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What You Are Getting and What You Will Be Getting: Testing Whether Verb Tense Affects Intertemporal Choices

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Prior research has shown that the way information is communicated can impact decisions, consistent with some forms of the Sapir-Whorf hypothesis that language shapes thought. In particular, language structure—specifically the form of verb tense in that language—can predict savings behaviors among speakers of different languages. We test the causal effect of language structure encountered during financial decision-making, by manipulating the verb tense (within a single language) used to communicate intertemporal tradeoffs. We find that verb tense *can* significantly shift choices between options, owing to tense-based inferences about timing. However, the spontaneous use of verb tense when making choices occurs only in the complete absence of other timing cues and is eliminated if even ambiguous or nondiagnostic time cues are present, although prompted timing inferences persist. We test between multiple competing accounts for how verb tense differentially impacts timing inferences and choices. We find evidence for a cue-based account, such that the presence of other cues blocks the spontaneous use of verb tense in making intertemporal decisions, consistent with the "Good Enough" proposal in psycholinguistics.

Keywords: cue competition, implicatures, intertemporal choice and inferences, linguistic priming, Sapir-Whorf Hypothesis

Since the 19th century, philosophers, linguists, and psychologists have debated whether language has a causal impact on thought. Perhaps the best-known version of this idea, often called the Sapir-Whorf hypothesis, is that differences across languages determine, or at least influence, differences in thought. In this view, the unique aspects of a given language can facilitate some ways of thinking and impede others, leading some cognitions to be more accessible and therefore more prevalent among speakers of that language, in ways that are empirically testable (see Hunt & Agnoli, 1991 for a review). Correspondingly, a large literature in psychology has investigated ways in which receiving the same information, communicated in grammatically or semantically different ways, can impact one's decision-making.

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In this article, we investigate under what conditions specifically linguistic cues, identified in prior research, affect decision-making, and whether those differ from other language-based effects (e.g., framing). We focus on a well-motivated test case: whether differences in verb tense cues, within a single language, influence intertemporal choices between less resources sooner and more resources later. Research in linguistics, economics and psychology all raise the possibility that people's intertemporal tradeoffs are sensitive to linguistic cues in how those tradeoffs are expressed. At the same time, other research in each of these three areas has provided strong reasons to question the likelihood of a pervasive influence of language on choice.

In linguistics, specific differences in the way languages structure and relate concepts have been posited to affect how people think about those concepts when using that language. The Sapir-Whorf hypothesis states that people's thoughts can be influenced by the language they speak (Koerner, 1992; Sapir, 1929; Whorf, 1956). Consistent with this view, Boroditsky (2001) argued that different spatial metaphors for expressing time in Chinese (vertical) and English (horizontal) affect people's performance in spatial cognition tasks. However, linguists have argued that human thought and action are determined by other factors than language (Berlin & Kay, 1991; Kay et al., 1991), and subsequent research has called the spatial metaphor finding into question (Chen, 2007).

In psychology, research has suggested that even subtle differences in language can affect people's choices. In particular, research has found effects of framing, priming and language structure. Priming and framing effects, in particular, have been extended to intertemporal choices (see Rung & Madden, 2018 for a review). That said, recent research has demonstrated that prior conclusions

about the pervasiveness of priming were premature, questioning the replicability of classic social priming findings (e.g., Pashler & Wagenmakers, 2012). Likewise, while some research has found effects of grammatical structure on behavior (e.g., noun vs. verb forms of voting and donation appeals; Bryan et al., 2011, 2013, 2014), the robustness and generalizability of these findings has been debated (Bryan et al., 2016; Gerber et al., 2016a, 2016b). The disagreements in this literature stem, at least in part, from a focus on demonstrating the existence of effects and insufficient investigation of boundary conditions which could identify the specific psychological mechanisms by which exposure to linguistic cues impact decisions.

In economics, explaining levels and variation in household savings that are seemingly inconsistent with traditional economic principles of intertemporal choice has been a long-standing puzzle (Laibson, 1997; Sutter et al., 2015; Warner & Pleeter, 2001). In particular, savings rates vary across countries in ways that are not well explained by having sufficient resources to save (Boschini et al., 2013; Torvik, 2009). A recent influential paper (Chen, 2013) in economics has posited linguistic differences as a partial explanation for differences in savings rates, relying on a two-part Sapir-Whorf theory of intertemporal choice, in which verb tenses that distinguish the future from the present cause people to perceive future events as having both more distant and more nonspecific timing. In line with the theorizing, Chen (2013) documented a correlational relationship between the structure of the future tense in the language used and consumer savings rates (as well as other presumably far-sighted behaviors), both across countries and by comparing speakers of different languages within the same countries.

Thus, across disciplines, how linguistic cues might or might not shape intertemporal preferences is an important and unresolved question, and research on these questions is limited by the fact that cross-language comparisons involve multiple confounded but relevant differences (Thoma & Tytus, 2018). In fact, subsequent research has argued that at least some of the correlational relationship in Chen (2013) is explained by shared culture (Roberts et al., 2015). Furthermore, culture may even influence language formation (e.g., geographical origins influencing cultural norms and language development over time; Galor et al., 2016).

In this article, we investigate the causal effect of specifically the grammatical structure that decision-makers engage with during decision-making on their time preferences. We vary the verb tense used in describing choice options, within a single language (English) to avoid culture as a confound and test the effect on both temporal judgments and the intertemporal choices that people make. Our studies test whether such linguistic effects *can* reliably occur, and if so, to identify under what conditions verb tense would and would not affect intertemporal preferences. Our main goal is to identify the psychological mechanism that governs when and how grammatical structure influences decision-making, using the case of verb tense & farsightedness.

Across nine studies, 3,744 participants, and 114 unique choice questions, we find that the use of present versus future verb tense (e.g., "get" vs. "will get") does affect choices, but only in the impoverished situation where no other timing information is presented. Our results further suggest that while verb tense can impact choices, it does so via an inferential (rather than attention-based priming or framing) mechanism. In the presence of objective timing information, or even ambiguous and noninformative timing cues, the impact of verb tense on choices is eliminated, consistent with a cue-based inference mechanism.

This mechanism is also consistent with the "Good Enough" proposal of language processing, which contends that processing of linguistic stimuli can be imprecise because not every cue is interpreted during processing, unless doing so is made necessary (Ferreira & Patson, 2007; Karimi & Ferreira, 2016). We conclude that, as weak cues that compete with other cues, syntactic structures such as verb tense will not be processed unless necessary and will therefore affect choices primarily when no other cues are present, resulting in limited impact on everyday decision-making. Data, analysis code, and study materials are publicly available at https://osf.io/dmybj/, and all studies have IRB approval.

Theoretical Development and Proposed Framework

Linguistic Determinism Versus Relativity

Does the language we use to process information shape the way we think? This possibility, known as the Sapir-Whorf hypothesis in linguistics (Sapir, 1929; Whorf, 1956), can be thought of in terms of two possibilities. The strong version of the hypothesis suggests that language *determines* thought, in the sense that thoughts which are possible in one language may not even be conceivable in another. The weak version, on the other hand, posits a less deterministic relationship in which language *influences* thought, via what a person is likely to spontaneously perceive or remember (Chandler, 1994; Tohidian, 2009). The weak version can be interpreted as related to psychological theories in which activating a particular construct makes related constructs temporarily more accessible (Balch et al., 1992; Shah et al., 2012) or in which a particular framing makes an associated interpretation more salient (Tversky & Kahneman, 1981).

Carroll and Casagrande (1958) claimed early empirical backing for the strong Sapir-Whorf hypothesis. They documented the ability of children who only spoke Navajo to pick up form recognition more quickly than children speaking only English. They argued that this was consistent with linguistic determinism, because the Navajo language has verb conjugations that depend on form and shape, while English does not. However, their study also documented evidence inconsistent with the hypothesis, as bilingual children (speaking both Navajo and English) developed form recognition *later* than English speaking children.

Linguists have largely rejected the deterministic version of the Sapir-Whorf hypothesis for lack of clear evidence. For example, some researchers have suggested that the translation of the Native American languages to English in the original work by Sapir and Whorf was overly literal, rendering it too simplistic (Garnham & Oakhill, 1994). It has also been pointed out that the strong hypothesis fails to account for reverse causality, where thought or culture can impact the development of language (Lenneberg & Roberts, 1956). Relationships between language and thought could be bidirectional and affected by social context—that is, language may affect thought but conversely, thought may also affect language use (Chandler, 1994).

More recent research has instead focused on the weak hypothesis. Differences across languages in how colors are named provides an illustrative example of the mixed evidence for the weak

hypothesis. Initial evidence from cross-language differences in color naming and color recognition suggested that language influences color recognition and perception (Brown & Lenneberg, 1954; Lenneberg & Roberts, 1956), lending support to the weak Sapir-Whorf hypothesis. However, subsequent research found that there were semantic universals in color naming schemes, with variation in people's color descriptions driven primarily by individual differences in visual physiology (Berlin & Kay, 1991; Heider, 1972; Kay et al., 1991). On the other hand, subsequent papers on color recognition provided additional support for the weak hypothesis—speakers of a language with fewer color categorizations grouped similar colors together more than speakers of languages with more color categories (Davidoff et al., 1999; Davies et al., 1998; Özgen & Davies, 1998).

Research on the Sapir-Whorf hypothesis has largely focused on the effect of language structure on language usage and recognition (e.g., naming colors, recognizing patterns), but little has been done to test whether language structure influences decision-making. By contrast, in this article, we focus on whether (and how) the linguistic feature of verb tense affects people's decisions, in intertemporal choices.

While linguists have continued to investigate the possibility that thought is influenced by language, perhaps via shifts in attention (Gumperz & Levinson, 1991; Levinson & Gumperz, 1996), most research on the effects of linguistic differences on decisions has been conducted in psychology. Research on semantic priming has found that even incidental exposure to specific words can make associated constructs more salient, but not necessarily shifting attitudes and behaviors, including in a financial context (Caruso et al., 2017). Research on framing has found that expressing the same informational content in different forms can systematically impact choices (e.g., in terms of lives saved or lives lost, Tversky & Kahneman, 1981; in terms of % fat vs. % fat-free foods, Levin, 1987). Furthermore, some research has found that communications that differ in language structure can affect decisions. Highlighting the noun forms instead of their corresponding verb forms in identity-related appeals (e.g., "being a voter" vs. "voting") can result in more normative behaviors, including voting (Bryan et al., 2011), donating (Bryan et al., 2013), honesty (Bryan et al., 2014), water conservation (Mallett & Melchiori, 2016), and engagement with science among children (Rhodes et al., 2019, 2020). However, the literature also includes mixed results and unresolved debates about the generality of such effects. Overall, moderators and boundary conditions, as well as differences in the effects of different types of linguistic cues are not well understood.

Intertemporal Choices and Farsighted Behavior

A large research literature has studied intertemporal choices (e.g., between a sooner-smaller and a later-larger option), to understand the discount rates implied by people's preferences. This research has established that people are more impatient than can be explained by normative economic standards, and that people's intertemporal preferences are sensitive to a variety of contextual factors (see Frederick et al., 2002; Urminsky & Zauberman, 2016, for detailed reviews).

Intertemporal preferences have long been viewed as one of the primary determinants of savings and investment decisions (Bernheim & Rangel, 2007; Carroll 1992; Fisher, 1930; Gourinchas & Parker, 2002; Laibson, 1997; Samuelson, 1937). Empirical work has documented that less extreme time discounting predicts prudent financial behaviors (Chabris et al., 2008; Harrison et al., 2002; Johnson et al., 2011; Meier & Sprenger, 2010) and farsighted health behaviors (see Urminsky & Zauberman, 2017 for a review), although not necessarily savings (Chabris et al., 2008; Chapman, 2001).

People's intertemporal preferences depend specifically on how they process prospective time and perceive the future. The most widely documented behavioral anomaly is hyperbolic discounting, the tendency for people to be more patient when choosing between two options far in the future than when choosing between the same two options in a time perceived as the present (Ainslie, 1975; Jang & Urminsky, 2022; Thaler, 1980). Prior work attempting to explain high discount rates and hyperbolic discounting has demonstrated that intertemporal preferences depend on people's subjective time perception (Zauberman et al., 2009), their assessment of their future self (Bartels & Urminsky, 2011) and the salience of future opportunity cost (Read et al., 2017). Therefore, intertemporal preferences could be influenced by language, to the degree that linguistic cues affect relevant factors, such as subjective time perception, that contribute to preferences.

Linguistic Cues and Time Perception

Prior research has suggested that differences across languages can impact how people think about time. For example, time is often expressed in vertical terms ("up" vs. "down") in Mandarin and some researchers have therefore argued that Mandarin speakers also think of time more vertically than English speakers do (Boroditsky, 2008; Boroditsky et al., 2011; Miles et al., 2011). Differences in spatial representation of time by language has also been shown in comparisons between Hebrew and English (Fuhrman & Boroditsky, 2010), and between English and Greek/Spanish (Casasanto et al., 2004). This idea, although intuitive, has been quite controversial, however, and seemingly promising empirical demonstrations (Boroditsky, 2001) have subsequently failed to prove robust (Chen, 2007; January and Kako, 2007).

In this article, we focus on how temporal events are syntactically marked by verb forms (i.e., future time reference). In certain languages, considered "futureless," present and future timing is not conveyed by how verbs are expressed (e.g., Finnish and Estonian; Dahl, 2000). However, most languages have future markers on the verb that distinguish present and future. For example, in English, a modal (e.g., "will") can be placed before another verb ("go") to form the futured pair ("will go"), to denote a future act of going (e.g., "I will go to the mall tomorrow"; Wekker, 1976). In languages with future markers, the presence or absence of such verb modifiers may convey timing information.

The Relationship Between Language and Farsightedness

Chen (2013) proposes that speaking a language with future tense increases future-mindedness (e.g., as revealed by savings rates) among speakers of that language. Specifically, using a language with no future tense markers involves "speaking about future events as if they were happening now," which is assumed to cause people to both "perceive future events as less distant" and to have more precise beliefs about timing, resulting in lower saving behaviors of native speakers (Chen, 2013). Conversely, using

future tense markers to modify verbs in a language is proposed to increase the psychological distance between the two times and reduce certainty regarding the timing of the delayed outcome, inducing native speakers of such languages to exhibit more far-sighted behavior. While acknowledging the potential role of longer-term effects of language (e.g., the development of habits of speech), Chen's theory is primarily motivated by short-term *contextual* effects of language during use, such as the impact of present versus future tense in literature on the subjective experience of a person while reading.

Chen (2013) then presents a variety of evidence that, on average, speakers of futureless languages save more, retire with more wealth, smoke less, practice safer sex, and are healthier. Extending these findings, subsequent research found that firms located in countries with futureless languages had higher precautionary cash holdings (Chen et al., 2017), and firms that used less futured writing in their annual reports generated above-average positive returns (Karapandza, 2016). The same correlational relationship between futureless language and patience in intertemporal choices (on an index comprised of time discounting tasks and attitudinal measures) has been replicated across 76 countries (Falk et al., 2018; see also Sutter et al., 2015; c.f., Thoma & Tytus, 2018). Pérez and Tavits (2017) provided an initial causal test of a contextual short-term effect of the language used during decision making on farsightedness. They report that bilingual speakers of both Estonian (futureless) and Russian (futured) who were randomly assigned to complete a survey in Estonian were more patient and more supportive of future-oriented policies than those questioned in Russian.

The interpretation of these findings, particularly Chen (2013), has been widely debated. Linguists have objected to the inference that language structure has a meaningful causal effect on thinking about time, especially when interpreted in terms of the strong Sapir-Whorf hypothesis (e.g., Dahl, 2013; McCulloch, 2013; 2014; Pullum, 2012). These objections are largely based on the long-standing debates over the Sapir-Whorf hypothesis in general, as summarized above, with a lack of evidence for the strong form and conflicting evidence regarding the weak form (Au, 1983; Garnham & Oakhill, 1994; Lenneberg & Roberts, 1956; Pinker, 2003). Furthermore, Fabb (2016) criticizes categorizations of languages used in such research as oversimplified, such as labeling English as a strong future-time-reference language despite usage of weak future time reference in conversational English.

If the proposed relationship between language and farsighted behaviors is robust and generalizable, why might it occur? Differences in both language and farsightedness between speakers of different languages could be caused by corresponding long-standing differences in cultural norms (Wang et al., 2016), which in turn could arise from geographical differences (Galor et al., 2016). The relationship between language and farsightedness still holds when accounting for the fact that languages are not independent of each other (i.e., share cultural norms), but the effect size does diminish (Roberts et al., 2015).

Focusing on purely linguistic influences, we can also think of farsightedness as potentially shaped by long-term immersion in a language with a structure that promotes thinking of the future as a continuation of or distinct from the present (e.g., the associations formed between language structure and timing estimates; Casasanto, 2008). In both the cultural hypothesis and the immersion hypothesis, language predicts differences in farsightedness across people, but a given person's farsightedness should be relatively stable and we would not expect variation in language use or exposure, especially within a given language, to shift intertemporal preferences.

Alternatively, in line with much of the theorizing in Chen (2013), we can think of language as influencing intertemporal preferences directly in the moment, during stimulus processing and subsequent deliberation. This could occur in one of two ways. The first possibility is that linguistic elements activate specific associations, which impact intertemporal preferences via semantic priming (Neely, 1991). For example, seeing a future outcome described using a verb tense associated with the present could activate more near-term associations than would seeing a future-only verb tense. A slight variation on this possibility is that the verb tense acts as a framing device, making a particular interpretation more salient. The second possibility is that people engage in some form of inferential reasoning, treating linguistic elements as cues to meaning. In particular, people might infer a longer delay from the objectively equivalent timing information when expressed in a future-only verb tense.

Priming and Framing to Increase Far-Sightedness

According to theories of spreading activation, thinking about a concept activates a node that represents it, and temporarily increases activation of other linked nodes that represent similar concepts (Anderson & Pirolli, 1984). This process accounts for the phenomenon of priming, in which presenting the prime facilitates responses to a subsequent, related item—the target (McKoon & Ratcliff, 1992).

The effects of some kinds of priming (of affect, mortality, timing, future thinking or construal) on time discounting in one-off choices have been tested, with mixed results (see Rung & Madden, 2018 for a review). In particular, some recent work proposes that specifically semantic priming can impact time discounting (Sheffer et al., 2016; Shevorykin et al., 2019), although other research has not found effects on time discounting from textual primes (Israel et al., 2014). However, given recent failures to replicate priming effects in general (as discussed in Bower, 2012; Cesario, 2014; Molden, 2014; Nistal et al., 2016; Pashler & Wagenmakers, 2012), it is not currently understood how robust or generalizable such findings are.

By contrast, there is stronger evidence that framing can systematically shift intertemporal preferences (e.g., Rung & Madden, 2018). In particular, stimuli presenting intertemporal choices (e.g., $30 today vs. $50 in 6 weeks) typically only describe the timing in which payments are to be received, but not times in which a payment could have been but will not be received (e.g., $0 in 6 weeks if $30 today is chosen). Making these "hidden zeros" explicit, despite not providing additional information, has been shown to increase choices of the later-larger option (Magen et al., 2008; Read et al., 2017). The same future timing can also be conveyed either as the delay until receipt of a reward or as the date at which it would be received. Prior research on the date-delay effect has found greater patience when the same timing information is presented as a date rather than the delay (LeBoeuf, 2006; Read et al., 2005).

Conversational Implicatures and Inference

Pragmatics, a subfield of linguistics, offers a different perspective on how language can affect cognitions in the moment. Beyond the literal meaning of a semantic expression, people's understanding involves conversational implicatures, speaker-intended suggestive inferences about the meaning of the expression, in the context in which the information is encountered, by making assumptions about the information provider's intentions (Grice, 1975; Horn, 1984; Levinson, 2000).

In typical theories of implicature, the information recipient assumes that the information provider intends to be truthful, succinct but complete, consistent with the general principle of least effort (Zipf, 1949). Speakers economize their message by making their communication as brief as possible, and as relevant as possible. Listeners, knowing this, rely on all cues in the information given, to interpret the message (Grice, 1975; Wilson & Sperber, 2002). One such cue, for inferring timing, can be the verb tense. To the degree that people infer timing from verb tense, the linguistic structure of how timing is expressed may affect intertemporal choices.

In this view, whether people make an inference depends on whether the needed information is available without the inference (i.e., literally stated), and whether the receiver believes the person has and intends to convey the information (for more discussion, see Grundy, 2013; Horn & Ward, 2008). For example, referring to the timing of two options using the same word might signal that the speaker does not know or does not intend to convey which occurs first. Conversely, using two different words for the timing of two options may signal that the speaker is conveying a difference in timing, prompting the recipient to engage in additional inference about which occurs first when that is not already clear (consistent with a manner-based implicature).

By contrast, people may selectively rely on only a subset of available information when making inferences. Rescorla and Wagner (1972), building on prior work in animal behavior (Kamin, 1969), showed that when a stimulus is known to be a predictor of the outcome, people perceive a second, additional, stimulus to have a minimal or negligible effect, and do not use it to predict outcomes. In particular, Dickinson et al. (1984) showed that, in humans, the effect of a stimulus on perceived outcome will be blocked (or attenuated) when it is presented along with another stimulus that has been previously identified as a predictor of the outcome.

