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LINGUISTIC CUES CAN AFFECT DECISION-MAKING IN THE ABSENCE OF FULL COMPREHENSION

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OVERVIEW

In my dissertation research, I explore how, even without full comprehension, linguistic cues can impact people's decision-making. People encounter language cues in most decision contexts. Ranging from product descriptions, advertisements, political messaging, and small text-based nudges, language is constantly being deployed to inform and influence consumers. A common view is that to be persuaded by these cues, people need to be able to deliberate about them (Petty & Cacioppo 1986). It is plausible to therefore assume that for a language-based cue to be effective, it needs to be comprehensible and diagnostic to the recipient. In fact, some theories of pragmatic linguistics contend that if people cannot understand the literal meaning of the cue, then its presence in a decision context might not seem relevant (Sperber & Wilson 2002; Grice 1975) and hence would be ignored.

In my dissertation, however, I show that people even use language cues, without full comprehension, in their decisions. In the first essay, I depict an instance of how the presence of two ambiguous timing cues – which have similar meanings, and cannot be semantically differentiated from each other (hence being non-diagnostic) – still block the use of another linguistic cue of timing. In the second essay I take the non-diagnosticity of a cue further by showing that, in the context of ethnic dining, completely incomprehensible (foreign) language on menus positively impacts people's decisions, because its presence incites intangible benefits. In the third essay, I test a different type of incomprehensible language in consumer decisions – ingredient names – and suggest that people base their decisions about such language on the associations cued by morphological structures of the name, even if the resulting beliefs are incorrect.

In Essay 1 (published in the Journal of Experimental Psychology: General), I study how people make inferences about timing from the verb tense, and the consequences of those inferences on people's intertemporal choices. This question, is broadly, an instance of how people spontaneously incorporate information at the time of decision-making. That is, do they systematically use all the cues given to them or do they only pick a few? Across nine studies, I show that people do make inferences about timing from verb tense and that they spontaneously use verb tense when making choices, but only when there is a complete absence of other potential timing cues in the decision environment. Specifically, in studies 4a-5b, I show that using the *same* ambiguous timing cue (e.g., "soon), or using word pairs pretested as indistinguishable (e.g., "quickly" vs. "swiftly") in the intertemporal choice options, blocks the impact of tense on choice. Thus, in those studies, I show that the presence of even non-diagnostic linguistic information can override other information and impact choices.

In Essay 2 (invited revision at Journal of Consumer Psychology), I take the idea of inferences from non-diagnostic linguistic cues further and show that even fully incomprehensible language – like the presence of foreign language unreadable by the consumer – can enhance consumer perceptions and increase preference. I use both secondary data and experiments to document the main effect. I show that, across multiple cuisines, menus that add foreign language (unfamiliar to the participants) to the food names had a higher average willingness to pay, compared to the exact same menus without the foreign language, holding constant information about the country of origin of the cuisine. Similarly, when choosing between two similar menus, people significantly preferred the one with the foreign language more than the one without, including when making consequential choices. Mediation analyses supports our theory that foreign language is beneficial because it makes the menu seem more authentic (and unique) and therefore of higher quality. Furthermore, I confirm an important boundary condition, that the effect of foreign language is strongest among people who have overall positive country and cuisine perceptions. Thus, this paper suggests that even when language does not communicate literal information, the presence of incomprehensible (but potentially meaningful) language is not ignored, but instead prompts associations that impact consumer decisions.

Finally, in Essay 3, I take the idea of incomprehensible language further by testing another common domain of such language – ingredient names in product information. Specifically, I focus on the associations people make when they encounter unknown ingredient names (including equivalent names for the same substance or completely made-up names) that structurally resemble chemical-seeming vs natural-seeming words, and how that affects their choices of products. Initial findings show that people choose products with chemical-seeming ingredients in their descriptions significantly less than products with natural-seeming ingredients, even when the ingredients have the same meaning. However, the effect is more nuanced – chemical-seeming ingredients are seen as more harmful, so in situations where perceived harm is tolerated because it implies higher perceived effectiveness, products with chemical-seeming ingredients are chosen more than when not. Using a generative algorithm to create stimuli names, I also find that there are morphological structures in generated chemical-seeming names that people can recognize as "chemical" but that is not the case for generated natural-seeming words, where there are no sufficiently identifying markers. Thus, I show that people make pragmatic inferences about meaningful incomprehensible cues, when semantic meaning is not accessible. Even when people have multiple associations with those inferences, only the most important association, in the context of the current decision, impacts choice.

