoing action (imperfective aspect) would improve the level of accessibility of intention-relevant concepts in memory (e.g., "want"), in comparison to reading about what someone had already done (perfective aspect). The participants read a set of behavioural descriptions, worded in either the imperfective or perfective form, that were attributed to a fictional individual. They then completed a measure of memory for intention-relevant concepts in form of word stems, half of which could be made to form intention words (*try*, *aim*, *goal*, *determination*, *plan*, *intent*, and *want*) or a word not related to intentions (e.g., *toy*, *ail*, *coal*, *extermination*, *peon*, *indent*, and *wand*, respectively). It was found that in the imperfective condition there were more completed word stems with words denoting intentions in comparison to the perfective trials. These findings implied that participants who read the imperfective descriptions considered the person performing the action's possible intentions, whereas those who saw the perfective descriptions

did not.

The second study was to test if presenting past behaviour of an individual in the imperfective aspect (as what the person *was doing*) would elicit more fine-grained analysis of their actions when compared to events framed in the perfective aspect (as what the person *did*) (Hart & Albarracín, 2011). Participants read about neutral behaviours of a fictitious individual, presented in either imperfective or perfective aspect (e.g., "Keith sipped/was sipping his coffee"). They then imagined this behaviour and reported by tally if they imagined it as being a meaningful action. The results showed an effect in the imperfective aspect trials, but not in the perfective. Events phrased in the imperfective were perceived to be more intentional (based on three intention-attribution items from the Mind Attribution Scale (Kozak, Marsh, & Wegner, 2006 as cited in Hart & Albarracín, 2011)) than those phrased in the perfective, and were also rated as more meaningful.

The results for their third study showed that presenting a description of an event in either imperfective or perfective aspect in a legal decision-making scenario affected the participant's perception of criminal intent to harm when acting as the judge. It was found that the imperfective phrasing created a stronger belief of criminal intention of causing harm to a victim (versus perfective condition). Participants also imagined the described criminal actions in a more detailed manner for ongoing events. When examined all together, the results of the three experiments show that GA influences how actions of others are perceived in terms of the intent behind such actions.

GA has also been shown to influence the activation of event knowledge from semantic memory (Ferretti, Kutas, & McRae, 2007). For example, in Ferretti et al.'s first study, verbs were paired with either related or unrelated locations (e.g., was skating–arena, vs. was praying–arena)

in a semantic priming task. The phrases were presented in the imperfective or the past perfect aspectual forms for 250 ms. Participants read the verb phrase silently and then a location appeared on the screen. Participants were required to pronounce the location out loud. This experiment found that location naming latencies were faster for the related than unrelated pairs, but only when the phrases were in the imperfective form.

In the second experiment, participants made continuations to sentence fragments that included a verb in either the imperfective or past perfect aspect (e.g., The diver was snorkelling……). Their results demonstrated that sentence fragments with imperfective aspect were more often completed with locative prepositional phrases, and that sentences with the past perfect aspect were more often completed with noun phrases and adverbial information.

In their third experiment, participants were presented with complete sentences in the imperfective or past perfect form. These sentences each featured an action and a location and the verbs were in imperfective or past perfect form. The action and location combinations had either high expectancy relationships (e.g., The diver was snorkelling in the ocean) or low expectancy relationships (e.g., The diver was snorkelling in the pond). While reading the sentences, the N400 component was examined by recording electroencephalography (EEG), as it indexes semantic expectancies (Brown, Hagoort, & Kutas, 2000). Words that elicit greater N400 amplitudes are less semantically expected. The results showed that when imperfective verbs were combined with locations that were connected to the event, participants had high expectancies, and therefore less difficulty in integrating the highly expected locations. The most difficulty seen for integrating locations occurred when imperfective verbs were used in combination with events not commonly associated with the verb, and the location presented was unexpected. Together, the results of these experiments indicate that during sentence processing

the morphosyntactic information associated with verbs and the reader's background knowledge of the world interact (Ferretti et al., 2007).

Another element closely linked to GA is the temporal component of events, as the different aspectual forms variably focus on the temporal development of events. There are three temporal components of events: the beginning, middle, and end. The beginning component is the initiating conditions of an event, the middle temporal component is the actual event, and the end is the resultant states (Moens & Steedman, 1988). Madden and Zwaan (2003) demonstrated the close relationship between GA and the different temporal components. In their study, participants chose between two photographs: one describing a completed event and the other describing an ongoing event. They found that participants were more likely to choose photographs of completed events when primed with related sentences with perfective aspect, but this was not seen for the imperfective aspect. Participants were also faster at choosing the photograph depicting the completed event rather than the ongoing event in general. Another finding was that participants read perfective sentences faster after being cued with a picture of a completed event as compared to one of an event in an intermediate stage of completion (Madden & Zwaan, 2003). These findings suggest that the participants represented more than one temporal component for the imperfective aspect, as well as the fact that readers construct mental representations of completed events when the event is presented to them in the perfective aspect. As this effect was not found in the imperfective trials it suggests that readers represent an ongoing event at varying stages of completion.

Lexical Aspect

Another important source of temporal information associated with verbs is lexical aspect, which is an inherent part of their meaning. The two types of lexical aspect investigated in this

thesis are activity and accomplishments. Activity verbs have an ongoing nature, as they do not contain natural temporal endpoints (e.g., the verb "act"), whereas accomplishment verbs possess natural temporal endpoints (the verb "build", something gets built).

Yap et al. (2009) conducted a study that combined grammatical and lexical aspect, and consisted of a picture matching task. In this task, the participants heard sentences that contained either activities or accomplishments that were in either imperfective or perfective form and then selected one of two pictures that depicted either an ongoing or completed version of the event described in the auditory sentences. Participants were asked to select the picture that best matched the sentences as fast as possible. The results of this study showed that picture selection times were fastest to ongoing pictures of events when activity verbs were phrased in the imperfective aspect, and responses to completed pictures were fastest when accomplishment verbs were phrased in the perfective (Yap et al., 2009). These results show that processing events that do not have natural end points (activities) is easier when they are presented in a sentence that focuses attention on the ongoing development of the event (imperfective), whereas processing events that naturally have an endpoint (accomplishments) is easier when the focus is placed on the completion of those events (perfective). The present thesis also further examines this interaction between grammatical and lexical aspect in an event imagination task to establish if a similar effect is seen during event representation.

In another recent lexical aspect experiment participants read short stories containing an accomplishment or activity event that were grammatically inflected with either imperfective or perfective aspect (Becker, Ferretti, & Madden-Lombardi, 2013). In this EEG study, short stories were presented with an intervening sentence that briefly described a long or short event that happened before the target situation was reintroduced later in the story. EEGs were time-locked

to the reintroduction of the target event. It was found that a larger N400 was present for perfective accomplishments than for imperfective accomplishments, but this effect was only seen in the trials containing shorter intervening events. However, in the activity condition there was no difference between imperfective or perfective trials or the differing time durations of the intervening events at the N400 (Becker et al., 2013). These results provide evidence as to how the grammatical and lexical aspect can impact the maintaining of concepts in discourse.

Imagined Events

Conway, Pleydell-Pearce, Whitecross, and Sharpe (2003) conducted a memory retrieval and imagined event study that recorded slow cortical potentials (SCPs). SCPs are ERPs that indicate the difficulty of cognitive processing over longer periods of time (i.e., seconds to minutes), with greater negativity in amplitudes representing more difficulty (Conway et al., 2003; King & Kutas, 1995). SCPs have been shown to reflect the activity in neural tissue underlying the cortex (Skinner & Yingling, 1976). As they originate from large cell assemblies in the upper cortical layer, increased negativity in SCPs indicate greater depolarization of these large cell assemblies. This, in turn, lowers the threshold of excitement of the neurons and leads to increased activity in the brain (Strehl et al., 2006).

Based on the provided cue, participants in Conway et al.'s study either recalled a personal memory or constructed an imagined event, which sometimes included real objects, entities, and locations relevant to their lives. Negative SCP amplitudes for the left prefrontal cortex were found across both construction and maintenance of episodic memories and imagined events. However, greater negativity was observed in the posterior temporal-occipital networks during construction of memories versus imagined events. This was thought to occur because in autobiographical memories the images are event-specific, episodic representations built from

actual sensory–perceptions the person has experienced, whereas the images in imagined events are generic and may be less a result of episodic representation. The generation of both autobiographical memories and imagined events produced greater right versus left negative shifts over the posterior occipital regions, and the construction of imagined events led to larger negative shifts over left frontal regions as compared to recall of prior experienced events (Conway et al., 2003). These results show that, in general, similar neural networks are activated during the construction of imagined events and the retrieval of recalled events, although differences are found in SCP negativity across the different brain regions (i.e., posterior and frontal regions).

Hassabis, Kumaran, and Maguire (2007) conducted a study aimed at identifying the brain regions associated with recalling episodic memories or imagining something novel. To test this, the researchers had participants recall memories, imagine novel scenes, or imagine novel objects during functional magnetic resonance imaging (fMRI) scanning. The imaging results showed that there was activation in the hippocampus, parahippocampal gyrus, ventromedial prefrontal cortex, posterior parietal cortices, and retrosplenial cortex during the processes of both recalling memories and imagining new scenes or objects. The ability to distinguish imagined memories from personally experience memories was associated with activation in the anterior medial prefrontal cortex, posterior cingulate cortex, and the precuneus, as these areas were more actively engaged during memory recall over imagined events (Hassabis et al., 2007).

In another fMRI study, Addis, Wong, and Schacter (2007) examined the neural substrates of remembering episodic events and imagining future episodic events. Participants were cued with a noun while being scanned. For each trial they were told either to remember a past event or imagine a future event, based on the cued stimuli. After this, they would mentally elaborate on

the recalled or imagined event by adding as much detail as possible in the allotted time. It was found that the left hippocampus and posterior visuospatial regions were both activated by event construction (both past and future) (Addis et al., 2007). However, the construction (imagination) of future events also engaged the right frontopolar cortex, left ventrolateral prefrontal cortex, and right hippocampus. The elaboration-phase results showed that all the regions that make up the autobiographical memory retrieval network were involved in the elaboration process, which was not seen for the construction phase (Addis et al., 2007). Both of these fMRI studies, along with the previously discussed SCP research, come together to provide evidence of similar brain regions used in both autobiographical memory recall and imagining events.

Recently, Hong et al. (2014) compared both GA (imperfective and perfective) and lexical aspect (activities and accomplishments) and the effects they had on SCPs while people imagined events (e.g., accomplishment, imperfective - “I was calculating”; accomplishment, perfective - “I calculated”; activity, imperfective - “I was speaking”; activity, perfective - “I spoke”). The SCP results showed that imagining ongoing accomplishments was more difficult than imagining completed accomplishments. Alternatively, imagining completed activities was more difficult than imagining ongoing activities. These results may indicate that forcing an ongoing status (imperfective) on imagined situations that have natural endpoints (accomplishment verbs) and forcing completion status (perfective) on events without natural endpoints (activity verbs) can impact imagination difficulty, a result consistent with previous research by Yap et al. (2009).