In language processing, people mis-analyze "garden-path" sentences (e.g., "While Mary bathed the baby played in the crib"), such that they answer factual questions about the sentence wrong (e.g., Answering "yes" to "Did Mary bathe the baby?"). This has been interpreted as evidence that people strive for a "good enough" understanding of the sentence by processing the more local interpretation (i.e., relying on the first few words, as the most relevant and accessible cues) instead of incorporating all the available cues (Christianson et al., 2001; Ferreira et al., 2001; Ferreira & Patson, 2007). Therefore, when competing cues are present, which of the cues people rely on can determine the meaning they extract from the information given, and thereby what decision they make. Thus, contrary to the basic implicature account, cue-based inference suggests that people look for the most relevant cue(s) in the available information, as opposed to assuming that all the information has been expressed for a purpose and therefore incorporating all the information in the decision.

The Single-Language Approach to Testing Linguistic Effects on Intertemporal Preferences

To summarize, prior research has found robust correlational relationships between language structure and time preferences across languages and has suggested that these may be evidence of an effect of a language's linguistic structure on mental representations of relevant information among speakers of the language. Furthermore, research in psychology and linguistics provides multiple potential means by which linguistic cues in information may influence mental representations during decision-making, and thereby influence decisions, primarily based on within-language comparisons of linguistic cues.

We investigate the fundamental question raised but left unanswered by this interdisciplinary body of research: How is language structure incorporated into people's mental representations and decisions in a single language, and can these cognitive processes credibly explain cross-linguistic differences in behavior? Specifically, we test whether in-context linguistic differences (i.e., the verb tense used in the wording of choice options) influence timing judgments and intertemporal preferences in the moment, during stimulus processing and deliberation, via either semantic priming/framing or pragmatic inference (either implicature or cue-based). This hypothesis is testable within any single language, as long as usage allows for sufficient flexibility, so that the verb tense can be independently manipulated when conveying information.

According to the distinction relied on by Chen (2013), English is a futured language and it has tense marking (i.e., separate tense forms denote present vs. future events; Dahl, 2000). However, in practice, the English language is more flexible, as multiple forms can be used to express a future event (Copley, 2009). In conversational English, receiving a future amount of money can be conveyed in multiple ways:

1. You get $5 in a week.
2. You are getting $5 in a week.
3. You would get $5 in a week.
4. You will get $5 in a week.
5. You are going to get $5 in a week.

Although these sentences may be interpreted differently, all could be used to refer to the same future event. The only difference is that (1) and (2) use the present-tense grammatical form, (3) uses a neutral form[1] that ostensibly does not imply a timing,[2] while (4) and (5) use a form reserved for discussing the future. As discussed in Chen (2013), these kinds of differences in the tense used when conveying specific information can reflect a "tense-shifting-strategy" that attempts to convey either immediacy or temporal distance.

[1] We use the phrase "neutral tense" loosely throughout this article. To be specific, we are referring to the acceptability of the use of the modal "would" with the primary verb—which is neither strictly present nor future tense—in sentences.

[2] While it does not imply timing, it can imply other characteristics, particularly conditionality (as will be seen later).

Overview of Hypotheses, Explanatory Accounts, and Studies

Our empirical approach is to directly test the effect of the tense-shifting-strategy on intertemporal preferences, manipulating verb tense by presenting the same English-language choice options to English-speakers in different linguistic forms. The advantage of testing the effect of linguistic cues on intertemporal choice within a single language (e.g., as opposed to using two languages in a bilingual population, as in Pérez and Tavits, 2017), is that doing so allows for more precise conclusions by reducing the potential confounded differences in the comparison, particularly different cultural norms associated with (and potentially suggested by) different languages (Roberts et al., 2015).

Across the studies, we will test between three competing theories of how linguistic structure may be incorporated into people's mental representations and decisions: the future-priming hypothesis, implicature-based pragmatic inference and cue-based inference.

If verb tense acts as a prime, activating concepts related to the associated timing of events, then we would expect an option with the present tense to be consistently most attractive, followed by the neutral tense and then the future tense (holding constant other potential attributes, such as amount and objective delay), regardless of what other timing information is available. Thus, according to the priming hypothesis, we would expect the future amount expressed in the present tense (for example, in sentences [1] and [2]) to be chosen more than the objectively equivalent offer expressed in the neutral tense (3), followed by the future tenses (4) and (5).

By contrast, according to both the inference hypotheses, people would use an extractable cue, such as verb tense, to infer timing only in the absence of diagnostic timing information (i.e., excluding "in a week" from the examples above). If uncertain timing information is provided (e.g., "soon" instead of "in a week"), whether or not people are sensitive to verb tense will depend on how the cues are processed. However, when objective unambiguous timing information is available, there is no uncertainty to resolve and no need to draw inferences from cues such as verb tense, and no effect would be observed.

The two inference-based accounts differ in the predictions regarding prompted judgments versus choices when objective timing information is absent. From a conversational implicature perspective, the sender's (or speaker's) intention is to be cooperative in a conversational setting (Grice, 1975). We assume that receivers of a message will expect the sender to follow the Cooperative Principle and hence will assume that every available cue has been communicated for a reason. Consistent with a manner-based implicature, if the sender uses the word "soon" for timing rather than an objective timeline, the receiver would assume that the sender could not or did not want to provide specific timing. However, the receiver would also assume that the tense used reflected a deliberate attempt to convey information. Thus, from the conversational implicature perspective, people would spontaneously use verb tense as an indicator of differences in timing to the same degree when making prompted judgments or when making choices.

However, other linguists have suggested that people instead engage in a "psycholinguistic guessing game" (Goodman, 2014), attempting to use the fewest (but most informative) possible cues from the information provided to infer meaning beyond what is literally stated, when deemed necessary. This account is consistent with the notion of competition among cues (Dickinson et al., 1984; Kamin, 1969; Rescorla & Wagner, 1972), such that not all cues that are provided will be spontaneously incorporated into decision-making. From this perspective, although people will infer timing from a cue such as verb tense when prompted to do so, other more relevant-seeming cues may block the incorporation of verb tense when making choices.

Across nine studies (summarized in Table 1), we test the effect of verb tense framing of choice options on both direct judgments of timing (Studies 1a, 4a and 5a) and on intertemporal choices (Studies 1b, 2a, 2b, 3, 4b and 5b), varying the specificity of information about timing as well as the degree to which other diagnostic or relevant-seeming cues are present in the decision context. Studies 1a, 1b, and 3 presented options with no timing information (e.g., "You will get $10"), Studies 2a, 2b, and 3 presented objective timing information ("You will get $10 in 6 days"), and Studies 3–5b presented ambiguous qualitative timing information ("You will get $10 soon"). All studies had more than 90% power to detect an effect of the magnitude found by Falk et al. (2018) (i.e., $r = .32$, required $N > 100$ at 90% power). Overall, we find that verb tense consistently impacts prompted judgments but only impacts choices when other timing cues (diagnostic or not) are completely absent, supporting the cue-based version of the inference hypothesis.

Study 1a: Direct Inferences, Absent Timing Information

In the first study, we test the inferences people draw from verb tense in the absence of any timing information, when prompted to make judgments. In particular, identifying whether people see the present tense as conveying a sooner time than the future tense—a necessary condition for the inference hypotheses described earlier—is an untested question in pragmatics.

Table 1
Summary of Studies

Study	Timing Information	Outcome	Accounts Tested
1a	None	Timing judgments	Any effect of tense on mental representation
1b	None	Choices	Any effect of tense on choice
2a	Objective	Choices	Effect on full-information choices (Priming vs. inference)
2b	Objective	Choices	Inattention explanation
3	None vs. objective vs. ambiguous	Choices, varying magnitude	Priming vs. inference
4a	Ambiguous (same)	Timing judgments	
4b	Ambiguous (same)	Choices	Implicature-based pragmatic inference
5a	Ambiguous (equivalent)	Timing judgments	vs. cue-based inference
5b	Ambiguous (equivalent)	Choices	

Method

Participants (N = 248 after exclusions[3]) recruited from Amazon Mechanical Turk (AMT) were shown brief descriptions of two people receiving the same amount of money, described using different tenses. The participants then indicated which person they thought would be receiving the money sooner. For example, they were asked "Which do you think occurs earlier? – 'Bob gets $20' versus 'John will get $20.'" Across 10 such scenarios, we varied only the verb tense used in each option. We used two versions of the present tense ("get" and "is getting"), two versions of the future tense ("will get" and "is going to get"), and a neutral tense ("would get"). Our dependent variable was the proportion of times the description using each verb tense was chosen as the earlier outcome (compared with the baseline rate of 50%, which would be expected if there was no effect of verb tense). This study had more than 99% power to detect an effect of the magnitude found by Falk et al. (2018) (i.e., r = .32). See Appendix A for a detailed discussion of statistical power.

Throughout this article, "test" trials consist of questions in which the verb tense forms were *different* between the two options, and in "filler" trials the verb tense was the same in both options. Since, in this study, the only thing that differed between options was the verb tense, there were no filler trials.

Using this design, we can predict choices between the two options as a function of tenses used, to test whether people infer that outcomes described in the present tense ("get" and "is getting") as occurring earlier than the neutral tense ("would get") and whether neutral tense outcomes are inferred as occurring earlier than the future tense outcomes ("will get" and "is going to get"). This empirical test is important because people may not infer earliness from verb tense as grammatically prescribed, and even if they do, their everyday usage may not align with such grammatical prescriptions.

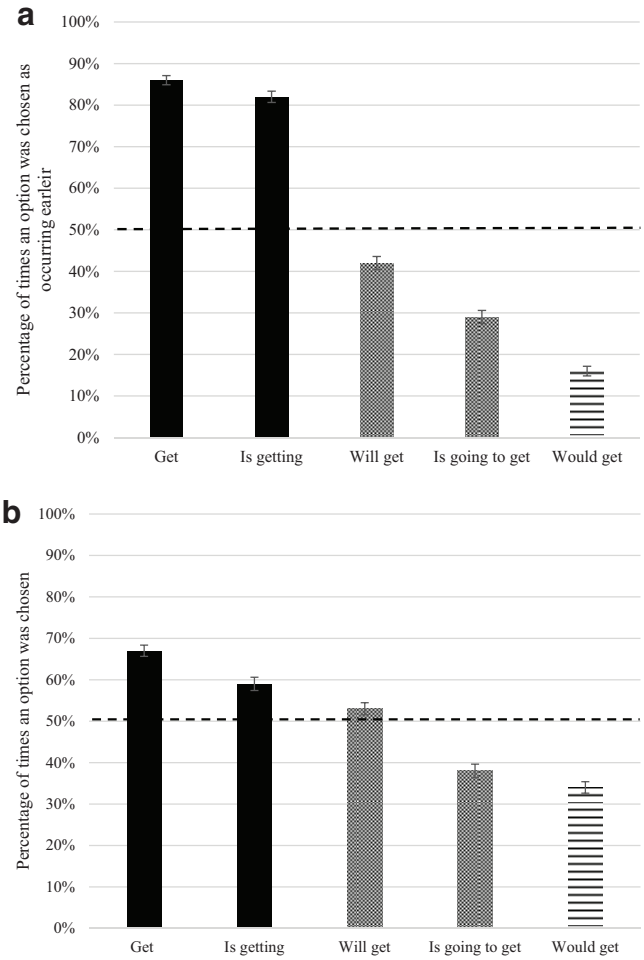
Results and Discussion

As shown in Figure 1a, verb tense had a substantial and statistically significant effect on participants' judgments of relative timing of occurrence (Figure 1a). For example, 86% of participants reported that "Bob gets $20" would occur sooner (on average, compared with options with other verb tense variations) but only 42% thought "John will get $20" would occur sooner than the other verb tense options.

We first discuss an exploratory analysis of all the tenses, and we then introduce a linear utility model (to predict the impact of tense on inferences and choices) that we will use in the remainder of the article. As an initial overall test of differences by tense, we fit a linear regression with clustered standard errors, predicting which option was chosen as occurring sooner, based on the verb tense in each option. We created separate dummy codes for each tense (two present tenses, one neutral tense, and two future tenses): -1 if the tense was only used in the first option, $+1$ if it was only used in the second option, and 0 otherwise. For example, when people chose between "John will get $20" (Option 1) and "John gets $20" (Option 2), the tense "get" was scored as $+1$, and "will get" was scored as -1, and all other tenses were scored as 0.

Based on the combined regression analysis, present tense options ("get" and "is getting") were seen as occurring the earliest ("Get": $\beta = -.56$, $t[247] = -25.05$, $p < .001$; "Is Getting": $\beta = -.46$, $t[247] = -21.78$, $p < .001$), followed by future tense options ("will get" and "is going to get") ("Will get": $\beta = -.21$, $t[247] = -12.28$, $p < .001$; "Is going to get": $\beta = -.15$, $t[247] = -8.40$, $p < .001$), compared with the neutral tense ("would get").

Figure 1
Choice Percentage of an Option Presented With Each Tense



Note. (a) The average percentage of times participants chose the option expressed in each verb tense as the earlier option. "Get" and "Is getting" are variants of the present tense; "Will get" and "Is going to get" are variants of the future tense; "Would get" is the neutral or nonspecific tense. (b) The average percentage of times participants chose an option expressed in the present tense vs. future tense vs. neutral tense.

As a flexible framework to quantify the general effect of tense across the studies, we will use an additive-utility linear probability model[4]:

$$P(Option\ 1) = \alpha + U(o_1) - U(o_2) \quad (1)$$

Here, $U(o_1)$ is the utility from choosing the first option and $U(o_2)$ is the utility of the second option. The utility of an option is

[3] In all studies, we excluded surveys with duplicate IP addresses and failed attention checks.

[4] We use the linear probability model for simplicity since we are conducting significance testing but not generating predictions (for which a logit model would be more justified).

modeled in terms of the tense, such that β_1 and β_2 represent the subjective value implied by present and neutral tense, respectively, relative to the utility of future tense, which is set at 0:

$$U(o_i) = \beta_1\ Present_i\ +\ \beta_2\ Neutral_i \quad (2)$$

$Present_i$ is 1 if option i has present tense, 0 if not; and $Neutral_i$ is 1 if option i has neutral tense, 0 if not. Thus, the linear probability model in (1) can be rewritten as:

$$P(Option\ 1) = \alpha + \beta_1(Present_1 - Present_2) + \beta_2(Neutral_1 - Neutral_2) \quad (3)$$

In this simplified regression model, α represents average preference for the first option when both options have the same tense variation (e.g., each is one of the forms of present tense).

The general model (4), which we will use subsequently, is an extension of the simplified regression model (3), controlling for the monetary amounts in the options and the objective delay between the options (when presented):

$$P(Option\ 1) = \alpha + \beta_1(Present_1 - Present_2) + \beta_2(Neutral_1 - Neutral_2) + \beta_3(Amount_1 - Amount_2) + \beta_4\ Delay \quad (4)$$

In this study, fitting the tense-only regression in (3) reveals that people were significantly more likely to choose the option with present tense as occurring earlier (β = .33, $t[248]$ = 23.34, $p < .001$) and people were significantly less likely to choose the option with the neutral tense ($\beta = -.18$, $t[248] = -11.86$, $p < .001$), compared with the baseline of future tense.

The fact that participants treated present verb tense as indicating earlier timing than future verb tense is consistent with our prior discussion of prescriptive grammar. However, contrary to prescriptive grammar, "would get" was seen as occurring significantly later than either present or future tense. These results suggest that people make other inferences than neutral timing (perhaps uncertainty or conditionality) from the "would get" formulation, which makes it a poor test of the hypothesis. Accordingly, we will only present comparisons between present and future tense in the following studies, but the analyses will still control for neutral tense, when applicable.

Study 1b: Tense-Based Choices, Absent Timing Information

Study 1a demonstrated that people infer timing information from present versus future verb tense (i.e., perceive an outcome described as "get" as occurring sooner than an option described as "will get," absent objective timing information). Next, we test whether such linguistic framing can affect choices between options.

Method

In this preregistered study (https://aspredicted.org/v87s4.pdf), participants (N = 296 recruited from AMT, more than 99% power to detect the correlation of r = .32 in Falk et al., 2018), made a series of 10 hypothetical test choices between two options. Each option specified only the amount (randomly determined, between \$19 and \$21) and verb tenses were randomized, from among the five forms tested in Study 1a. No other cues as to timing were presented in the choice options. For example, a participant would be asked to choose between "You get \$19" and "You will get \$21." There were no filler trials (i.e., the verb tense forms between the two options were never exactly the same).

Results and Discussion

Participants were significantly more likely to choose an option if it was described in present tense ("get" or "is getting") than if it was described in the future tense ("will get" or "is going to get"), as shown in Fig. 1b. Consistent with the inferences observed in Study 1a, options described using the neutral tense ("would get") were the least likely to be selected.

We fit the full linear utility model (4) to account for differences in monetary amounts, using a linear regression with clustered standard errors. Participants were more likely to choose options expressed in the present tense than in the future tense (β = .13, $t[295]$ = 9.48, $p < .001$) in the absence of other timing information, and were less likely to choose options in neutral tense than in future tense ($\beta = -.09$, $t[295] = -5.77$, $p < .001$). Tense did not merely serve as a tie-breaker, but instead affected choices not only when monetary amounts were equal (β = .23, $t[288]$ = 10.44, $p < .001$), but also when the monetary outcomes differed (β = .08, $t[295]$ = 4.76, $p < .001$).

It is important to note, however, that the choice options used in this study included only small differences in magnitudes (i.e., no larger than \$19 vs. \$21). We ran a follow-up study (N = 189), reported in Appendix A, which was identical to Study 1b except that the options ranged between \$10 and \$30 (thus, having a maximum difference of \$20 between amounts), and no neutral tense was used. In this study, we again found significant sensitivity to present tense versus future tense (β = .12, $t[188]$ = 5.31, $p < .001$). This suggests that verb tense can lead to differences in inferred timing, when no other information on timing is present, even when differences in amounts between two options was somewhat larger. Surprisingly, we found only a directional (nonsignificant) preference for larger monetary amounts in choice (β = .004, $t[188]$ = 1.12, p = .263). Even though the difference in amounts in this study was higher than Study 1b, we posit that the current differences in amounts are moderate and increasing them would likely result in a significant effect in choice. We conduct further direct tests of amount magnitude as a moderator of sensitivity to verb tense in Studies 3 and 5b.

Study 2a: Intertemporal Choices

The stimuli in Studies 1a and 1b represent one extreme, in which the decision-maker has no timing information about the options whatsoever. In Study 2a, we test the opposite extreme, investigating the effect of verb tense when the objective timing of each option is provided. The inference and priming hypotheses provide differing predictions in this context. If verb tense is an effective prime to consistently shift people's subjective sense of timing (e.g., by changing the subjective distance of future events), then verb tense should continue to impact choices, even when

objective timing is presented. However, since there is no need for people to infer timing when the objective information is available, the inference hypotheses would predict no sensitivity to verb tense in this case.

Method

In this study (N = 113, more than 99% power to detect the effect observed in Study 1b), we administered a series of 18 intertemporal choices to AMT participants. Every participant made a series of choices between a sooner-smaller and a later-larger option, each specifying the (randomly determined) amount and the timing of each option. The sooner-smaller amounts occurred "today" and ranged between \$10 and \$16. The later-larger amounts were between \$3 and \$6 more than the corresponding sooner-smaller option and occurred in 6–8 days, with amounts and delays randomized. The verb tense of both the sooner-smaller and later-larger option were independently and randomly varied within subjects, across questions. For example, participants would see questions like "Please choose between 'You get \$10 today' versus 'You will get \$15 in 6 days.'" We also tested all the other verb tense variants, as in the previous studies. Out of these 18 intertemporal choices, 12 were test trials (with two options differing in verb tense), and 6 were filler trials (same verb tense for both options).

Results and Discussion

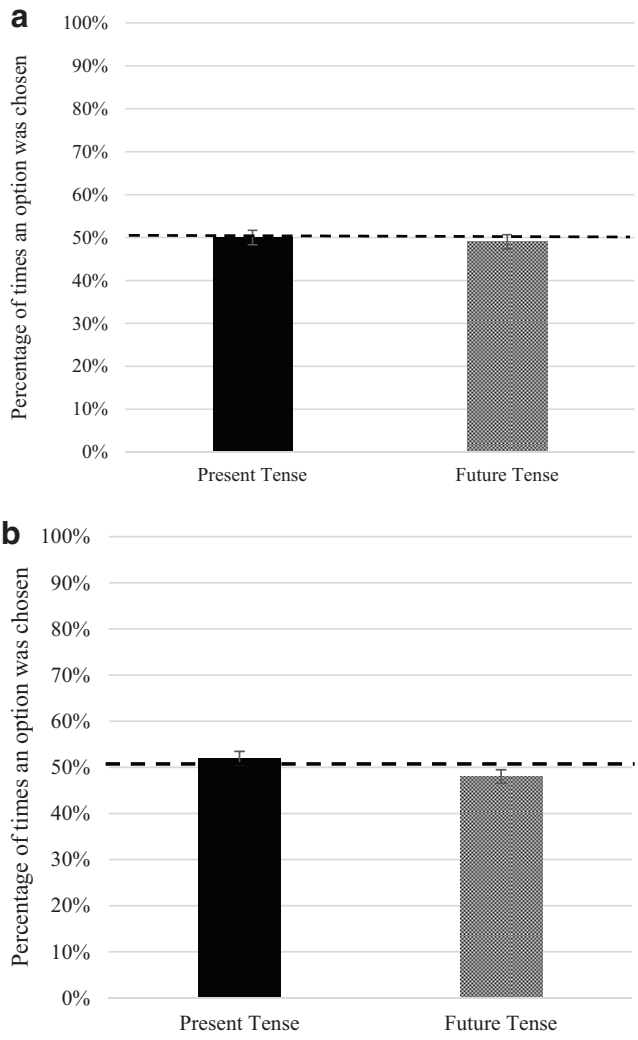
In this study, we found no significant effect of present versus future tense (Figure 2a) on participants' choices. A regression analysis with clustered standard errors for the linear utility model (4) showed that choices were sensitive to differences in monetary magnitudes (β = .06, t[111] = 2.81, p = .006), but not to present versus future tense (β = .01, t[111] = 1.11, p = .271) or differences in objective delay (β = .01, t[111] = .33, p = .739). The lack of sensitivity to tense in this study is consistent with the inferential hypotheses but would not be predicted by the priming hypothesis. This result is also consistent with the results of Study 3 in Thoma and Tytus (2018), which found that the choice of a sooner-smaller option in an intertemporal question with objective delays did not differ by the tense of the option.