ESSAY 1

What you are getting and what you will be getting:

Testing whether verb tense affects intertemporal choices

Abstract

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, due 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 non-diagnostic 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: Linguistic Priming; Intertemporal Choice and Inferences; Sapir-Whorf Hypothesis; Implicatures; Cue Competition

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 and 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.

In this paper, 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 (Sapir 1929; Whorf 1956; Koerner 1992). 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; Bryan et al. 2013; Bryan et al. 2014), the robustness and generalizability of these findings has been debated (Gerber et al. 2016; Bryan et al. 2016). 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; Warner and Pleeter 2001; Sutter et al. 2018). In particular, savings rates vary across countries in ways that are not well explained by having sufficient resources to save (Torvik 2009; Boschini et al. 2013). 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 2017). In fact, subsequent research has argued that at least some of the correlational relationship in Chen (2013) is explained by shared culture (Roberts, Winters, & Chen 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 paper, 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 and farsightedness.

Across 9 studies, 3744 participants, and 114 unique choice questions, we find that the use of present vs. 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 non-informative 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 vs. 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 (Tohidian 2008; Chandler 1994). 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 & 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 bi-directional 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 (Lenneberg & Roberts 1956; Brown & Lenneberg 1954), 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 (Heider 1972; Berlin & Kay 1991; 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 (Davies et al. 1998; Ozgen et al. 1998; Davidoff et al. 1999).

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 paper, 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 (Levinson & Gumperz 1996; Gumperz & Levinson 1991), 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, Shapira & Landy 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, Leslie, Yee, and Katya Saunders 2019; Rhodes, Cardarelli and Leslie 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, Loewenstein, & O'Donoghue 2002 and Urminsky & Zauberman 2016 for detailed reviews).

Intertemporal preferences have long been viewed as one of the primary determinants of savings and investment decisions (Irving 1930; Samuelson 1937; Carroll 1992; Laibson 1997; Gourinchas & Parker 2002; Bernheim and Rangel 2007). Empirical work has documented that less extreme time discounting predicts prudent financial behaviors (Chabris et al. 2008; Harrison, Lau, and Williams 2002; Johnson, Atlas and Payne 2011; Meier and Sprenger 2010) and farsighted health behaviors (see Urminsky & Zauberman 2017 for a review), although not necessarily savings (Chabris et al. 2008; Chapman et al. 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, Thaler 1980, Jang and Urminsky 2021). 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, Olivola and Hardisty 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.

<u>Linguistic cues and time perception</u>

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 (Miles et al. 2011; Boroditsky et al. 2011; Boroditsky 2008). 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. 1994). This idea, while intuitive, has been quite controversial, however, and seemingly promising empirical demonstrations (Boroditsky 2001) have subsequently failed to prove robust (January and Kako 2006; Chen 2007).

In this paper, 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.

<u>The relationship between language and farsightedness</u>

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 farsighted 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 vs. 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 2017). Perez & 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.,* Pullum 2012; McCulloch 2013; McCulloch 2014; Dahl, 2013). 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 (Pinker 2003; Au 1983; Lenneberg & Roberts 1956; Garnham & Oakhill 1994). Furthermore, Fabb (2016) criticizes categorizations of languages used in such research as over-simplified, 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, Winters, & Chen 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.

<u>Priming and framing to increase far-sightedness</u>

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 (Shevorykin et al. 2019; Sheffer et al. 2016), 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; Pashler & Wagenmakers 2012; Cesario 2014; Molden 2014; Vadillo et al. 2016) 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, Dweck & Gross 2008; Read, Olivola & Hardisty 2016). 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 (Read et al 2005; LeBoeuf 2006).