Furthermore, Hong et al.’s behavioural results demonstrated that participants were more likely to imagine activities than accomplishments from a first-person perspective. Hong et al. suggest that the ongoing nature of activities leads to imagined event representations that are consistent with how people experience events (i.e., from the first-person perspective). Although

GA did not have an impact on the visual perspective adopted for activity verbs, for accomplishment verbs participants adopted the first-person perspective more often for perfective than imperfective aspect. These results show that when an accomplishment event is completed and the goal is obtained, people imagine the result or goal as if looking from their own eyes.

Experiment 1

The current research extends previous research by Hong et al. (2014) by addressing a possible concern about their accomplishment sentence cues: mainly the imagining cues in that study did not contain direct objects. Hong et al. wanted to investigate imagining when just the verb and pronouns were provided as cues. However, accomplishment verbs occur in transitive structures that involve nouns that serve as direct objects for the event (e.g., I was building the fence), unlike activity verbs that are commonly intransitive (I was skating). Therefore, in the current study, an object/noun was added to the accomplishment imagining cues to create complete sentences, and therefore remove any concerns that variation in SCP amplitudes in previous research was due to a transitivity violation. As no past research has examined accomplishment verbs using a forced perspective task, this experiment aimed to determine what effect forcing a specific visual perspective would have on the imagining of accomplishment events presented in either an imperfective or past perfect aspect.

Based on the results of Hong et al. (2014) and Yap et al. (2009), the main prediction of the current study was that accomplishment verbs phrased in the imperfective aspect should elicit more negative SCP amplitudes than accomplishment verbs phrased in the past perfect aspect. As discussed above, this result is expected because accomplishment verbs have natural endpoints, and past perfect aspect focuses directly on the endpoint of events, thereby creating a temporal match between GA and lexical aspect.

Method

Participants.

Forty-two undergraduate Wilfrid Laurier University students (six males, 36 females) ages 17 to 23 (mean age 18.6) were recruited to participate in the study. Pre-test screening ensured that they were native English speakers, right-handed, and had normal, or corrected-to-normal, vision. Participants received course credit for their participation.

Materials.

This experiment included accomplishment verbs (e.g., build, prepare, compose) presented in differing GAs (imperfective or past perfect). There were 80 accomplishment sentence cues (40 per condition) in the study (see Appendix A, Table 1). The sentence cues were counterbalanced across two experimental lists such that each sentence cue appeared in imperfective and past perfect aspect, and each list contained 40 imperfective and 40 past perfect sentence cues. A Google frequency search was run on each of the verbs used in the study to determine if there may be an effect of frequency between the imperfective and past perfect forms. A paired samples t-test was conducted and this was found not to be the case, $t(79) = -1.049$, $p > .29$ (see Appendix A, Table 2).

Consent forms were provided to inform participants of the nature of the study and obtain consent to participate in the experiment. The study took place in an electrically shielded chamber (Faraday cage). A 64-electrode EEG cap was used to measure scalp-conducted neuronal signals. Signals were recorded using “SCAN” software running on a Windows XP computer. Stimuli was created and presented using “STIM” software.

Each participant was provided with behavioural questionnaires to answer after each trial. The behavioural measures questionnaires involved inquiries about the event the participant

imagined in the trials. The questions included information about vividness of the people/entities, objects, location, and level of difficulty to imagine, all rated on a 1-7 Likert scale (1 = not at all, 7 = very much). There were also inquiries as to the temporal component(s) of the imagined event (beginning, middle, end), the duration of the event (if it were to occur in real life), the importance of the event to the participant, the imagined event cue that was provided, and which visual perspective the participant imagined the event from (first- or third- person) (see Appendix B, Figure 1).

Procedure.

Participants first read and filled out the consent form and then were brought into a Faraday cage that contained a computer monitor and button box for recording responses. A 64-electrode EEG cap was then fitted on the participant's head. Once capping was complete, the researcher then gave an explanation, with stimuli, of how the participant was to perform each trial and how to properly fill out the behavioural measures questionnaire. When the explanation was complete, the researcher left the Faraday cage, the recording started, and the participant completed four practice trials. The researcher then re-entered the Faraday cage and answered any questions the participants may have had and ensured that they were properly completing the behavioural measures questionnaire for each trial. Following completion of the practice trials the researcher left the Faraday cage and the experimental trials began.

Participants were first prompted with a screen displaying the word "Ready?". When they felt that they were ready to proceed they pressed the button provided, and the screen proceeded to a fixation point (+) directly in the middle of the screen. Participants were informed that the purpose of this section is to focus their attention on the centre of the screen and while the fixation is on the screen to blink normally, as during the actual reading and imagining portion that

followed they were not to blink or move their eyes (and body) in any way. This was to ensure that there was as little interference as possible in the recording of the SCP amplitudes, as the electrodes applied to the facial region would record all these movements. Next, the sentence cue (e.g., "I/was/wrapping/the/gift") was presented in the centre of the screen, one word at a time. Each word remained on the screen for 300 ms, with a 200 ms blank screen in between each word. The fixation point then reappeared on the screen for four seconds after the offset of the last word of the sentence to give participants time to construct the imagined event. The screen then automatically prompted the participants to record their answers on the behavioural measure questionnaire ("Record answers now") (see Appendix B). Participants were told not to expand on their imagined event after the allotted time, and to only answer the questionnaire based on what was imagined in the allotted five seconds. They were also instructed to create a new event during the imagination period and not to simply recall a memory of such an event that may have happened to them before.

Results

EEG results.

The raw EEG data was re-referenced off-line to the average of the mastoids (left and right). A low-pass filter set to 30 Hz was applied so as to remove high frequency noise, and then the trials that were contaminated by artifacts (blinks, excessive muscle artifact, etc.) were removed. Event-related potential (ERP) baseline corrected averages were created for each participant. These averages covered 200 ms before the onset of the "was/had" in each sentence to 6.5 seconds following that time lock, which was when the end of the trial occurred. For the statistical analysis the averages were separated into 500 ms time segments for the first 2.5 seconds, which consisted of the stimuli sentence (from "was/had" to the direct object), and then separated into

1000 ms segments for the remaining 4 seconds, which was the imagining period. This was done as the shorter time periods in the beginning portion of the trial allowed the examination of any changes in amplitude that occurred during the transition from reading comprehension to active event imagining.

The mean amplitudes for each topographical region were calculated and run through a 2 GA (imperfective vs. past perfect) X 5 Anteriority (prefrontal vs. frontal vs. central vs. parietal vs. occipital) X 3 Laterality (left medial vs. medial vs. right medial) X 2 Participant List (list 1 vs. list 2) ANOVA. GA, Anteriority, and Laterality were within participant variables, whereas List was between participants. List was included to reduce variability from rotating participants across different experimental lists, but has no theoretical interest (Pollatsek & Well, 1995). Therefore, effects of list are not discussed in the behavioural analysis and also the ERP analysis discussed below. The electrodes used for the topographical analysis were FP1, F3, C3, P3, CB1, FPZ, FZ, CZ, PZ, OZ, FP2, F4, C4, P4, and CB2 (see Appendix B, Figure 2). Topographical effects are only reported below if they interacted significantly with GA. All p-values are reported after Epsilon correction (Huynh-Felt) for repeated measures with greater than one degree of freedom. See Appendix D, Tables 3-5 and Figures 4 and 5, for ANOVA results and graphical representations of the SCP amplitudes.

0-500 ms time region (was/had). No effects of interest were significant.

500-1000 ms time region (verbing/verbed). No effects of interest were significant.

1000-1500 ms time region (the). No effects of interest were significant.

1500-2000 ms time region (noun). There was a main effect of GA, as mean SCP amplitudes were less negative for past perfect (M = 6.93 μV) than imperfective sentence cues (M = 5.18 μV), $F(1,40) = 5.59$, $p < .03$. No other effects of interest were marginal or significant.

2000-2500 ms time region (imagine period). The main effect of GA did not reach significance, $F(1,40) = 2.46$, $p = .13$, but as in the previous region, mean amplitudes were less negative for past perfect ($M = 11.77\ \mu V$) than imperfective sentence cues ($M = 10.11\ \mu V$).

2500-3500 ms time region (imagine period). There was marginally significant main effect of GA, with the mean amplitudes being less negative for past perfect ($M = 11.40\ \mu V$) than imperfective sentence cues ($M = 9.87\ \mu V$), $F(1,40) = 3.87$, $p < .06$. No other effects of interest were marginal or significant.

3500-4500 ms time region (imagine period). There was again a main effect of GA, with the mean amplitudes being less negative for past perfect ($M = 11.13\ \mu V$) than imperfective sentence cues ($M = 10.05\ \mu V$), $F(1,40) = 9.16$, $p < .005$. No other effects of interest were marginal or significant.

4500-5500 ms time region (imagine period). There was a main effect of GA, as the mean amplitudes were less negative for past perfect ($M = 11.16\ \mu V$) than imperfective sentence cues ($M = 9.68\ \mu V$), $F(1,40) = 9.24$, $p < .005$. No other effects of interest were marginal or significant.

5500-6500 ms time region (imagine period). There was a main effect of GA, as the mean amplitudes were less negative for past perfect ($M = 10.37\ \mu V$) than imperfective sentence cues ($M = 9.85\ \mu V$), $F(1,40) = 10.44$, $p < .003$. No other effects of interest were marginal or significant.

Behavioural results.

The behavioural measures were subjected to a 2 GA (imperfective vs. past perfect) X 2 Participant List ANOVA. GA was a within subjects variable and List was between subjects. See

Appendix D, Tables 6 and 7, for a list of the overall means for the different conditions for each of the questions answered and the associated F-values.

Vividness. Vividness of People/Entities was found to be significantly more vivid for imperfective sentence cues ($M = 4.30$) than for past perfect sentence cues ($M = 4.15$), $F(1,40) = 5.58$, $p < .03$. No other effects of vividness were significant (all Fs < 2.5).

Temporal components. The middle component of the accomplishment events was more often imagined for imperfective sentence cues (78.12%) than for past perfect sentence cues (69.5%), $F(1,40) = 7.59$, $p < .01$. Alternatively, the end component was more often imagined for past perfect (42.4%) than imperfective sentence cues (31.26%), $F(1,40) = 14.11$, $p < .002$. No significant result was found for the beginning component, $F < 1.03$.

No other behavioural ratings were found to be significant (difficulty $F < 1$, importance $F < 1$, length of imagined event $F < 1$, first-person perspective $F < 2.5$, third-person perspective $F < 2.4$, both visual perspectives $F < 1$).

Discussion

The results of this experiment were as expected. As seen in the results section, for the majority of the imagined event time (4.5 seconds of the 6.5 seconds recorded) there were less negative SCP results for the past perfect aspect over the imperfective aspect. These results were topographically similar across the head and indicate that it is easier to imagine accomplishment events when worded in the past perfect aspect over the imperfective aspect. This effect is consistent with previous research by Hong et al. (2014), who found similar results with their accomplishments. Importantly, the present research shows that the differences between SCP amplitudes remain after controlling for the transitivity of the accomplishment verbs. These findings also concur with the work of Yap et al. (2009), which found evidence that it takes more

effort to constructing mental representations of events when GA forces an ongoing status (imperfective) to events with natural endpoints (accomplishment), or when GA forces a completion status (perfective) on events without natural endpoints (activities).