We also analyzed the results of the filler questions to check if choice of the later larger option was higher when both options are described in the future tense (vs. both in the present tense). We found no differences in the rate of choosing the later larger option (both options in present vs. both options in future: z = −.14, p = .889; both present vs. both neutral: z = −.5, p = .614; both future vs. both neutral: z = −.67, p = .501). These results are consistent with a recent paper which showed that the inclusion of a future tense marker on both options (vs. on neither), had no effect on intertemporal choices in Chinese, when amounts and objective time were present (Chen et al., 2019).

Study 2b: Contrasting Grammatical Structure and Framing

The difference in sensitivity to timing between Study 1b and Study 2a suggests that tense provides people with an approximate sense of timing, helping them choose when timing information is not available, but not influencing the use of objective timing information. However, an alternative interpretation is that people do not pay sufficient attention to any contextual cues when the choice options specify both amount and timing. To distinguish selective sensitivity to tense from general inattention, we contrasted tense with two established framing effects on time discounting in the next study.

Figure 2
Choice Percentage of an Option Presented With Each Tense



Note. (a) The percentage of times participants chose an option expressed in present tense vs. future tense. (b) The average percentage of times participants choose an option expressed in present vs. future tense, overall.

Method

In this study (N = 1460; 99% power to detect the difference between present and future tense), participants from AMT made two intertemporal choices: (a) between \$30 today and \$50 in 6 weeks and (b) between \$30 in 6 weeks and \$50 in 12 weeks.

Participants were randomly assigned to one of five between-subjects tense-display conditions: (a) both options in present tense, (b)

both options in future tense, (c) the first option in present tense and the second in future tense, (d) the first option in future tense and the second in present tense, or (e) no tense information provided ("$30 today"). In this study, we used only one form of present tense ("is getting") and one form of future tense ("is going to get").

In addition, we tested framing manipulations that have been shown to impact intertemporal choices in prior research, "hidden-zeros" and "date-delay" framing, discussed earlier. We varied whether the choice options specified the nonpayments or not (e.g., "$30 today" or "$30 today and $0 in six weeks"). We also varied whether the timing was presented as a delay or a date (e.g., "in 6 weeks" or "on September 2d"). In all, the study included 20 conditions in a 5 (tense-display) × 2 (date vs. delay format) × 2 (standard vs. hidden zero highlighted) between-subjects design (see Appendix B for question wording). Varying these other aspects of how the options are communicated provides a basis of comparison for assessing whether participants in this study are sensitive to framing, that will be useful as a baseline in interpreting the sensitivity to tense.

Results and Discussion

We found similar rates of choosing an option displayed in present tense or future tense (Figure 2b). We fit a linear utility regression analysis model with clustered standard errors, including additional terms for the other experimental treatments (date/delay and hidden zero) and the timing of the sooner-smaller option (today or in 6 weeks) as controls. Consistent with the results of Study 2a, we again found no significant effect of present tense on intertemporal preferences, despite high statistical power ($\beta = .02$, $t[1459] = 1.40$, $p = .163$).

By contrast, we found that participants were sensitive to the framing manipulations tested, strongly replicating findings from the prior literature. Consistent with the date-delay effect, people were less likely to choose the sooner-smaller option when the delays were presented as the length of delay rather than the date of the payment ($\beta = .14$, $t[1459] = 7.87$, $p < .001$). Likewise, we replicated the hidden zero effect, with more patient choices when the hidden zeros were shown ($\beta = -.17$, $t[1459] = -9.19$, $p < .001$). We did not find a difference based on the timing of the sooner-smaller option, potentially consistent with recent research which indicates that present-bias may only be detected with a sufficiently long common delay (Jang and Urminsky, 2022).

The lack of detectable sensitivity to verb tense was robust to differences in presentation format (date vs. delay, hidden-zero present vs. absent, sooner-smaller today or in 6 weeks; see Appendix A). Because participants were highly sensitive to other contextual framing cues, these results suggest that people specifically neglect tense when the exact timing is presented (even when they are sensitive to framing) and rule out general inattention. In fact, these results suggest that the effects of verb tense are distinct from framing effects. In the next study, we systematically test whether the absence versus availability of objective timing information moderates sensitivity to verb tense.

Study 3: Different Type of Timing Information

Thus far, across studies, we have found that presenting a choice option in present tense increases preferences for that option (vs. an alternative option in future tense), but only when no timing information is present, consistent with the inferential hypothesis. However, the studies thus far have only tested the two extremes: timing information that is either objective or completely absent. In everyday conversation, however, objective timing information may be lacking because people use ambiguous time words instead. A friend might promise to return money they had loaned "soon" rather than "in 2 days," for example.

Ambiguous temporal words such as "soon" and "later" are informative but require interpretation as to the timing of an outcome. The priming account would predict particularly large effects of verb tense in this context, because decision-makers are particularly likely to be relying on a subjective sense of delay. Similarly, because ambiguous timing words are consistent with a range of timing values, inference from the verb tense may be used to reduce the uncertainty (e.g., based on the conversational implicature assumption that relevant information is being conveyed). On the other hand, if people are selecting among cues for making the intertemporal choice, they may treat even ambiguous timing words (along with other cues, like amounts) as sufficiently informative, and therefore may either overlook or choose not to rely on verb tense in making their choices. In this study, we vary the format of the timing information between-subjects, presenting either no timing information, ambiguous timing words, or objective quantitative timing for the intertemporal choice options.

Method

Participants ($N = 660$, more than 99% power per condition to detect the effect observed in Study 1b) from AMT were randomly assigned to one of four timing-information conditions: (a) both options had no timing information ("You get $30" vs. "You will get $35"), (b) both options had objective timing ("You get $30 in 1 day" vs. "You will get $35 in 7 days"), and two ambiguous timing conditions, in which (c) the sooner-smaller option was described as "soon" and the later-larger option was described as "later" ("You get $30 soon" vs. "You will get $35 later"), or (d) the sooner-smaller option was described as "now" and the later-larger option was described as "at some point" ("You get $30 now" vs. "You will get $35 at some point"). The first condition, with no timing information, had a larger sample size than the other conditions, because we planned to compare it to the other conditions as our primary analysis. Conditions 1 and 2 are replication tests of our prior studies, whereas Conditions 3 and 4 extend our investigation to ambiguous timing words.

Each participant made 15 intertemporal choices. Across these choices, we randomized the verb tense (across two present-tense forms, two future tense forms and the neutral tense). Participants answered 10 test questions (different tense forms in both options) and five filler questions (the same tense form in both options). We also varied (within subjects) the difference in magnitude between the sooner-smaller amounts (between $30 and $35) and the later-larger amounts (between $1 and $30 more than the sooner-smaller). This design allows us to test whether the effect of tense on intertemporal preferences depends on the available timing information or on the magnitude differences between the options.

Results

No Timing Information

In the no-timing-information condition, we replicated the results of Study 1a. The linear utility model regression analysis with clustered

standard errors revealed higher subjective utility for options in the present tense than in future tense (β = .04, t[254] = 5.28, $p < .001$). In addition, the effect of present versus future tense on intertemporal preferences was significantly moderated by the magnitude of difference in amounts between the two options (interaction β = .003, t[254] = 2.20, p = .029; Figure 3a), suggesting that a sufficiently large difference in amounts does reduce the effect of tense on choice.

Objective Timing Information

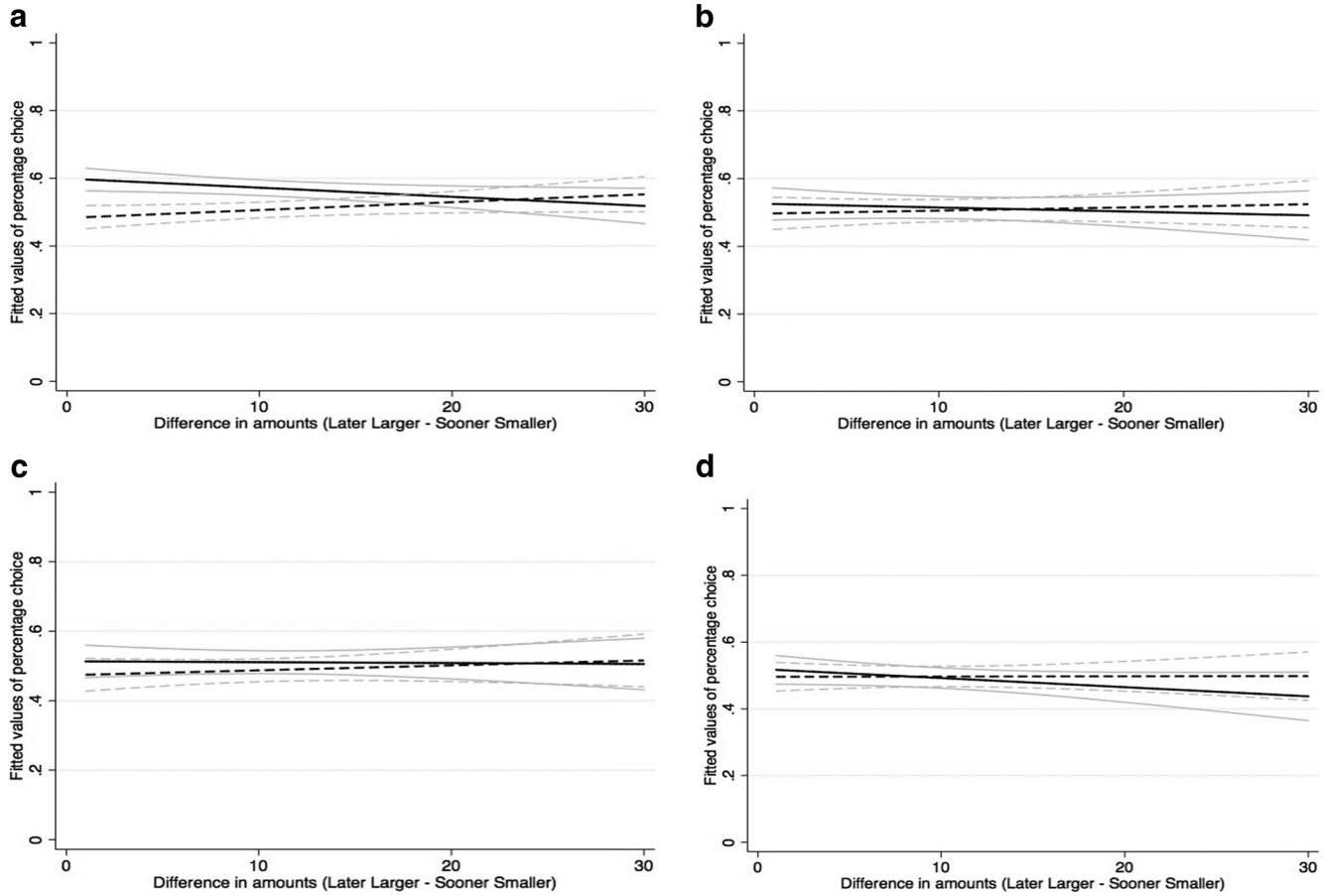
By contrast, present versus future tense had no significant effect on choice overall, when objective timing information was present, based on the linear utility regression analysis with clustered standard errors, replicating Studies 2a and 2b (β = .003, t[130] = .31, p = .755). This result was not moderated by the magnitude of difference between the two options in the amounts (interaction β = .002, t[130] = 1.34, p = .184; Figure 3b).

Next, we investigate whether people rely on tense when choosing between options characterized by ambiguous timing words (e.g., "soon" vs. "later" or "now" vs. "at some point") that do not specify the exact timing of the options.

Ambiguous Timing Information

Based on a linear utility regression analysis with clustered standard errors, in condition 3, when the smaller option was described as

Figure 3
Predicted Choice Percentage as a Function of Difference in Amounts



Note. (a) The fitted values of percentage of times an option with present tense is chosen compared with an option with future tense, as a function of the difference in the amounts between the two options, when no timing information was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% confidence intervals. (b) The fitted values of percentage of times an option with present tense is chosen compared with an option with future tense, as a function of the difference between the two options in the amounts, when objective timing information was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% confidence intervals. (c) The fitted values of percentage of times an option with present tense is chosen compared with an option with future tense, as a function of the difference in the amounts between the two options, when ambiguous timing information ("soon" vs. "later") was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% confidence intervals. (d) The fitted values of percentage of times an option with present tense is chosen compared with an option with future tense, as a function of the difference in the amounts between the two options, when ambiguous timing information ("now" vs. "at some point") was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% confidence intervals.

"soon" and the larger option as "later," tense did not significantly impact choice ($\beta = .02$, $t[126] = 1.27$, $p = .206$), and this was not moderated by magnitude (interaction $\beta = .001$, $t[126] = .79$, $p = .432$; Figure 3c).

Finally, based on the linear utility regression analysis with clustered standard errors, in condition 4, where the smaller option occurred "now" and the larger would be "at some point," the pattern of results was similar. Present tense was not a significant predictor of choice ($\beta = -.001$, $t[146] = -.19$, $p = .847$), however the interaction between magnitude and tense was borderline significant ($\beta = .002$, $t[146] = 1.98$, $p = .050$), as depicted in Figure 3d.

Overall, pooling across the conditions (no timing, objective timing, and ambiguous timing), we find that the available information is a moderator of sensitivity to tense. Tense affects choice when the timing information is absent, but not when objective timing information is present (interaction $\beta = -.08$, $t[659] = -6.94$, $p < .001$). Similarly, the impact of tense is eliminated when even ambiguous timing information is present ($\beta = -.08$, $t[659] = -7.38$, $p < .001$). This suggests that the inclusion of any timing information in the choice options attenuates the impact of tense on choice that is observed in the absence of timing information.

Discussion

We again confirm that people prefer options described in present tense significantly more than options described in future tense when no other timing information is available. In this study, we also found an attenuation of the impact of tense on choice when the difference in amounts was large, in the absence of timing information. However, no effect of verb tense was found when any other type of timing information (either objective or ambiguous) was provided to the participants.

There are multiple possible explanations for why people neglected verb tense when ambiguous timing information was available. It may be that the ambiguous timing words provided enough information for participants to make their decision. In this study, the ambiguous words clearly distinguished between the earlier ("now" or "soon") and more delayed ("at some point" or "later") options. To the degree that participants did not engage in tradeoff-based reasoning, simply identifying the earlier option may have provided all the information they needed to make a decision. If this is the case, we would expect people to be sensitive to verb tense even if ambiguous timing information is included, as long as the timing information does not clearly identify which option occurs earlier.

The lack of sensitivity to verb tense when even ambiguous timing information is present is inconsistent with the priming hypothesis but is potentially compatible with an inference hypothesis. From the perspective of conversational implicature, participants may have concluded that although the ambiguous timing words did not provide sufficient information to decide, no more precise information (i.e., as communicated by verb tense) could be or was intended to be conveyed.

Alternatively, participants may have focused on the more salient ambiguous timing words and neglected to spontaneously incorporate verb tense. Thus, the lack of sensitivity to verb tense when ambiguous timing information is available may be understood in terms of cue competition (Dickinson et al., 1984; Kamin, 1969; Rescorla & Wagner, 1972), in which people ignore less salient cues that they otherwise find informative (verb tense) when another more salient cue (timing information) is available. In the next two studies, we investigate these two competing accounts (implicature and cue competition), as well as informativeness as a possible moderator, by testing the effects of verb tense on people's reasoning when provided with ambiguous timing information that does *not* identify which of the options will occur first.

Study 4a: Inferences With the Same Ambiguous Timing Information

In this study, we test the effect of verb tense on people's prompted inferences about timing (as in Study 1a), but in this case both options are characterized by the same ambiguous timing word. We saw in Study 1a that people inferred earliness from verb tense when no timing information was present. In this study, we tested whether presenting the same ambiguous timing information in both options (and therefore providing no information about which occurs earlier) would also lead people to rely on tense to infer earliness.

Method

AMT Participants ($N = 230$, over 99% power to detect the effect observed in Study 1a) were asked to judge which of two options occurred earlier. Across the 9 questions, we varied both the tense ("get" or "will get" or "would get") of each option and the ambiguous timing word used to characterize both options. For example, participants were asked "Which do you think occurs earlier? 'John gets $20 soon' or 'Bob will get $20 soon.'" Only the verb tense varied between the two options, as the amount was fixed at $20 and the vague word presented was either "soon" for both options, "later" for both options, or "at some point" for both options. Verb tense was the only factor varied across questions in this study, so there were no filler questions and all nine questions were test trials.

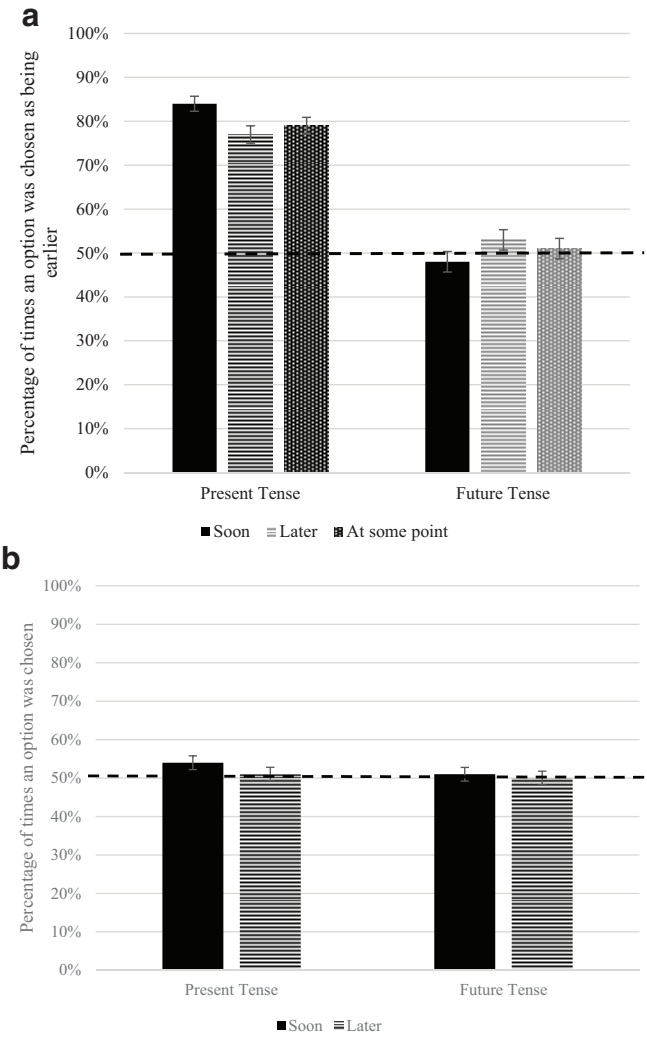
Results and Discussion

As shown in Figure 4a, participants were more likely to identify an option described using present tense as earlier than an option in future tense, regardless of the ambiguous word used to characterize both options. Based on a linear utility regression analysis with clustered standard errors, participants inferred that an option described with an ambiguous temporal word in present tense would occur earlier than the same option described in the future tense, regardless of which ambiguous timing word characterized both options (for "soon": $\beta = .48$, $t[229] = 9.15$, $p < .001$; for "later": $\beta = .27$, $t[229] = 4.66$, $p < .001$; for "at some point": $\beta = .24$, $t[229] = 4.02$, $p < .001$).

The results of this study reveal that participants consistently infer timing from verb tense, when prompted to do so, even in the presence of nondiagnostic ambiguous timing information.

Figure 4

Choice Percentage of an Option Presented With Each Tense, Split by Type of Ambiguous Word



Note. (a) The average percentage of times participants chose the option expressed in the present tense vs. future tense, split by ambiguous word. (b) The average percentage of times participants chose the option expressed in present vs. future tense, split by ambiguous word.

Study 4b: Choices With the Same Ambiguous Timing Information

Given that people can make inferences from verb tense when prompted, even though uninformative ambiguous timing words are displayed, we next tested whether tense would impact choices when the same ambiguous timing words characterize both options. If, in Study 3, people only ignored tense because they could infer order of timing without tense, then when people see the same uninformative ambiguous timing word characterizing both options, they should rely on tense for making choices. This study tests whether reducing informativeness yields choices that are based on verb-tense inferences.

