Does L1 Influence Time Perception in L2? L1 Dutch Speakers' and L1 Mandarin Chinese Speakers' Answers to "Two Days Forward From Next Wednesday" Compared to L1 English Speakers'

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Abstract

"Move the meeting forward two days from Wednesday" is a well-known prompt to investigate perspectives on time, specifically whether someone perceives time as "ego-moving" (i.e. I am the one moving through time; the "Friday" answer) or "time-moving" (i.e. time itself is the one doing the moving; the "Monday" answer). Answers to this prompt in English exhibit clear indecisiveness, argued to stem from the ambiguity of "forward" and "move." Some languages, such as Dutch, reflect this ambiguity and indecisiveness. Other languages display a clear preference for "Monday" (German and Mandarin Chinese) or "Friday" (Swedish). Most of these studies focus on L1 speakers, with few studies investigating cross-linguistic interactions. Studies, like Lai and Boroditsky (2013), suggest that there may be influence from a person's L1 and L2. How exactly L1 may influence L2 regarding time is the central research question in this paper. A group of L1 Dutch speakers and a group of L1 Mandarin Chinese speakers were compared to a L1 English control group in their answers to the Wednesday prompt. Quantitatively, it was found that the Dutch group was significantly different from the English group, while the Chinese group was not. Qualitatively, explanations from the Dutch and Chinese group differed from the English group. Findings show evidence that L1 does have an influence on L2 (and that this may be language dependent) and that ambiguity may not be a reliable determining factor for if a language holds a preference toward a certain time perspective. The former finding supports previous research on conceptual transfer and t-FoR of time while the latter contrasts previous research.

Keywords: time perspectives, Wednesday prompt, native language, L2, conceptual transfer, temporal frames of reference

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Introduction

Imagine that today is Sunday and that your boss has called you up to inform you that "next Wednesday's meeting has been moved forward two days." They end the call promptly, leaving you to assume what day the meeting has been re-scheduled to. Take a moment to think about what day you think the meeting is now on. If you are like me, you would have assumed that the meeting is now on Friday. Except the next day, your boss calls you up asking where you are --the meeting is about to start…on Monday? What is going on here? Why do you and your boss have two different interpretations of moving the meeting forward?

This distinction lies in the different perspectives on time you and your boss have. By assuming Friday, I imply that I am viewing time a certain way. Namely, that I am moving through time and that "moving forward" is like walking forward and away from the present (otherwise known as the "ego-moving" perspective on time) (Elvevåg et al., 2011). On the flip side, people who assume Monday see time itself as the thing doing the moving, with "forward" meaning that time moves closer to the present (this is the "time-moving" perspective) (Elvevåg et al., 2011). This "Wednesday prompt" was originally devised by McGlone and Harding (1998) and has since been a popular method in exploring ego-moving and time-moving perspectives both within English and when translated into other languages. The beauty of this prompt is the ambiguity in what is meant by "moved forward."

In English, there is a clear indecisiveness between the two answers. Some studies find that native English speakers have a slight preference for Friday (e.g. the meta-analysis by Stickles and Lewis, 2018), while others find Monday to be the preferred answer (Buono, 2017; Fletcher et al., 2024). Either way, it remains the case that native English speakers are remarkably consistent in being *inconsistent* when answering this question.

Cross-linguistically, preferences have varied depending on the language (Duffy & Feist, 2014; Lai & Boroditsky, 2013) and even language variety (Stocker & Hartmann, 2019). A study by Elvevåg et al. (2011) found that the Wednesday prompt translated into Dutch (*voorwarts*

verplaatst: “moved forward”) resulted in ambiguity similar to English, with Dutch speakers showing an inconsistency similar to that of native English speakers. This ambiguity was also found in other languages, such as Afrikaans, Danish, and Hungarian, when translating the prompt (Duffy & Feist, 2014). On the other hand, languages with a strong preference for either “Monday” or “Friday” have been found as well. Mandarin Chinese and standard German speakers display a strong preference for “Monday” (Bender et al., 2010; Lai & Boroditsky, 2013; Stocker & Hartmann, 2019), while Swedish speakers prefer “Friday” (Rothe-Wulf et al., 2015).

While this preference has been argued to, at least partially, stem from translating the original English prompt into languages that use less ambiguous terms (Lai & Boroditsky, 2013; Stocker & Hartmann, 2019), Lai and Boroditsky (2013) suggest through their study on monolingual speakers and bilinguals of Mandarin Chinese and English that conceptual differences between Mandarin and English may also be an influence. Using the Wednesday prompt, Lai and Boroditsky (2013) found that bilinguals consistently straddled the middleground between the ego-moving answer “Friday” and the time-moving answer “Monday” (e.g. “Friday” answers: Mandarin 0%, bilinguals 38%, English 68%). They postulate that bilinguals were drawing on conceptual frameworks for time from both their L1 and L2. If translation differences were the only factor affecting the answers, then bilinguals should match the answers of the monolinguals for that language. Because they did not, this suggests that more than just translation differences are influencing participants’ answers. While the bilinguals had advanced levels of both Mandarin and English, whether they were native in both languages or only one (and if so, which one) was not recorded. Further research on if a person’s L1 can affect their time perception to be either ego-moving or time-moving in their L2 is needed.

Additionally, Bender et al. (2010) argues that a bias for either “Monday” or “Friday” arises because of the conventionalization of one particular temporal frame of reference (t-FoR) in a language. In other words, how people speak about time in everyday use of a language pushes its speakers toward either an ego-moving or time-moving perspective. This can be seen in the t-FoR they use to speak about time --the two most relevant t-FoR being the absolute t-FoR (i.e. “forward” is going futureward, so Wednesday to Friday; reflects the ego-moving perspective) and intrinsic t-FoR (i.e. “forward” is going pastward, so Wednesday to Monday; reflects the time-moving perspective). Mandarin Chinese and standard German are cases in which Bender et al. (2010) observes an intrinsic t-FoR to be vastly dominant (95.7% and 85.0% respectively).

English, alternatively, uses both absolute and intrinsic t-FoRs (41.0% and 45.8% respectively). A study by Rothe-Wulf et al. (2015) also found that Swedish speakers held an absolute t-FoR, preferring the ego-moving perspective, while further confirming that US participants had both absolute and intrinsic t-FoR.

Conventionalization and t-FoR are both closely linked to spatial language. Bender et al. (2010) suggest that spatial language (e.g. *up*, *down*, *move*, *back*, *forward*, etc.) does not determine the way that temporal concepts are referenced, but rather opens up a range of choices in how it *could* be talked about (essentially a weak form of linguistic relativity, where a language influences thought but does not determine, see Boroditsky, 2001 and Boroditsky and Gaby, 2010) (Bender et al., 2010). While some languages employ this range liberally (like English), others do so selectively and decide to favor just one way or word. For instance, standard German uses *vor-* ("aheadness"), which is not ambiguous and encourages a time-moving perspective. Therefore, the conventionalization of how time is talked about in language seems to be a critical factor in whether speakers of a language prefer one answer or neither. This conventionalization is reflected by a particular t-FoR and thus ego-moving and/or time-moving perspectives. Differences between languages and their t-FoR have been investigated through studies such as Bender et al. (2010) and Rothe-Wulf (2015). Yet, research on how these t-FoR transfer cross-linguistically to a L2 is lacking. This ties into the gap left in the wake of Lai and Boroditsky's findings on bilinguals, regarding if a person's L1 could affect the perception of time in their L2 (Lai & Boroditsky, 2013). Is some sort of transfer of conceptual frameworks occurring from L1 to L2? How can we see if this is the case?

This gap lends itself to several questions in light of the Wednesday prompt: do non-native speakers of English match native speakers' inconsistency when answering the prompt? Are their conceptualization strategies different or similar? Is there evidence that these similarities or differences potentially draw on their native language? These questions make up the core of this paper's research question: *how is the Wednesday prompt in English answered and conceptualized by non-native English speakers of different L1s?* In other words, are L2 English speakers inconsistent like native English speakers or exhibit a preference for either Monday or Friday? Does this depend on their L1? The goal of this question is to see if there is evidence that a person's L1 is influencing their perception of time in their L2.

This question is relevant because it aids in uncovering how people conceptualize time in a language that is not their native language; it adds to the research on what influences answers to the Wednesday prompt by investigating if how a person perceives time is influenced by a person's first language. The qualitative aspect of this paper also delves into if the explanations for choosing one answer over the other are different between the language groups.

To answer this question, a group of native Dutch speakers and a group of native Mandarin Chinese speakers will be compared to a group of native English speakers regarding their answers to the Wednesday prompt. "Native" refers to those who learned a language at an advanced level before the age of 5 in this study (this age was chosen since it is the middle ground between two studies on native or native-like ages of acquisition: Abrahamsson and Hyltenstam, 2009 and Vulchanova et al., 2022). These two languages were chosen since they are linguistically quite distinct from each other with Dutch being a Germanic language and Mandarin Chinese a Sinitic language (Glottolog 5.2., n.d.). As such, there are less chances of linguistic and conceptual overlaps due to the languages being similar.

Dutch was chosen to compare to English because Dutch is also a Germanic language. Rothe-Wulf (2015) has demonstrated that Germanic languages can differ from each other when it comes to t-FoR. These differences are meaningful when they are within the same language family because if cognate terms (i.e. terms that have the same linguistic derivation or origin) are interpreted differently, preferences are unlikely to depend on the linguistic terms themselves but must spring from the conventions used among speakers; thus, making it a cultural phenomenon (Rothe-Wulf, 2015).

Mandarin Chinese was selected as the other language group because of its linguistic and cultural distance from English. English is a Germanic language, making it markedly different from Mandarin Chinese. Many studies have also been conducted on how Mandarin speakers perceive time differently than English speakers, primarily that the former can see as time both vertical and horizontal (with a stronger preference for vertical) while the latter as only horizontal (Boroditsky, 2000; Boroditsky, 2001; Khatin-Zadeh et al., 2023; Radden, 2003). These arguments draw from the idea that time in language is based on cultural factors like the spatial direction preferences (e.g. English writing goes from left to right, therefore an English speaker sees time the same way) (Fuhrman & Boroditsky, 2007). Additionally, time-space metaphors in Mandarin much more commonly denote a time-moving perspective (Lai & Boroditsky, 2013).