It is worth noting that this effect of GA did not occur until the 1500-2000 ms time frame. As it is at the 1500-2000 ms time frame that the noun/object of the sentence is presented (e.g. “fence”), and thus the goal of the accomplishment can be imagined, which results in the influence of GA on imagining the specific event.

The behavioural results indicated that Vividness of People/Entities was found to be more vivid for imperfective than for past perfect cues. Past research by Hong et al. (2014) showed a similar effect, but only in activity verbs and not accomplishment verbs. One possibility for this difference is that the current study employed nouns/objects, and including the goal noun in the sentence cue may have enhanced the impact of GA.

The temporal component results were as expected. Due to the ongoing nature of the imperfective aspect, it was predicted that these event cues would be more likely to elicit imaginations of the middle of events. The results for the past perfect sentence cues also followed the hypothesized expectations. As the past perfect aspect places focus on the completed state of an event it seems natural that when presented with such events participants imagine the end of events more often than for imperfective aspect. This finding has been seen in previous research by Madden and Zwaan (2003), which used the perfective rather than the past perfect aspect, though both focus on the completed component of events.

These findings also coincide with those of Hong et al. (2014), who found that participants imagined the end temporal component more frequently for perfective than imperfective events. However, for accomplishment phrases there were no significant differences in GA for the middle

component. The results of the current study differed because there was an effect of GA on the frequency of imaginations that included the middle component. This effect may also be a result of the addition of an object/noun to the stimuli, which was not used in Hong et al. As the object places more emphasis on the result of the event, the difference between imperfective and past perfect may have become more salient to the participants at the time the stimuli was presented, leading to more focus on the middle component for the imperfective phrases.

Experiment 2

Visual perspective can impact memory, imagined events, and cognitive processing in general. The first-person perspective is that in which individuals see events through their own eyes (e.g., picturing themselves driving a car from the driver perspective). The third-person perspective is that in which individuals see themselves as if they were an observer of the event (e.g., seeing themselves driving a car from the perspective of the passenger). It has been found that almost one-third of autobiographical memories are recalled from the third-person perspective, even though they are, of course, originally experienced from a first-person perspective (Nigro & Neisser, 1983). This assessment is also supported by Fischer and Zwaan's (2008) review of embodied cognition, in which it is proposed that there is a the stark contrast between first-person action coding and third-person perception coding leading to an advantage of first- over third-person narratives.

A study by Macrae et al. (2012) assessed how an imagined sensory experience from different visual perspectives can impact one's perceptions of others. Participants imagined themselves holding either a cup of hot coffee or a cup of iced coffee while talking to a fictitious individual. After the experience they answered several questions on a 7-point Likert scale related to the characteristics of the fictitious individual. These questions were related to psychological

warmth (e.g., generous/ungenerous; happy/unhappy; good-natured/irritable). It was found that an imagined sensory experience of temperature could impact perceptions of others in specific conditions, but was only effective when the imagined event happened from the first-person perspective. In other words, it seems that when they imagined themselves holding a hot beverage, they rated the fictitious individual as having more "warm" traits. However, when they imagined the cold beverage there was no impact (Macrae et al., 2012). Again, this effect was only shown when the event was imagined from a first-person perspective. When asked to imagine themselves from a third-person perspective holding the hot or iced coffee there was no change in valence ratings. This study emphasizes the impact that visual perspective can have on imagined events, and that it can act as a critical factor in the mental representations of events.

In another visual perspective study, conducted by Libby, Valenti, Pfent, and Eibach (2011), participants recalled or imagined personal failures, and the experimenters then compared the reported results of participants with high and low self-esteem on several tests centred on self-concept. Their results demonstrated that asking someone to picture an imaginary event from a third-person perspective impacted how that person felt about the event, based on their individual self-view. Specifically, the individuals with high self-esteem felt less negative emotions in situations where negative emotions are the main focus. Those with low self-esteem indicated that they felt the opposite. However, this result was not seen when the event was imagined from a first-person perspective. This study showed that forcing a visual perspective could prompt people to fall back on their own self-concepts to assist in interpreting the meaning of the event.

Rice and Rubin (2009) found that individuals could experience more than one perspective during memory retrieval. After recalling a series of life events (one each from post-secondary education, high school, middle school, elementary school, and before the first grade) participants

gave a rating as having experienced each memory through either first- or third-person perspective. The scale used was "When remembering the event, do you see the event through your own eyes or as an outside observer?" with responses anchored at "own eyes" and "observer" (1 = own eyes; 7 = observer). Participants were then asked to visualize the same memory, but to switch visual perspectives, and rate on the same perspective scale to indicate whether they had experienced a complete switch, or only a slight alteration. Analysis of these ratings showed that participants could remember events from both perspectives. It was also found that vividness ratings correlated differentially for the two perspectives. First-person ratings were positively correlated with vividness ratings, whereas third-person perspective ratings only correlated with vividness during the "elementary school time period," even though first- and third-person perspective ratings were highly negatively correlated across all five time periods. This would suggest that first- and third-person perspectives should not be considered mutually exclusive of one another, as is often done. These results emphasize the fact that there is still a lot about the factors that influence visual perspective, and how it is processed, that remain unknown. The present thesis adds to this literature by examining how temporal properties associated with verbs interact with visual perspective during imagining when a specific visual perspective is enforced.

Perspective and Grammatical Aspect

Research by Ferretti and Katz (2010) has provided some evidence for the relationship between GA and the perspective people use to recall autobiographical memories. In the first phase of the experiment participants were shown concrete nouns and were asked to recall and record on paper a personal event based on the cue. They were told to use a verb and salient properties of the event in their description. These descriptions were then randomly assigned one

of the three GAs (imperfective, perfective, or past perfect) and were altered accordingly (e.g., imperfective, “I was writing an exam in high school”; perfective, “I wrote an exam in high school”; and past perfect, “I had written an exam in high school”). In the second phase of the experiment participants read the altered versions of the sentences they wrote in the first session and were asked, once more, to recall and write a description of a cue-based, personal event. Results of this study showed that most events were recalled from the first-person perspective, as opposed to third-person perspective, for all three aspectual forms of the sentence cues. When cued with an imperfective aspectual phrase, first-person perspective memories were more salient than when cued with perfective or past perfect aspects. First-person perspective memories were also reported as more vivid than those of the third-person perspectives.

Recent research on perfective activity verbs by Siklos-Whillans et al. (2014) employed a forced perspective imagination task with the addition of a third-person other perspective (e.g., Karen was running) as well as the first-person and third-person self perspectives. Their results demonstrated that third-person other invoked the least negative SCP amplitudes, and therefore indicated that it required less cognitive effort, than both first-person and third-person self perspectives. The first-person perspective was also found to be easier to imagine than third-person self, as was hypothesized (Siklos-Whillans et al., 2014) and complying with previous research (e.g., Fischer & Zwaan, 2008). One possibility for these results is that both first-person and third-person self perspectives require the input and consideration of more knowledge one has about oneself than for the third-person other perspective in which participants are imagining another person. Finally, it is also likely that because people have more experience in seeing others perform actions and seeing from the first-person perspective that these are easier to process and represent in an imagined event relative to the third-person self perspective.

As was previously discussed, research by Hong et al. (2014) found that it is easier to imagine an event with a natural end point (accomplishment) as being completed (perfective), or an event with no natural end point (activity) as ongoing (imperfective), than to imagine the same events as ongoing or completed, respectively. In their second study, they used a force perspective task and observed that imagining imperfective activities from a third-person self perspective takes more cognitive effort than imagining from a first-person perspective. Taken together, the results of Siklos-Whillans et al. (2014) and Hong et al. (2014) show that activities are easier to imagine from a first- than third-person perspective, and that GA had no influence on the ability to imagine from different visual perspectives.

The current experiment built upon the findings of Experiment 1 and previous research (Hong et al., 2014; Siklos-Whillans et al. 2014). As with Experiment 1, the present study used only accomplishment sentence cues that appeared in both imperfective and past perfect aspect. However, this experiment added a forced visual perspective task in which participants were asked to imagine themselves performing the accomplishment event from either a first- or third-person perspective. Thus the present study is the first to examine how visual perspective taking combines with GA to influence the ability of people to imagine events with well-defined endpoints (i.e., accomplishments).

The main predictions for Experiment 2 are partly based on previous research by Hong et al. (2014) and Siklos-Whillans et al. (2014). The authors of that research suggest that there was a first-person imagination advantage for activities because they are naturally ongoing situations, and because people more frequently use first-person perspective to imagine and remember in general (Ferretti & Katz, 2010). Accomplishments have natural endpoints, and thus SCP amplitudes for the first-person perspective may be reduced relative to amplitudes for the third-

person perspective. However, the behavioural results of Experiment 1 demonstrated that people were more likely to employ the first- than third-person perspective when not being cued to take a particular visual perspective. Accordingly, we expect there to still be an advantage in the ease to imagine accomplishments from a first-person than third-person perspective, although we expect the difference between perspectives to be reduced because accomplishments have well-defined endpoints.

As discussed above, the combined results of Hong et al. (2014) and Siklos-Whillans et al. (2014) demonstrated that GA did not influence the ease of imagining activities from first- or third-person self perspectives (Hong et al., 2014; Siklos-Whillans et al., 2014). It is important to note, however, that this finding is based on findings across two different experiments with different participants. The present experiment manipulated GA in a within subjects design. If it is the case that GA does not influence the ability to imagine from different visual perspectives, then we would not expect differences in amplitudes between first- and third-person perspective as a function of GA.

Method

Participants.

Sixty participants (17 males, 43 females) from Wilfrid Laurier University and the surrounding area with ages ranging from 17 to 51 (mean age 20.83) took part in the study. They received either course credit or monetary compensation ($22) for their participation. All participants were right-handed, native English speakers who had normal, or corrected-to-normal, vision.

Materials.

The materials used were the same as those used for Experiment 1 with exception of the behavioural measures questionnaire. The behavioural questionnaire was similar to that used in Experiment 1 except the indication as to which visual perspective was taken during the imagined event was removed (see Appendix C, Figure 3). This was to ensure participants used the visual perspective that was instructed, and to not make it appear as though it was optional.

Procedure.

The procedure was also the same used for Experiment 1, with a few alterations (see Appendix C). After the “Ready?” prompt, the participants were given the perspective on the screen that they were to employ during the trail (i.e. "From my eyes" / "Looking at self"). When they felt that they were prepared to adopt the proper perspective, the participant would then press a button, which proceeded to the first fixation point (+).

Results

EEG results.

All processes performed on the EEG data in Experiment 1 were repeated for the data of Experiment 2, including the time regions analyzed.