Method

Participants (N = 221, more than 99% power per condition to detect the effect observed in Study 1b) from AMT made 10 choices between two options, varying the monetary amount and verb tense but using the same ambiguous-word characterization (either "soon" or "later," depending on the question) for both options. For example, participants were asked questions like "Please choose between: 'You get $19 soon' versus 'You will get $20 soon.'" The amounts ranged between $19 and $21, as in Study 1b. We used both forms of present tense ("get" and "is getting"), both forms of future tense ("will get" and "is going to get"), as well as neutral tense ("would get"). There were no filler questions in this study.

Results and Discussion

Even though the same ambiguous word was used to characterize both the options in each question, and therefore the timing words did not identify the order of the outcomes, the verb tense had no detectable effect on choices (Figure 4b). Based on a linear utility regression analysis with clustered standard errors, options described in present tense were not significantly more likely to be chosen than options described in future tense, either when both options were presented as "soon" (β = .017, t[220] = .85, p = .397) or as "later" (β = .004, t[220] = .17, p = .862).

These results suggest that the mere presence of noninformative ambiguous timing words prevented people from spontaneously incorporating tense into their decisions, even though they did rely on verb tense when prompted to make inferences in Study 4a. This cannot be explained by people having sufficient information about the order of outcome timing to decide, as could have been the case in Study 3. The results are instead most consistent with a cue-based inference account, in which the presence of the ambiguous (but uninformative) timing cue distracted people from processing the tense cue when making choices (Study 4b), unless explicitly prompted to search for more cues by the direction to make a timing inference (in Study 4a). However, the findings could also be consistent with an implicature interpretation, if participants interpreted the use of the *same* ambiguous timing word in both choice options as signaling that no additional timing information was being conveyed (which may not have been the case when people were explicitly prompted to make an inference in Study 4a).

Study 5a: Inferences With Distinct Qualitative Timing Information

To test between the two remaining possibilities (implicature-based pragmatic inference and cue-based inference), we first identified pairs of distinct ambiguous timing words that nevertheless convey the same timing. This allowed us to present people with choice options described using different ambiguous timing words that have a similar meaning. This was done so as to preclude the pragmatic inference that both options will occur at the same time, allowing tense to potentially be used to infer which was earlier, per the implicature-based pragmatic account. To be more specific, we assume that having two similar meaning but distinct ambiguous words in the inference or choice context will be marked and hence will result in a manner-based implicature (Rett, 2020). We

conducted two pretests (see Appendix B) which identified two pairs of words as yielding very similar estimates of which occurred earlier: "promptly" (52%) versus "quickly" (48%, $t[76] = -.34$, $p = .73$); and "someday" (47%) versus "eventually" (53%, $t(46) = -.43$, $p = .67$).

We used these two pairs of ambiguous words so that one pair would indicate a more immediate timeframe ("promptly" and "quickly"), and another to indicate a more delayed timeframe ("someday" and "eventually"), for robustness. In another pretest, we confirmed that "promptly" and "quickly" were both inferred as occurring earlier (by approximately 80% of people) than "someday" and "eventually" (by approximately 8% of people, all ps $< .001$; see Appendix B).

We saw in Studies 1a and 4a that people prompted to make time judgments inferred earliness from verb tense either when no timing information was presented, or when the same ambiguous timing word was present in both options. In this study, we tested whether presenting options characterized by distinct (but similar-meaning) ambiguous timing information (and therefore not signaling that both options would occur at the same time) would also lead people to rely on tense to infer earliness when prompted.

Method

AMT Participants ($N = 113$, more than 99% power to detect the effect observed in Study 1a) were asked to judge which of two options occurred earlier. Across the 24 questions, we varied both the tense ("get" or "will get" or "would get") of each option and the pair of ambiguous timing words used to characterize both options (counterbalanced). For example, participants were asked "Which do you think occurs earlier? – 'John gets $20 promptly' or 'Bob will get $20 quickly.'" Across the questions, only the verb tense and the ambiguous word varied between the two options, as the amount was fixed at $20. Each choice pair used either immediate or delayed words—people always saw "promptly" only paired with "quickly," and "someday" only paired with "eventually." There were no filler questions in this study.

Results and Discussion

As shown in Figure 5a, participants were more likely to identify an option in present tense as earlier than an option in future tense, regardless of the ambiguous word pair used to characterize both options. Overall, based on a linear utility regression analysis with clustered standard errors, participants inferred that an option described with an ambiguous temporal word in present tense would occur earlier than the corresponding option described with the other ambiguous temporal word in the future tense, regardless of which ambiguous timing word pair characterized both options (for the more immediate pair "promptly" vs. "quickly": $\beta = .09$, $t[112] = 4.51$, $p < .001$; for the more delayed pair "someday" vs. "eventually": $\beta = .07$, $t[112] = 3.91$, $p < .001$) .

The results of this study reveal that when people encounter distinct ambiguous words which indicate similar timing (but which do not clearly indicate which is first, as in Study 3), they rely on a secondary cue, verb tense, when prompted to infer timing.

Study 5b: Choices With Distinct Qualitative Timing Information

The prompted timing inferences observed in Study 5a were consistent with both the implicature-based pragmatic account and cue-based account of the inference hypothesis. In this study, we tested between the two accounts by having participants make choices between options using the same pairs of distinct ambiguous timing words as in Study 5a. If the implicature-based pragmatic version is correct, then people will rely on tense to make choices between options involving distinct ambiguous timing words, consistent with the implicature of manner. On the other hand, if the cue-based account is right, then tense would not impact choices, because the presence of the ambiguous timing words would block spontaneous incorporation of the verb tense.

Method

Participants ($N = 403$, more than 99% power per condition to detect the effect observed in Study 1b) from AMT were randomly assigned to two conditions. In the sooner-timing condition, participants were shown choice options with the immediate pair of words ("promptly" vs. "quickly"), while in the later-timing condition they were shown options with the delayed pair of words ("someday" vs. "eventually"). Participants then made a series of 16 choices between two options that varied in verb tense (each option in either present or future tense), with the order of the ambiguous timing words counterbalanced.

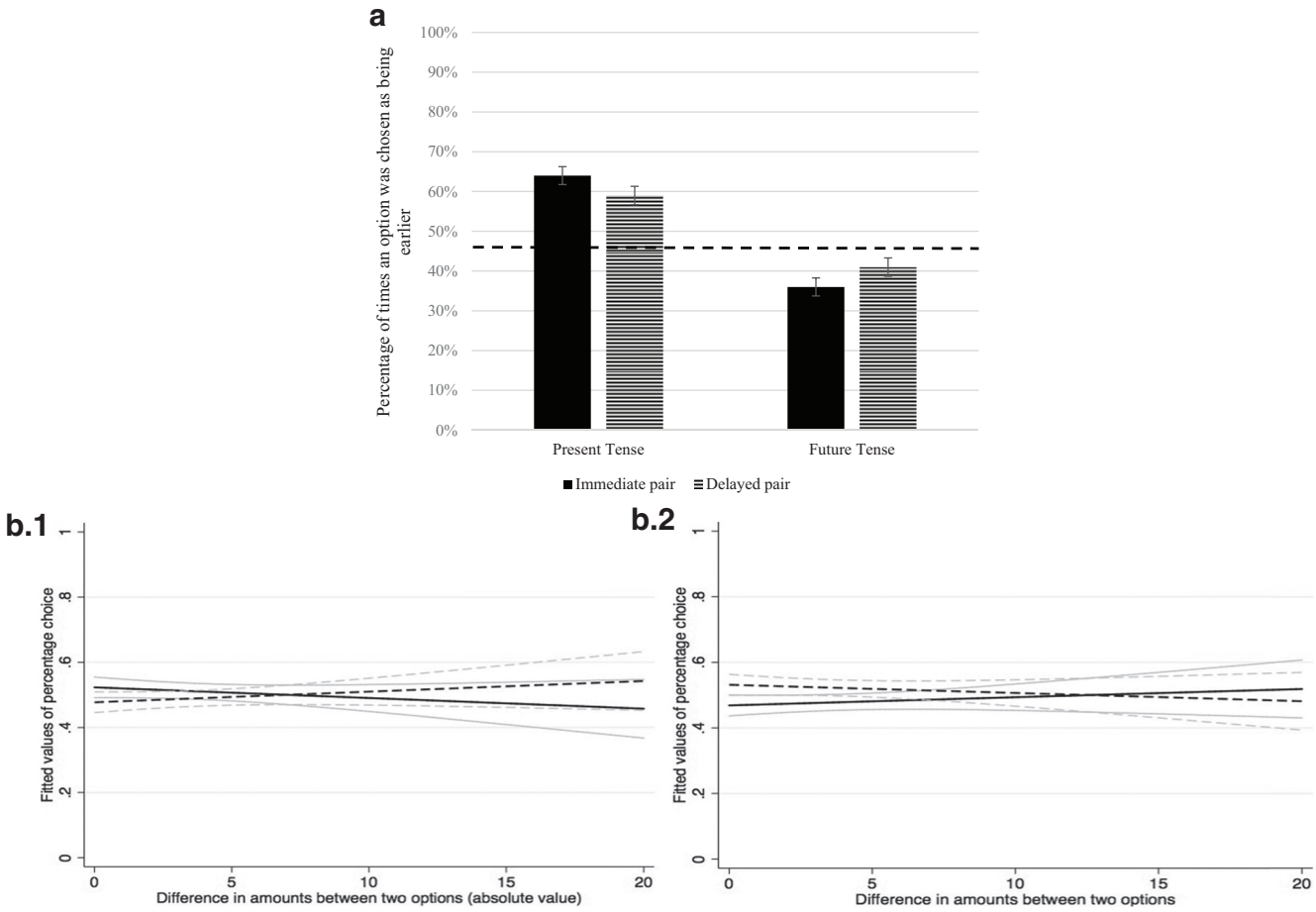
We also varied the differences in option amounts within-subjects, such that participants made choices both between options with small differences in one block (values for both options ranging between $19 and $21) and between options with large differences in another block (values for both options ranging between $10 and $30). In this study, we use only one form of present tense ("get"), and one form of future tense ("will get"). Participants completed 8 test trials, choosing between two options using different tenses, and 8 filler trials, choosing between two options expressed in the same tense. The filler trials were included to further preclude the pragmatic inference that both words were intended to convey the same time.

Results and Discussion

Once again, based on a linear utility regression analysis with clustered standard errors, we found that people were not sensitive to present versus future verb tense, even when choosing between two options described with different but similar-meaning ambiguous timing words. For the immediate timing words, the insensitivity to present tense held both when tested overall ($\beta = .02$, $t[200] = 1.23$, $p = .220$), and in trials with small ($\beta = .03$, $t[200] = 1.44$, $p = .151$) or large ($\beta = -.001$, $t[200] = -.41$, $p = .684$) monetary differences (interaction between tense and monetary difference: $\beta = .0004$; $t[200] = .19$, $p = .851$). This suggests that people did not spontaneously use present tense as a cue for resolving their uncertainty about which of two options described in immediate terms (e.g., as promptly vs. quickly) would occur earlier when making choices between the two options (Figure 5b.1). Consistent with the pretest results, respondents did not prefer options described with one ambiguous timing word over the other ($\beta = -.03$, $t[200] = -.79$, $p = .433$).

Figure 5

Choice of Options When Presented With Similar-Meaning Ambiguous Timing Information, Overall and by Difference in Amounts



Note. (a) The average percentage of times participants chose the option expressed in the present tense vs. future tense, split by ambiguous word pair. (b.1) The fitted values of percentage of times participants chose the option expressed in the present tense vs. the future tense over the absolute value of differences in monetary amounts between options (promptly vs. quickly). The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% confidence intervals. (b.2) The fitted values of percentage of times participants chose the option expressed in the present tense vs. the future tense over the absolute value of differences in monetary amounts between options (someday vs. eventually). The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% confidence intervals.

Among people who saw the delayed pair of timing words ("someday" vs. "eventually"), there was an unexpected preference for the option described in the future tense ("will get"), both overall ($\beta = -.02$, $t[201] = -2.08$, $p = .039$), and specifically when differences in amounts were small ($\beta = -.05$, $t[201] = -2.72$, $p = .007$). However, no difference was found when the amounts were large ($\beta = .004$, $t[201] = .23$, $p = .821$) and the interaction between tense and monetary difference between the two amounts was also not significant ($\beta = -.003$, $t[201] = -1.21$, $p = .226$). Figure 5b.2 depicts these differences. Again, consistent with the pretest results, respondents did not prefer options described with one ambiguous timing word over the other ($\beta = -.08$, $t[201] = -1.81$, $p = .071$).

The significantly higher preference for the future tense option when the amounts were small is unlikely to have occurred because people preferred to receive a *later* outcome (as implied by the inferences in Study 5a). Instead, this result suggests that participants may have spontaneously used tense to draw *nontiming* inferences favoring the future tense option (e.g., such as potentially seeing the future tense "will get" as more likely to occur than the present tense "get," as supported by a posttest, see Appendix B). In any case, neither of the conditions in Study 5b provide evidence that people making choices spontaneously used tense to infer timing when the options were presented using two different ambiguous timing terms.

These findings are therefore not consistent with the predictions of an implicature account in which participants infer from the use of two different words that the timing of the options differs and then use tense to infer which is earlier. When explicitly asked to make inferences about earliness, people rely on multiple cues, including verb tense, not just the ambiguous timing words, which

are insufficient to resolve the question. By contrast, when people make choices, the presence of ambiguous timing word cues block reliance on verb tense as a timing cue. Overall, these results are most consistent with the cue-based version of the inference hypothesis and suggest that the process of multiple-cue inference may be more complex and context-dependent than previously identified.

General Discussion

In this article, across nine studies, we tested the role of verb tense in intertemporal judgments and decision-making. We find that people do make consistent earliness inferences from verb tense, when prompted to do so, with events described in the present tense perceived as occurring sooner than events described in the future or neutral tense. A meta-analysis of all the studies we conducted (see Appendix A) summarizes the earliness inferences in Figure 6. Relevant variables were z-scored for a standardized interpretation of the regression coefficients. Present tense is seen as occurring earlier than future tense either when no timing information is provided ($\beta = .53$, $t[247] = 23.34$, $p < .001$) or when ambiguous timing information is presented ($\beta = .16$, $t[342] = 6.77$, $p < .001$). However, the presence of ambiguous timing words significantly reduces the reliance on verb tense in prompted timing inferences (interaction between tense and timing information: $\beta = -.74$, $t[590] = -11.45$, $p < .001$).

Even though we found a consistent impact of tense on prompted earliness inferences, the evidence for spontaneous effects of verb tense on intertemporal choices was much more limited. Specifically, verb tense only impacted choices in the highly impoverished situation when no timing information of any kind (informative or not) was present. Furthermore, as shown in Figure 7, a meta-analysis of all the relevant intertemporal choice studies we collected reveal that when no timing information was presented, tense consistently impacted choices whether the magnitude of differences between the amounts was small ($\beta = .19$, $t[414] = 10.05$, $p < .001$) or larger ($\beta = .05$, $t[253] = 3.01$, $p = .003$), although larger differences in amounts significantly reduced the impact of tense on choice (significant interaction between difference in amounts and tense: $\beta = .08$, $t[550] = 5.02$, $p < .001$). By contrast, tense did not significantly impact choices when either ambiguous or objective timing information was presented (all ps $> .1$), and this was not moderated by differences in amounts (ps $> .1$; see Tables in Appendix A).

Our studies were designed to test under what conditions verb tense influences intertemporal preferences, with a focus on three possibilities: priming, implicature-based inference and cue-based inference. The priming hypothesis proved inconsistent with the results, because tense did not have a significant effect on choices when the options specified either objective timing (Studies 2a, 2b, 3 and meta-analysis) or ambiguous timing information (Studies 3, 4b, 5b, and meta-analysis). The results, for both judgments and choices, were instead best explained by an inference process. In particular, the results of Studies 4 and 5 point to a cue-based inference account, instead of implicature-based inference. Faced with outcomes described with ambiguous timing words, people used verb tense to judge relative timing when prompted but did not spontaneously use verb tense to disambiguate timing when making choices, contrary to the implicature account and consistent with cue-competition between timing words and verb tense.

Across the studies, we rule out several alternative accounts. The lack of sensitivity to verb tense when timing words are present cannot

Figure 6

The Regression Coefficients of Present Tense (Compared With Future Tense) Impacting Earliness Inferences, by No Timing and Ambiguous Timing Conditions

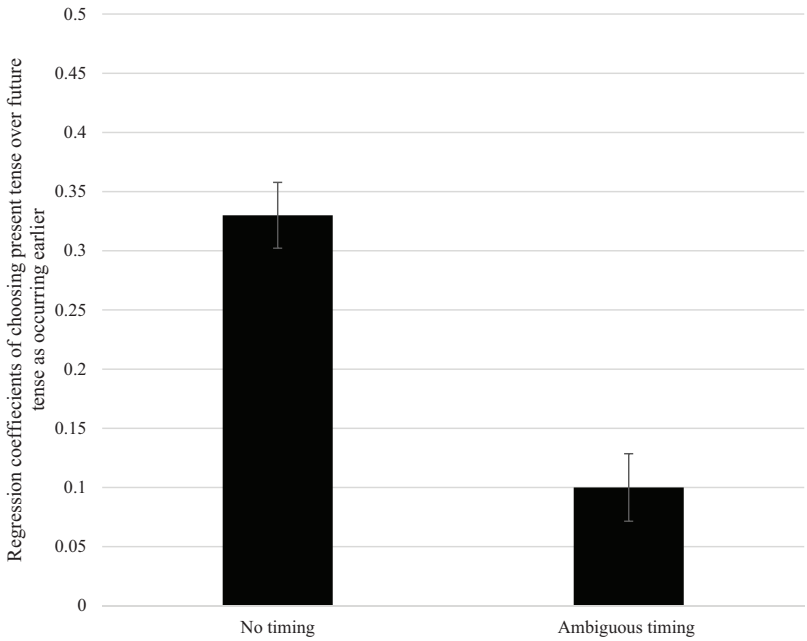
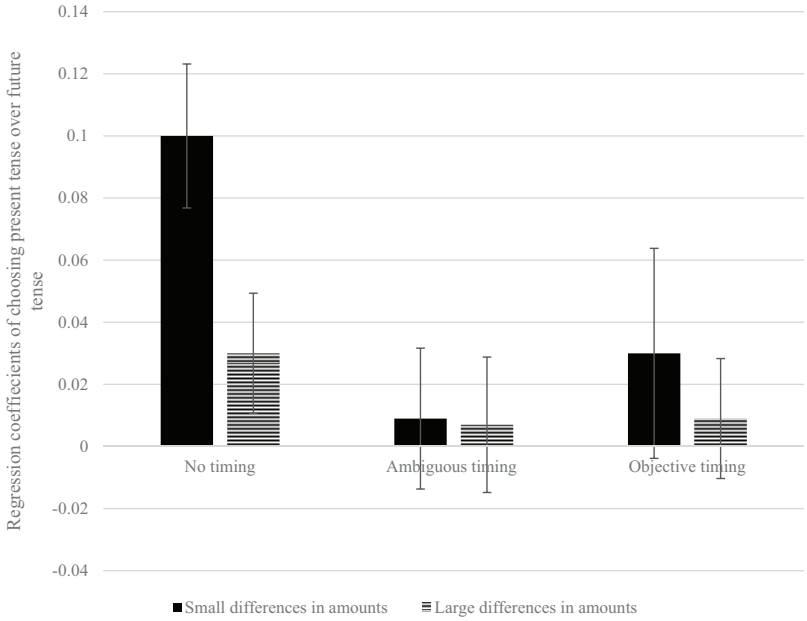


Figure 7

The Regression Coefficients of Present Tense (Compared With Future Tense) on Intertemporal Choices, by Timing Conditions and Size of Magnitude Differences in Amount



be explained by inattention, since participants were influenced by other subtle cues (e.g., framing) previously identified in the literature (Study 2b). The results also cannot be explained by timing words providing sufficient information for respondents to make decisions, as the insensitivity to verb tense occurred in choices but not judgments, when both options were described with the same timing word (Study 4) or with different but similar-meaning timing words (Study 5). Overall, we conclude that verb tense is used as a cue for timing in intertemporal choices only when no other timing cue blocks its usage, even though verb tense is consistently used to make prompted relative timing inferences.

Prior research about the role of linguistic factors on decision-making has primarily focused on either framing or priming. Our approach illustrates the benefit of also considering concepts and distinctions identified in the pragmatics literature. We were able to not only test between priming and inferential processes, but also distinguish between different forms of linguistic inference. We found that that intertemporal decision-making is akin to a psycholinguistic "guessing game" (Goodman, 2014) in which people rely on a "good enough" interpretation (Ferreira & Patson, 2007), prioritizing some cues in a way that blocks the impact of other cues, rather than inference based on implicatures, since people do not treat all the given information as relevant. Our key test, in Study 5, was based on the notion of manner implicatures, in which the use of distinct words (pretested to have similar meaning) conveys a distinction (Rett, 2020), which prompts readers to deduce timing from other cues. Future research on linguistic factors in decision-making could benefit from taking a similar approach, informed by pragmatics and focused on identifying boundary conditions of phenomena, to theory development and testing.