English, on the flip side, uses both ego-moving and time-moving metaphors (Boroditsky, 2000). The combination of these factors contribute to why Mandarin speakers so greatly prefer "Monday" and additionally showcase why Mandarin speakers provide a well-established contrast to English speakers who hold no strong preferences.

It is predicted that native Dutch speakers will match native English speakers' roughly 50-50 split between "Monday" and "Friday" due to the question being rather ambiguous when translated into Dutch (Elvevåg et al., 2011). Applying t-FoRs from Bender et al. (2010) and Rothe-Wulf et al. (2015), Dutch should match English's split of absolute and intrinsic t-FoR because of this ambiguity. That being said, the cultural influence and conventions of how time is conceptualized in Dutch remain unknown. While cultural influence is not the direct focus of this paper, it is important to acknowledge that this could be a factor when comparing different L1s. Moreover, it should be pointed out that that ambiguity does not necessarily *cause* inconsistency when answering the Wednesday prompt; however, past studies seem to suggest that ambiguity and multiple t-FoR within a language may point to speakers being split between ego/time-moving perspectives (Elvevåg et al., 2011).

The native Mandarin Chinese speakers are predicted to prefer "Monday," but possibly less so than if the prompt was given in Chinese. This prediction draws upon previous studies finding that Mandarin Chinese speakers greatly prefer the time-moving perspective, but also blends the possibility of employing two conceptual frameworks at once. This is related to the bilinguals in Lai and Boroditsky's (2013) study, who were argued to use both English and Mandarin conceptual frameworks on time. By having to operate in their L2 that prefers a different t-FoR, it could be the case that the L1 Chinese speakers opt to blend the two conceptual frameworks together, similar to the bilinguals; and therefore, show a lower preference for "Monday" than monolingual Mandarin speakers. Past studies on Mandarin Chinese have also shown that speakers of this language conceptualize time differently than English speakers (Boroditsky, 2001; Lai & Boroditsky, 2013); thus, in light of these previous findings, it is predicted that the groups of native Mandarin speakers will be different from the native English speaker group.

In this study, a chi-square test was used to check if the frequencies of the groups differ from their expected frequencies. The null hypothesis (H0) was that the expected values were *the same* as the observed values and the alternative hypothesis (H1) was that the expected

frequencies were *different* from the observed values. Because English was the control group, the expected frequencies for the Dutch and Chinese group were derived from the proportional frequency of "Monday" and "Friday" in the English group.

The following section will explain some key concepts for understanding the theories behind the Wednesday prompt as well as the notion of conceptual transfer of time between L1 and L2. It is important to understand what influences the Wednesday prompt and how it works. Why is "move" and "forward" the source of ambiguity? Where do these metaphors originate from? What can influence answers?

Theoretical Framework

Ego-moving and Time-moving

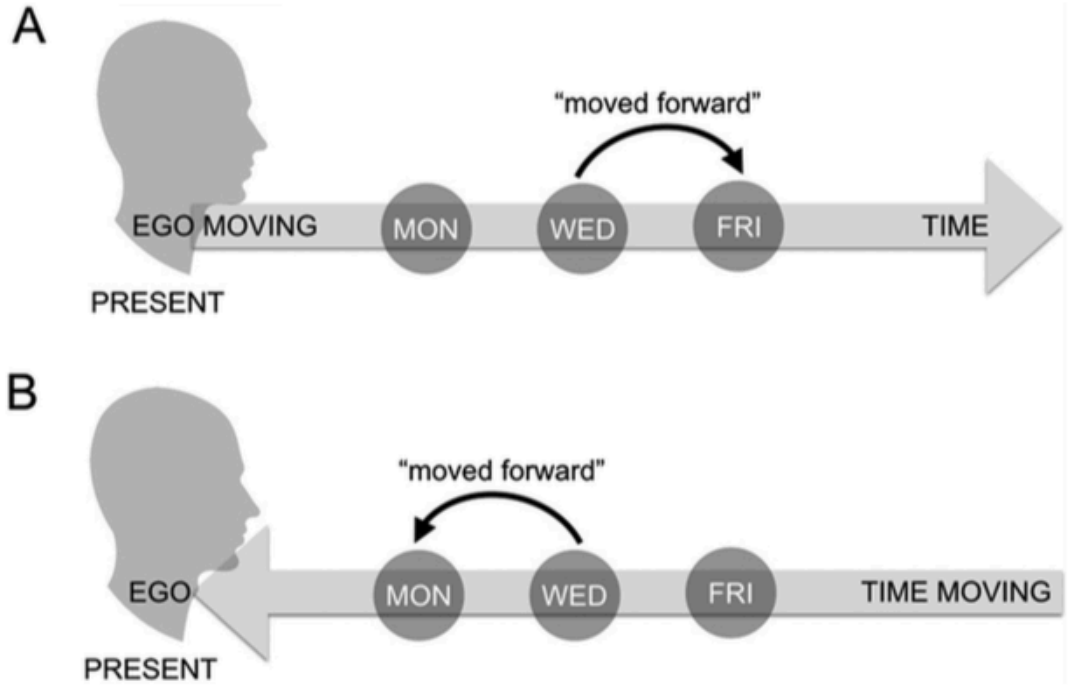
Central to this paper is time perception. Time perception can be seen as either ego-moving or time-moving. Ego-moving describes when an observer is moving relative to a stationary event (Elvevåg et al., 2011). In this perspective, time is considered a stationary entity. In other words, you are moving through time --we are moving toward the future (Stocker & Hartmann, 2019); you are moving through time from the present to the future while time remains still.

Time-moving describes when events are moving relative to a stationary observer (Elvevåg et al., 2011). Here, time is a dynamic entity, such as in "the weekend is approaching" (Elvevåg et al., 2011; Stocker & Hartmann, 2019). Time is moving toward them while they themselves remain still (Stocker & Hartmann, 2019). A visual example of the ego-moving and time-moving perspectives can be found in Figure 1.

Studies using ego/time-moving ambiguous questions suggest that individuals who answer chronologically later dates (e.g. Friday) are ego-moving while those who answer chronologically earlier dates (e.g. Monday) are time-moving. Metaphors are an important aspect of this, using spatial terms to help indicate the passage of time through space. Famous examples in English are plentiful: looking *forward* to tomorrow, troubled times are *behind* us now, we're *ahead* of schedule, the holidays are *approaching*, the band played *through* the night, looking *up* to the future, don't look *back* at the past, etc. The idea that spatial metaphors are mapped onto time in

Figure 1

Ego-Moving (Top) and Time-Moving Perspectives (Bottom) (Stocker & Hartmann, 2019, p. 62)



language largely dominates the field of time linguistics (Boroditsky, 2000; Boroditsky, 2010; Gentner, 2001; Sinha & Bernárdez, 2014), although other researchers concede that it is not as simple as that (Radden, 2003). For example, it has been argued that different time perspectives can be taught and learned successfully (Boroditsky, 2001), suggesting these culturally based time metaphors, while very influential, are not entirely deterministic.

Interestingly, it has been found that whether someone perceives time as ego-moving or time-moving can be influenced by common space-time metaphors and demographic factors. For instance, in the study by Lai and Boroditsky (2013), they observed that time-moving metaphors (e.g. “the deadline is approaching”) were found to be more frequent in Mandarin than ego-moving metaphors (e.g. “we are approaching the deadline”), while the reverse was true in English (see Figure 2 for more examples of this in Mandarin Chinese) (Athanasopoulos & Bylund, 2023). After asking participants questions where they would either adopt an ego- or time-moving perspective, they found that Mandarin speakers were more likely to take a time-moving perspective and English speakers an ego-moving one. Moreover, bilinguals were

more likely to adopt a time-moving perspective than English monolinguals, but less likely than Mandarin monolinguals, suggesting that bilinguals were operating with and/or in between both temporal frameworks (Lai & Boroditsky, 2013).

Figure 2

Examples of Spatio-temporal Metaphors in Mandarin Chinese (Lai & Boroditsky, 2013, p. 3)

(1)	期末考	快	到	了	(2)	快	到	期末考	了	
	qi-mo-kao	kuai	dao	le		kuai	dao	qi-mo-kao	le	
	final-exam	fast	arrive	particle-le		fast	arrive	final-exam	particle-le	
	"The finals are fast approaching."					"(Pro-drop we) are fast approaching the finals."				
(3)	二十一	世紀	已經	到來	(4)	我們	已經	進入	二十一	世紀
	er-shi-yi	shi-ji	yi-jing	dao-lai		wo-men	yi-jing	jin-ru	er-shi-yi	shi-ji
	twenty-one	century	already	come		we	already	enter	twenty-one century	
	"The 21st century has come."					"We have entered the 21st century"				
(5)	春假	過	了		(6)	他	才	進入	三十	
	chun-jia	guo	le			ta	cai	jing-ru	san-shi	
	spring-vacation	pass	aspectual-le			he	just	enter	three-ten	
	"The spring break has passed."					"He just entered the thirties."				

Additionally, demographic characteristics, such as age and employment status, seem to play a part in whether someone chooses an ego-moving or time-moving perspective. Previous research has found that people working full-time are more likely to adopt a time-moving perspective because they encounter time-moving metaphors more often at their jobs (Fletcher et al., 2024). Increased age was also found to result in a stronger preference for time-moving responses, most likely in correlation with working full-time (Fletcher et al., 2024).

Ego-moving and time-moving are perspectives that reside more so in the linguistic tools of a language. While it has been shown to be influenced by other factors, such as employment status and age (Fletcher et al., 2024), the core of these perspectives is how people are processing the word or phrase itself. That is, the meaning of the Wednesday prompt semantically. What mental image or understanding arises from the semantics of "moving the meeting forward?" On some level, these perspectives are more dependent on the individual to interpret the meanings of the words based on aspects like culture, experience, and common time metaphors. A more cognitive theory to frame time perception in would be temporal frames of reference. These frames add a cognitive aspect to time perception, while still rooting itself in culture.