The mean amplitudes for each temporal region were subjected to a 2 Grammatical Aspect (imperfective vs. past perfect) X 2 Perspective (first-person vs. third-person) X 5 Anteriority (prefrontal vs. frontal vs. central vs. parietal vs. occipital) X 3 Laterality (left medial vs. medial vs. right medial) x 2 Participant List (list 1 vs. list 2). The electrodes examined were FP1, F3, C3, P3, CB1, FPZ, FZ, CZ, PZ, OZ, FP2, F4, C4, P4, and CB2 (see Appendix B, Figure 2). All variables were within subject except for Participant List. Topographical effects are only reported below if they interacted significantly with GA or Perspective. All p-values are reported after

Epsilon correction (Huynh-Felt) for repeated measures with greater than one degree of freedom. See Appendix E, Tables 8-10 and Figures 6-8, for ANOVA results and graphical representations of SCP amplitudes.

0-500 ms time region (was/had). There were no significant effects in this region for the variables of interest.

500-1000 ms time region (verbing/verbed). The four-way interaction between GA X Perspective X Anteriority X Laterality was significant, $F(8,464) = 2.32$, $p < .02$. Visual inspection of the pattern of amplitudes over the different electrode locations suggests that imagining from the first-person perspective for imperfective sentence cues elicited less negative amplitudes than for third-person perspective over most electrode sites, and that this difference was maximal over frontal and central medial locations. Alternatively, the difference between first- and third-person sentence cues was smaller over the same electrode locations for past perfect sentence cues in general, and the size of the difference was similar over all head locations.

No other effects of interest were marginal or significant.

1000-1500 ms time region (the). There was a significant main effect of perspective, $F(1,58) = 4.77$, $p < .04$, with the mean amplitude of third-person perspective ($M = 3.50\ \mu V$) being less negative than first-person perspective ($M = 3.27\ \mu V$). No other effects of interest were marginal or significant.

1500-2000 ms time region (noun). There was a significant main effect of perspective, $F(1,58) = 4.46$, $p < .04$, with the mean amplitude of third-person perspective ($M = 4.69\ \mu V$) being less negative than first-person perspective ($M = 4.65\ \mu V$). No other effects of interest were marginal or significant.

2000-2500 ms time region (imagine period). There was a significant main effect of perspective $F(1,58) = 5.44$, $p < .03$, with the mean amplitude of third-person perspective (M = 8.30 μV) being less negative than first-person perspective (M = 8.22 μV). No other effects of interest were marginal or significant.

2500-3500 ms time region (imagine period). There was a marginally significant main effect of perspective, $F(1,58) = 3.77$, $p < .06$, with the mean amplitude of third-person perspective (M = 7.99 μV) being less negative than first-person perspective (M = 7.46 μV). No other effects of interest were marginal or significant.

3500-4500 ms time region (imagine period). There was a marginal main effect of perspective, $F(1,58) = 2.98$, $p < .09$, with the mean amplitude of third-person perspective (M = 7.76 μV) being less negative than first-person perspective (M = 6.97 μV). No other effects of interest were marginal or significant.

4500-5500 ms time region (imagine period). There was a marginal main effect of perspective, $F(1,58) = 3.18$, $p < .08$, with the mean amplitude of third-person perspective (M = 7.02 μV) being less negative than first-person perspective (M = 6.23 μV). No other effects of interest were marginal or significant.

5500-6500 ms time region (imagine period). There was a marginal main effect of perspective, $F(1,58) = 3.00$, $p < .09$, with the mean amplitude of third-person perspective (M = 6.53 μV) being less negative than first-person perspective (M = 5.64 μV). No other effects of interest were marginal or significant.

Behavioural results.

The behavioural data was analyzed with a 2 GA (imperfective vs. past perfect) X 2 Perspective (first-person vs. third-person) X 2 Participant List ANOVA. Both GA and

Perspective were within-subject variables. See Appendix E, Tables 11 and 12, for a list of the overall means for the different conditions for each of the questions answered and the associated F-values. Paired samples t-tests were performed to compare each of the behavioural measures by first- vs. third-person for imperfective and past perfect sentence cues separately. See Appendix E, Tables 13 and 14 for the t-scores.

Vividness. The main effect of GA for vividness of people/entities was marginally significant, $F(1,56) = 3.05$, $p < .09$, with imperfective sentence cues ($M = 4.11$) leading to higher ratings than for past perfect sentence cues ($M = 4.03$). Paired t-tests demonstrated that, for imperfective sentence cues, vividness ratings for third-person perspective ($M = 4.33$) were significantly higher than ratings for first-person perspective ($M = 3.88$), $t(59) = -2.79$, $p < .008$. Similarly, for past perfect sentence cues, vividness ratings for third-person perspective ($M = 3.71$) were higher than for first-person perspective ($M = 4.34$), $t(59) = -4.32$, $p < .001$. The GA X Perspective interaction was not significant.

The main effect of GA for vividness of objects was significant, $F(1,56) = 5.41$, $p < .03$. Imperfective sentence cues ($M = 4.98$) produced more vivid ratings than past perfect sentence cues ($M = 4.88$). Paired t-tests demonstrated that, for imperfective sentence cues, vividness ratings for first-person perspective ($M = 5.11$) were significantly higher than ratings for third-person perspective ($M = 4.85$), $t(59) = 3.27$, $p < .003$. Similarly, for past perfect sentence cues, vividness ratings for first-person perspective ($M = 4.99$) were higher than for third-person perspective ($M = 4.76$), $t(59) = 3.09$, $p < .004$. The GA X Perspective interaction was not significant.

The main effect of GA for location vividness was also marginally significant, $F(1,56) = 2.83$, $p < .1$, and followed the continued pattern of imperfective sentence cues ($M = 4.59$)

eliciting higher vividness ratings than past perfect sentence cues ($M = 4.5$). No other effects for vividness of location were marginal or significant.

Temporal components. Participants indicated they imagined the middle temporal component of the accomplishment events more often for imperfective sentence cues (75.26%) than for past perfect sentence cues (55.38%), $F(1,56) = 46.85$, $p < .001$. Paired t-tests for past perfect sentence cues demonstrated a marginally significant difference in middle component for first-person (53.51%) and third-person perspective (57.25%), $t(59) = -1.91$, $p < .07$. In contrast, perspective did not have an impact for imperfective sentence cues ($t < .02$). The interaction between GA and Perspective was also not significant.

Participants indicated they imagined the end temporal component of the accomplishment events more often for past perfect sentence cues (51.41%) than for imperfective sentence cues (25.55%), $F(1,56) = 48.64$, $p < .001$. No other effects were marginal or significant for the end and the beginning temporal components.

Importance. Participants rated events described imagined from the first-person perspective ($M = 3.54$) as having more real life importance than events imagined from the third-person perspective ($M = 3.38$), $F(1,56) = 5.83$, $p < .02$. Paired t-tests showed that for imperfective sentence cues, first-person perspective ($M = 3.51$) led to higher importance ratings than for third-person perspective ($M = 3.34$), $t(59) = 2.24$, $p < .03$. Similarly there was a marginally significant difference between first-person perspective ($M = 3.51$) and third-person perspective ($M = 3.34$) for past perfect sentence cues, $t(59) = 1.91$, $p < .07$.

Length of event. There were no marginal or significant effects for ratings of the perceived length of the imagined accomplishment events.

Discussion

The SCP results seen in this study make it clear that forcing a specific visual perspective influenced the ease of imagining accomplishments. Specifically, it was found that third-person perspective was easier to imagine than first-person perspective. These results were topographically similar across the head. Recall that past research has shown that it is easier to imagine activities from a first- over third- person perspective, which is suggested to be due to the natural ongoing nature of activities (Hong et al., 2014; Siklos-Whillans et al., 2014). We hypothesized that this advantage would be reduced for accomplishments as these events have well-defined end points. However, the present findings are surprising none-the-less because participants in Experiment 1 had indicated they used first-person perspective more frequently when imagining accomplishment events when not explicitly instructed to take a specific perspective.

A second key finding was the fact that GA did not influence the ease in which participants imagined accomplishments from the different visual perspectives. This finding is consistent with the research of Hong et al. (2014) and Siklos-Whillans et al. (2014) that shows GA had no influence on the ease of imagining activities from different visual perspectives. These results in conjunction with the present results suggest that visual perspective has a much stronger influence on the ease of imagining events than GA in general.

The behavioural measures showed that for imperfective sentence cues vividness of people/entities, objects, and location were all rated as more vivid than for past perfect sentence cues, which is consistent with the findings of Hong et al. (2014) and Ferretti and Katz (2010). Our results also revealed that visual perspective had an influence on vividness as well. Specifically, in the current study the vividness of people/entities was higher for third-person

perspective over first-person perspective, and this was true regardless of the GA of the sentence cues. These findings are also consistent with those of Hong et al. (2014) and Siklos-Whillans et al. (2014), who also found that third-person perspective was associated with higher people/entity vividness ratings than first-person perspective. A simple explanation of this consistent finding is that when participants use first-person perspective, they may not be looking at a person in the imagined events and so vividness is rated lower than when the participants are forced to look at themselves, as with the third-person perspective.

In contrast to people/entities, the vividness of objects was rated as higher for first-person over third-person perspective, for both past perfect and imperfective sentence cues. Unlike for people/entity vividness, objects are "viewed" when imagining from both a first- and third-person perspective and, importantly, first-person perspective should lead to more "viewing" of the object than a third-person perspective in which the self and object are viewed together.

The current results also showed that the middle temporal component was imagined most frequently to imperfective sentence cues, whereas the end temporal component was imagined more frequently for past perfect sentence cues. These results were as hypothesized and agreed with both Experiment 1 and other past research (e.g., Madden & Zwaan, 2003). For the middle temporal component there was also differences between past perfect first-person and past perfect third-person sentence cues, with middle component being imagined more often when the third-person perspective was used than when it was when imagined from first-person perspective. However, this difference was not seen between imperfective first-person and imperfective third-person for middle temporal component. This finding indicates that visual perspective has an influence on the middle temporal component, but only when using the past perfect phrasing. This

may be because when presented with imperfective phrasing the ongoing nature of the event is very salient, and therefore perspective does not have influence the temporal component.

Imagined events were rated as more important when they were imagined from a first-person perspective compared to a third-person perspective. There was also an effect of importance ratings between imperfective first-person and imperfective third-person, with higher importance ratings for first-person, and a slight difference of importance between perfect first-person and perfect third-person, again with higher ratings of importance for first-person perspective. Participants may have rated importance as higher during first-person perspective as the event seemed inherently more impactful to them, as they were experiencing it first-hand, rather than from an outsider perspective.