<u>Conversational Implicatures and Inference</u>

Pragmatics, a sub-field 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, in order to interpret the message (Grice 1975; Sperber & Wilson 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 Horn & Ward 2004; Grundy 2013). 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.

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 Perez & 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, Winters, & Chen 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

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[1] We use the phrase "neutral tense" loosely throughout this paper. 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).

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 (*e.g.*, 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 (Kamin 1969; Rescorla and Wagner 1972; Dickinson et al. 1984), 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-b 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.

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	Implicature-based pragmatic inference vs. cue-based inference
4b	Ambiguous (same)	Choices	
5a	Ambiguous (equivalent)	Timing judgments	
5b	Ambiguous (equivalent)	Choices	

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.

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' vs. '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 to 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 paper, '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

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

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 to 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 paper. 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" : β=-.56, $t(247)$=-25.05, p<.001; "Is Getting" : β=-.46, $t(247)$=-21.78, p<.001), followed by future tense options ("will get" and "is going to get") ("Will get": β=-.21, $t(247)$=-12.28, p<.001; "Is going to get": β=-.15, $t(247)$=-8.40, p<.001), compared to the neutral tense ("would get").

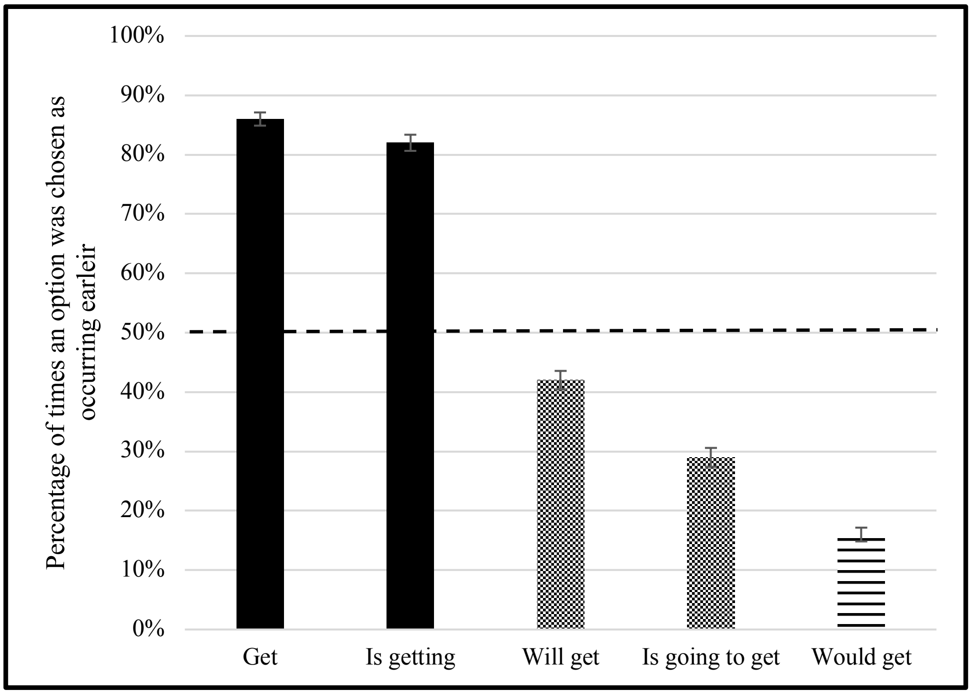

Figure 1a: The average percentage of times participants chose the option expressed in each verb tense as the earlier option. "Get" and "Is getting" are variants of the present tense; "Will get" and "Is going to get" are variants of the future tense; "Would get" is the neutral or nonspecific tense.