Temporal Frames of Reference

An important concept to understand when painting a complete picture of time perception is the idea of temporal frames of reference (t-FoR). This has been mentioned in the introduction already, but more detail will be provided here since it is necessary to understand them in the context of language and why they are relevant for this paper. Frames of reference (FoR) is a cultural phenomenon in which language plays an important part in shaping relationships (Bender et al., 2010); it is a "coordinate system that allows one to identify relationships between two entities" (Rothe-Wulf, 2015, p. 919). In other words, it is a framework in which people use to navigate an object or objects in space or time. Temporal FoRs are a cognitive theory in which language and linguistics operate within, rather than the concept existing within the confines of the two (Bender et al., 2010). This allows different aspects of t-FoRs to be focused on which are not limited to only language and linguistics, such as place, culture, or a mixture of all aspects.

These t-FoRs are relevant because the ego-moving and time-moving perspectives can be integrated into them (Núñez & Sweetser, 2006). Ego-moving can be overlaid on the absolute t-FoR while time-moving on the intrinsic (note, there is also the relative t-FoR but it is not relevant for this paper) (Bender et al., 2010); the absolute t-FoR has an event moving forward from a point of reference while the intrinsic t-FoR moves this event pastwards (Bender et al., 2010).

The ability to link t-FoR and the ego/time-moving perspectives adds a cognitive and cultural dimension to these concepts. It also helps to explain any language preferences for either "Monday" or "Friday" in terms of a shared cognitive framework, rather than only looking at the influence of metaphors or conventionalization. To clarify, if the ego/time-moving perspectives provide explanations of time based on metaphor and word meanings, t-FoRs give a cognitive framework to work with. Additionally, it lays the groundwork for the notion of conceptual transfer, which is a relevant theory to elucidate how L1 and L2 interaction can take place.

Conceptual Transfer

Before delving deeper into conceptual transfer, it would first be beneficial to explain how L1 and L2 interaction can happen in the first place. It has been found that a person's first language has the ability to interfere in their second language; thereby, influencing aspects of their L2. This influence ranges from writing (Karim & Nassaji, 2013; Wei, 2020) to phonology

(Fatemi et al., 2012; Fledge, 1980; González-Bueno, 1997) to structure similarities and differences between the two languages (Beardsmore, 1982). Moreover, L2 learners tend to transfer the forms, meaning, and culture of their L1 to their L2 (Derakhshan & Karimi, 2015).

A person's first language can be seen as a tool to solve mental and communicative problems in the L2, activating this tool frequently and constantly (Derakhshan & Karimi, 2015). Further research has shown that a learner never truly functions autonomously from their L1 and are never "free" of this influence. The strength of this influence does largely depend on how similar (or different) a person's L1 is from their L2 --the more similar the two are, the simpler it is to integrate the L2 (Derakhshan & Karimi, 2015). Recent research has demonstrated that a person's L2 can impact their L1 as well (Derakhshan & Karimi, 2015; Lord, 2008), showcasing how the relationship between L1 and L2 is bidirectional and can be quite nuanced. In summary, the idea of conceptual transfer can trace its origins back to this notion that there is interference, interaction, and influence between a person's L1 and L2, which can come from various aspects of a language.

Conceptual transfer (CT) assumes that speakers of different languages have somewhat differing patterns of conceptual categorization (Bylund & Jarvis, 2011) which provides them with fixed conceptual parameters on what something is, is not, or may be (Sharpen, 2016). In the context of second language learners, CT denotes that differing conceptualizations have the potential to transfer across languages; the conceptual distinctions and patterns in one language can affect their use in another language (Bylund & Jarvis, 2011).

While similar to linguistic relativity, CT focuses more on speaking and the context of communication. These patterns of conceptualization may only arise from actually speaking or communicating (Bylund & Jarvis, 2011). In a way, it can be described as a more hands-on approach, where transfer occurs *during* the act of speaking, rather than before. This makes the context and content of utterances quite important for CT.

CT has been found in languages near and distantly related to English. Sharpen (2016) explored conceptual transfer of L2 motion events in L1 Spanish to L2 English learners and L1 English to L2 Spanish learners. They found that there were clear signs of conceptual transferring occurring in both groups. Bagherian (2012) also found CT to be valid for L1 Persian-L2 English speakers. Bagherian (2012) looked at if proficiency and age had an effect on conceptual transfer. They found that participants with lower proficiency were found to transfer concepts twice as

much as intermediate learners and rely more on their native conceptual systems. Additionally, Bagherian (2012) found that age did have an effect on conceptual transfer. Younger learners were more susceptible to transferring. This ran counter to previous studies that argued that children are less likely to draw on their L1 than adults (Murphy, 2003). However, this changed with proficiency. Age did not matter for intermediate learners. Bagherian (2012) postulates that this could be due to these learners having more conceptual awareness, bestowing a more thorough understanding of conceptual nuances between the two languages.

In order to further illustrate this theory, an example of this conceptual transfer can be seen in the different preferences between L1 Finnish and L1 Swedish speakers of English living in Finland. When asked to describe a scene of two people sitting "in" or "on" the grass, Finnish speakers preferred "on" while Swedish speakers preferred "in" (Jarvis & Odlin, 2000). One possibility given for this division was that the two groups relied on two distinct concepts or conceptual representations of the same scene based on words from their native language (Kermer, 2019). For example, it is suggested that Finns may have considered a specific word in Finnish that requires use of an external locative case (i.e. "*on* the grass") when used (Kermer, 2019). Essentially, "it may have been possible that Finnish speakers relied on their L1-based conceptual experience when describing the scene in their L2" (Kermer, 2019, p. 30). This case is a good example of how conceptual transfer can work in everyday situations.

Previous Research on the Conceptual Transfer of Time between L1 and L2

Because the research question of this paper is concerned with if a person's L1 can influence their time perception in their L2, it is fundamental to first discuss previous research on the conceptual transfer of time between L1 and L2. This sketches a backdrop for the underlying mechanisms of what could be at work in the answers to the Wednesday prompt.

Past research on the conceptual transfer of time in L1 and L2 has been finite, but productive. The effect of differences in time metaphors and concepts between languages has been studied from multiple angles. Gabryś-Barker (2011) argued that time is a cultural construct. They do so on the basis that time conceptualization is founded on the words, phrases, and/or idioms of a language, which they classify as culture (Gabryś-Barker, 2011). They looked at native speakers of Polish and Portuguese, who had an advanced level of English as an L2, and how they conceptualized time in both languages. They compared the semantic, lexical, and

phrasal associations of time in both their native languages and in English by asking participants to recall and give expressions relating to time in their L1 and L2 English (Gabryś-Barker, 2011). The aim was to see if their perception of time was idiosyncratic or grounded in one's native culture. They found significant cultural differences (rather than idiosyncratic) between the Polish and Portuguese participants and that these differences affected their concept of time in English.

In their native language, Polish participants were less positive than the Portuguese participants as well as more abstract and general when discussing time (Gabryś-Barker, 2011). In contrast, Portuguese participants were more positive and described time as it was relevant to the individual (i.e. on a personal level) (Gabryś-Barker, 2011). These preferences were reflected in their L2 English, in which the Polish group shared more generalized proverbs and sayings (e.g. "absence makes the heart grow fonder;" "make hay when the sun shines;" "an early bird catches the worm") and the Portuguese group relayed more personal, positive sentiments (e.g. "we have got time, don't worry!" "don't do such things, relax a bit;" "time is me and you taking a coffee") (Gabryś-Barker, 2011).

Gabryś-Barker (2011) does not provide a cognitive explanation on how the participant's L1 affects their L2. They chose to instead focus on the historical and climate differences between Poland and Portugal to explain why the two places have different conceptualizations about time (Gabryś-Barker, 2011). Nevertheless, their findings do provide evidence that the concept of time can be transferred between the participant's L1 and L2 since the groups' L1 characterizations of time were seen reflected in their L2.

Other studies that investigate bilinguals' ability to navigate temporal frames in their L1 and L2 further shed light on the underlying mechanisms that could drive this influence. (Athanasopoulos & Bylund, 2023; Athanasopoulos & Bylund, 2024; Lai & Boroditsky, 2013). Athanasopoulos and Bylund (2023) found that time perception seemed to be modulated by L2 proficiency and L2 age of acquisition, to the degree that L1 influence on L2 time conceptualization could be predicted by these factors. Their study had participants estimate the duration of spatial arrangements to test how they perceived time (Athanasopoulos & Bylund, 2023). Participants who had lower ages of acquisition showed a weakening of L1 conceptualization, contrasting participants with higher ages who showed more L1-like time estimations (Athanasopoulos & Bylund, 2023). Athanasopoulos and Bylund's findings also support that the external environment (in addition to the internal mental processes) is an

important aspect when processing time (Athanasopoulos & Bylund, 2023). In other words, the context and physical experience aids in the cognitive conceptualization of time. Their study, moreover, provides strong empirical evidence for attentional learning (i.e. learning through the concept of attention) (Athanasopoulos & Bylund, 2023).

Attention refers to the tendency to focus on certain aspects of a language, usually ones that are prominent or critical to understanding (Kersten, 2010). Attention is language dependent, meaning that different languages pull attention to different things. For example, English speakers are more attentive to manner of motion than Spanish speakers because this detail is important in order to choose the correct verb in English (Kersten, 2010). Fulga (2012) proposed that this can also apply to time conceptualization. What is given attention to temporal matters in a L2 has a chance to differ or be transferred from the L1. This can possibly be seen in a L1 Korean or L1 Japanese speaker of L2 English, where the speaker may fail to express prepositions (i.e. *on*, *above*) in English since they are not encoded (i.e. given attention to) in their native language (Fulga, 2012).