General Discussion

Overall, the current research examined the relationship between GA (imperfective versus past perfect) and accomplishment verbs on event imagining, and also examined the effect of adding a forced visual perspective on this imagination process. In order to further our understanding of this relationship, EEGs were recorded from the scalp and SCPs were observed as a measure of cognitive processing of the imagination period, and behavioural measure questionnaires were acquired for each trial. It was hypothesized in Experiment 1 that the imperfective sentence cues would result in more negative SCP amplitudes than for past perfect sentence cues, indicating that imagining ongoing accomplishments required more cognitive effort than imagining completed accomplishments. The results were consistent with this hypothesis. Experiment 2 built on the results of Experiment 1, and hypothesized that it would be easier to imagine accomplishments from a first- than third-person perspective, but less so than in previous work (Hong et al., 2014; Siklos-Whillans et al., 2014). It was also hypothesized that there would not be differences in amplitudes between first- and third-person perspective as a function of GA. Although GA did not influence the difficulty of imagining from first- and third-person perspective, the SCP results demonstrated that it was easier to imagine accomplishments from a third- over a first-person perspective.

Experiment 1

The SCP results of Experiment 1 were consistent with the hypothesized outcome, and built upon the past work of Hong et al. (2014) that showed that accomplishments are easier to imagine as completed than as ongoing. Importantly, unlike Hong et al., the current research included accomplishment sentence cues that contained direct objects. Thus, the current research rules out variability in SCPs that may be due to imagining events denoted by transitive verbs placed in

cues with intransitive structure (e.g., I was building vs. I was building the fence). The current findings are also consistent with the picture-selection results of Yap et al. (2009), that showed that people are faster to select pictures that correspond completed accomplishment events following perfective auditory sentences than imperfective auditory sentences. These results strongly suggest that imagining events is easier when the inherent temporal properties of the events are consistent with the ongoing or completion status afforded by GA.

The temporal component results of this experiment demonstrated clearly that GA had the expected temporal focusing properties as found in previous research (Becker et al., 2013; Hong et al., 2014; Madden & Zwaan, 2003; Magliano & Schleich, 2000). Specifically, imperfective sentence cues led to more frequent imaginations of the middle temporal component, whereas past perfect sentence cues led to more frequent imaginations of the end temporal component.

Finally, the only influence of GA on the behavioural measures was on vividness ratings of the people/entities in the imagined events. Specifically, participants rated vividness higher for people/entities imagined in response to imperfective than past perfect sentence cues. This increase in vividness for imperfective aspect has also been found in previous research (Ferretti & Katz, 2010; Hong et al., 2014; Siklos-Whillans et al., 2014).

Experiment 2

The methodology of Experiment 2 was very similar to that of both Hong et al. (2014) and Siklos-Whillans et al. (2014) and it therefore extends upon the line of research. Hong et al. (2014) examined both activity and accomplishment verbs and Siklos-Whillans et al. (2014) focused solely on activity verbs. The current study continues this path by examining accomplishment verbs that were paired with direct objects to control for transitivity issues associated with Hong et al. (2014). The present study also contained a forced perspective task,

and thus extends previous research on perspective taking and event representation by focusing on events that are goal oriented and bound with natural and temporal endpoints.

As past research in the field has shown that it is easier to imagine using first- than third-person perspective with activities (i.e., Hong et al., 2014; Siklos-Whillans et al., 2014) we hypothesized both similar but slightly different results for Experiment 2. Previous researchers suggest that first-person perspective may be easier for activity verbs because they denote naturally ongoing events, which is most consistent with a first-person perspective (i.e., because that is how people usually experience real events). However, it was expected that this effect would be less pronounced than in the past, as accomplishment verbs have well-defined temporal endpoints. Once an accomplishment's goal is obtained, the result is a "state" which is a static representation. The SCP amplitudes in Experiment 2 showed that third-person perspective was easier than first-person to imagine in general. Therefore, it could be that accomplishments are imagined as more of a snapshot of the completed state, rather than as the continued action of activities, and thus making it easier to perceive the event from a third-person perspective.

In an fMRI study, Eich, Nelson, Leghari, and Handy (2009) found similar results in an autobiographical memory task, which showed that participants rated it to be easier to maintain a third- than first-person perspective when recalling personal events. One week before the fMRI scanning participants performed complex physical tasks. During the scan they recalled each of these tasks from the first- or third-person perspective, and then once more from either the same, or opposite, perspective. Participants then reported the events they recalled and rated how successful they had been at maintaining the cued perspective. The results showed that while they were able to maintain both visual perspectives adequately, the third-person perspective was rated as being easier to maintain than the first-person perspective. Their fMRI results also showed that

retrieving autobiographical memories using a third-person perspective appeared to decrease activity in the bilateral insula and left somato-motor cortex, both of which are associated with the physical, or "somatic", self. This indicates that first-person perspective memories hold a higher degree of somatosensory involvement than third-person perspective memories. Although the present study did not examine autobiographical memory retrieval, it is still possible that, at least for imagined accomplishment events, there is a third-person advantage because somatosensory information may not be as salient as with the first-person perspective.

The EEG results of Experiment 2 also showed no effect of GA on SCP amplitudes, a finding that is consistent with past research that examined activities (Hong et al., 2014; Siklos-Whillans et al., 2014). These results are surprising, given that GA was shown in those studies, and Experiment 1, to have a significant impact on SCP amplitudes when participants are not cued to take any visual perspective. The lack of evidence for the influence of GA when people are forced to take perspectives suggest that visual perspective is a much stronger constraint than GA on imagining events.

However, unlike the Experiment 2 SCP results, the behavioural results did demonstrate that GA had expected impacts on the imagined events. For example, the temporal component results indicated that when imagining ongoing events (imperfective) participants more frequently imagined the middle of the event, rather than the beginning or the end. Alternatively, when imagining a completed event (past perfect) they indicated they more frequently imagined the end component of the accomplishment events. These temporal focusing results for GA are consistent with a number of previous studies (Ferretti & Katz, 2010; Hong et al., 2014; Madden & Zwaan, 2003; Magliano & Schleich, 2000; Yap et al., 2009), and show that although GA did not have an

influence on SCP amplitudes in Experiment 2, it did influence how people temporally referenced the events while imagining.

Other behavioural measures for Experiment 2 also provided evidence for a relationship between GA and vividness ratings. Specifically, imperfective aspect led to higher ratings for the vividness of people/entities, objects, and locations in the imagined events. This finding was found in Experiment 1, and in research by Hong et al. (2014), and as such does not appear to be influenced by whether participants are forced to take a specific visual perspective.

The results also showed that object vividness was higher from a first-person over third-person perspective. As it is generally predicted for first-person to be more vivid than third-person imagined events (i.e. Macrae et al., 2012), this is an expected outcome. Since an object/noun was added to the stimuli sentence of this study it likely helped increase the object vividness specifically, by giving participants a very specific focal point. This finding adds to the work of Hong et al. (2014), which found a higher rating in vividness of touch, taste, people, and locations for first-person perspective over third-person. Past work has shown that more important events tend to elicit more vivid event recollections (Conway & Pleydell-Pearce, 2000). The higher ratings of importance for past first-person perspective in Experiment 2 may be due to this previously discussed increase in vividness.

Conclusion

Together, these experiments investigated how GA and visual perspective interact with accomplishment verbs in imagining events. SCP amplitudes were used as an index of the cognitive effort that is taking place during the imagination process. The results indicate that both GA and visual perspective influence the ease/difficulty of imagining accomplishment events,

although our results clearly show that visual perspective has a much more dominant influence when both constraints are available to influence imagining.

This study presents novel data on how the lexical aspect of a verb can have an impact on the effect of forced visual perspectives in imagined events, and therefore has extended on the previous research on grammatical/lexical aspect in combination with visual perspective. It also extends upon other past work on visual perspective (i.e. Macrae et al., 2012; Rice & Rubin, 2009) that had not examined the impact of temporal information associated with verbs.

Future directions of this research may work toward a direct comparison of both accomplishment and activity verbs in one forced visual perspective study so as to directly contrast lexical aspect effects. As well, since this is the only study thus far to directly examine the effects of this forced visual perspective task on accomplishment verbs, more studies of accomplishment verbs and perspective could be of importance in future work.

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Appendices

Appendix A

Table 1
Verb and noun pairings (practice trials bolded) in order presented during the study (top to bottom).

sculpt	**statue**		sketch	map		repair	dishwasher
stuff	**turkey**		tie	shoelace		fry	egg
clear	**desk**		mend	jacket		fix	hinge
sew	**pants**		read	obituary		alter	hemline
wax	van		deliver	package		paint	door
arrange	furniture		wash	dish		make	dinner
rinse	broccoli		sweep	garage		examine	tire
shovel	driveway		mow	lawn		dig	hole
photocopy	report		inflate	ball		lace	sneaker
construct	kite		polish	car		assemble	table
present	project		dye	hair		design	deck
trim	hedge		dress	baby		vacuum	carpet
cook	steak		bend	straw		bake	pie
program	computer		grill	fish		carve	ham
empty	garbage		secure	trailer		draw	barn
record	movie		renovate	basement		plant	tree
build	fence		organize	closet		dust	shelf
count	coins		develop	photograph		run	marathon
harvest	corn		knit	scarf		chop	carrot
drink	juice		evacuate	building		trace	pattern
climb	hill		calculate	tax		boil	noodles
fill	tub		devour	meal		cross	intersection
clean	counter		rescue	cat		prepare	breakfast
learn	rhyme		compose	email		recite	poem
pack	suitcase		eat	sandwich		shred	exam
blend	milkshake		chug	beer		load	truck
pour	wine		rake	yard		fold	shirt
transport	cargo		file	document		wrap	gift

Table 2

Experiment 1 Verb Frequencies Paired t-tests (Imperfective vs. Past Perfect).