Prior literature in economics has documented a relationship between the futured nature of language and farsighted behavior but has not explicitly tested why the relationship exists or how the linguistic marker of verb tense in a language might cause future-oriented behavior. Although we find that verb tense can impact how people make intertemporal choices, ultimately, this mechanism is insufficient to explain the relationship between language and explicit intertemporal choices demonstrated by Falk et al. (2018) or, more broadly, between language and savings demonstrated by Chen (2013). On the one hand, our results show that people consistently use verb tense as a cue for making judgments specifically about timing. However, when making decisions involving timing, the verb tense of the options only impacts choices in the complete absence of more directly related cues (e.g., any other timing information).

Given that everyday decision-making generally involves at least ambiguous information about timing, it is highly unlikely, therefore, that verb tense shifts intertemporal preferences and savings behavior during decision-making, contrary to much of the theorizing in Chen (2013). Instead, our results suggest that the relationships documented in Chen (2013), Falk et al. (2018), and other cross-language comparisons are likely due to differences across languages in stable (vs. stimulus-specific) intertemporal preferences. In addition to the cultural component identified in Roberts et al. (2015), long-run immersion during cognitive development remains a potential cause. Some longitudinal research has found effects of language acquisition and exposure on conceptual thinking among children (e.g., more spontaneous similarity comparisons after the age of learning the word "like," Ozçalişkan et al., 2009; poorer performance in nonlinguistic spatial reasoning tasks when lacking exposure to spatial language, Gentner et al., 2013). Similarly,

exposure to and acquisition of separate present versus future verb tenses during child development may impact subsequent stable temporal preferences during adulthood. While confounds would limit the conclusions that could be drawn, longitudinal research could explore this possibility.

In all, our results suggest caution when studying the causal effect of language structure on decision-making. Drawing on multiple literatures, we show evidence of cue-competition in moderating the effect of in-context language on decisions, a process that had not been explicitly suggested or tested before in this context. To the degree that inferential processes involving cue-competition underlie linguistic effects on attitudes and behavior more generally, we would expect that theoretical researchers would find consistent evidence in minimal-information paradigms but that attempts to then apply those insights to real-world decision-making (e.g., in field experiments) would often fail. Our findings suggest a more nuanced understanding of how language affects decision, and points to a more cautious approach to studying linguistic effects: going beyond demonstrations that isolated effects can happen, to research that identifies which commonly co-occurring cues will tend to be favored in decision-making.

Context Paragraph

We focus on a general psychological question that traces from the Sapir-Whorf hypothesis to recent descriptive research: When do differences in linguistic cues in the choice environment causally impact inferences and decisions? This is a fundamentally interdisciplinary question, and we draw on ideas from cognitive psychology, economics, and linguistics. Our studies test the effect of verb tense on timing inference and intertemporal choices within a single language to prevent cross-language confounds, varying both the magnitude of monetary tradeoffs and the available timing information, from the complete absence of timing information to objective timing information. The use of this setting is motivated by recent work (Chen, 2013; Falk et al., 2018) documenting cross-language relationships between futured versus futureless verb tense and far-sighted behaviors and preferences among speakers of that language. Our most informative results regarding the psychological process are in studies where we present commonplace ambiguous timing information (e.g., soon, promptly, quickly), either using the same timing words, words that imply different timing, or different words that imply a similar timing, methodically testing between multiple psychological accounts (priming, linguistic pragmatics and cue-based inference). Our article presents a comprehensive approach to conducting systematic research about the potential for linguistic influences on decision-making and highlights the importance of understanding how decision-makers prioritize available cues and testing theories in realistically enriched (i.e., multicue) settings.

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(*Appendices follow*)

Appendix A

Supplemental Statistical Results

Table A1
Variable List Used in Regressions

Variable	Description
dP	Present 1 − Present 2. This depicts the difference in occurrence of present tense in either option. If the first option had present tense and the second did not then Present 1 = 1 and Present 2 = 0. Therefore, dP = Present 1 − Present 2 = 1 − 0 = 1. Conversely, if the second option had present tense and not the first option, dP = 0 − 1 = −1. Its *z*-scored values will have the suffix _std attached to it.
dN	Neutral 1-Neutral 2. This depicts the difference in occurrence of neutral tense in either option. If the first option had neutral tense and the second did not then Neutral 1 = 1 and Neutral 2 = 0. Therefore, d *N* = Neutral 1 − Neutral 2 = 1 − 0 = 1. Conversely, if the second option had neutral tense and not the first option, d *N* = 0 − 1 = −1. Its *z*-scored values will have the suffix _std attached to it.
dMoney	Monetary amount in first option - Monetary amount in second option. Its z-scored values will have the suffix _std attached to it.
D	Objective Delay. E.g., 6 weeks for the timing information in an option.
Delay	Date/Delay dummy. Delay = 1 means the objective time was expressed as a delay like "in 2 weeks." Delay = 0 means the objective time was expressed as a date like "on August 28."
Hidden Zero	Hidden Zero dummy. Hidden Zero = 1 means hidden zero was mentioned in intertemporal choice options, like "$20 today and $0 in a week." Hidden Zero = 0 means hidden zero was not mentioned in intertemporal choice options, like "$20 today."
Earlier	Dummy for whether an option used the earlier ambiguous timing word when the ambiguous word pairs were distinct and different-meaning from each other like "soon" vs "later." In this example, if an option was depicted as "soon" then the corresponding earlier dummy was Earlier = 1 and 0 if it was "later."
Objective Time	Dummy for whether an option had objective time (objective time = 1) or not (objective time = 0).
Ambiguous Time	Dummy for whether an option had ambiguous time (ambiguous time = 1) or not (ambiguous time = 0).
Size	Dummy for whether the difference in monetary amounts between the two options was small (size = 1) or large (size = 2)
promptly_first	Dummy for whether the first option was described as "promptly" (= 1) or not (= 0)
quickly_first	Dummy for whether the first option was described as "quickly" (= 1) or not (= 0)
someday_first	Dummy for whether the first option was described as "someday" (= 1) or not (= 0)
eventually_first	Dummy for whether the first option was described as "eventually" (= 1) or not (= 0)
Timing Info	Dummy for whether the question had no timing information (Timing info = 1), ambiguous timing information (Timing info = 2), objective timing information (Timing info = 3)
dpXdMoney	Interaction of dP and dMoney. Its *z*-scored values will have the suffix _std attached to it.
DXdMoney	Interaction of D and dMoney. Its *z*-scored values will have the suffix _std attached to it.
earlierXdMoney	Interaction of Earlier and dMoney
dpXobjective	Interaction of dP and Objective Time
dpXambiguous	Interaction of dP and Ambiguous Time
dpXtime	Interaction of dP and Timing info. Its *z*-scored values will have the suffix _std attached to it.
dnXtime	Interaction of dN and Timing info. Its *z*-scored values will have the suffix _std attached to it.
dnXdMoney	Interaction of dN and dMoney. Its *z*-scored values will have the suffix _std attached to it.

(*Appendices continue*)

Study 1a

Table A2

Regression of Choice of the First Option in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.3310484	0.0141823	23.34	.000	[0.3031147, 0.358982]
dN	−0.1762097	0.0148567	−11.86	.000	[− 0.2054717, −0.1469477]
Constant	0.5229839	0.0085735	61	.000	[0.5060974, 0.5398704]

Study 1b

Table A3

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), and the Difference in Amounts Between the Two Options

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.1313126	0.0138443	9.48	.000	[0.1040664, 0.1585587]
dN	−0.0898723	0.0155695	−5.77	.000	[−0.1205136, −0.0592309]
dMoney	0.0072897	0.0148225	0.49	.623	[−0.0218814, 0.0364609]
Constant	0.4820995	0.0113559	42.45	.000	[0.4597507, 0.5044484]

Table A4

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When the Amounts in Both Options is Equal

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.2284378	0.021889	10.44	.000	[0.1853552, 0.2715204]
dN	−0.1025122	0.0259069	−3.96	.000	[−0.1535031, −0.0515212]
Constant	0.4865283	0.0180311	26.98	.000	[0.4510388, 0.5220178]

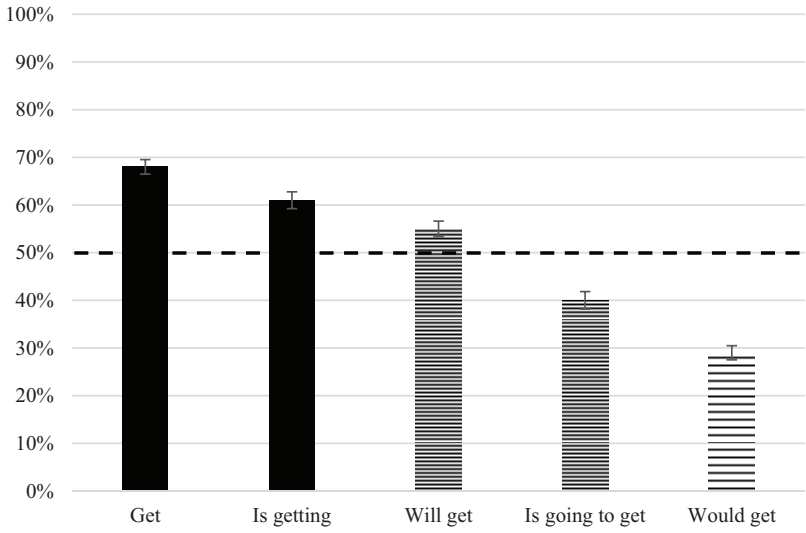
Table A5

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When the Amounts in Both Options are Unequal

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0781425	0.0164297	4.76	.000	[0.0458083, 0.1104768]
dN	−0.0849833	0.019018	−4.47	.000	[−0.1224114, −0.0475552]
Constant	0.4796191	0.0122714	39.08	.000	[0.4554686, 0.5037696]

(*Appendices continue*)

Figure A1
Full Graph of Percentage of People Choosing an Option Described by Each Tense (An Expanded Version of Figure 1b)



Replication of 1b With Larger Difference in Amounts

Table A6
Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), and the Difference in Amounts Between the Two Options

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.1188228	0.0223569	5.31	.000	[0.0747201, 0.1629255]
dMoney	0.0040097	0.0035683	1.12	.263	[−0.0030294, 0.0110488]
Constant	0.5271042	0.0156547	33.67	.000	[0.4962228, 0.5579855]

Study 2a

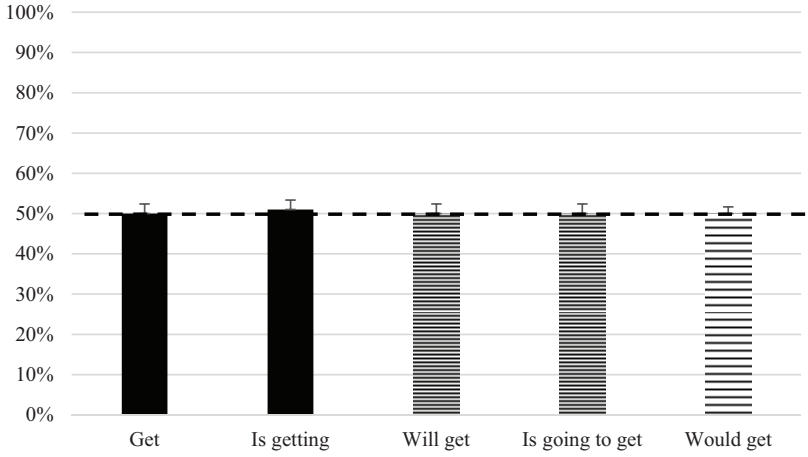
Table A7
Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, and the Objective Delay

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0103935	0.0094033	1.11	.271	[−0.0082398, 0.0290268]
dN	0.0090324	0.0077696	1.16	.248	[−0.0063636, 0.0244284]
dMoney	0.0609779	0.0216842	2.81	.006	[0.0180092, 0.1039467]
D	0.0058131	0.0174092	0.33	.739	[−0.0286843, 0.0403105]
Constant	0.624793	0.1535518	4.07	.000	[0.3205198, 0.9290662]

(*Appendices continue*)

Figure A2

Full Graph of Percentage of People Choosing an Option Described by Each Tense (An Expanded Version of Figure 2a)



Study 2b

Table A8

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), the Presence or Absence of Delay Timing (as Opposed to Date Timing), and Hidden Zero (Present or Absent)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.020514	0.0146835	1.4	.163	[−0.008289, 0.0493171]
Delay	0.1449767	0.0184163	7.87	.000	[0.1088514, 0.181102]
Hidden Zero	−0.1689475	0.0183926	−9.19	.000	[−0.2050263, −0.1328687]
Constant	0.2330158	0.016185	14.4	.000	[0.2012675, 0.2647641]

Table A9

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), and Hidden Zero (Present or Absent), When the Timing is Expressed as Delay (Instead of as a Date)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0204763	0.0225996	0.91	.365	[−0.0238921, 0.0648447]
Hidden Zero	−0.2148287	0.0289106	−7.43	.000	[−0.2715871, −0.1580704]
Constant	0.4007123	0.0224446	17.85	.000	[0.3566483, 0.4447763]

(*Appendices continue*)

Table A10

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), and Hidden Zero (Present or Absent), When the Timing is Expressed as Date (Instead of as a Delay)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0210994	0.0188104	1.12	.262	[−0.0158293, 0.0580282]
Hidden Zero	−0.1234432	0.0227141	−5.43	.000	[−0.1680357, −0.0788507]
Constant	0.2101069	0.018793	11.18	.000	[0.1732123, 0.2470014]

Table A11

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), the Presence or Absence of Delay Timing (as Opposed to Date Timing), When Hidden Zero is Present

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0330047	0.0187629	1.76	.079	[−0.0038311, 0.0698406]
Delay	0.099113	0.0222385	4.46	.000	[0.0554537, 0.1427723]
Constant	0.0866314	0.0127408	6.8	.000	[0.0616184, 0.1116444]

Table A12

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), the Presence or Absence of Delay Timing (as Opposed to Date Timing), When Hidden Zero is Absent

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0085332	0.0225918	0.38	.706	[−0.0358194, 0.0528859]
Delay	0.1904733	0.029262	6.51	.000	[0.1330255, 0.2479211]
Constant	0.2101414	0.0187885	11.18	.000	[0.1732554, 0.2470274]

Table A13

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), the Presence or Absence of Delay Timing (as Opposed to Date Timing), and Hidden Zero (Present or Absent), When Sooner-Smaller Amount is Realized "Today"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.025798	0.0164848	1.56	.118	[−0.0065385, 0.0581344]
Delay	0.1221279	0.0205275	5.95	.000	[0.0818613, 0.1623945]
Hidden Zero	−0.1890783	0.0204935	−9.23	.000	[−0.2292781, −0.1488785]
Constant	0.2438176	0.0186542	13.07	.000	[0.2072256, 0.2804095]

(*Appendices continue*)

Table A14

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense in the Two Options (Compared Against Future Tense), the Presence or Absence of Delay Timing (as Opposed to Date Timing), and Hidden Zero (Present or Absent), When Sooner-Smaller Amount is Realized "in 6 Weeks"

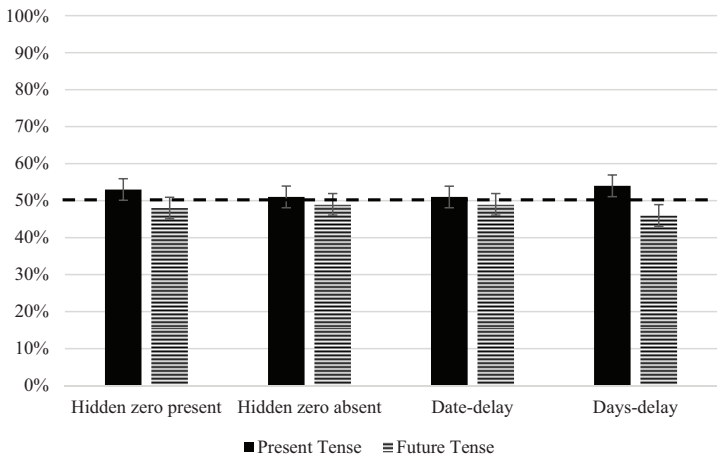
Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0152301	0.0171289	0.89	.374	[−0.0183698, 0.04,883]
Delay	0.1678255	0.0213186	7.87	.000	[0.1260071, 0.209644]
Hidden Zero	−0.1488167	0.0212854	−6.99	.000	[−0.1905699, −0.1070636]
Constant	0.2222141	0.0181343	12.25	.000	[0.1866421, 0.2577861]

Note. Full graph = percentage of people choosing an option described by each tense (an expanded version of Figure 2b), by each question.

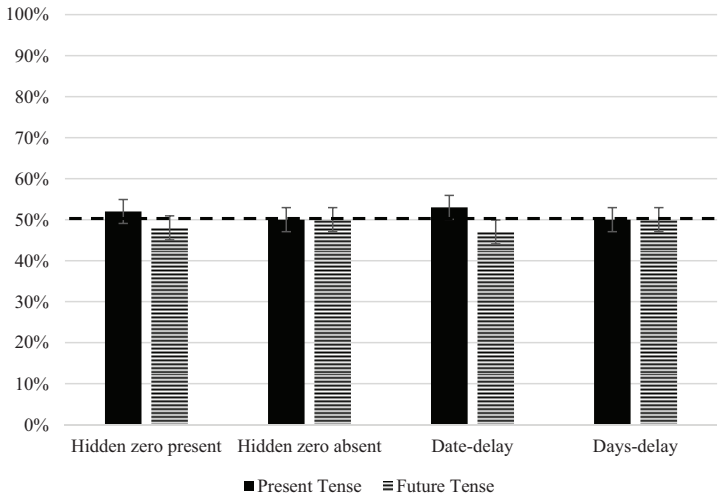
Figure A3

Full Graph of Percentage of People Choosing an Option Described by Each Tense (An Expanded Version of Figure 2b), by Each Question

(1) First Question



(2) Second Question



(*Appendices continue*)

Study 3

Table A15

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, When No Timing Information is Provided

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0427338	0.0081003	5.28	.000	[0.0267815, 0.0586861]
dN	−0.1286055	0.0129352	−9.94	.000	[−0.1540795, −0.1031316]
dMoney	−0.0001644	0.0007452	−0.22	.826	[−0.001632, 0.0013032]
Constant	0.4962379	0.0092856	53.44	.000	[0.4779514, 0.5145244]

Table A16

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, and the Interaction Between Present Tense and Difference in Amounts, When No Timing Information is Provided

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0714985	0.0164278	4.35	.000	[0.0391464, 0.1038506]
dN	−0.1277668	0.0129158	−9.89	.000	[−0.1532024, −0.1023312]
dMoney	−0.0001806	0.0007489	−0.24	.81	[−0.0016554, 0.0012943]
dpXdMoney	0.0026239	0.0011937	2.2	.029	[0.000273, 0.0049748]
Constant	0.4962385	0.0092884	53.43	.000	[0.4779465, 0.5145305]

Table A17

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Objective Delay, When Objective Information is Provided

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0029714	0.0094896	0.31	.755	[−0.0158026, 0.0217454]
dN	0.0012031	0.0152891	0.08	.937	[−0.0290446, 0.0314509]
D	0.0066717	0.0122604	0.54	.587	[−0.0175841, 0.0309274]
dMoney	0.0001642	0.0008843	0.19	.853	[−0.0015852, 0.0019136]
Constant	0.4364496	0.1115307	3.91	.000	[0.2157994, 0.6570998]

Table A18

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Objective Delay, the Interaction Between Present Tense and Difference in Amounts, and the Interaction Between Difference in Amounts and Objective Delay, When Objective Information is Provided

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0223393	0.0146826	1.52	.131	[−0.0067085, 0.0513871]
dN	0.0015954	0.0151332	0.11	.916	[−0.0283438, 0.0315346]
D	0.0188123	0.0180338	1.04	.299	[−0.0168653, 0.05,449]
dMoney	−0.0088362	0.0102637	−0.86	.391	[−0.0291417, 0.0114693]
dpXdMoney	0.0017096	0.0012796	1.34	.184	[−0.0008219, 0.0042412]
DXdMoney	0.0010047	0.0011588	0.87	.388	[−0.0012879, 0.0032973]
Constant	0.3272502	0.1606581	2.04	.044	[0.0094074, 0.645093]

(*Appendices continue*)

Table A19

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Presence of the Earlier Ambiguous Word for the Option or Not ("Soon"), When Ambiguous Timing Information is Provided ("Soon" vs. "Later")

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0158246	0.0124545	1.27	.206	[−0.0088224, 0.0404716]
dN	0.0040146	0.014633	0.27	.784	[−0.0249436, 0.0329728]
earlier	0.0308088	0.0357663	0.86	.391	[−0.0399715, 0.1015892]
dMoney	−0.0012474	0.0010873	−1.15	.253	[−0.0033991, 0.0009043]
Constant	0.4851554	0.0163623	29.65	.000	[0.4527749, 0.5175359]

Table A20

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Presence of the Earlier Ambiguous Word for the Option or Not ("Soon"), the Interaction Between Present Tense and Difference in Amounts, and the Interaction Between Difference in Amounts and the Presence of the Earlier Ambiguous Word, When Ambiguous Timing Information is Provided ("Soon" vs. "Later")