Utility-Model Estimation of the Verb Tense Effect

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

$$P(Option\ 1) = \alpha + U(o_1) - U(o_2) \qquad \textbf{(1)}$$

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 modeled in terms of the tense, such that β_1 and β_2 represent the

[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).

subjective value implied by present and neutral tense, respectively, relative to the utility of future tense, which is set at 0:

$$U(o_i) = \beta_1\, Present_i + \beta_2\, Neutral_i \qquad \textbf{(2)}$$

$Present_i$ 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 re-written as:

$$P(Option\ 1) = \alpha + \beta_1(Present_1 - Present_2) + \beta_2(Neutral_1 - Neutral_2) \qquad \textbf{(3)}$$

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):

$$P(Option\ 1) = \alpha + \beta_1(Present_1 - Present_2) + \beta_2(Neutral_1 - Neutral_2) + \beta_3(Amount_1 - Amount_2) + \beta_4\, Delay \qquad \textbf{(4)}$$

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 (β=-.18, t(248) = -11.86, p<.001), compared to 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 vs. 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 pre-registered 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 (β=-.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, $p<.001$).

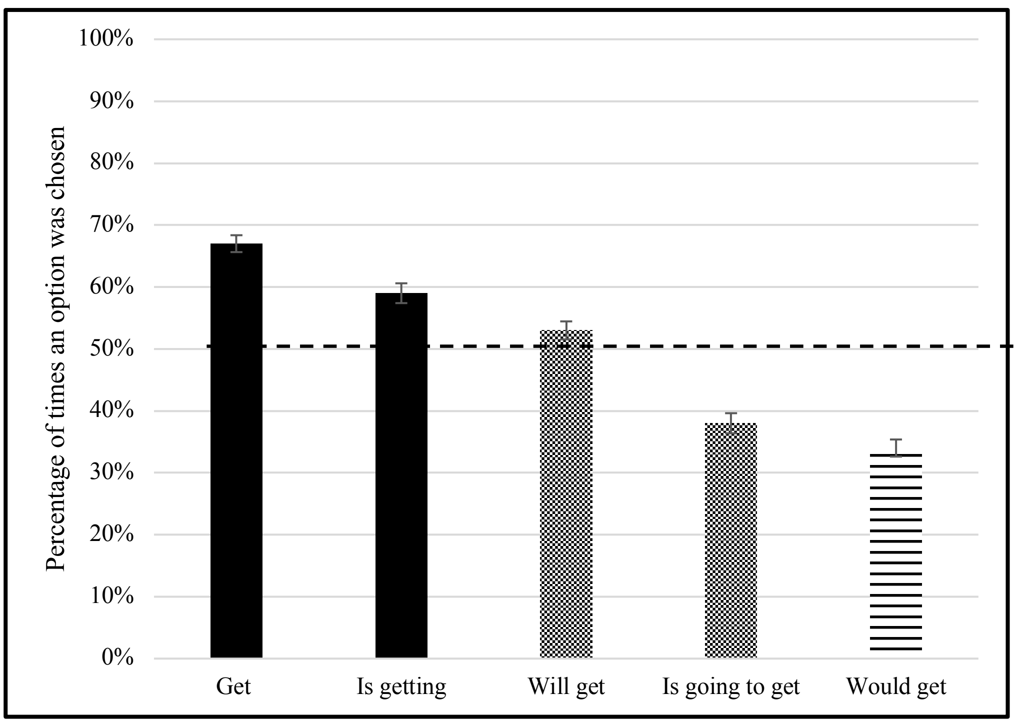

Figure 1b: The average percentage of times participants chose an option expressed in the present tense vs. future tense vs. neutral tense.

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 vs. 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 (non-significant) 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, over 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-$16. The later-larger amounts were between $3-6 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’ vs. ‘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 vs. 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 vs. future tense (β=.01, t(111) =1.11, p=.271) or differences in objective delay (β=.01, t(111) =0.33, 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 & Tytus (2017), 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).