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Imperfective – Past Perfect	-76137762.5	648968931.3	72556932.28	-220558723.6	68283198.62	-1.049	79	0.297

Appendix B

Experiment 1 Materials

Rate how vivid the people/entities were. 1 (not at all) to 7 (very much)	_____	Rate how vivid the objects were. 1 (not at all) to 7 (very much)	_____
Rate how vivid the location was. 1 (not at all) to 7 (very much)	_____	Rate how difficult it was to imagine the event. 1 (not at all) to 7 (very much)	_____
Which components of the event did you imagine? (Circle all that apply)	Beginning	Middle	End
How long would the imagined event take if it actually occurred?	_____	Rate how important the imagined event would be if it actually occurred (1-7):	_____
Imagined Event Cue:	_____	Perspective of imagined event:	Looking from my eyes ❍ Looking at self ❍

Figure 1. Experiment 1 Behavioural Questionnaire

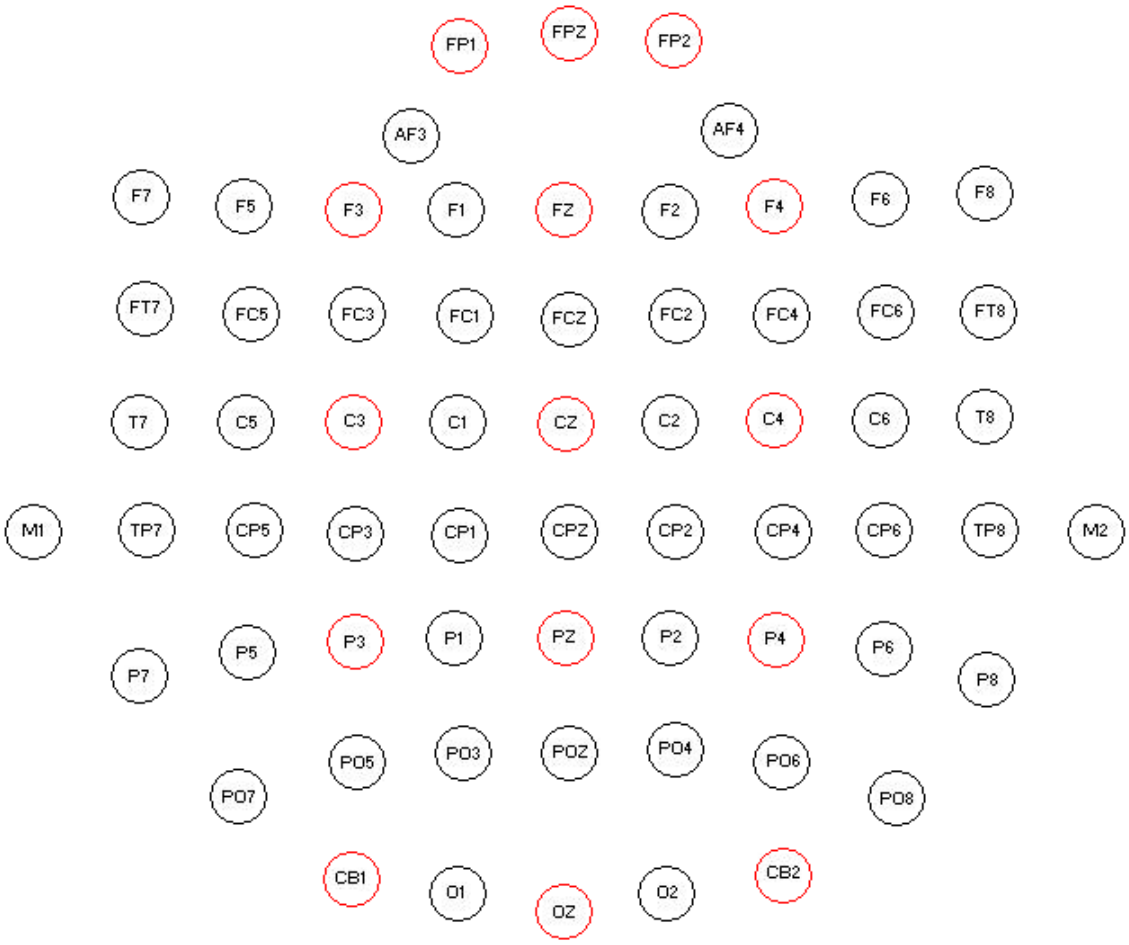

Figure 2. Topographical Electrode Map. The electrodes used for analysis in the current research are indicated in red (FP1, F3, C3, P3, CB1, FPZ, FZ, CZ, PZ, OZ, FP2, F4, C4, P4, and CB2). The top of the image aligns with the front of the head.

Experiment 1 Stimulus Timing.

Two examples of the stimulus timing presentation for imperfective (left) and past perfect (right) aspect.

Ready?	**Prompt**
+	2000ms
	500ms
I	300ms
	200ms
was	300ms
	200ms
building	300ms
	200ms
the	300ms
	200ms
fence	300ms
	700ms
+	4000ms
Record answers now	**Prompt**

Ready?	**Prompt**
+	2000ms
	500ms
I	300ms
	200ms
had	300ms
	200ms
built	300ms
	200ms
the	300ms
	200ms
fence	300ms
	700ms
+	4000ms
Record answers now	**Prompt**

Appendix C

Experiment 2 Materials

Rate how vivid the people/entities were. 1 (not at all) to 7 (very much)	_____	Rate how vivid the objects were. 1 (not at all) to 7 (very much)	_____
Rate how vivid the location was. 1 (not at all) to 7 (very much)	_____	Rate how difficult it was to imagine the event. 1 (not at all) to 7 (very much)	_____
Which components of the event did you imagine? (Circle all that apply)	Beginning	Middle	End
How long would the imagined event take if it actually occurred?	_____	Rate how important the imagined event would be if it actually occurred (1-7):	_____
Imagined Event Cue:	_____		

Figure 3. Experiment 2 Behavioural Questionnaire

Experiment 2 Stimulus Timing.

Two examples of the stimulus timing presentation for imperfective (left) and past perfect (right) aspect.

Ready?	**Prompt**
From my eyes	**Prompt**
+	2000ms
	500ms
I	300ms
	200ms
was	300ms
	200ms
building	300ms
	200ms
the	300ms
	200ms
fence	300ms
	700ms
+	4000ms
Record answers now	**Prompt**

Ready?	**Prompt**
Looking at self	**Prompt**
+	2000ms
	500ms
I	300ms
	200ms
had	300ms
	200ms
built	300ms
	200ms
the	300ms
	200ms
fence	300ms
	700ms
+	4000ms
Record answers now	**Prompt**

Appendix D

Experiment 1 Results

Table 3
Experiment 1 SCP Results ANOVA (0-1500 ms)

Effect	**0-500 ms**	**500-1000 ms**	**1000-1500 ms**
GA	$F<1$	$F(1,40)=1.76$	$F<1$
Anteriority	$F<1$	$F<1$	$F<1$
Laterality	$F<1$	$F<1$	$F<1$
GA × Anteriority	$F(4,160)=1.91$	$F<1$	$F(4,160)=1.36$
GA × Laterality	$F<1$	$F<1$	$F<1$
Laterality × Anteriority	$F(8,320)=1.86$	$F<1$	$F(8,320)=1.84$
GA × Anteriority × Laterality	$F<1$	$F<1$	$F<1$

*p< .05, **p<.01, ***p<.005,****p<.001, *****p<.0005, †.05<p>.10

Table 4

Experiment 1 SCP Results ANOVA (1500-3500 ms)

Effect	**1500-2000 ms**	**2000-2500 ms**	**2500-3500 ms**
GA	$F(1,40)=5.59$*	$F(1,40)=2.46$	$F(1,40)=3.87$†
Anteriority	$F<1$	$F<1$	$F<1$
Laterality	$F<1$	$F(2,80)=1.27$	$F(2,80)=1.10$
GA × Anteriority	$F(4,160)=1.17$	$F(4,160)=1.46$	$F(4,160)=1.21$
GA × Laterality	$F<1$	$F<1$	$F<1$
Laterality × Anteriority	$F(8,320)=1.92$	$F(8,320)=1.66$	$F(8,320)=1.53$
GA × Anteriority × Laterality	$F<1$	$F<1$	$F<1$

*$p<.05$, **$p<.01$, ***$p<.005$,****$p<.001$, *****$p<.0005$, †$.05<p>.10$

Table 5
Experiment 1 SCP Results ANOVA (3500-6500 ms)

Effect	**3500-4500 ms**	**4500-5500 ms**	**5500-6500 ms**
GA	$F(1,40)=9.12$***	$F(1,40)=9.24$***	$F(1,40)=10.44$***
Anteriority	$F<1$	$F<1$	$F<1$
Laterality	$F(2,80)=1.02$	$F(2,80)=1.24$	$F(2,80)=1.62$
GA × Anteriority	$F(4,160)=1.43$	$F(4,160)=1.10$	$F(4,160)=1.03$
GA × Laterality	$F(2,80)=1.04$	$F<1$	$F<1$
Laterality × Anteriority	$F(8,320)=1.38$	$F(8,320)=1.44$	$F(8,320)=1.31$
GA × Anteriority × Laterality	$F<1$	$F<1$	$F<1$

*p< .05, **p<.01, ***p<.005,****p<.001, *****p<.0005, †.05<p>.10

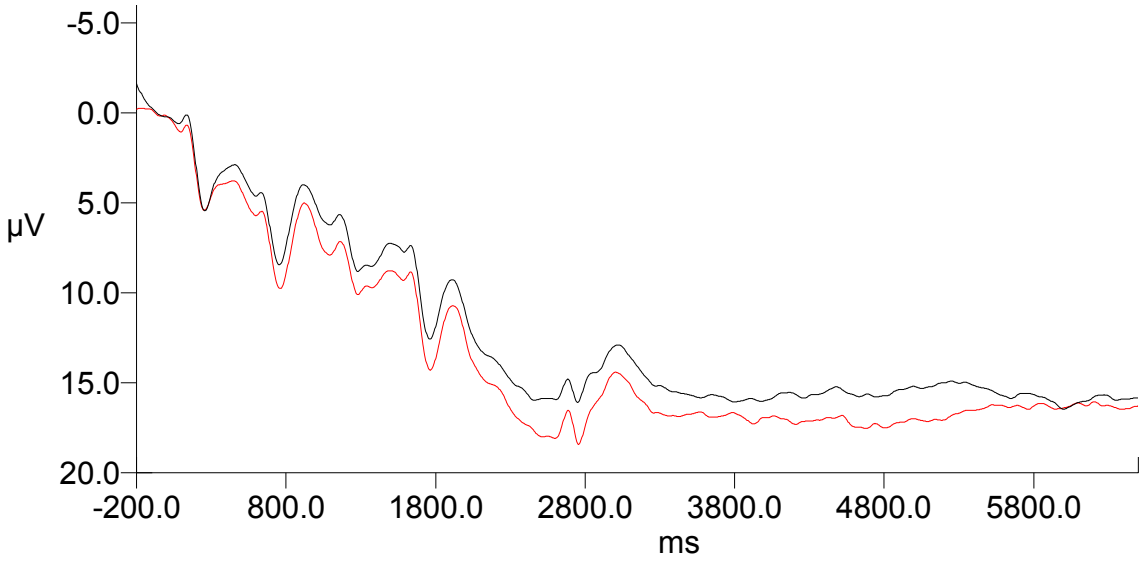

Figure 4. Experiment 1 SCP amplitudes at FPZ electrode. Black is imperfective aspect and red is past perfect aspect.