A final avenue of research is the bidirectionality of L1 and L2 influence on time; influence is not limited to L1 affecting the L2, but can also include how L2 affects the L1. Bylund and Jarvis (2011) found that concept transfer with time can occur in the opposite direction --L2 time conceptualizations can transfer to L1. They established that speakers with L1 Spanish and an advanced level of L2 Swedish were influenced by Swedish when conceptualizing events in Spanish. Lai and Boroditsky (2013) also found that Mandarin-English bilinguals appeared to be affected equally and simultaneously by their L1 and L2, being less likely than the monolinguals to adopt a time-moving bias from Mandarin or ego-moving bias from English. This suggests a complex and elaborate system at work when it comes to the conceptual transfer of time.

Overall, research on the conceptual transfer of time between L1 and L2 has proposed various explanations for why and how this can occur. Culture and place of origin may influence time perception in L2 (Gabryś-Barker, 2011). Proficiency and age of acquisition in bilinguals suggest that the internalization of an L2 at an early age may cause the L1 to have less of an impact on the concept and conceptualization of time in an L2 (with the vise versa also being true) (Athanasopoulos & Bylund, 2023). The notion that the external environment may have an influence is noteworthy as well (Athanasopoulos & Bylund, 2023). Regarding attention,

language differences in what is given attention to has been cited as a possible explanation for why time perception varies between L1 and L2 (Fulga, 2012; Kersten, 2010). Lastly, the idea that influence can go both ways postulates that time conceptualization may draw from many different areas (e.g. the L1, the L2, external experience, etc.) (Bylund & Jarvis, 2011). The culmination of these arguments provide a more thorough understanding of any conceptual transfer of time that may occur when answering the Wednesday prompt.

Previous Research Using The Wednesday Prompt

It is, of course, necessary to provide an overview of the research already done using the Wednesday prompt. Unlike the previous section, past research for this topic is quite extensive. As such, the focus here will largely be on trends, what is causing ambiguity (in English), and the main shortcomings of the prompt. What findings have previous research already given us? What does this imply for time perception?

Many previous studies around this prompt focus primarily on one language or variations of the same language. Due to this being an easy to understand and short question, there have been both formal and informal surveys. Buono (2017) in a tweet asked twitter users for their opinions and found that 66% said “Monday.” In more formal studies, “Monday” has also been seen to win out over “Friday.” This was not only for native English speakers (Fletcher et al., 2024), but for native German and Mandarin Chinese speakers as well (a translation of this question in Mandarin Chinese can be found in Figure 3) (Duffy & Feist, 2014; Lai & Boroditsky, 2013; Stocker & Hartmann, 2019). An overwhelmingly large majority of German speakers in both standard German and Swiss German chose “Monday” rather than “Friday” (up to 82.7%) (Stocker & Hartmann, 2019). Other research centering on native English speakers found the opposite result, suggesting “Friday” to be the preferred answer.

Stickles and Lewis (2018) conducted a meta analysis on past native English speaker studies using the Wednesday prompt. They found that there was a baseline preference for the ego-moving perspective (i.e. “Friday”). However, Fletcher et al. (2024) note that many of studies analyzed by Stickles and Lewis were done with a younger demographic, which could have possibly influenced the results to be more representative of the ego-moving perspective. In a later study by Fletcher et al. (2024), their study’s older demographic yielded a more Monday-biased outcome, tying into the idea that preferences are partially dependent on the

Figure 3

Translation of the Wednesday Prompt into Mandarin Chinese (Lai & Boroditsky, 2013, p. 4)

Next Wednesday's meeting has been moved forward two days. What day is the meeting now that it has been rescheduled?

下	週三的	會議	要	往	前	挪	兩天.
Xia	zhou-san-de	hui-yi	yao	wang	qian	nuo	liang-tian.
down	Wednesday's	meeting	will	toward	front	move	two days.
請	問	這個	意思	是	下	週幾	開會?
qing	wen	zhe-ge	yi-si	shi	xia	zhou-ji	kai-hui?
Please	ask	this	meaning	is	down	week which	meet?

demographic characteristics of the sample. Ultimately, the contradicting results serve to further demonstrate the ambiguous nature of the Wednesday prompt in English. What is causing this ambiguity?

Some researchers point to the adverb "forward" as being the culprit for the ambiguity (Boroditsky, 2000; Kranjec & McDonough, 2011). Others take issue with the directionally neutral verb "move," which does not imply movement toward a specific direction (Restak, 2011). More recently, a more holistic analysis taking into account both verb and adverb has become a popular explanation (Elvevåg et al., 2011; Feist & Duffy, 2015).

Multiple studies have investigated how event valence (positive or negative) can also affect ambiguity (Duffy & Evans, 2017; Margolies & Crawford, 2008). Duffy and Evans (2017), in their study on factors motivating the resolution of temporal ambiguity, postulate this to be because there is a perceived sense of stress and lack of agency toward negative valenced events, such as an assignment due date (and thereby adopting the time-moving perspective when describing it). This also ties into life experiences since a person, like a student, has experienced the stress and anxiety of an approaching assignment due date, they harbor more negative feelings toward the event (Duffy & Evans, 2017). The lack of control to do anything about it places them in the perception that the event is approaching them (i.e. the time-moving perspective) (Duffy & Evans, 2017); however, Duffy and Evans (2017) in an supplementary experiment find contradicting results regarding this --namely, that an event with a positive valency, a party, was also seen as the entity doing the approaching. They explain this discrepancy by arguing that events can trigger different types of t-FoR. A party, being eagerly looked forward to, triggers an earlier-later t-FoR rather than a future-past one (these types of t-FoR have to do with the idea of

transience, which is our subjective experience of time rather than the physical passage of it) (Duffy & Evans, 2017). So while a party or assignment may trigger an earlier-later t-FoR, a meeting would trigger a future-past t-FoR.

Regarding factors that seem to influence the perception of time, Duffy and Evans (2017) and Rothe-Wulf et al. (2015) find that event valence has a stronger effect than individual personality traits (e.g. introvert, extrovert), and that language has a stronger effect than spatial priming. The former is argued to be because event valency can activate certain feelings and memories based on past experiences, which are able to outweigh personality traits (Duffy & Evans, 2017). For example, being an introvert did not reliably predict that the person would view the event, a party, negatively and vice versa for an extrovert. Duffy and Evans (2017) attribute this to wanting the partier to come sooner (i.e. earlier) rather than viewing it in a future-past FoR. Language having a stronger effect than spatial priming is postulated to be due to if a language's temporal metaphors or word lends itself to ambiguity (Duffy & Evans, 2017). For example, Mandarin Chinese and standard German do not use ambiguous phrasing for the prompt and strongly prefer "Monday" (Duffy & Feist, 2014; Lai & Boroditsky, 2013; Stocker & Hartmann, 2019); therefore, even when spatial priming is applied, speakers of those languages would still choose "Monday" since the question leaves little room for interpretation. Native speakers of English, on the other hand, were shown to be quite susceptible to priming due to the prompt's ambiguity (Rothe-Wulf et al., 2015). Whether language trumps event valency in terms of influence or the other way around remains to be uncovered.

There are two main drawbacks with the prompt. The first is that most studies are based on only a single question. Limited research has gone into different variations of the prompt, such as changing the prepositions (Kranjec et al., 2010), grammar (Núñez & Sweetser, 2006), or the inclusion of cultural artifacts (Duffy, 2014; Lai & Boroditsky, 2013). While they do exist, it is still being investigated on how these aspects may affect the results.

The second is that it is not possible for there to be a universally neutral context in which the question can be asked. Culture in particular has been found to be a powerful influence since it has been argued that culture has the ability to influence language and, by extension, cognition through the interplay of spatial-temporal frameworks with culture (Boroditsky & Gaby, 2010; Danziger, 1996); a culture's t-FoR of and/or metaphors on time can influence how the prompt can be interpreted. On the individual level, lifestyle (Duffy & Feist, 2014), personality (Duffy &

Evans, 2017; Duffy et al., 2014), and agency (Richmond et al., 2012) also play a role in influencing answers to the prompt. This paper acknowledges these drawbacks, but chooses to focus on the cross-linguistic differences based on L1 rather than multiple individual and cultural factors --although the role that culture may play was taken into account by asking participants where they grew up. However, in an effort to keep the question simple and to avoid too much translation speculation of Dutch and Mandarin Chinese, only a single question was asked.

The findings of previous research using the Wednesday prompt on time perception indicate that various factors contribute to how a person may perceive time. While native English speakers are very inconsistent in their answers, this is not the case for other languages. Ambiguity seems to play an important role, varying from language to language. If the Wednesday prompt in a language is very unambiguous, then priming appears to have no effect on time perception. Event valency as well has seen considerable attention, suggesting that positive or negative feelings on an event and t-FoRs contribute to how a person conceptualizes time. Lai and Boroditsky's study on bilinguals (mentioned in the introduction), also indicate that bilinguals perceive time in their L2 languages differently from the monolinguals. These studies on the Wednesday prompt in combination with the previous studies on the conceptual transfer of time in a person's L1 and L2, paint the backdrop for which this paper will approach its research question: *how is the Wednesday prompt in English answered and conceptualized by non-native English speakers of different L1s?* Does a person's L1 show evidence for influencing their concept of time in their L2?

Methodology

Participants

In total, 145 participants were analyzed. L1 English speakers had a sample size of 44, L1 Dutch speakers had one of 69, and L1 Mandarin Chinese speakers had 32. Overall, more participants identified as female than male. There were only four people who did not identify as either male or female. The most evenly distributed group between male and female was the English group (56.8% female), while the Chinese group was the least evenly distributed (75% female). All groups had more female participants than male participants. An overview of the gender distribution can be found in Table 1.

Table 1

Gender Distribution

	English	Dutch	Chinese	Overall
Male	17	25	8	50
Female	25	42	24	91
Other	1	2	0	3
Prefer not to say	1	0	0	1
Total	44	69	32	145

The average age of all participants was 29.1 (*SD* = 10.6). The youngest participant was 19 while the oldest was 75. For a complete overview of participant ages, see Table 2. The majority of participants in the L1 English group (*n* = 44) grew up in the United States (*n* = 26). Three participants grew up in the United Kingdom and another three from the Netherlands. Two participants were raised in China, two in Singapore. There was only one participant from each of the following countries: Canada, Australia, Belize, Sri Lanka, France, Hungary, Luxemburg, and Belgium.