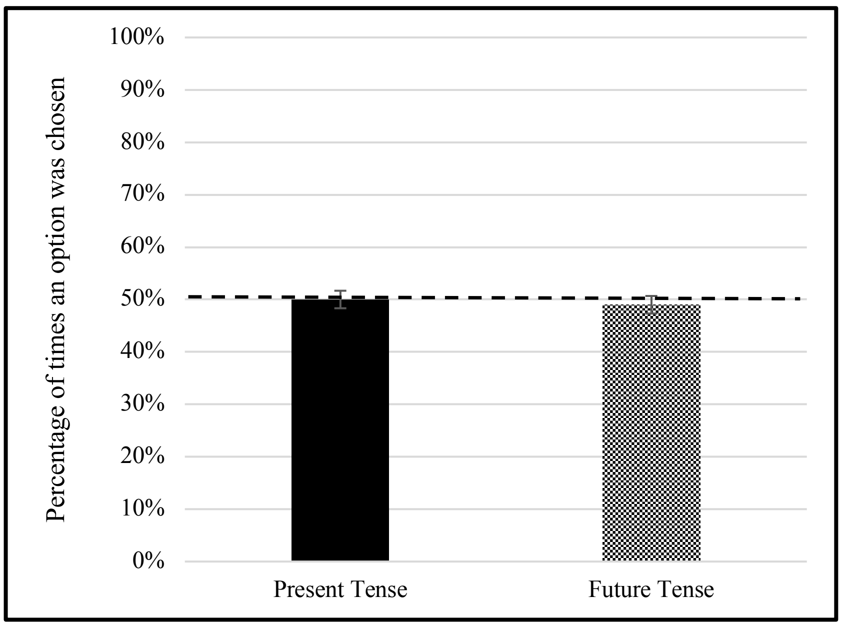

Figure 2a: The percentage of times participants chose an option expressed in present tense vs. future tense.

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 don't 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.

Method

In this study (N=1460, 99% power to detect the difference between present and future tense), participants from AMT made two intertemporal choices: (1) between $30 today and $50 in 6 weeks and (2) between $30 in 6 weeks and $50 in 12 weeks.

Participants were randomly assigned to one of five between-subjects tense-display conditions: (1) both options in present tense, (2) both options in future tense, (3) the first option in present tense and the second in future tense, (4) the first option in future tense and the second in present tense, or (5) 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 non-payments 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) x 2(date vs. delay format) x 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 (β=.02, t(1459) =1.40, p=.163).

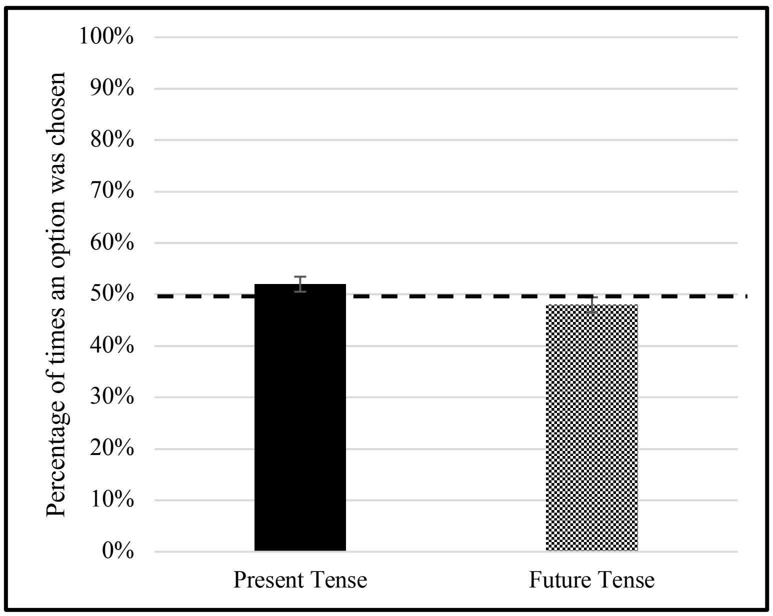

Figure 2b: The average percentage of times participants choose an option expressed in present vs. future tense, overall

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 (β=.14, t(1459)=7.87, p<.001). Likewise, we replicated the hidden zero effect, with more patient choices when the hidden zeros were shown (β=-.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 2021).