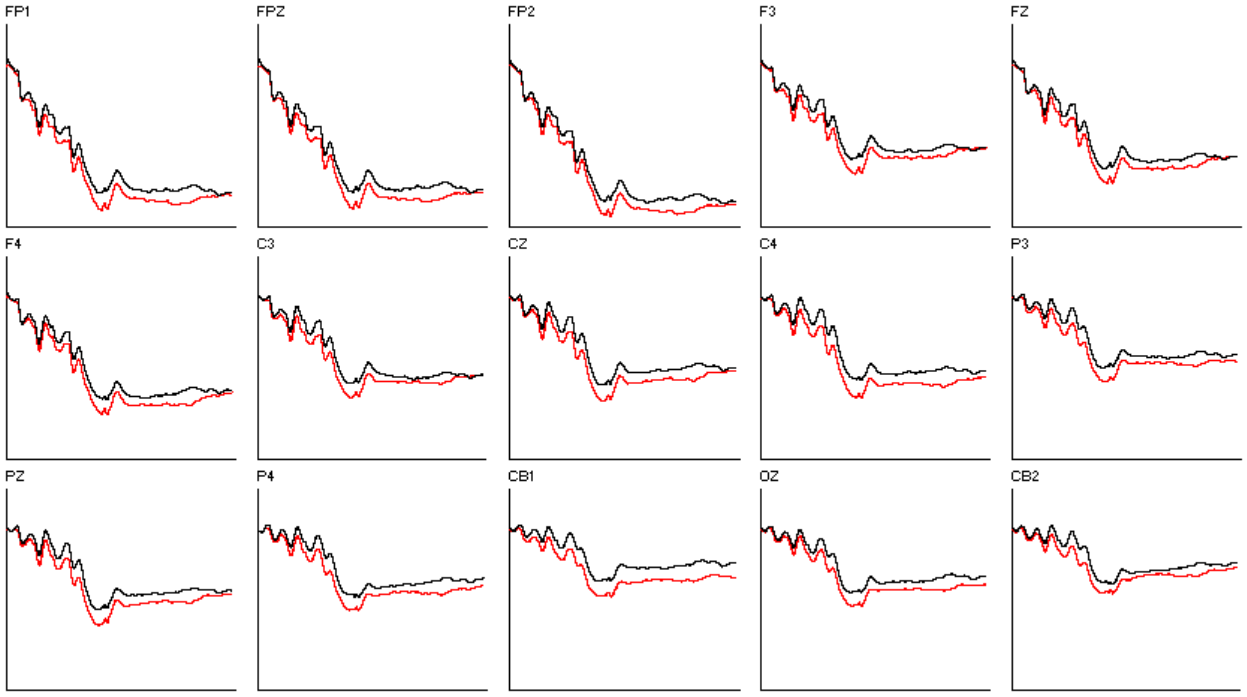

Figure 5. Experiment 1 SCP amplitudes at all electrodes analyzed. Black is imperfective aspect and red is past perfect aspect. Y-axis scale is 20 μV to -5 μV. X-axis is -200.0 ms to 5800.0 ms. For topographical locations of electrodes refer to Figure 2.

Table 6
Experiment 1 Behavioural Means

Measure	Imperfective	Past Perfect
Vividness of People/Entities (1-7)	4.30	4.15
Vividness of Objects (1-7)	5.09	5.03
Vividness of Location (1-7)	4.58	4.47
Difficulty Level (1-7)	2.57	2.61
Beginning	0.42	0.40
Middle	0.78	0.70
End	0.31	0.42
Importance of Event (1-7)	3.43	3.41
Length of Event (seconds)	394983.26	589320.44
First-Person Perspective	0.57	0.59
Third-Person Perspective	0.44	0.42

Table 7
Experiment 1 Behavioural Results ANOVA

Measure	GA
Vividness of People/Entities (1-7)	$F(1,40)=5.58$*
Vividness of Objects (1-7)	$F<1$
Vividness of Location (1-7)	$F(1,40)=2.43$
Difficulty Level (1-7)	$F<1$
Beginning	$F(1,40)=1.02$
Middle	$F(1,40)=7.59$**
End	$F(1,40)=14.11$****
Importance of Event (1-7)	$F<1$
Length of Event (seconds)	$F<1$
First-Person Perspective	$F(1,40)=2.48$
Third-Person Perspective	$F(1,40)=2.32$

*$p<.05$, **$p<.01$, ***$p<.005$,****$p<.001$, *****$p<.0005$, †$.05<p>.10$

Appendix E

Experiment 2 Results

Table 8
Experiment 2 SCP Results ANOVA (0-1500 ms)

Effect	**0-500 ms**	**500-1000 ms**	**1000-1500 ms**
GA	$F(1,58)=1.64$	$F<1$	$F<1$
Perspective	$F(1,58)=1.73$	$F(1,58)=2.03$	$F(1,58)=4.77$*
Anteriority	$F(4,232)=8.80$*****	$F(4,232)=15.11$*****	$F(4,232)=11.46$*****
Laterality	$F(2,116)=2.33$	$F(2,116)=2.00$	$F(2,116)=1.97$
GA × Perspective	$F<1$	$F<1$	$F<1$
GA × Anteriority	$F<1$	$F<1$	$F<1$
GA × Laterality	$F(2,116)=1.04$	$F<1$	$F(2,116)=1.59$
Laterality × Anteriority	$F(8,464)=1.92$†	$F(8,464)=1.99$†	$F(8,464)=1.32$
Perspective × Anteriority	$F(4,232)=1.01$	$F<1$	$F(4,232)=2.12$
Perspective × Laterality	$F(2,116)=2.24$	$F(2,116)=1.85$	$F<1$
GA × Perspective × Anteriority	$F<1$	$F<1$	$F<1$
GA × Perspective × Laterality	$F<1$	$F<1$	$F(2,116)=1.59$
GA × Anteriority × Laterality	$F<1$	$F<1$	$F<1$
Perspective × Anteriority × Laterality	$F<1$	$F<1$	$F<1$
GA × Perspective × Anteriority × Laterality	$F(8,464)=1.94$†	$F(8,464)=2.32$*	$F(8,464)=2.09$†

*p< .05, **p<.01, ***p<.005,****p<.001, *****p<.0005, †.05<p>.10

Table 9
Experiment 2 SCP Results ANOVA (1500-3500 ms)

Effect	**1500-2000 ms**	**2000-2500 ms**	**2500-3500 ms**
GA	$F<1$	$F<1$	$F<1$
Perspective	$F(1,58)=4.46$*	$F(1,58)=5.44$*	$F(1,58)=3.77$†
Anteriority	$F(4,232)=12.60$*****	$F(4,232)=12.57$*****	$F(4,232)=10.60$*****
Laterality	$F(2,116)=1.40$	$F(2,116)=1.56$	$F<1$
GA × Perspective	$F<1$	$F<1$	$F<1$
GA × Anteriority	$F<1$	$F<1$	$F<1$
GA × Laterality	$F<1$	$F(2,116)=1.29$	$F(2,116)=1.22$
Laterality × Anteriority	$F(8,464)=1.26$	$F(8,464)=1.45$	$F(8,464)=1.38$
Perspective × Anteriority	$F<1$	$F<1$	$F<1$
Perspective × Laterality	$F<1$	$F<1$	$F<1$
GA × Perspective × Anteriority	$F<1$	$F<1$	$F<1$
GA × Perspective × Laterality	$F(2,116)=1.52$	$F(2,116)=1.61$	$F(2,116)=1.62$
GA × Anteriority × Laterality	$F<1$	$F<1$	$F<1$
Perspective × Anteriority × Laterality	$F<1$	$F<1$	$F(8,464)=1.06$
GA × Perspective × Anteriority × Laterality	$F(8,464)=1.69$	$F<1$	$F(8,464)=1.29$

*$p<.05$, **$p<.01$, ***$p<.005$,****$p<.001$, *****$p<.0005$, †$.05<p>.10$

Table 10

Experiment 2 SCP Results ANOVA (3500-6500 ms)

Effect	**3500-4500 ms**	**4500-5500 ms**	**5500-6500 ms**
GA	$F<1$	$F<1$	$F<1$
Perspective	$F(1,58)=2.98$†	$F(1,58)=3.18$†	$F(1,58)=3.00$†
Anteriority	$F(4,232)=10.51$*****	$F(4,232)=9.13$*****	$F(4,232)=8.06$*****
Laterality	$F<1$	$F<1$	$F<1$
GA × Perspective	$F<1$	$F<1$	$F<1$
GA × Anteriority	$F<1$	$F(4,232)=1.32$	$F<1$
GA × Laterality	$F<1$	$F(2,116)=1.04$	$F<1$
Laterality × Anteriority	$F(8,464)=1.28$	$F(8,464)=1.11$	$F<1$
Perspective × Anteriority	$F<1$	$F<1$	$F<1$
Perspective × Laterality	$F<1$	$F<1$	$F<1$
GA × Perspective × Anteriority	$F<1$	$F<1$	$F(4,232)=1.03$
GA × Perspective × Laterality	$F(2,116)=1.00$	$F<1$	$F<1$
GA × Anteriority × Laterality	$F<1$	$F<1$	$F<1$
Perspective × Anteriority × Laterality	$F(8,464)=1.12$	$F(8,464)=1.05$	$F(8,464)=1.08$
GA × Perspective × Anteriority × Laterality	$F(8,464)=1.31$	$F(8,464)=1.34$	$F(8,464)=1.38$

*$p<.05$, **$p<.01$, ***$p<.005$,****$p<.001$, *****$p<.0005$, †$.05<p>.10$

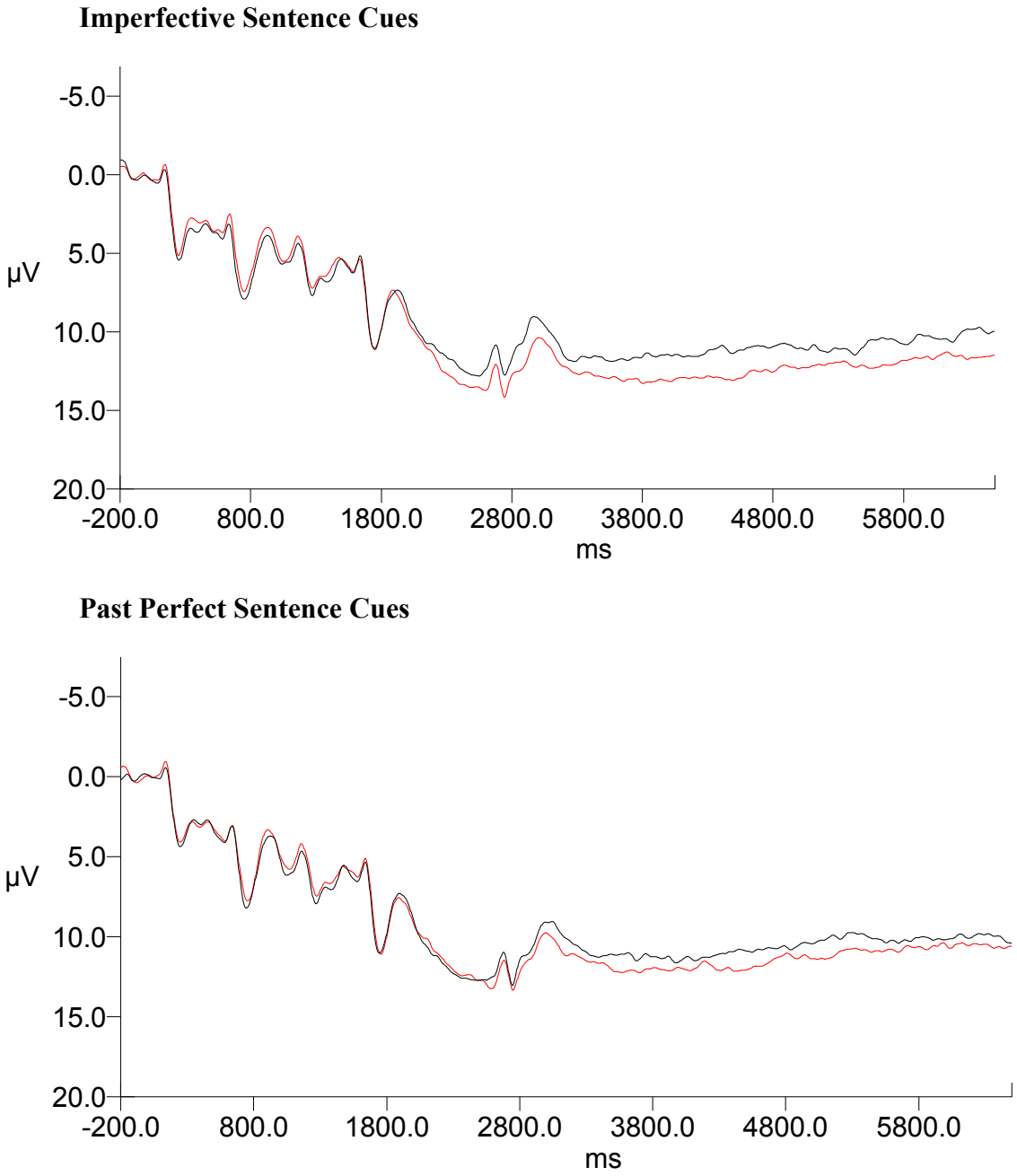

Figure 6. Experiment 2 SCP amplitudes of FPZ electrode for imperfective sentence cues (top panel) and past perfect sentence cues (bottom panel). Black is first-person perspective and red is third-person perspective.