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0212787	0.0202766	1.05	.296	[−0.018848, 0.0614055]
dN	0.0073188	0.0132563	0.55	.582	[−0.0189149, 0.0335525]
earlier	−0.1692944	0.0455467	−3.72	.000	[−0.25,943, −0.0791587]
dMoney	−0.0004818	0.0009316	−0.52	.606	[−0.0023254, 0.0013619]
dpXdMoney	0.0011517	0.0014601	0.79	.432	[−0.0017378, 0.0040412]
earlierXdMoney	−0.0188325	0.0029339	−6.42	.000	[−0.0246385, −0.0130265]
Constant	0.4947847	0.0152466	32.45	.000	[0.4646121, 0.5249573]

Table A21

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Presence of the Earlier Ambiguous Word for the Option or Not ("Now"), When Ambiguous Timing Information is Provided ("Now" vs. "at Some Point")

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	−0.0014683	0.0076188	−0.19	.847	[−0.0165256, 0.013589]
dN	0.0198413	0.0117312	1.69	.093	[−0.0033437, 0.0430263]
earlier	−0.1904129	0.0323722	−5.88	.000	[−0.2543916, −0.1264341]
dMoney	−0.0007507	0.0011217	−0.67	.504	[−0.0029676, 0.0014661]
Constant	0.4781049	0.0108269	44.16	.000	[0.4567072, 0.4995026]

(*Appendices continue*)

Table A22

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Presence of the Earlier Ambiguous Word for the Option or Not ("Now"), the Interaction Between Present Tense and Difference in Amounts, and the Interaction Between Difference in Amounts and the Presence of the Earlier Ambiguous Word, When Ambiguous Timing Information is Provided ("Now" vs. "at Some Point")

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0214436	0.0111197	1.93	.056	[−0.0005329, 0.04,342]
dN	0.0219289	0.009915	2.21	.029	[0.0023334, 0.0415244]
earlier	−0.4088197	0.035764	−11.43	.000	[−0.4795018, −0.3381377]
dMoney	−0.0009772	0.000919	−1.06	.289	[−0.0027935, 0.0008392]
dpXdMoney	0.002227	0.0011273	1.98	.05	[−9.62E-07, 0.004455]
earlierXdMoney	−0.0215508	0.0027786	−7.76	.000	[−0.0270422, −0.0160593]
Constant	0.4778867	0.0099623	47.97	.000	[0.4581977, 0.4975756]

Table A23

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), the Difference in Amounts Between the Two Options, the Dummy for Presence of Objective Timing Information, the Dummy for Presence of Ambiguous Timing Information, and the Relevant Interactions, Pooling Across All Data

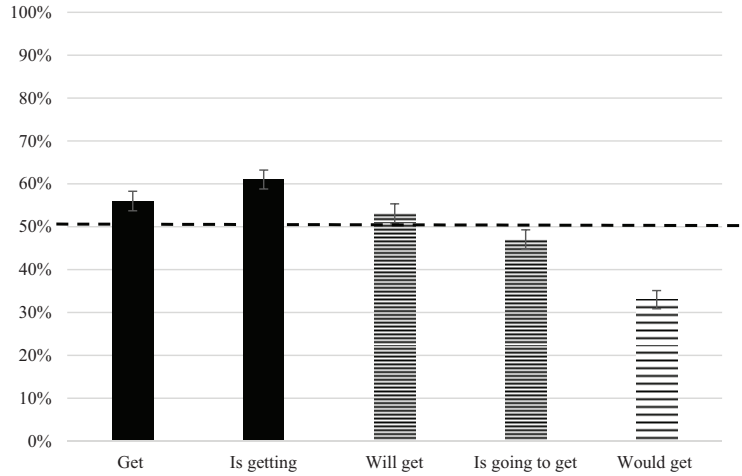
Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0909011	0.0117085	7.76	.000	[0.0679106, 0.1138916]
dN	−0.0439352	0.0074345	−5.91	.000	[−0.0585334, −0.029337]
dMoney	−0.0004431	0.0004581	−0.97	.334	[−0.0013426, 0.0004564]
objective time	−0.0040057	0.0084497	−0.47	.636	[−0.0205974, 0.012586]
ambiguous time	−0.0062027	0.0072817	−0.85	.395	[−0.0205009, 0.0080956]
dpXdMoney	0.0018399	0.0006514	2.82	.005	[0.0005608, 0.0031189]
dpXobjective	−0.0823971	0.0118784	−6.94	.000	[−0.1057212, −0.059073]
dpXambiguous	−0.0839932	0.0113786	−7.38	.000	[−0.1063359, −0.0616505]
Constant	0.493308	0.0063898	77.2	.000	[0.4807612, 0.5058547]

(*Appendices continue*)

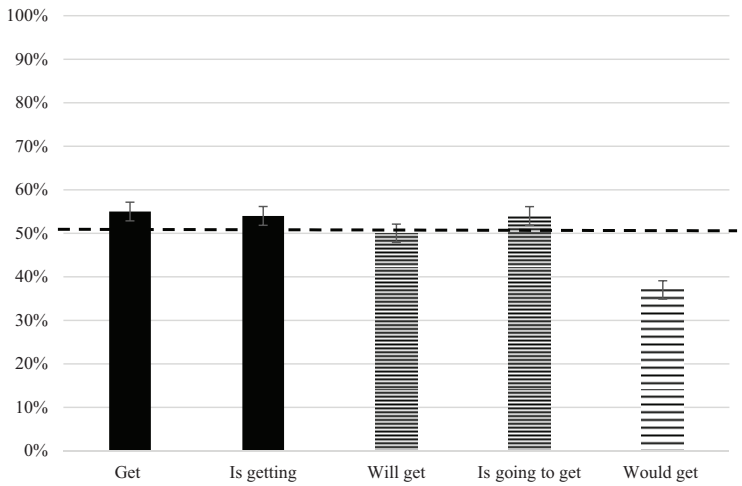
Figure A4

Full Graph of Percentage of People Choosing an Option Described by Each Tense, by Each Condition

(1) No timing information, small differences in amounts:



(2) No timing information, large differences in amounts:



(*Appendices continue*)

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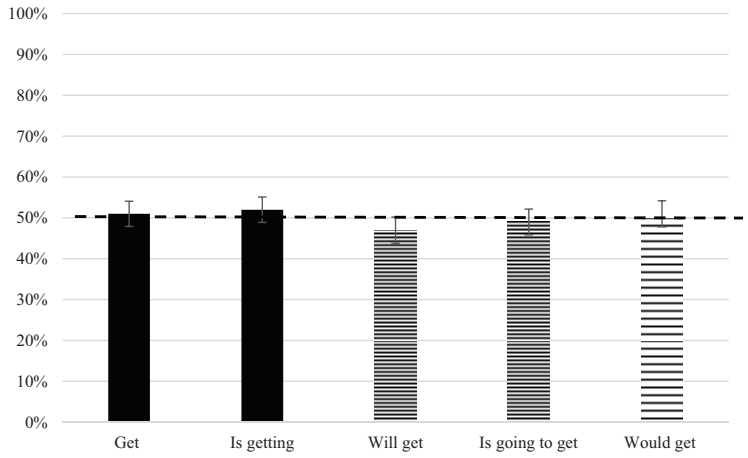
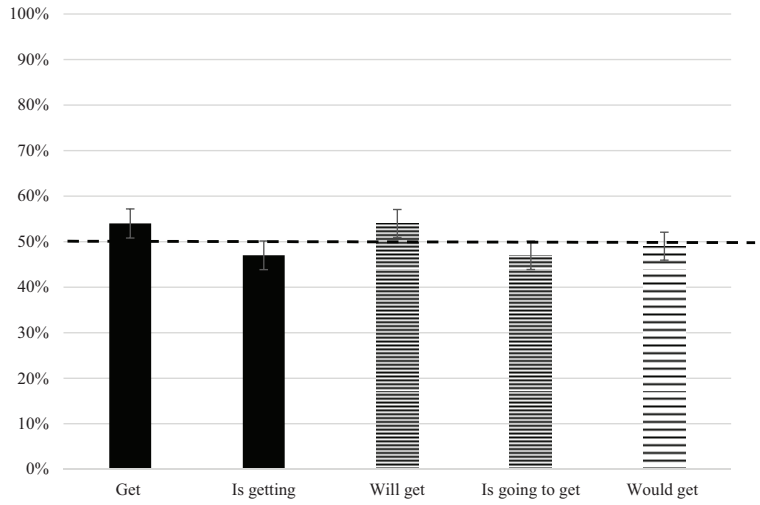
(3) Soon vs. Later, small differences in amounts:



(4) Soon vs. Later, large differences in amounts:



(*Appendices continue*)

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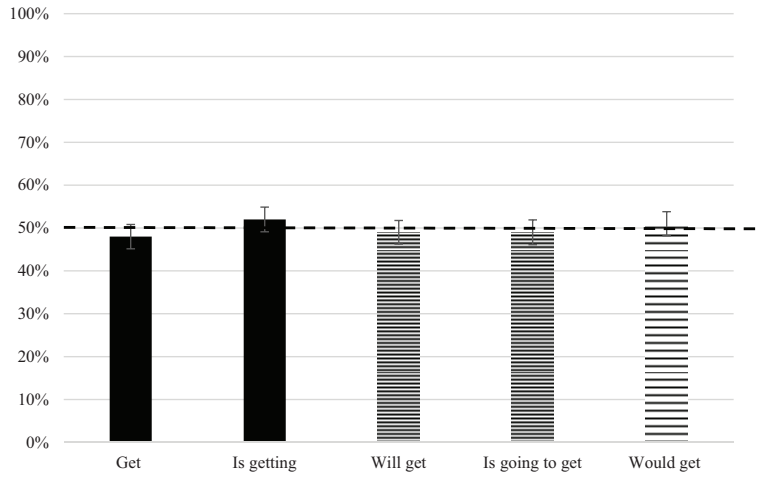
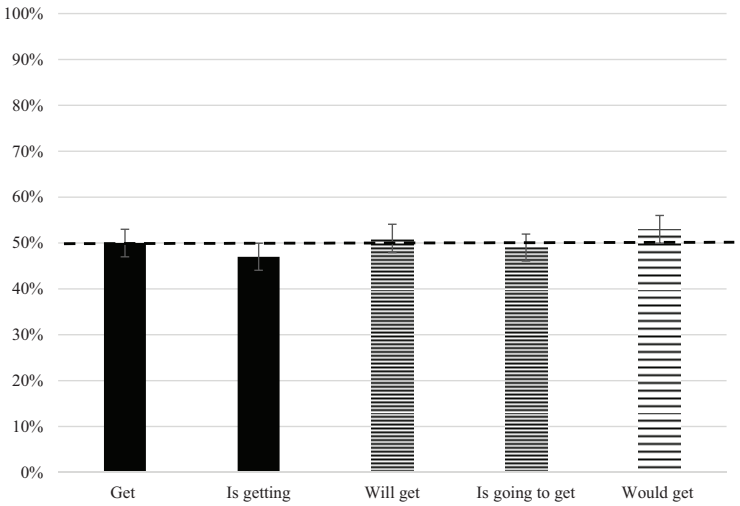
(5) Now vs. At some point, small differences in amounts:



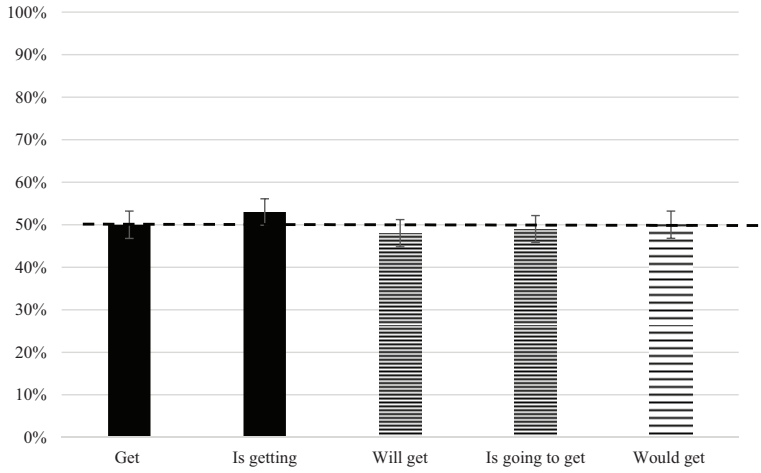
(6) Now vs. At some point, large difference in amounts:



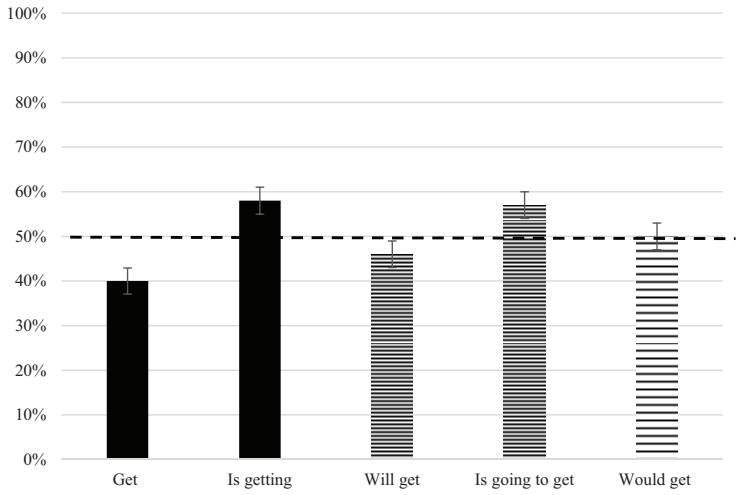
(*Appendices continue*)

.

(7) Objective timing, small differences in amounts:



(8) Objective timing, large differences in amounts:



(*Appendices continue*)

Study 4a

Table A24

Regression of Choice of the First Option in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described as Occurring "Soon"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.4782609	0.052253	9.15	.000	[0.3753028, 0.5812189]
dN	−0.0782609	0.028478	−2.75	.006	[−0.1343733, −0.0221484]
Constant	0.3217391	0.0344124	9.35	.000	[0.2539338, 0.3895445]

Table A25

Regression of Choice of the First Option in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described as Occurring "Later"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.273913	0.0588273	4.66	.000	[0.158001, 0.389825]
dN	−0.1608696	0.0311773	−5.16	.000	[−0.2223006, −0.0994386]
Constant	0.4173913	0.0370089	11.28	.000	[0.3444699, 0.4903128]

Table A26

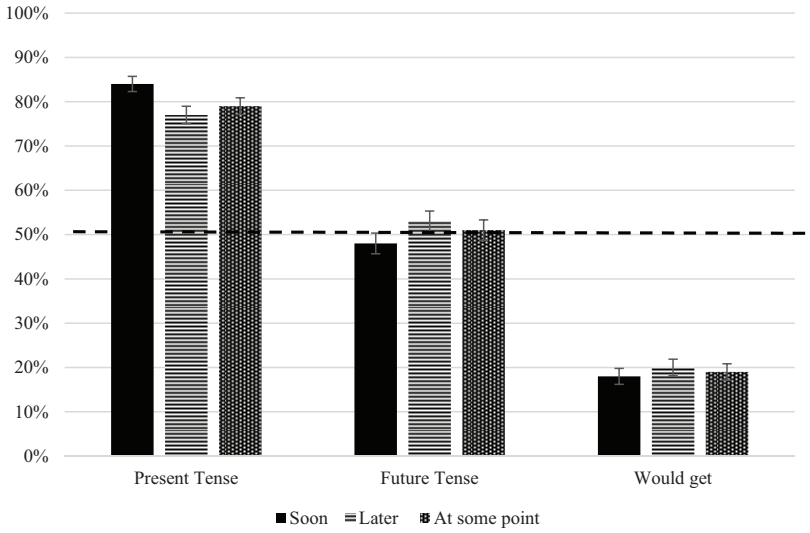
Regression of Choice of the First Option in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described as Occurring "at Some Point"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.2391304	0.0594879	4.02	.000	[0.1219169, 0.356344]
dN	−0.1869565	0.0305333	−6.12	.000	[−0.2471187, −0.1267943]
Constant	0.4608696	0.0373207	12.35	.000	[0.3873336, 0.5344055]

(*Appendices continue*)

Figure A5

Full Graph of Percentage of People Choosing an Option Described by Each Tense (An Expanded Version of Figure 4a)



Study 4b

Table A27

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), and the Difference in Monetary Amounts Between the Two Options, When Both the Options Were Described as Occurring "Soon"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0169116	0.0199482	0.85	.397	[−0.0224024, 0.0562256]
dN	−0.3286382	0.0222099	−14.8	.000	[−0.3724096, −0.2848667]
dMoney	0.0011164	0.017771	0.06	.95	[−0.0339068, 0.0361396]
Constant	0.5031826	0.0155896	32.28	.000	[0.4724585, 0.5339066]

Table A28

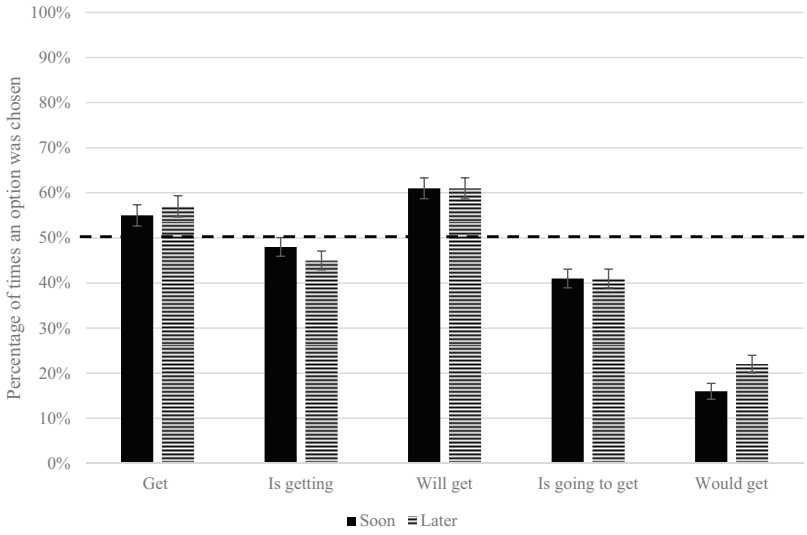
Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), and the Difference in Monetary Amounts Between the Two Options, When Both the Options Were Described as Occurring "Later"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0037348	0.0214378	0.17	.862	[−0.0385149, 0.0459846]
dN	−0.2787307	0.0241134	−11.56	.000	[−0.3262536, −0.2312078]
dMoney	0.0243707	0.0181549	1.34	.181	[−0.011409, 0.0601505]
Constant	0.478711	0.0156781	30.53	.000	[0.4478125, 0.5096095]

(*Appendices continue*)

Figure A6

Full Graph of Percentage of People Choosing an Option Described by Each Tense (An Expanded Version of Figure 4b)



Pretest Study 5a: Earliness Inferences of Immediate Versus Delayed Ambiguous Words

Overview

People were asked to indicate the earliness inference between choices where one option was described in an immediate ambiguous word and the other was described using a delayed one—for example, "Which of the two statements do you think would occur earlier? – "You will get $20 promptly" versus "You will get $20 someday."" The only manipulated variable was the ambiguous word, but one was always an immediate word ("promptly" or "quickly") and the other was always a delayed word ("someday" or "eventually"; sample question in Appendix B).