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). Since 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 vs. 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, since decision-makers are particularly likely to be relying on a subjective sense of delay. Similarly, since 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, over 99% power per condition to detect the effect observed in Study 1B) from AMT were randomly assigned to one of four timing-information conditions: (1) both options had *no timing* information ("You get $30" vs. "You will get $35"), (2) 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 (3) 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 (4) 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, while 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 answered10 test questions (different tense forms in both options) and 5 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 and Discussion

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 ($\beta=.04$, $t(254)= 5.28$, $p<.001$). In addition, the effect of present vs. future tense on intertemporal preferences was significantly moderated by the magnitude of difference in amounts between the two options (interaction $\beta=.003$, $t(254)=2.20$, $p=.029$; Figure 3a), suggesting that a sufficiently large difference in amounts does reduce the effect of tense on choice.

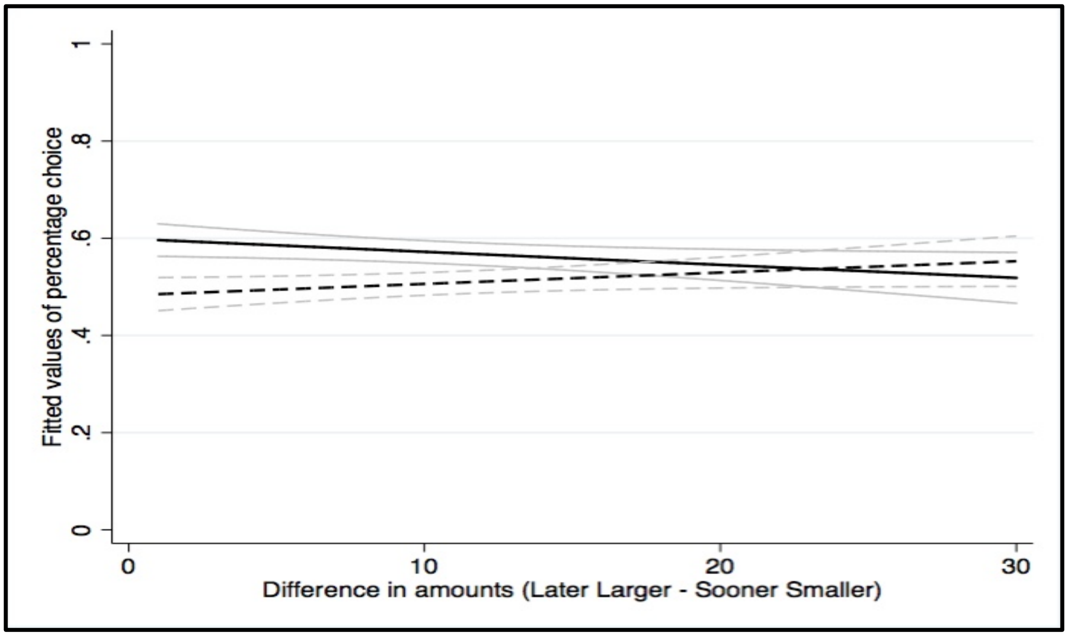

Figure 3a: The fitted values of percentage of times an option with present tense is chosen compared to an option with future tense, as a function of the difference in the amounts between the two options, when no timing information was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% Confidence Intervals.

<u>Objective Timing Information</u>

By contrast, present vs. 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)= 0.31, 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).