Within the L1 Dutch group (*n* = 69), the vast majority of participants grew up in the Netherlands (*n* = 65). An additional two grew up in Belgium, one in Suriname, and one in Germany. The L1 Chinese group (*n* = 32) had its vast majority of participants grow up in China (*n* = 30). The remaining two participants were from Taiwan and Luxemburg.

There were three L1 Dutch-L1 English bilinguals and four L1 Chinese-L1 English bilinguals, counting seven in total. There were no L1 Chinese-L1 Dutch bilinguals. The Dutch-English bilinguals grew up in the Netherlands (*n* = 2) or Belgium (*n* = 1). The Chinese-English bilinguals grew up in either Singapore (*n* = 2) or China (*n* = 2). The seven bilinguals were treated as L1 English speakers, and thus were included in the English group only.

The distribution of age of acquisition (AoA) can be found in Table 2. On average, the Chinese group had a younger age of acquisition than the Dutch group. It is important to note,

Table 2

Age and Age of Acquisition (AoA) Distribution

	English (*n* = 43)			**Dutch (*n* = 69)**			**Chinese (*n* = 32)**			**Overall**		
	M	*SD*	Range	*M*	*SD*	Range	*M*	*SD*	Range	*M*	*SD*	Range
Age (*n* = 144)	31.3	12.9	19-75	27.4	10.2	21-62	30.0	7.4	21-50	29.1	10.6	19-75
AoA (*n* = 101)	--	--	--	9.5	2.5	5-17	7.8	3.6	2-15	8.9	3.0	2-17

Note. The English group and overall sample excludes one participant due to them not providing an usable number (the participant put "old" as their age). The overall sample size for AoA (*n* = 101) is the combined total of the Dutch and Chinese groups; English speakers did not answer the AoA question.

however, that although some participants put their AoA below five, they did not learn English at an advanced level and did not classify themselves as native speakers of English.

For place of acquisition, refer to Table 3. The overwhelming majority of participants learned English in school compared to any other place overall and within both groups. Those who answered "Other" most commonly said they learned English from social media, social gatherings, TV, or online.

Table 3

Place of Acquisition (PoA)

	Dutch (*n* = 69)		**Chinese (*n* = 32)**		**Overall (*n* = 101)**	
	Participants	%	Participants	%	Participants	%
School	66	95.7%	31	96.9%	97	96.0%
Home	24	34.8%	9	28.1%	33	32.7%
Hobbies	33	47.8%	9	28.1%	42	41.6%
Work	8	11.6%	9	28.1%	17	16.8%
Other	8	11.6%	0	0%	8	7.9%

Note. Participants could choose more than one answer.

Design and Material

The independent variables were the different groups of native speakers: L1 English, L1 Dutch, and L1 Mandarin Chinese. The dependent variable was participants' answers to the Wednesday prompt: either "Monday" or "Friday." What was examined was how each group answered the prompt and if the Dutch and Chinese groups significantly differed from the English group, which was the control group.

The experimental stimulus was the Wednesday prompt. The wording of the prompt was as such: "Next Wednesday's meeting has been moved forward two days. What day has the meeting been re-scheduled to?" Participants needed to input their answer in a textbox directly

below the question. They could also explain their answer if desired in a textbox following their answer ("Please explain your choice. (optional)"). This, as shown, was optional.

Procedure

The design of the study was a Qualtrics survey. The survey was distributed using WhatsApp, Facebook, family and friends, and SurveyCircle. SurveyCircle is a survey distribution website where you collect points for taking other users' surveys. The survey consisted of three sections: demographic questions (5-8 questions), experimental stimuli (2 questions), and debriefing. The survey takes approximately 2-5 minutes. For the full survey, refer to Appendix A.

Following the instructions given on the opening page of the survey, participants were asked to give consent for their results being used in the data analysis. It was reaffirmed that their results would be anonymous. Participants were then asked about their gender, age, and cultural and linguistic background. After, the participants were asked to type in their age. The survey would bring them to an apology page explaining why they cannot participate in the survey and end the survey if they put in an age under 18.

A series of linguistic background questions followed those on cultural background. Participants were first prompted to confirm that one of their native languages is English, Dutch, or Chinese. If they answered "No" to this question, the survey would bring them to an apology page and subsequently end. If they answered "Yes," the survey would ask which native language they speak (note, more than one language could be selected). Additional information was provided for this question in order to clarify what is meant by "native," namely that they would be considered native if they learned the language at an advanced level before the age of five. Those who selected "English" were brought directly to the experiential stimuli. Participants who did not select "English" were asked three supplementary questions about their English level, age of acquisition, and place(s) of acquisition.

For the English level question, participants could choose "Advanced" or "Below advanced." Participants were given clarification on and examples for what was meant by "Advanced" (see Appendix A for this description). If participants answered "Below advanced," then they were sent to an apology page and the survey would end. The next question, age of acquisition, allowed the participant to enter in a number. Participants were asked to give a

number (rather than an age range like “childhood” or a school grade). The last question of the demographic section was place of acquisition, which asked where the participant learned English. They could also choose more than one option.

Following the conclusion of the demographics section of the survey begins the experimental stimuli. This section was all presented on one page. At the core of this section is the Wednesday prompt. The participant is first given instructions to read. These instructions were based on the ones given by Feist and Duffy (2015) (see Appendix A for these instructions).

Below these instructions was a version of the Wednesday prompt, also based on Feist and Duffy’s iteration of the question: “‘Next Wednesday's meeting has been moved forward two days.’ What day has the meeting been re-scheduled to? (please choose just one day).” Participants gave their answer by typing the day in a textbox. There were no multiple choice options, participants had to proactively decide on a day. This was done so as to not bias the participants toward certain days or confuse them by introducing the possibility of two days. Lastly, participants could then give an explanation for their answer. This was optional --participants could skip this question and go to the last section of the survey if desired.

The survey concluded with a description of what the study was about and the two most likely answers for the Wednesday prompt (i.e. Monday or Friday). It asks to not share the survey questions, their answers, and their reasonings with people who plan to take the survey. Participants could leave any thoughts or comments in the provided text box if desired.

Quantitative Results

Descriptive Statistics

The sample tested consisted of native speakers of English, Dutch, and Mandarin Chinese with the latter two groups having an advanced knowledge of English. In order to be included in the sample, participants needed to have written something in the answer textbox for the Wednesday prompt. Of the 195 recorded responses, 146 entered an answer into this textbox. Those who did not input an answer were not included. Because this textbox was one of the final questions in the survey, it was assumed that all necessary requirements have been met if the participant input an answer here.

One additional participant was excluded following this exclusion criteria. One participant from the English group put "Tuesday" as their answer. Since Tuesday was a highly unusual answer and only one person answered this out of all participants, this participant was excluded from the sample; thus, the final sample size was 145. The sample sizes for the groups were as follows: L1 English speakers (n = 44); L1 Dutch speakers (n = 69); L1 Mandarin Chinese speakers (n = 32).

Due to the categorical nature of the variables, mean, standard deviation, and range cannot be provided. Rather, two tables showcasing observed frequencies will be given in Table 4. The proportional frequencies seen in Table 4 from the English group were the values used to calculate the Dutch and Chinese groups' expected values. These proportional frequencies were out of 100.

Inferential Statistics

A chi-square test was conducted for which our H0 was that the expected values were *the same* as the observed values and our H1 was that the expected values were *different* from the observed values. Because English was the control group, only the Dutch and Chinese group were part of the chi-square test. Three tests were conducted in total; therefore, a Bonferroni correction was applied where .017 was the significant value threshold. Test assumptions were met. Expected frequencies can be found in Table 4, while a side-by-side comparison of observed vs. expected frequencies can be seen in Figure 4.

The outcome of the test comparing the Dutch and Chinese sample to the English sample was that there was a significant difference between the observed frequencies for the Dutch and Chinese group compared to their expected frequencies, $\chi^2(2, N = 145) = 22.1$, $p = <.001$. The Dutch and Chinese groups were significantly different from the English control group in their answers for the Wednesday prompt.

A chi-square test was also done on the Dutch and Chinese group separately, comparing each to the English group. There was a significant difference between the observed frequencies for the Dutch group compared to their expected frequencies, $\chi^2(1, N = 113) = 18.8$, $p = <.001$. The Dutch group was significantly different from the English control group in their answers for the Wednesday prompt. For the Chinese group, there was no significant difference between their observed frequencies compared to their expected frequencies, $\chi^2(1, N = 76) = 3.4$, $p = .07$. The

Table 4

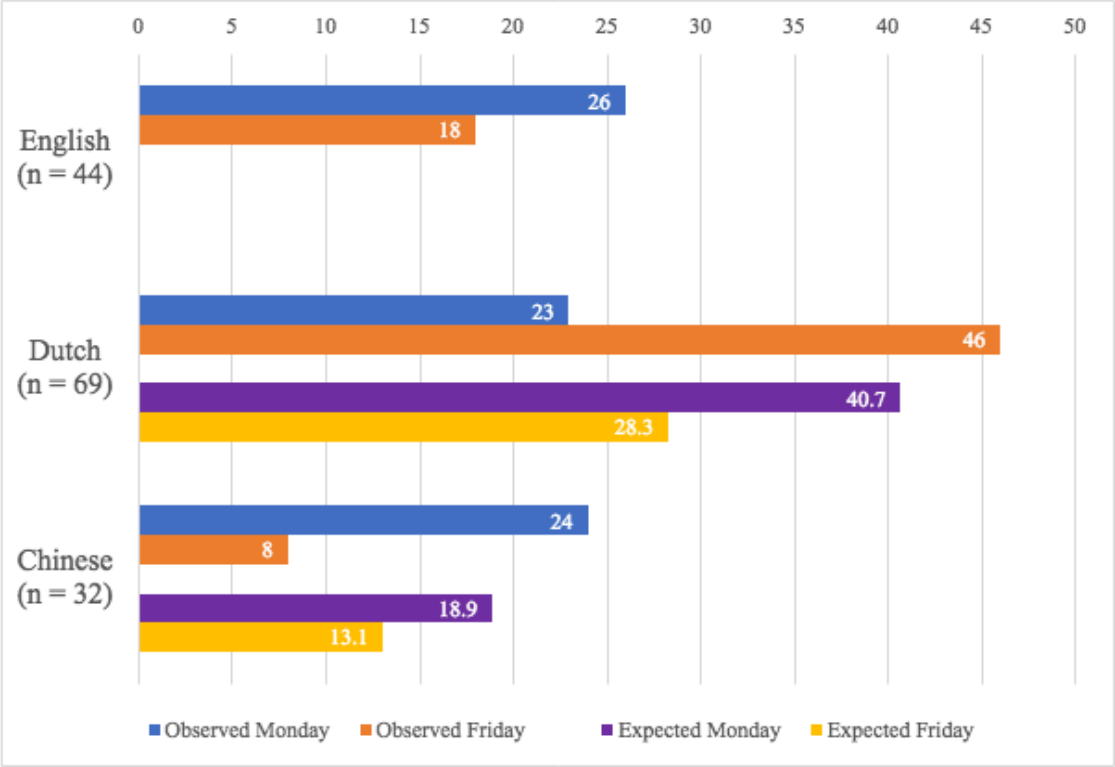
Observed and Expected Frequencies for Wednesday Prompt