Results Summary

- "Promptly" vs. "Someday": 80% chose promptly and 8% chose someday, $t(117) = 12.58$, $p < .001$
- "Promptly" vs. "Eventually": 80% chose promptly and 8% chose someday, $t(117) = 12.58$, $p < .001$
- "Quickly" vs. "Someday": 81% chose promptly and 8% chose someday, $t(117) = 13.01$, $p < .001$
- "Quickly" vs. "Eventually": 81% chose promptly and 8% chose someday, $t(117) = 13.01$, $p < .001$

(*Appendices continue*)

Study 5a

Table A29

Regression of Choice of the First Option in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Immediate Pair of Ambiguous Words ("Promptly" vs. "Quickly")

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0877581	0.0194395	4.51	.000	[0.0492413, 0.126275]
dN	−0.109882	0.0186732	−5.88	.000	[−0.1468805, −0.0728835]
Constant	0.5103245	0.0104905	48.65	.000	[0.489539, 0.53111]

Table A30

Regression of Choice of the First Option in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Delayed Pair of Ambiguous Words ("Someday" vs. "Eventually")

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.070059	0.0179009	3.91	.000	[0.0345906, 0.1055273]
dN	−0.0634218	0.0190521	−3.33	.001	[−0.1011712, −0.0256725]
Constant	0.5110619	0.0156729	32.61	.000	[0.4800081, 0.5421158]

Study 5b

Table A31

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), and the Difference in Monetary Amounts Between the Options, When Both the Options Were Described Using the Immediate Pair of Ambiguous Words ("Promptly" vs. "Quickly"), Overall

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0160237	0.0130214	1.23	.22	[−0.009653, 0.0417005]
dMoney	0.0309093	0.0021534	14.35	.000	[0.0266631, 0.0351555]
Constant	0.5208305	0.0130244	39.99	.000	[0.4951478, 0.5465133

Table A32

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Immediate Pair of Ambiguous Words ("Promptly" vs. "Quickly") and the Difference in Amounts was Small

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.028552	0.0198031	1.44	.151	−[0.0104977, 0.0676016]
Constant	0.511052	0.0198031	25.81	.000	[0.4720023, 0.5501016]

(*Appendices continue*)

Table A33

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Immediate Pair of Ambiguous Words ("Promptly" vs. "Quickly") and the Difference in Amounts was Large

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	−0.0075619	0.0185306	−0.41	.684	[−0.0441023, 0.0289785]
Constant	0.5199381	0.0185306	28.06	.000	[0.4833977, 0.5564785]

Table A34

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Immediate Pair of Ambiguous Words ("Promptly" vs. "Quickly") and the Interaction Between Tense and Monetary Differences Between Two Amounts

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0160946	0.0130249	1.24	.218	[−0.0095892, 0.0417784]
dMoney	0.0309153	0.0021479	14.39	.000	[0.0266799, 0.0351507]
dpXdMoney	0.0004043	0.0021479	0.19	.851	[−0.0038311, 0.0046397]
Constant	0.5209039	0.0130249	39.99	.000	[0.4952201, 0.5465877]

Table A35

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), and the Difference in Monetary Amounts Between the Options, When Both the Options Were Described Using the Delayed Pair of Ambiguous Words ("Someday" vs. "Eventually"), Overall

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	−0.0227086	0.0109129	−2.08	.039	[−0.0442271, −0.0011902]
dMoney	0.0190996	0.0023964	7.97	.000	[0.0143742, 0.023825]
Constant	0.5143821	0.010906	47.17	.000	[0.4928772, 0.535887]

Table A36

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Delayed Pair of Ambiguous Words ("Someday" vs. "Eventually") and the Difference in Amounts Was Small

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	−0.0462618	0.0170069	−2.72	.007	[−0.0797967, −0.0127269]
Constant	0.5258536	0.0170069	30.92	.000	[0.4923187, 0.5593885]

Table A37

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Delayed Pair of Ambiguous Words ("Someday" vs. "Eventually") and the Difference in Amounts Was Large

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dP	0.0038265	0.0169064	0.23	.821	[−0.0295102, 0.0371632]
Constant	0.5038265	0.0169064	29.8	.000	[0.4704898, 0.5371632]

(*Appendices continue*)

Table A38

Regression of Choice of the First Option in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense in the Two Options (Compared Against Future Tense), When Both the Options Were Described Using the Immediate Pair of Ambiguous Words ("Someday" vs. "Eventually") and the Interaction Between Tense and Monetary Differences Between Two Amounts

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp	−0.0226184	0.0109463	−2.07	.040	[−0.0442026, −0.0010341]
dMoney	0.0188419	0.0024095	7.82	.000	[0.0140909, 0.023593]
dpXdMoney	−0.0029248	0.0024095	−1.21	.226	[−0.0076759, 0.0018262]
Constant	0.5146166	0.0109463	47.01	.000	[0.4930324, 0.5362009]

Table A39

Regression of Choice of the First Option in an Intertemporal Choice Task by Whether the First Option Had the Word "Promptly" or the Word "Quickly"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
promptly_first	−0.0323383	0.041166	−0.79	.433	[−0.1135135, 0.0488368]
Constant	0.5223881	0.0267125	19.56	.000	[0.4697138, 0.5750623]

Table A40

Regression of Choice of the First Option in an Intertemporal Choice Task by Whether the First Option Had the Word "Someday" or the Word "Eventually"

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
someday_first	−0.0816832	0.045078	−1.81	.071	[−0.1705697, 0.0072034]
Constant	0.5544554	0.0278271	19.93	.000	[0.499585, 0.6093258]

Note. Full graph = percentage of people choosing an option described by each tense (an expanded version of Figure 4b).

Posttest Study 5b

Overview

People were asked to make a decision on which option is more likely to occur, when the only thing that differed between the options was the tense. for example, "Which of the following do you think is more likely to occur? – "You get $20" versus "You will get $20"" (sample question in Appendix B).

Results Summary

- **Present Tense vs. Future Tense:** For their inference of likelihood of occurrence, people chose future tense (will get) 55% of the times and present tense (get) 32% of the times ($t(127) = -4.23$, $p < .001$).
- **Neutral Tense vs. Future Tense:** For their inference of likelihood of occurrence, people chose future tense (will get) 55% of the times and neutral tense (get) 20% of the times ($t(127) = -5.03$, $p < .001$).

Interpretation

In Study 5b, for the pair of someday versus eventually, the option with the future tense ("will get") was chosen significantly more than the option with present tense ("get"). This posttest suggests that "will get" seems more likely to occur than "get" (and "would get") and hence seems to resolve some uncertainty, if there is any in the context. We hypothesized that may be "someday" and "eventually" seemed too risky, in that they were seen as less likely to occur, and that is why in that context "will get" was chosen more often to resolve the uncertainty. However, that explanation seems unlikely since we ran likelihood questions for "someday" and "eventually" (compared with "promptly" and "quickly," along with the earliness inferences in pretest 5a) and found no significant results. That is, "someday" and "eventually" are **not** seen as less likely to occur than "promptly" and "quickly," even though they are seen as occurring later than "promptly" and "quickly."

(*Appendices continue*)

Meta-Analysis

Table A41

Regression of Choice of the First Option (z-Scored) in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense), When No Timing Information was Present

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.5343213	0.0228906	23.34	.000	[0.4892356, 0.5794069]
dn_std	−0.2287234	0.0192843	−11.86	.000	[−0.266706, −0.1907408]
Constant	0.1298268	0.0171213	7.58	.000	[0.0961044, 0.1635492]

Note. Because only one study (Study 1a) did this, there are no fixed effects by study in this regression.

Table A42

Regression of Choice of the First Option (z-Scored) in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Study, When Ambiguous Timing Information was Present (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.1590986	0.0234951	6.77	.000	[0.1128854, 0.2053117]
dn_std	−0.2014923	0.015856	−12.71	.000	[−0.2326799, −0.1703048]
Study 4a	0.0878763	0.0382169	2.3	.022	[0.0127066, 0.163046]
Constant	0.0822503	0.0215938	3.81	.000	[0.0397768, 0.1247237]

Table A43

Regression of Choice of the First Option (z-Scored) in an Earliness Inference Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Study, and Both No Timing and Ambiguous Timing Along With Their Interaction With Tense Differences (Both z-Scored) (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.909544	0.0514053	17.69	.000	[0.8085844, 1.010504]
dn_std	−0.2559544	0.0416561	−6.14	.000	[−0.3377667, −0.1741421]
timing_info	−0.0246129	0.0275406	−0.89	.372	[−0.0787024, 0.0294766]
dpXtime_std	−0.7378978	0.0644545	−11.45	.000	[−0.864486, −0.6113097]
dnXtime_std	0.0527327	0.0483027	1.09	.275	[−0.0421335, 0.1475989]
Study 4a	0.0878763	0.0381972	2.3	.022	[0.0128572, 0.1628954]
Constant	0.1313738	0.0405404	3.24	.001	[0.0517528, 0.2109947]

Table A44

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, When No Timing Information Was Present and Difference Between Amounts was Small (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.1918177	0.0190907	10.05	.000	[0.1542909, 0.2293444]
dn_std	−0.1271532	0.0175246	−7.26	.000	[−0.1616016, −0.0927048]
Study 1b	−0.0066329	0.0322553	−0.21	.837	[−0.0700374, 0.0567716]
Constant	0.0336147	0.0229472	1.46	.144	[−0.0114928, 0.0787223]

(*Appendices continue*)

Table A45

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, When No Timing Information was Present and Difference Between Amounts was Large (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0479625	0.0159339	3.01	.003	[0.0165825, 0.0793425
dn_std	−0.1663411	0.0201712	−8.25	.000	[−0.2060659, −0.1266163]
Constant	0.0622842	0.0116032	5.37	.000	[0.039433, 0.0851354]

Table A46

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, When Ambiguous Timing Information Was Present and Difference Between Amounts was Small (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0146181	0.0186713	0.78	.434	[−0.0220997, 0.051336]
dn_std	−0.2683904	0.0204752	−13.11	.000	[−0.3086557, −0.2281251]
Study 3	0.018693	0.0337445	0.55	.580	[−0.0476669, 0.085053]
Constant	0.0338713	0.024532	1.38	.168	[−0.0143718, 0.0821144]

Table A47

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense Both (z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, When Ambiguous Timing Information was Present and Difference Between Amounts was Large (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0109686	0.0179469	0.61	.542	[−0.0243674, 0.0463047]
dn_std	0.0102816	0.0191549	0.54	.592	[−0.027433, 0.0479962]
Constant	0.0302979	0.0175646	1.72	.086	[−0.0042854, 0.0648812]

Table A48

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, When Objective Timing Information was Present and Difference Between Amounts was Small (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0409645	0.0278566	1.47	.143	[−0.0140273, 0.0959563]
dn_std	0.0488334	0.0246846	1.98	.050	[0.0001035, 0.0975633]
Study 2a	−0.1776898	0.1039291	−1.71	.089	[−0.3828562, 0.0274766]
Constant	0.0717623	0.0334233	2.15	.033	[0.0057814, 0.1377433]

(*Appendices continue*)

Table A49

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, When Objective Timing Information was Present and Difference Between Amounts was Small (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0152756	0.0159096	0.96	.337	[−0.0159303, 0.0464814]
dn_std	−0.0046548	0.0163427	−0.28	.776	[−0.03,671, 0.0274004]
Study 2b	−0.2352159	0.0862352	−2.73	.006	[−0.4043614, −0.0660705]
Study 3	0.299275	0.0873075	3.43	.001	[0.1280262, 0.4705237]
Constant	−0.2717259	0.0840397	−3.23	.001	[−0.436565, −0.1068868]

Table A50

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense), Difference in Monetary Amounts Between Two Options and Its Interaction With Tense Differences (All of Them z-Scored), With the Fixed Effects for the Appropriate Studies, for No Timing Information (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.1821631	0.0179573	10.14	.000	[0.1468897, 0.2174365]
dn_std	−0.1354643	0.0165529	−8.18	.000	[−0.1679788, −0.1029497]
dMoney_std	−0.001162	0.018068	−0.06	.949	[−0.0366526, 0.0343287]
dpXdMoney_std	0.0758139	0.0150925	5.02	.000	[0.0461678, 0.1054599]
dnXdMoney_std	0.0065835	0.0129238	0.51	.611	[−0.0188025, 0.0319695]
Study 1b	−0.0311984	0.0291499	−1.07	.285	[−0.088457, 0.0260603]
Constant	0.0577452	0.0177714	3.25	.001	[0.0228371, 0.0926534]

Table A51

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense), Difference in Monetary Amounts Between Two Options and Its Interaction With Tense Differences (All of Them z-Scored), With the Fixed Effects for the Appropriate Studies, for Ambiguous Timing Information (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0227325	0.0171911	1.32	.187	[−0.0110443, 0.0565092]
dn_std	−0.2408195	0.0190186	−12.66	.000	[−0.2781868, −0.2034522]
dMoney_std	−0.020036	0.0180087	−1.11	.266	[−0.055419, 0.0153471]
dpXdMoney_std	0.015413	0.0154022	1	.317	[−0.0148488, 0.0456748]
dnXdMoney_std	−0.1179758	0.0149481	−7.89	.000	[−0.1473455, −0.0886061]
Study 3	−0.0153636	0.0314939	−0.49	.626	[−0.0772422, 0.046515]
Constant	0.0352376	0.0245863	1.43	.152	[−0.0130691, 0.0835443]

(*Appendices continue*)

Table A52

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense), Difference in Monetary Amounts Between Two Options and Its Interaction With Tense Differences (All of Them z-Scored), With the Fixed Effects for the Appropriate Studies, for Objective Timing Information (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.0145003	0.0108482	1.34	.182	[−0.0067778, 0.0357784]
dn_std	−0.001354	0.0141081	−0.1	.924	[−0.0290263, 0.0263182]
dMoney_std	0.0165642	0.0207098	0.8	.424	[−0.0240569, 0.0571853]
dpXdMoney_std	0.0104865	0.0092826	1.13	.259	[−0.0077208, 0.0286937]
dnXdMoney_std	−0.0098573	0.0160729	−0.61	.540	[−0.0413834, 0.0216689]
Study 2a	0.3279438	0.0955418	3.43	.001	[0.1405442, 0.5153435]
Study 3	0.5931335	0.0590548	10.04	.000	[0.4773009, 0.7089662]
Constant	−0.5371013	0.042042	−12.78	.000	[−0.6195643, −0.4546383]

Table A53

Regression of Choice of the First Option (z-Scored) in an Intertemporal Choice Task by the Difference in the Occurrence of Present Tense and Neutral Tense (Both z-Scored) in the Two Options (Compared Against Future Tense) With the Fixed Effects for the Appropriate Studies, Type of Timing Information, Difference in Amounts Between the Two Options (z-Scored), and the Relevant Interactions With Difference in Tenses (z-Scored) (Pooling Across All Relevant Studies)

Variable	Coef.	*SE*	*t*	$p > \|t\|$	95% CI
dp_std	0.2228746	0.0224234	9.94	.000	[0.1789023, 0.2668469]
dn_std	−0.2506283	0.0213924	−11.72	.000	[−0.2925788, −0.2086777]
dMoney_std	−0.0057347	0.0109668	−0.52	.601	[−0.0272407, 0.0157713]
timing_info	−0.004846	0.0080392	−0.6	.547	[−0.0206109, 0.010919]
dpXtime_std	−0.1544815	0.0188831	−8.18	.000	[−0.1915112, −0.1174518]
dpXdMoney_std	0.0310738	0.0071319	4.36	.000	[0.0170882, 0.0450595]
dnXtime_std	0.1084108	0.0173573	6.25	.000	[0.0743731, 0.1424485]
dnXdMoney_std	−0.0509517	0.008527	−5.98	.000	[−0.0676732, −0.0342302]
Study 1b	0.2235986	0.0861496	2.6	.010	[0.0546592, 0.392538]
Study 2b	−0.2801362	0.0869403	−3.22	.001	[−0.4506264, −0.1096461]
Study 3	0.2480298	0.0824425	3.01	.003	[0.0863599, 0.4096997]
Study 4b	0.2459118	0.0855152	2.88	.004	[0.0782165, 0.4136072]
Constant	−0.1992521	0.0850288	−2.34	.019	[−0.3659936, −0.0325106]

Power Analysis

All the studies were highly powered to detect relevant effects. Studies 1a and 1b had more than 99% power to detect the effects observed in (Falk et al., 2018) or $r = .32$. In fact, Studies 1a and 1b had more than 99% power using only a single trial per person but included 10 trials per person.

However, the relationship in Falk et al. (2018) is quite different (i.e., correlations across languages) from what we study here. Therefore, the power for the remaining studies is assessed relative to the effects found in Studies 1a and 1b. The power in Study 2b was assessed based on the observed difference in choice proportions in Study 1b, between choices of "is getting" a larger amount (63%) over "is going to get" a smaller amount and choices of "is going to get" a larger amount (45%) over "is getting" a smaller amount.

For the remaining studies, where the focal analysis was a regression using repeated measures data, we conducted a bootstrapped power analysis. The power analysis for Study 4a was based on bootstrapping the data in Study 1a using $N = 230$ and three trials (i.e., for each of the three types of questions tested). Likewise, the power analysis for Study 5a was based on bootstrapping Study 1a using $N = 113$ and 12 trials (i.e., for each of the two types of questions tested).

The power analyses for the remaining studies were based on bootstrapping the data from Study 1b: Study 2a ($N = 113$, 12 trials), Study 3 ($N = 165$ per condition, 10 trials), Study 4b ($N = 221$, five trials per ambiguous timing word) and Study 5b ($N = 201$ per condition, eight trials).

(*Appendices continue*)

Appendix B

Sample Questions

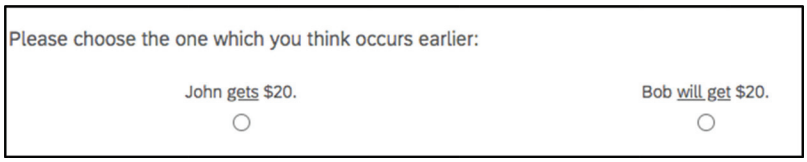
Study 1a

Overview

The study included 10 earliness inference questions, where only the tense form was changed between options within subjects. We tested five total tense forms—two present tense forms ("get" and "is getting"), two future tense forms ("will get" and "is going to get"), and one neutral tense form ("would get").

Sample Question

The other pairs tested were "will get" versus "would get"; "will get" versus "is getting"; "will get" versus "is going to get"; "gets" versus "would get"; "gets" versus "is getting"; "gets" versus "is going to get"; "is getting" versus "would get"; "is getting" versus "is going to get"; "is going to get" versus "would get."



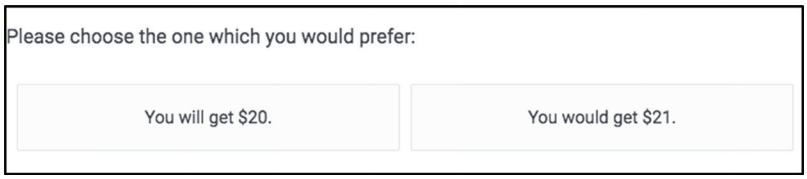
Study 1b

Overview

The study included 10 choice questions, where the tense form was changed between options within subjects. We tested five total tense forms—two present tense forms ("get" and "is getting"), two future tense forms ("will get" and "is going to get"), and one neutral tense form ("would get"). The amounts were also manipulated to be between $19 and $21 for *each* option.

Sample Question

The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "gets" versus "would get"; "gets" versus "are getting"; "gets" versus "are going to get"; "are getting" versus "would get"; "are getting" versus "are going to get"; "are going to get" versus "would get." For each option, the amount could be $19, $20, or $21.



Replication of Study 1b

Method

In this replication, participants (N = 189, after exclusions) were recruited from AMT, made a series of eight hypothetical test choices between two options, of which four questions were test trials (i.e., tense differed between the options) and four were filler trials (i.e., tense was the same between the options). For the test trials, the tense form was changed between options within subjects. We tested 2 total tense forms—one present tense form ("get") and one future tense form ("will get"). Each option specified only the amount (randomly determined, between $10 and $30) and verb tenses were randomized, from among the four aforementioned forms. No other cues as to timing were presented in the choice options. For example, a participant would be asked to choose between "You get $13" and "You will get $28."

Sample Question

For each option, the amount could be any whole number between $10 and $30 (inclusive).

(*Appendices continue*)

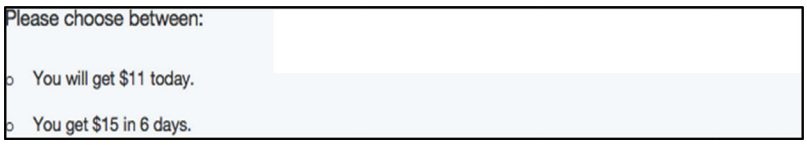
Study 2a

Overview

The study included 18 choice questions. We split the sample into two groups. One group saw the following three tense forms—neutral ("would get"), short version of present tense ("get"), and short version of future tense ("will get"). The other group saw the following three tense forms—neutral ("would get"), longer version of present tense ("are getting"), and longer version of future tense ("are going to get"). The sooner-smaller amount ranged between $10–16. The later larger amount ranged between $3 and $6 MORE than its corresponding sooner-smaller amount. for example, If the sooner-smaller was $10, the later larger would be something between $13 and $16 (inclusive). Finally, the later-larger amount's delay was between 6 to 8 days, and the sooner-smaller amount was always "today."

Sample Question

Shorter versions of the tenses: The other tense pairs tested (test trials) were "will get" vs. "would get," "get" vs. "would get."



Longer versions of the tenses: The other tense pairs tested (test trials) were "are going to get" versus "would get," "are getting" versus "would get."

Study 2b

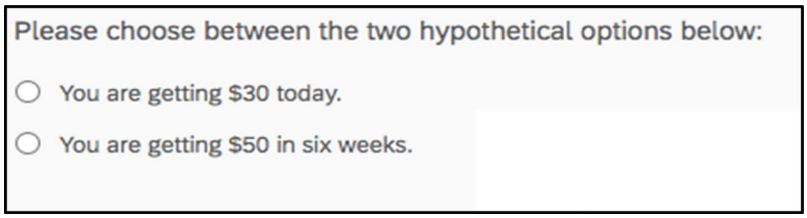
Overview

The study included 20 conditions in a 5 (tense-display) × 2 (date vs. delay format) × 2 (standard vs. hidden zero highlighted) between subjects design, for intertemporal choice questions.

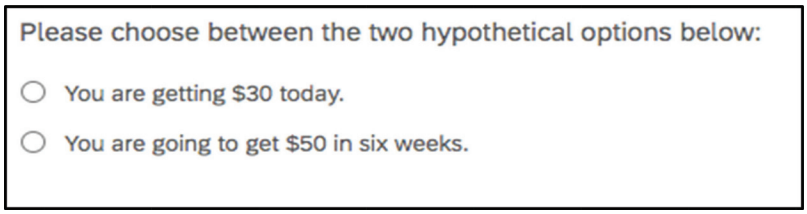
Types, First Factor (tense-display): Both sooner-smaller and later-larger in present tense ("are getting"), both in future tense ("are going to get"), sooner-smaller in present tense and later-larger in future tense, sooner-smaller in future tense and later-larger in present tense, and both options tense-less.

Sample Question First Factor (tense-display), same tense for both options: The other tense used for both options was "are going to get."