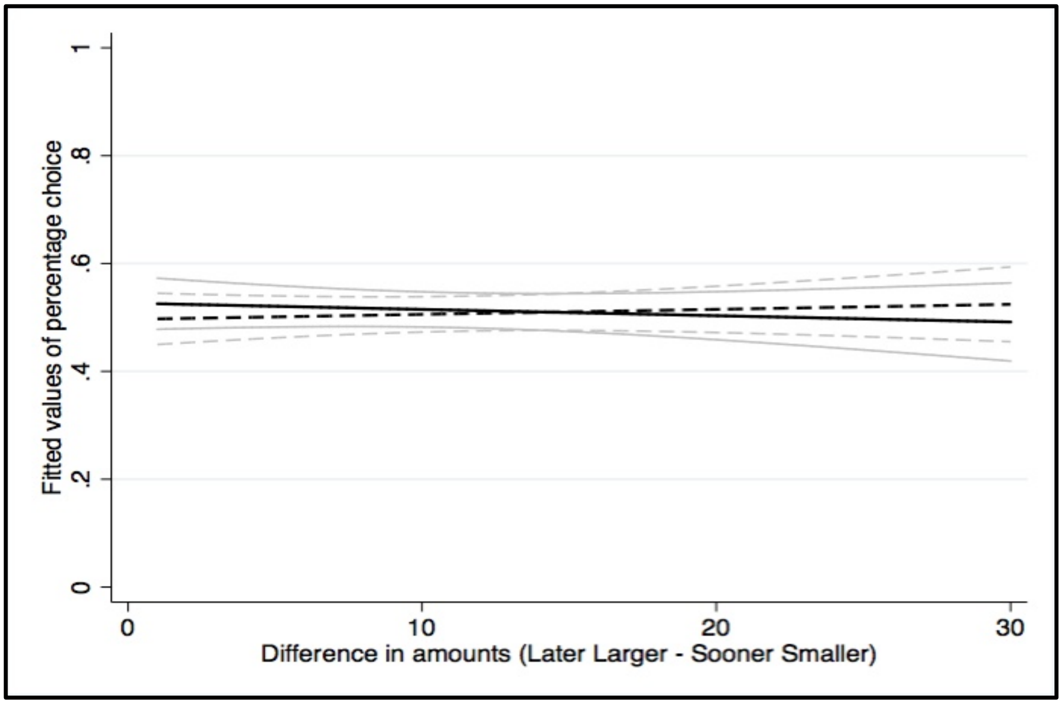

Figure 3b: The fitted values of percentage of times an option with present tense is chosen compared to an option with future tense, as a function of the difference between the two options in the amounts, when objective timing information was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% Confidence Intervals.

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.

<u>Ambiguous timing information</u>

Based on a linear utility regression analysis with clustered standard errors, in Condition 3, when the smaller option was described as "soon" and the larger option as "later", tense did not significantly impact choice (β=.02, t(126)=1.27, p=.206), and this was not moderated by magnitude (interaction β=.001, t(126)=0.79, p=.432; Figure 3c).