	Monday			**Friday**		
	Obs.	Obs. %	Exp.	Obs.	Obs. %	Exp.
English (*n* = 44)	26	59.1	26	18	40.9	18
Dutch (*n* = 69)	23	33.3	40.7	46	66.7	28.3
Chinese (*n* = 32)	24	75	18.9	8	25	13.1
Total (*n* = 145)	73	--	--	72	--	--

Note. "Obs. %" stands for the proportional frequency of the observed values. The proportional frequency is out of 100. Expected frequencies for the L1 Dutch and L1 Mandarin Chinese groups are calculated from the observed proportional frequencies of the L1 English group (e.g. 59.1 percent of the English group answered "Monday;" therefore, the expected values of "Monday" for the Dutch group would be 59.1 percent of 69, which is 40.7, etc.). Because of this, the expected values for the English group remain the same as the observed values.

Figure 4

*Observed Frequencies vs. Expected Frequencies for Wednesday Prompt (*n *= 145)*



Note. The English group's expected frequencies were the same as their observed frequencies; therefore, only the observed frequencies are shown here.

Chinese group was not significantly different from the English control group in their answers for the Wednesday prompt.

Qualitative Results

The qualitative results consist of a thematic analysis of participants who explained their answer. A total of 91 participants gave explanations: L1 English speakers (n = 32), L1 Dutch speakers (n = 46), and L1 Mandarin Chinese speakers (n = 13). Refer to Table 5 for the distribution of explanations between "Monday" and "Friday." Explanations were coded as *ego/time-moving*, *semantics*, *equation*, *experience*, and/or *ambiguity*. Multiple themes could be assigned to an explanation. There were eight outliers. Outliers consist of explanations that did

not provide any thematic insight or were very off topic. They were not included in the thematic overview. A detailed summary of the distribution of themes can be found in Table 6.

Table 5

Distribution of Monday and Friday Explanations

	Monday	**Friday**
English (*n* = 32)	18	14
Dutch (*n* = 46)	14	32
Chinese (*n* = 13)	9	3
Overall (*n* = 91)	41	49

Ego/Time-moving

Explanations labeled *ego/time-moving* described time as either moving further away (ego-moving) or moving closer to them (time-moving). This theme was derived from the wording used to describe the movement of time, and how this matched the wording describing ego-moving and time-moving from previous literature on the topic.

Explanations marked only with this theme matched the definition of these concepts extremely closely, at times word-for-word. Participants may also imply this relationship through their descriptions (they would be marked as *ego/time-moving* / *semantics* in this case). These explanations often denoted a direction or movement of some sort (e.g. “Wednesday is further away and moving it up two [days] means it is 2 [closer] to me”). Explanations that were not given this theme described their reasoning outside of strict references of moving through time or time moving through space.

The English group’s explanations were marked with this theme 14 times, eight for “Monday” and six for “Friday.” “Monday” explanations tended to describe how the meeting was moved closer to the present (“If something is moved forward or brought forward, it's been brought closer to the present or time of reference”). “Friday” explanations focused on the meeting being placed after Wednesday (“Friday is two days after Wednesday;” “2 days after wed is fri”).

Table 6

Distribution of Themes (Monday -- Friday)

	Ego/Time-moving	**Semantics**	**Equation**	**Experience**	**Ambiguity**	**Outliers**
English (*n* = 32)	8 -- 6	12 -- 7	0 -- 4	3 -- 3	0 -- 1	1 -- 3
Dutch (*n* = 46)	3 -- 22	13 -- 15	0 -- 9	1 -- 1	1 -- 1	0 -- 3
Chinese (*n* = 13)	6 -- 0	5 -- 3	2 -- 0	0 -- 1	1 -- 1	1 -- 0
Overall (*n* = 91)	17 -- 28	30 -- 25	2 -- 13	4 -- 5	2 -- 3	2 -- 6

Note. Participants could have multiple themes assigned to their explanation. Outliers consist of explanations that did not provide any thematic insight or were very off topic.

The Dutch group had 25 explanations marked with this theme, three for "Monday" and 22 for "Friday." The Dutch group's explanations for "Monday" saw the meeting as taking place before Wednesday ("2 days before;" "It's 2 days earlier"). The "Friday" explanations moved the meeting further in time ("My initial thought was that the meeting was moved further in time;" "My first instinct is that the meeting is moved into the future by two days").

The Chinese group had seven explanations marked with this theme. The Chinese group only had "Monday" explanations with this code. They moved the meeting sooner and earlier along the timeline ("Moved forward as in it would happen sooner;" "Move forward means moving earlier - so next Monday"). See Table 7 for examples of this *ego/time-moving* explanations.

Semantics

The *semantic* theme refers to explanations that drew certain meanings from the adverb "forward" and/or the "verb" move. The *semantic* code differs from the *ego/time-moving* code because the former focuses more on the semantic meanings of the adverb and/or verb, while the latter looks more at the movement of time conceptually (i.e. on a timeline). Often, these themes overlap, but not in every case; therefore, it was decided to distinguish the two themes from each other.

The *semantic* code was derived from literature regarding how the adverb "forward" and the verb "move" could be interpreted as ambiguous or not (Boroditsky, 2000; Elvevåg et al., 2011; Feist & Duffy, 2015; Kranjec & McDonough, 2011; Restak, 2011). Because in English, the directionality of "move forward" is vague, participants solved this problem by understanding either the adverb or the verb (or both) in comparison or contrast to something else. For instance, "forward" being juxtaposed with *before*, *earlier*, *closer*, or *sooner* for "Monday" and as *after*, *later*, or *away* for "Friday."

The English group's explanations were marked with this theme 19 times, 12 for "Monday" and seven for "Friday." The Dutch group had 28 explanations marked with this theme, 13 for "Monday" and 15 for "Friday." The Chinese group had eight explanations marked with this theme. The Chinese group had five "Monday" explanations with this code and three "Friday" explanations. All three groups shared very similar explanations for this theme, understanding "moved forward" to mean *before*, *earlier*, *closer*, or *sooner* for "Monday" and as

Table 7

Ego/Time-moving Explanation Examples

	Monday	**Friday**
English (*n* = 14)	➢ Wednesday is further away and moving it up two means it is 2 close[r] to me ➢ It's moved forward so it has move[d] closer in time to me, i.e. Monday instead of Wednesday ➢ Moved forward in time ➢ If something is moved forward or brought forward, it's been brought closer to the present or time of reference	➢ Friday is two days after Wednesday[a] ➢ 2 days after wed is fri[a]
Dutch (*n* = 25)	➢ 2 days before[a] ➢ It's two days earlier[a] ➢ It is moved forward, so it is rescheduled two days prior to the original date which is Monday[a]	➢ My initial thought was that the meeting was moved further in time ➢ Forward means (to me) further away in time, so two days from Wednesday is Friday ➢ My first instinct is that the meeting is moved into the future by two days
Chinese (*n* = 7)	➢ Moved forward as in it would happen sooner[a] ➢ Move forward means moving earlier - so next Monday[a]	--

[a]Also given *semantics* code.

after, *later*, or *away* for "Friday." See Table 8 for examples of explanations coded as *semantics*. Explanations with the *semantics* code often used a system of synonyms and antonyms to explain reasoning.

There were some cases in which participants who answered "Monday" revealed that it was simply the case of "if not this, than that;" opposite meanings or antonyms were employed to explain their answers. For example, one participant who answered "Monday" wrote that "forward means AHEAD, or EARLIER. If it was Friday you'd say it was pushed back two days." Another wrote: "the opposite of forward is backwards and if you move it backwards then you are pushing it back [to Friday]." Since the verb *pushed* or phrase *pushed back* was not used, "forward" therefore must mean the opposite direction; "forward" is closer to the present while *pushed* is further away. This was a logic that could be found throughout multiple "Monday" *semantic* explanations.

On the other hand, participants who answered "Friday" tended to be less sophisticated in their reasoning, simply viewing "moved forward" as synonymous with *pushed back*. In other words, no "Friday" explanations employed the strategy seen in "Monday" explanations in which the meaning of "moved forward" must be the opposite of the alternative direction (i.e. if participants who answered "Monday" prescribed "moved forward" as the opposite of *pushed back*, then no "Friday" answering participants prescribed "moved forward" as being the opposite of a direction).

Equation

The code *equation* refers to explanations that convert the prompt into a mathematical equation. Essentially, the prompt was treated as a logic problem in which they used numbers to solve. It would most often take the form of Wednesday +/- 2 = Friday/Monday. This was very explicitly done --participants employed plus or minus notation or wrote the words out. Some participants translated Wednesday to the number 3 and then added or subtracted 2. This explanation was used almost exclusively for "Friday" explanations. No "Monday" participants in the English and Dutch group used this explanation, while three and 13 of the "Friday" participants used it respectively. Alternatively, two "Monday" participants and no "Friday" participants used this strategy in the Chinese group. See Table 9 for explanation examples of this code.