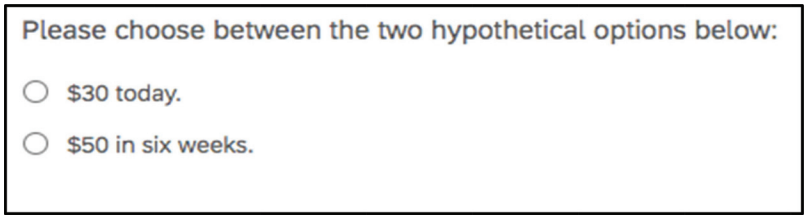
(*Appendices continue*)



Sample Question First Factor (tense-display), different tense for both options: Tense for sooner-smaller and later-larger counterbalanced. That is, sooner-smaller was also paired with future tense "are going to get" and later-larger with present tense "are getting."

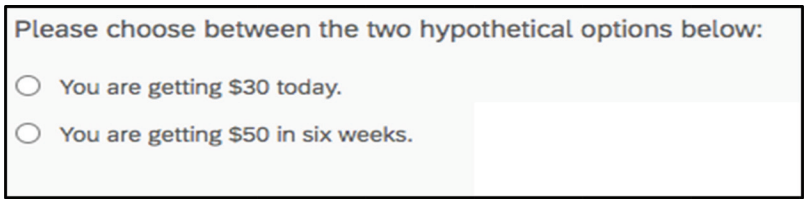


Sample Question First Factor (tense-display), tense-less for both options:

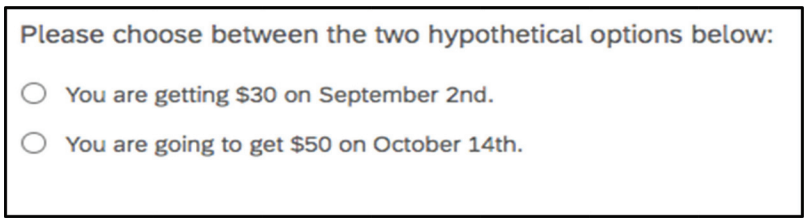


Types, Second Factor (date vs. delay): Timing of sooner-smaller and later-larger in delay format or date format.

Sample Question Second Factor (Delay):



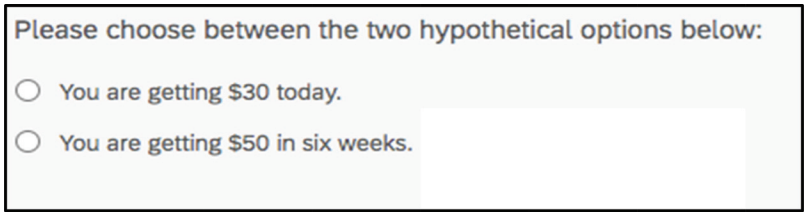
Sample Question Second Factor (Date)



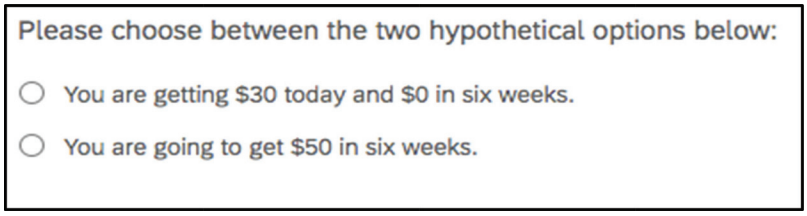
Types, Third Factor (standard vs. hidden zero): Hidden zero highlighted with choice or not.

(*Appendices continue*)

Sample Question Third Factor (Standard)



Sample Question Third Factor (Hidden Zero)



Study 3

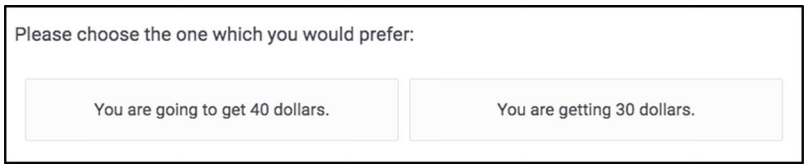
Overview

This study had four main conditions, displayed between subjects—one with no timing information, one with objective timing information, one with ambiguous timing information ("soon" vs. "later"), and the last with another type of ambiguous timing information ("now" vs. "at some point"). Each participant made 15 intertemporal choices. Across these choices, we randomized the verb tense (across two present-tense forms, two future tense forms and the neutral tense). We also varied (within subjects) the difference in magnitude between the sooner-smaller and later-larger amount. The smaller amounts ranged between $30 and $35 and the larger amounts were between $1 and $30 *more* than the smaller amount.

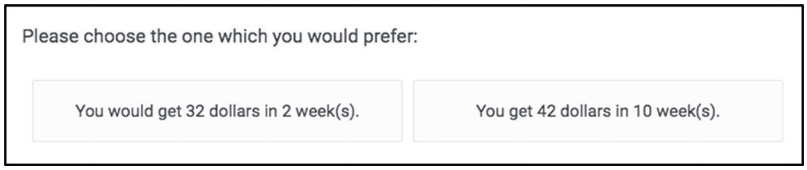
Most importantly, tense was manipulated between options to be one of the 5 tense forms—two present tense forms ("get" and "is getting"), two future tense forms ("will get" and "is going to get"), and one neutral tense form ("would get").

Sample Questions

No timing information: The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "will get" versus "would get"; "get" versus "would get"; "get" versus "are getting"; "get" versus "are going to get"; "are getting" versus "would get"; "are going to get" versus "would get."

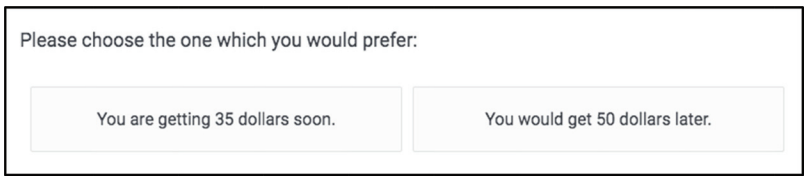


Objective timing information: The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "will get" versus "would get"; "get" versus "are getting"; "get" versus "are going to get"; "are getting" versus "would get"; "are going to get" versus "would get"; "are going to get" versus "are getting." Order of tenses, and delays counterbalanced between the two options.

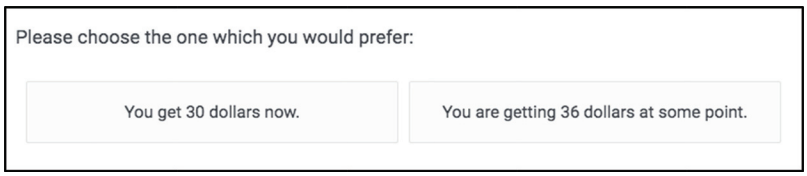


(*Appendices continue*)

Ambiguous timing information (soon vs. later): The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "will get" versus "would get"; "get" versus "are getting"; "get" versus "are going to get"; "get" versus "would get"; "are going to get" versus "would get"; "are going to get" versus "are getting." Order of tenses, and "soon" versus "later" counterbalanced between the two options.



Ambiguous timing information (now vs. at some point): The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "will get" versus "would get"; "get" versus "are going to get"; "get" versus "would get"; "are going to get" versus "would get"; "are getting" versus "would get"; "are going to get" versus "are getting." Order of tenses, and "now" versus "at some point" counterbalanced between the two options.



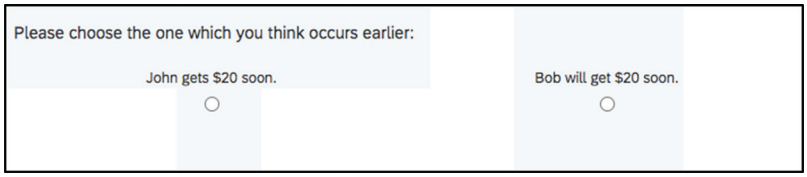
Study 4a

Overview

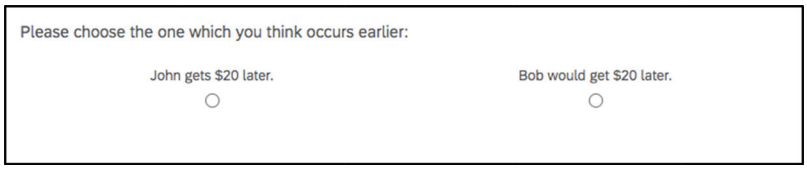
The study included nine earliness inference questions, where only the tense form was changed between options within subjects. We tested three total tense forms—one present tense form ("get"), one future tense form ("will get"), and one neutral tense form ("would get"). Three of the nine questions had the ambiguous word "soon" in both options, three had "later" in both options, and the remaining three had "at some point" in both options.

Sample Question

Soon in both options: The other pairs tested were "will get" versus "would get"; "gets" versus "would get." Tense order counterbalanced between both options.

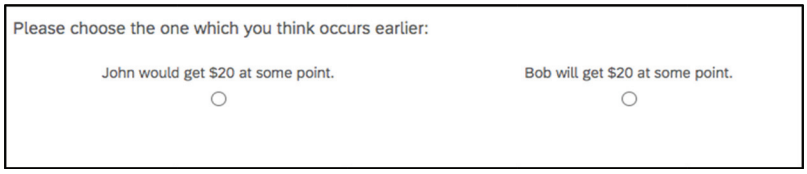


Later in both options: The other pairs tested were "will get" versus "would get"; "gets" versus "will get." Tense order counterbalanced between both options.



(*Appendices continue*)

At some point in both options: The other pairs tested were "will get" versus "gets"; "gets" versus "would get."



Study 4b

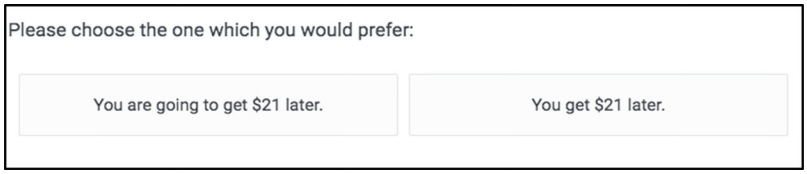
Overview

The study included 10 choice questions, where the tense form was changed between options within subjects. We tested all the five tense forms. Five of the 10 questions had the ambiguous word "soon" in both options and the other fie had "later" in both options.

Sample Question

Soon in both options: The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "will get" versus "would get"; "get" versus "are going to get"; "get" versus "are getting"; "are going to get" versus "would get"; "are getting" versus "would get"; "are going to get" versus "are getting." Amounts in each option between $19 and $21. Order of tense counterbalanced.

Later in both options: The other tense pairs tested were "get" versus "will get"; "will get" versus "are getting"; "will get" versus "are going to get"; "will get" versus "would get"; "get" versus "would get"; "get" versus "are getting"; "are going to get" versus "would get"; "are getting" versus "would get"; "are going to get" versus "are getting." Amounts in each option between $19–21. Order of tense counterbalanced.



Pretest for Study 5a—Similar Meaning Ambiguous Word Pairs

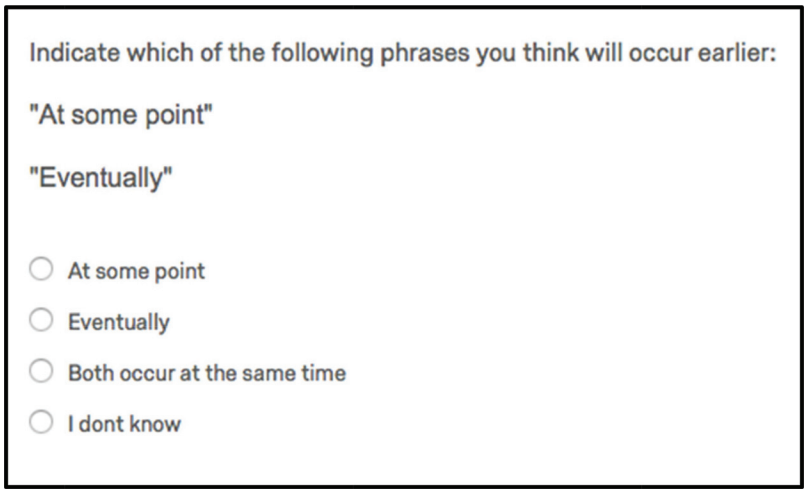
Method

In these two pretests we recruited participants from AMT to test which pair of ambiguous words sounded the closest to each other in terms of timing. Participants were asked to indicate which out of the two given ambiguous words would occur earlier (sample questions below). We tested the delayed sounding word pairs in one and the immediate sounding word pairs in the other. For the delayed ambiguous words pretest, participants answered 3 questions, and the for the immediate ambiguous words pretest, participants answered 10 questions. The purpose of these pretests was to see which pairs of words were chosen as occurring earlier almost the same number of times.

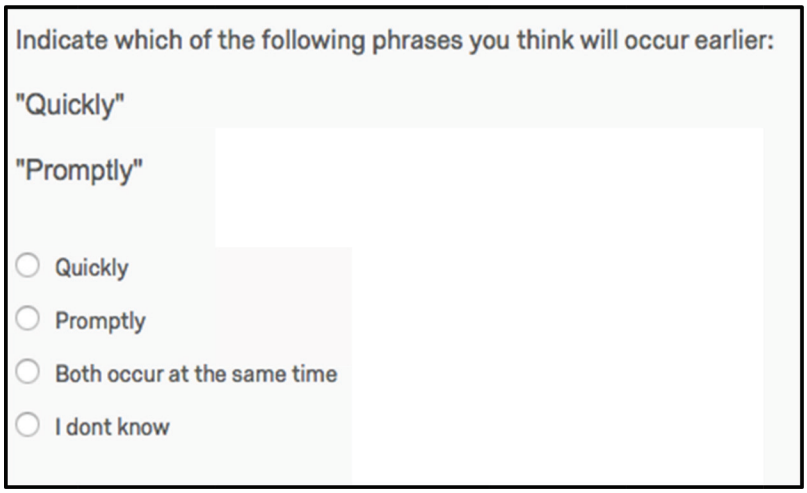
Sample Question

Delayed ambiguous words (*N* = 65, after exclusions): The other word pairs were – "Someday" versus "Eventually"; "At some point" versus "Someday."

(*Appendices continue*)



Immediate ambiguous words (*N* = 95, after exclusions): The other word pairs were – "Shortly" versus "Presently"; "Shortly" versus "Promptly"; "Shortly" versus "Quickly"; "Shortly" versus "Swiftly"; "Presently" versus "Promptly"; "Presently" versus "Quickly"; "Presently" versus "Swiftly"; "Promptly" versus "Swiftly"; "Quickly" versus "Swiftly."



Pretest for Study 5a: Earliness and Likelihood Inferences for Immediate Versus Delayed Pair of Ambiguous Words

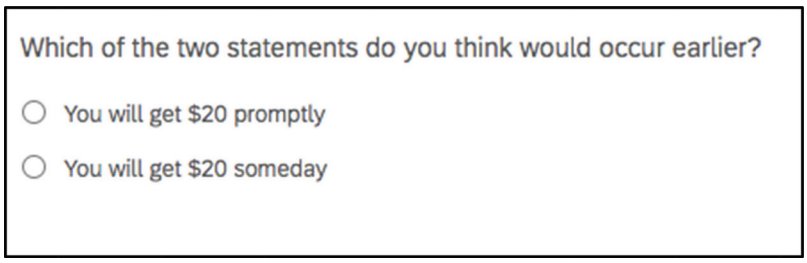
Method

In this pretest (*N* = 240, after exclusions), we recruited participants from AMT to test whether the immediate ambiguous word pair chosen from the last pretest ("promptly" and "quickly") were seen as occurring earlier than the delayed ambiguous word pair ("someday" and "eventually"). Participants were randomly assigned to the earliness or the likelihood inference condition. In the earliness inference condition, participants were asked 4 questions (as shown in sample question below), where only the ambiguous word was manipulated between the options (the tense was kept at future tense, and amount at $20 for both options). In the likelihood inference condition, we asked participants whether immediate ambiguous words would be seen as more likely to occur than the delayed ones, however we did not find any significant result for that. Participants in this condition also answered 4 questions, where again only the ambiguous word was manipulated between the two options (see sample question below).

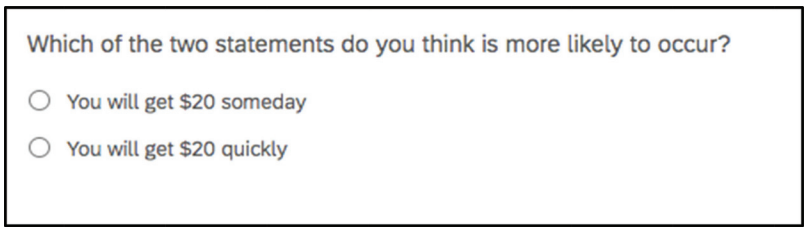
(*Appendices continue*)

Sample Questions

Sample Question (Earliness): The other word pairs were – "Promptly" versus "Eventually"; "Quickly" versus "Someday"; "Quickly" versus "Eventually."



Sample Question (Likelihood): The other word pairs were – "Promptly" versus "Eventually"; "Promptly" versus "Someday"; "Quickly" versus "Eventually."



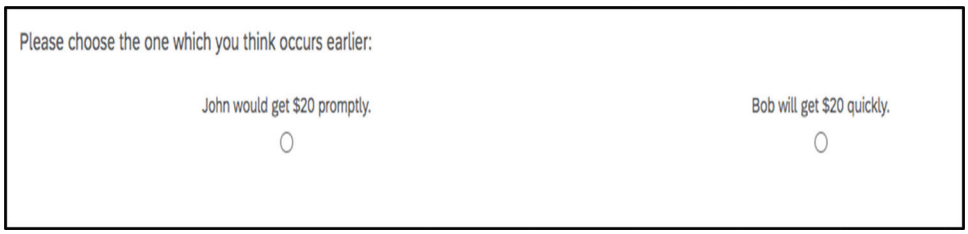
Study 5a

Overview

The study included 24 earliness inference questions, where the tense form was changed between options within subjects. We tested 3 total tense forms—one present tense form ("get"), one future tense form ("will get"), and one neutral tense form ("would get"). Twelve out of the 24 questions had "promptly" versus "quickly" (counterbalanced) in the two options, and the remaining 12 had "someday" versus "eventually" (counterbalanced) in the two options. Order of tense also counterbalanced between options.

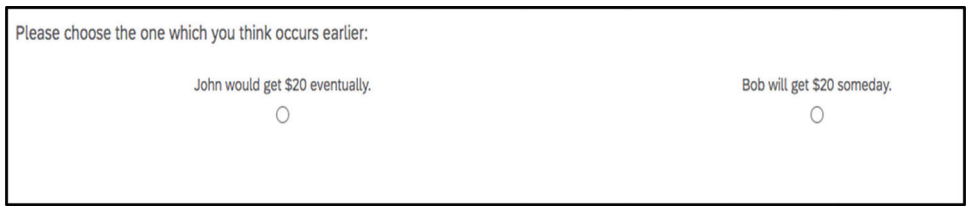
Sample Questions

Promptly versus Quickly: The other pairs tested were "will get" versus "gets"; "gets" versus "would get."



(*Appendices continue*)

Someday versus Eventually: The other pairs tested were "will get" versus "gets"; "gets" versus "would get."



Study 5b

Overview

In this study, there were two groups making intertemporal choices—one that would only see options with the immediate pair of words ("promptly" vs. "quickly") and the other that would see options with the delayed pair of words ("someday" vs. "eventually"). There were 16 choices between two options that varied in verb tense (either present "get" or future tense "will get"), described either using the immediate word pair (promptly/quickly, order counterbalanced) or the delayed word pair (someday/eventually, order counterbalanced).We also varied the differences in option amounts within-subjects, such that participants made choices both between options with small differences (values for both options ranging from $19–21) and between options with large differences (values for both options ranging from $10–30).

Sample Questions

Promptly Versus Quickly, Small Differences

Promptly Versus Quickly, Large Differences

(*Appendices continue*)

Someday Versus Eventually, Small Differences

Someday Versus Eventually, Large Differences

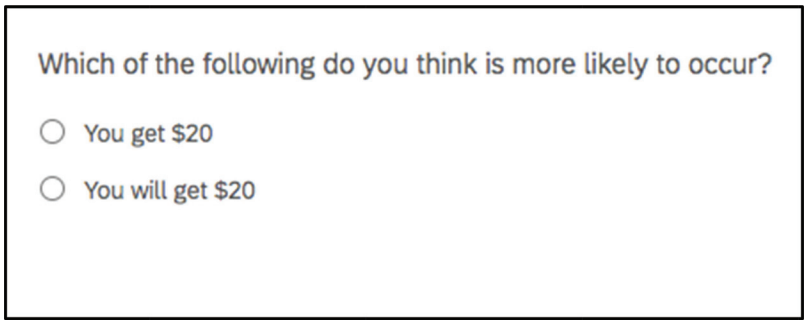
Posttest for Study 5b: Likelihood Inferences of Future Tense Compared With Present and Neutral Tenses

Overview

In this posttest (N = 128, after exclusions), participants were recruited from AMT to test whether the future tense is seen as more likely to occur compared with present tense and neutral tense. Participants were asked 2 questions, where only the tense was manipulated between the two options (amount held constant at $20). Specifically, future tense was tested against the present and neutral tense (see sample question below).

Sample Question

The other option pair was "will get" versus "would get," order counterbalanced



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