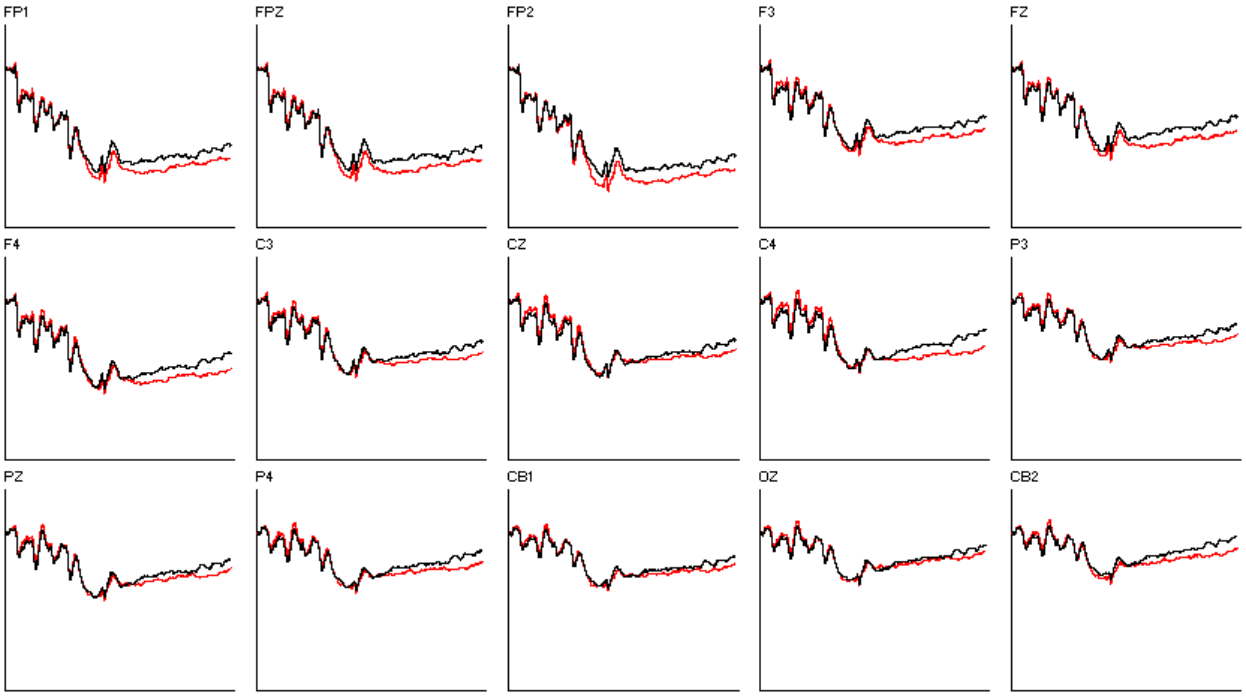

Figure 7. Experiment 2 SCP amplitudes at all electrodes analyzed for imperfective sentence cues. Black is first-person perspective and red is third-person perspective. Y-axis scale is 20 μV to -5 μV. X-axis is -200.0 ms to 5800.0 ms. For topographical locations of electrodes refer to Figure 2.

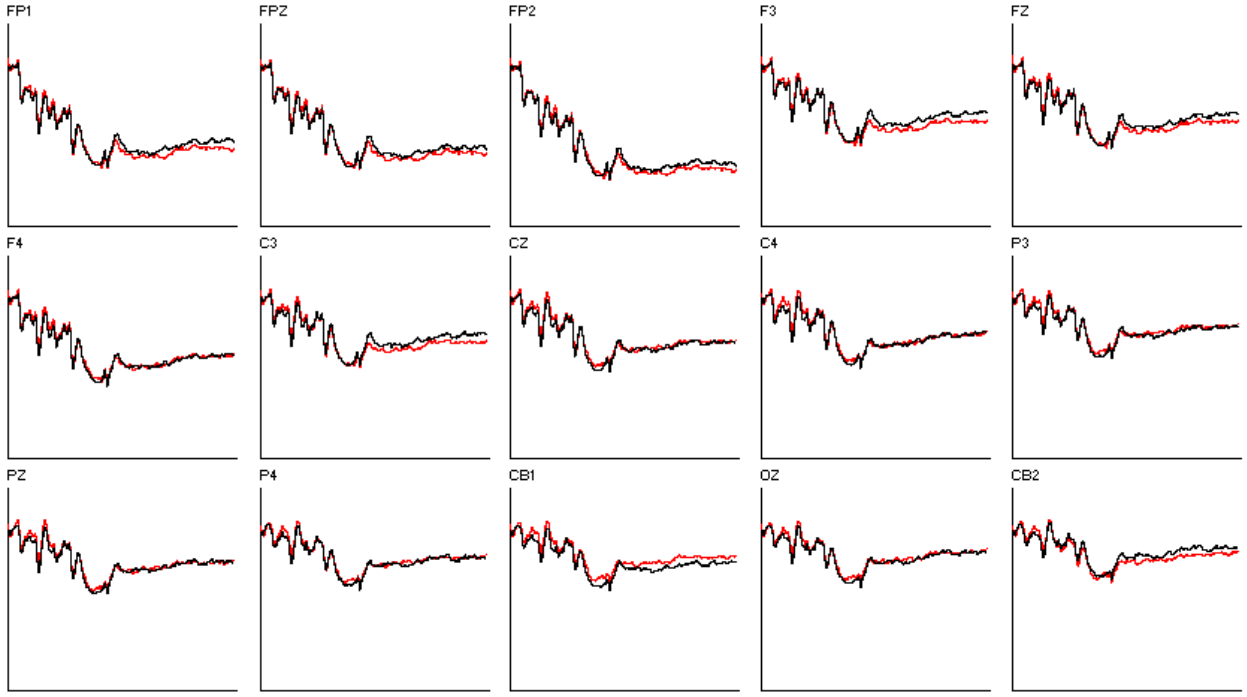

Figure 8. Experiment 2 SCP amplitudes at all electrodes analyzed for past perfect sentence cues. Black is first-person perspective and red is third-person perspective. Y-axis scale is 20 μV to -5 μV. X-axis is -200.0 ms to 5800.0 ms.

Table 11
Experiment 2 Behavioural Means

Measure	First-Person Imperfective	Third-Person Imperfective	First-Person Past Perfect	Third-Person Past Perfect
Vividness of People/Entities (1-7)	3.88	4.34	3.71	4.34
Vividness of Objects (1-7)	5.11	4.85	4.99	4.77
Vividness of Location (1-7)	4.54	4.64	4.46	4.55
Difficulty (1-7)	2.70	2.80	2.78	2.84
Beginning	0.28	0.26	0.27	0.25
Middle	0.75	0.75	0.54	0.57
End	0.27	0.25	0.52	0.51
Importance of Event (1-7)	3.52	3.34	3.55	3.41
Length of Event (seconds)	430390.30	324765.17	370168.63	435742.68

Table 12
Experiment 2 Behavioural Results ANOVA

Measure	GA	Perspective	GA × Perspective
Vividness of People/Entities (1-7)	$F(1,56)=3.05$†	$F(1,56)=14.38$****	$F(1,56)=2.55$
Vividness of Objects (1-7)	$F(1,56)=5.41$*	$F(1,56)=17.28$****	$F<1$
Vividness of Location (1-7)	$F(1,56)=2.83$†	$F(1,56)=1.14$	$F<1$
Difficulty (1-7)	$F(1,56)=1.55$	$F(1,56)=1.57$	$F<1$
Beginning	$F<1$	$F(1,56)=2.57$	$F<1$
Middle	$F(1,56)=46.85$****	$F(1,56)=1.88$	$F(1,56)=2.28$
End	$F(1,56)=48.64$****	$F(1,56)=1.94$	$F<1$
Importance of Event (1-7)	$F(1,56)=1.24$	$F(1,56)=5.83$*	$F<1$
Length of Event (seconds)	$F<1$	$F<1$	$F<1$

*$p<.05$, **$p<.01$, ***$p<.005$,****$p<.001$, *****$p<.0005$, †$.05<p>.10$

Table 13
Experiment 2 Behavioural Results Paired t-tests (First vs. Third person) for Imperfective Sentence cues.

Measure	Visual Perspective
Vividness of People/Entities (1-7)	t(59) = -2.79**
Vividness of Objects (1-7)	t(59) = 3.27***
Vividness of Location (1-7)	t(59) = -.85
Difficulty (1-7)	t(59) = -1.24
Beginning	t(59) = 1.15
Middle	t(59) = .02
End	t(59) = 1.10
Importance of Event (1-7)	t(59) = 2.24*
Length of Event (seconds)	t(59) = .51†

*p< .05, **p<.01, ***p<.005,****p<.001, *****p<.0005, †.05<p>.10

Table 14
Experiment 2 Behavioural Results Paired t-tests (First vs. Third person) for Past Perfect Sentence cues.

Measure	Visual Perspective
Vividness of People/Entities (1-7)	t(59) = -4.32****
Vividness of Objects (1-7)	t(59) = 3.09***
Vividness of Location (1-7)	t(59) = -.88
Difficulty (1-7)	t(59) = -.69
Beginning	t(59) = 1.22
Middle	t(59) = -1.91†
End	t(59) = .94
Importance of Event (1-7)	t(59) = 1.91†
Length of Event (seconds)	t(59) = -.32

*p< .05, **p<.01, ***p<.005,****p<.001, *****p<.0005, †.05<p>.10