Table 8

Semantics Explanation Examples

	Monday	**Friday**
English (*n* = 19)	➢ The opposite of forward is backwards and if you move it backwards then you are pushing it back ➢ Forwards in the week would be ahead while pushed back is Friday ➢ Forward means AHEAD, or EARLIER. If it was Friday you'd say it was pushed back two days ➢ Two days forward is two days earlier	➢ Friday is two days after Wednesday ➢ It sounds to me that a meeting had been scheduled for Wednesday, but it is now being rescheduled for two days later
Dutch (*n* = 28)	➢ A meeting moved forward means it is happening earlier than initially planned ➢ …I believe the meeting to take place two days sooner ➢ It has been move[d] to earlier in the week. If it was moved backwards I would say that it was Friday ➢ 2 days before	➢ Two days after Wednesday is Friday ➢ Two days later ➢ If the meeting was on Wednesday, then Friday is 2 days ahead[a]
Chinese (*n* = 8)	➢ Moved forward as in it would happen sooner[a] ➢ Move forward means moving earlier - so next Monday[a] ➢ Two days before next Wednesday	➢ "Forward" seems to suggest a time that is further away from Wednesday, but if I would read this sentence in Chinese, I would believe that the date has been

	is definitely next Monday	moved to Monday, because 前 [meaning *forward* but also *before* or *front*] implicates a time that is closer to now than the past[a, b] ➢ Initially I thought forward is like "push forward", so added another 2 days ➢ After two days

[a]Also given *ego/time-moving* code.

[b]Also given *experience* code.

Table 9

Equation Explanation Examples

	Monday	**Friday**
English (*n* = 4)	--	➢ Wednesday plus 2 equals Friday ➢ …The expression "two days" would mean 48 hours starting after midnight of Wednesday, thus, the second day lands on a Friday ➢ Wednesday + 2 days is friday
Dutch (*n* = 9)	--	➢ 3+2 ➢ Wednesday + 2 = Friday ➢ In my head this is the most logical day. Wednesday + 2 days = Friday ➢ Well initially it was Wednesday, let's say 9, and then 2 days is 48 hours so I'd say Friday at 9
Chinese (*n* = 3)	➢ Next Wednesday-2 ➢ 3-2=1 that's Monday	--

[a]Also given *semantics* code.

Experience

Experience refers to explanations related to certain social or language systems, experiences, or contexts. This theme is inspired by Gabryś-Barker's study on cultural differences of time between L1 and L2, where daily experiences (e.g. work, school, timetable, exam, etc.) were used as one of their codes (Gabryś-Barker, 2011). The most obvious of these experiences from the Wednesday prompt explanations was the calendar. This explanation could be seen from both "Monday" and "Friday" answering participants; however, only English participants addressed calendars in their explanations. These participants employed calendars to move the

meeting to Monday or Friday ("For calendars and time - back is understood to mean later. Thus forward would mean sooner;" "…two days forward assuming the week is on a left to right calendar is Friday"). This was often used in conjunction with the *semantic* theme of assuming "forward" meant *before* or *sooner*, or *later*. One Dutch "Friday" answering participant explains that they see time going linearly from left to right ("Moving forward to the future, linear going from left to right").

Two participants mentioned social systems as being an important factor. One participant is from the English group, claiming that "it's a vibe, based on how people talk about time;" they feel that Monday would be the most likely day based on what people around them would probably think. The other participant is from the Dutch group, who argues that it is logical for the meeting to now be on Monday in the social context ("…this one feels a little more logical").

One Chinese participant who chose "Friday" finds the language of operation to be a critical factor. For them, the question being in English implies that the answer is "Friday," while it would have been "Monday" in Chinese: "…but if I would read this sentence in Chinese, I would believe that the date has been moved to Monday, because 前 [meaning *forward* but also *before* or *front*] implicates a time that is closer to now than the past." See Table 10 for all experience explanations.

Ambiguity

If the participant acknowledges that there could have been more than one answer to the prompt, then their explanation would be marked with *ambiguity*. This was an uncommon theme, only occurring a total of five times: once in the English group and twice in the Dutch and Chinese group. Participants who were marked with this theme recognize that the opposite answer could be chosen or express confusion on which day the meeting is now on.

The participant in the English group elucidated that in a real situation, they would have likely asked for more clarification and expressed confusion. The participants from the Dutch and Chinese group did not express confusion, but did acknowledge that the answer could be either "Monday" or "Friday." See Table 11 for all *ambiguity* coded explanations.

Table 10

Experience Explanation Examples

	Monday	**Friday**
English (*n* = 6)	➢ For calendars and time - back is understood to mean later. Thus forward would mean sooner ➢ Monday is in front of Wednesday on a calendar ➢ It's a vibe, based on how people talk about time	➢ …moving forward on a physical calendar would place an event physically forward from Wednesday to Friday ➢ …two days forward assuming the week is on a left to right calendar is Friday ➢ The word "day" means the time period when the sun is in the sky, but also implies a 24 hour cycle of time. the expression "two days" would mean 48 hours starting after midnight of Wednesday, thus, the second day lands on a Friday[a]
Dutch (*n* = 2)	➢ …this one feels a little more logical	➢ Moving forward to the future, linear going from left to right
Chinese (*n* = 1)	--	➢ …but if I would read this sentence in Chinese, I would believe that the date has been moved to Monday, because 前 [meaning *forward* but also *before* or *front*] implicates a time that is closer to now than the past[a, b]

[a]Also given *ego/time-moving* code.

[b]Also given *semantics* code.

Table 11

Ambiguity Explanation Examples

	Monday	**Friday**
English (*n* = 1)	--	➢ …The thing is that if I thought about it more I would need to have it clarified because normally I would phrase that as "Let's push back the meeting two days". So if someone used this phrasing I would just be confused by what they mean
Dutch (*n* = 2)	➢ I was on the fence with choosing Friday	➢ *Had ook maandag kunnen zijn* (“Could have been Monday too”)
Chinese (*n* = 2)	➢ Cuz forward means the meeting will happen earlier. But I can imagine it can also be Friday, but that’s not my initial thought. The sentence doesn’t sound very grammatical to me somehow[a]	➢ This was my initial answer although after a second thought i think it should be Monday. Initially i thought forward is like “push forward”, so added another 2 days[a]

[a]Also given *semantics* code.

Discussion

To reiterate the main research question of this paper: *how is the Wednesday prompt in English answered and conceptualized by non-native English speakers of different L1s?* That is, are L2 English speakers inconsistent like native English speakers or exhibit a preference for either Monday or Friday? Moreover, does this depend on their L1? The goal of this question is to see if there is evidence that a person’s L1 is influencing their perception of time in their L2.

These questions were investigated using the Wednesday prompt: “Next Wednesday’s meeting has been moved forward two days. What day has the meeting been re-scheduled to?” Three groups with different L1 speakers were created. The first was L1 English speakers, who acted as the control group. The second was L1 Dutch speakers and the third L1 Mandarin Chinese speakers. The participants of the Dutch and Chinese groups had an advanced level of L2 English. The English group distribution was 59.1% “Monday” and 40.9% “Friday;” The Dutch group distribution was 33.3% “Monday” and 66.7% “Friday;” and the Chinese group distribution was 75% “Monday” and 25% “Friday.”

The Dutch and Chinese groups were compared together and separately to the English control group’s answers to the prompt. It was found that there was a significant difference between the Dutch and Chinese groups compared to the English group in their “Monday” and “Friday” distributions. When separated, the Dutch group was significantly different from the English group, while the Chinese group had no significant difference. Ultimately, the quantitative results show potential evidence that L1 Dutch speakers perceive the Wednesday prompt differently from the L1 English group. On the other hand, they do not show support for L1 Mandarin Chinese speakers perceiving the prompt differently than the L1 English group.

The qualitative results coded explanations using five themes: *ego/time-moving*, *semantics*, *equation*, *experience*, and *ambiguity*. The most common theme in the English group was *semantics* with the second most common being *ego/time-moving*. Explanations coded as *equation* did exist, but on a lesser scale than the Dutch group and only for “Friday” explanations. The English group was the only group to have calendars in their *experience* explanations. They were also the only group to express confusion or a need for clarification regarding the prompt for *ambiguity* themed explanations.

Compared to the English group, the Dutch group greatly favored *ego/time-moving* explanations, particularly for “Friday,” although *semantics* was the more common theme overall. *Ego/time-moving* “Friday” explanations for this group tended to describe the meeting as being moved through time rather than being placed relative to Wednesday (e.g. “...the meeting was moved further in time;” “…the meeting is moved into the future by two days”). These explanations used more of a future-past t-FoR than an earlier-later t-FoR. This was in contrast to the English group, who tended to do this for “Monday” explanations, but not for “Friday” ones (“Friday is two days after Wednesday;” “2 days after wed is fri”). The Dutch group also had a

surprisingly large amount of *equation* explanations (n = 9), over twice as much as the English group (n = 4) (although like the English group, these were only for "Friday" explanations). This was interesting because this theme was entirely unexpected and unpredicted in the first place. *Experience* explanations were limited to an answer feeling more "logical" (for "Monday") and time moving "linearly from left to right" (for "Friday"). The external environment (Athanasopoulos & Bylund, 2023) was much less of a factor for this group compared to the English group. For *ambiguity*, the Dutch group acknowledged that there could be more than one answer to the prompt and expressed no confusion, unlike the English group.

Common themes in the Chinese group were *ego/time-moving* and *semantics*, with the latter being the most common. Compared to the English group, the Chinese group always paired *ego/time-moving* explanations with an earlier-later t-FoR and only used this theme for "Monday" explanations, contrasting the English group's tendency to use this t-FoR for "Friday" explanations. Unlike the English group, while they did have *equation* themed explanations, they only had them for "Monday." An explanation from the Chinese group was additionally the only *experience* explanation that explicitly translated the prompt into Mandarin and then compared it with the prompt to English to give an answer ("…but if I would read this sentence in Chinese, I would believe that the date has been moved to Monday, because 前 [meaning *forward* but also *before* or *front*] implicates a time that is closer to now than the past"). Lastly, the Chinese group's explanations regarding *ambiguity*, like the Dutch explanations and unlike the English explanations, were able to understand that there could be more than one answer to the prompt without expressing confusion about it.

In sum, there is evidence that non-native English speakers differ from native English speakers in the conceptualization of time. There is strong evidence for this from the Dutch group quantitative results, but not from the Chinese group; however, it is important to understand that this does not mean that there is no effect whatsoever. It may still be the case that there is a difference between the Chinese and English group. The Chinese group's qualitative explanations when compared to the English group's, while similar on some fronts, differ on others; thereby, suggesting that the Chinese group may be conceptualizing time in a different manner than the English group, even if this could not be seen from the quantitative results.

Is there evidence that a group's L1 was affecting their perception of time in their L2? Based on the quantitative results, there was evidence for this from the Dutch group but no

significant evidence for this from the Chinese group. Based on the qualitative results, unique clustering of themes and insightful explanations suggest that L1 is having an effect on how people are conceptualizing time in the Wednesday prompt. One noteworthy thematic cluster was the *equation* explanations from the Dutch group.

The *equation* coded explanations were polarizing in general; in the sense that these explanations were always either for only "Monday" (Chinese group) or only "Friday" (English and Dutch groups). As aforementioned, there were a surprisingly good amount of explanations with this code in the Dutch group (n = 9). This could possibly be explained by cultural or language differences between the Dutch group and the other two groups. Culturally, it may be the case that Dutch culture operates and encourages a more equation based perspective on time, where the concept of time is a matter of adding or subtracting to something rather than a vague notion of the concept. This could be partially supported by many Dutch explanations describing the passage of time as moving one direction or the other but not philosophizing on it as much as English or Chinese explanations. This can be seen in Dutch *experience* explanations, which point to "logic" and the linear movement of time, while English explanations imagine calendars and what the "vibe" may be, and the Chinese *experience* explanation considering both English and Mandarin time frameworks.

It could also be the case that the Dutch language encourages a more equation-based approach to time than compared to English, even if the Wednesday prompt is ambiguous in Dutch as well (Elvevåg et al., 2011). For instance, relaying time in Dutch can be quite different from in English. To say the time 10:40 in English (i.e. "what time is it? Ten-forty") can be argued to be comparatively simpler than in Dutch, *tien over half elf*: "ten [minutes] after half of eleven [o'clock]" or 11 o'clock minus 30 minutes plus 10 minutes. This adding and subtracting of time may extend to other conceptualizations of time, like moving a date. It is possible that this may suggest CT from Dutch to English, utilizing Dutch language habits for time and applying them to English.

Another insightful explanation can be found in the one *experience* explanation from the Chinese group: "…but if I would read this sentence in Chinese, I would believe that the date has been moved to Monday, because 前 [meaning *forward* but also *before* or *front*] implicates a time that is closer to now than the past." This answer not only provided valuable insight into why the Chinese group may have preferred "Monday," but on how participants are potentially able to

distance themselves from their L1 and place themselves in another language's t-FoR. This participant's explanation implies that they are able to operate their L1 and L2 time concepts and t-FoR separately and successfully, showcasing that L1 may have influence but that awareness of this influence trumps the effect of this influence.

Ultimately, the results from this paper run counter to the predictions proposed in the introduction. Namely, that the Dutch group would not be significantly different from the English group and that the Chinese group would be significantly different from the English group; however, one aspect of the prediction for the Chinese group was fulfilled: this group did prefer "Monday" less so than preferences from monolinguals of Mandarin Chinese. Yet notably, the Chinese group in this paper preferred "Monday" slightly more than in other studies where Mandarin-English bilinguals were given the prompt in English. Lai and Boroditsky (2013) in their study found that 62% of their Mandarin-English bilinguals preferred "Monday" compared to this paper's 75%. This discrepancy may possibly be due to their study's larger sample size (n = 55) or that bilinguals whose L1 was English and L2 was Mandarin were also included. The latter explanation may skew the results to reflect more of an L1 English distribution.

In the context of other studies, this paper's findings contrast the findings by Elvevåg et al. (2011), who found that their Dutch participants' answers to the prompt in Dutch (*voorwarts verplaatst*: "moved forward") was at chance level. This was largely attributed to the ambiguity of the prompt in Dutch. Ambiguity in a language determining the distribution of time perspectives was also argued by Duffy and Evans (2017); however, the significant difference of the Dutch group compared to the English group found in this paper suggests evidence that some aspects of Dutch not rooted in ambiguity may influence the Dutch participants to adopt the ego-moving perspective and choose "Friday." In other words, there is evidence that ambiguity is not the (only) determining factor for time perspective preferences. One possible explanation for this could be that Dutch prefers a more absolute t-FoR than intrinsic one. This may not be apparent in Dutch, but may reveal itself more clearly in a L2, although explanations for why this may be are limited and speculative. For instance, attention to certain aspects may shift when operating in an L2, which may result in a dominant t-FoR to emerge.

Contrastingly, the participant from the Chinese group who expressed awareness of their L1's influence on their time perception suggests that language may simply be a tool to wield rather than a determining force. This awareness, however, may be a more idiosyncratic trend.

That is, only one participant explicitly expressed the differing time conceptualizations for the Wednesday prompt between their L1 and L2. While the influence of awareness does seem to be a powerful one, it may not be a common strategy blatantly employed in the implicit processing of time perception (perhaps if a person was asked explicitly how their L1 perception of time differed from their L2, they may distinguish any discrepancies, but when the perception is implicit, this seems to be overlooked).

How do these paper's results enhance the current understanding of L1 influence of time perception in L2? Firstly, there is compelling evidence that L1 can influence time perception in L2 based on the results from the Dutch group compared to the English group. There is possible evidence that this may also be the case for the Chinese group, but this can only be speculated from the qualitative results compared to the English group's. Nonetheless, although there is evidence for L1 influence on L2, the strength of influence may be language dependent judging from the differences in significance for the non-native groups compared to the native one. Overall, there is evidence that non-native speakers do conceptualize time differently from native speakers based to some extent on their L1.

A prominent limitation of this paper was its focus on only one version of the Wednesday prompt. Variations of the prompt may have been able to further trace how the L1 was influencing the L2, such as "move the meeting *up*" "*push* the meeting *back*," etc. Preliminary findings regarding these variations show ambiguity in L1 English speakers for these questions using new adverbs and verbs as well. Testing if these variations produce similar results to the original version of the prompt could better sketch how t-FoRs from L1 may be operating in a L2. Additionally, taking more into account age of acquisition may have been fruitful, since past studies have found the strength of L1 influence on L2 being reflected in this characteristic (Athanasopoulos & Bylund, 2023). There may have been a correlation between age of acquisition and L1 influence in L2 given the ability to test a wider sample of acquisition ages.

Conclusion

This paper set out to investigate if a person's L1 has an influence on their L2 regarding time perception. Findings provide evidence that there is an influence, but that this may be language dependent (to an extent). Cultural and language differences between the L1 and L2 may

play a role in preferring the ego-moving or time-moving perspective. Explicit awareness of different time concepts between a L1 and L2 appears to have a powerful effect, allowing the person to successfully navigate and switch between two time concepts; however, whether the Wednesday prompt is ambiguous in a language or not does not seem to be a entirely reliable determiner for how L1 speakers of a language may perceive time.

Further research on other L1 languages may prove beneficial; comparing L2 English speakers with ambiguous translations of the prompt to L1 English speakers could provide insight on if ambiguity is a predictor for inconsistency or not. Nevertheless, the paper hopefully encourages more exploration into how different L1s' time conceptualizations may manifest in a L2 in a way that is not strictly rooted in comparing temporal metaphors in the L1 to the L2, which was often the method of many previous studies.

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Appendix A
Full Survey

Q1.1 **Survey Instructions**

The following survey investigates how you perceive time. You will be asked a question on what you believe to be the proposed time and why. The survey will take approximately 1-2 minutes. Your response will be anonymous and you may withdraw from the survey at any point in time!

To take this survey, you must be a native speaker of English, Dutch, or Chinese and at least 18 years old. If your native language is Dutch or Chinese, you must at least have an advanced level of English.

Q1.2 By ticking this box I confirm that I give consent to my results being (anonymously) used for the data analysis. If you do not consent, then your results cannot be used and the survey will end.

- ○ I consent
- ○ I do not consent

Q1.3 What gender do you identify as?

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

Q1.4 What is your age? _____

Q1.5 Where did you grow up? (please provide a country) _____

Q1.6 Is English, Dutch, and/or Chinese your native language?

- ○ Yes
- ○ No

Q1.7 What is your native language? You would be considered "native" if you have learned the language at an advanced level before the age of five. You may choose more than one language if applicable.

- ☐ English
- ☐ Dutch
- ☐ Chinese

[The next set of questions (up until Q2.1) are for non-native English speakers.]

Q1.8 What level is your English?
You would be considered "advanced" if you follow an English-taught higher education degree, use English daily at work, and/or have lived in an English speaking country for a long period of time (etc.).

- ○ Advanced
- ○ Below advanced

Q1.9 At what age did you start learning English? (please give a number) _____

Q1.10 Where did you learn English? You may choose more than one.

- ☐ School
- ☐ Home
- ☐ Hobbies
- ☐ Work
- ☐ Other _____

Q2.1 **Wednesday Prompt Instructions**

Please read the following question and provide your answer below. Do not spend too much time thinking about it and do not change your answer: I am interested in your initial reaction. An explanation is not required, but encouraged.

Q2.2 "Next Wednesday's meeting has been moved forward two days."
What day has the meeting been re-scheduled to? (please choose just one day) _____

Q2.3 Please explain your choice. (optional) _____

Q3.1 **Debriefing**

Thank you for participating! The aim of this study is to compare how native speakers of different languages experience time in English. The Wednesday question is purposely ambiguous for this reason! There is no objectively "correct" answer. People vary between choosing either Monday or Friday.

Please do not share your response or reasoning with other people if they plan on taking the survey.

Q3.2 Do you have any other thoughts or comments regarding the experiment? (optional)

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