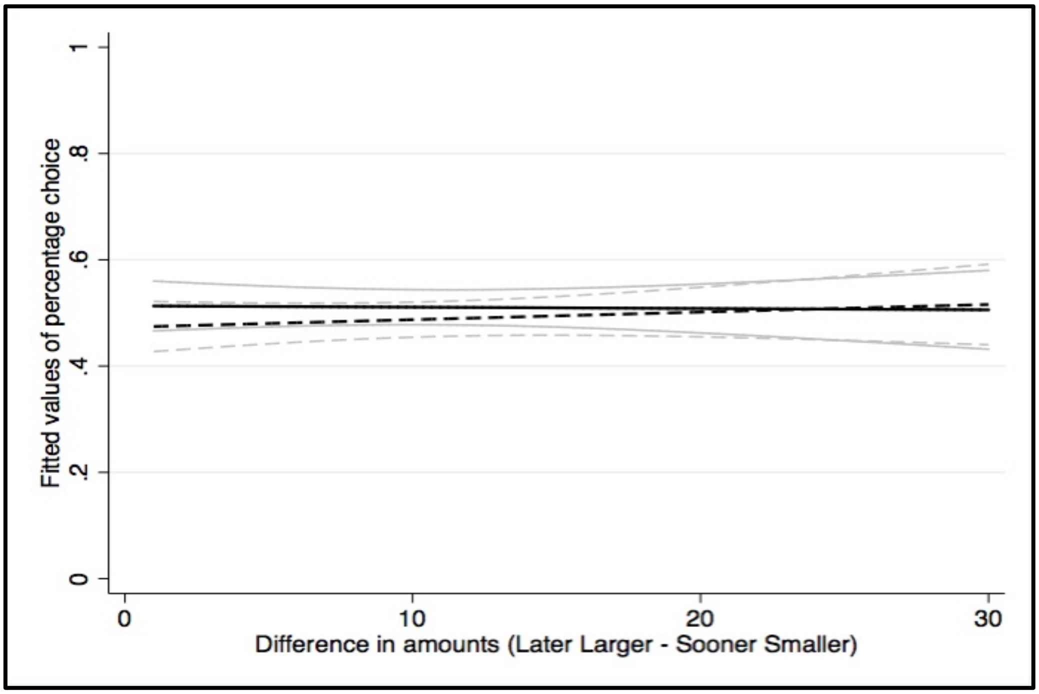

Figure 3c: The fitted values of percentage of times an option with present tense is chosen compared to an option with future tense, as a function of the difference in the amounts between the two options, when ambiguous timing information (“soon” vs. “later”) was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% Confidence Intervals.

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 (β=-.001, t(146)=-.19, p=.847), however the interaction between magnitude and tense was borderline significant (β=.002, t(146)=1.98, p=.050), as depicted in Figure 3d.

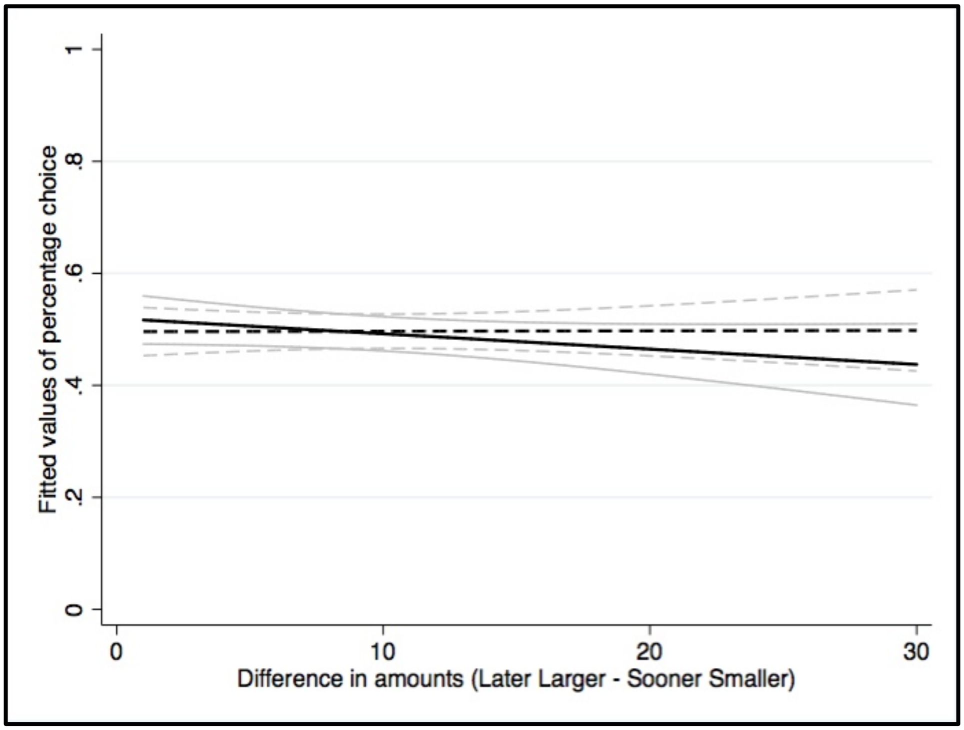

Figure 3d: The fitted values of percentage of times an option with present tense is chosen compared to an option with future tense, as a function of the difference in the amounts between the two options, when ambiguous timing information ("now" vs. "at some point") was present. The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% Confidence Intervals.

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

(Kamin 1969; Rescorla and Wagner 1972; Dickinson et al. 1984), 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 9 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": β=.48, t(229)=9.15, p<.001; for "later": β=.27, t(229)=4.66, p<.001; for "at some point": β=.24, t(229)=4.02, p<.001) .

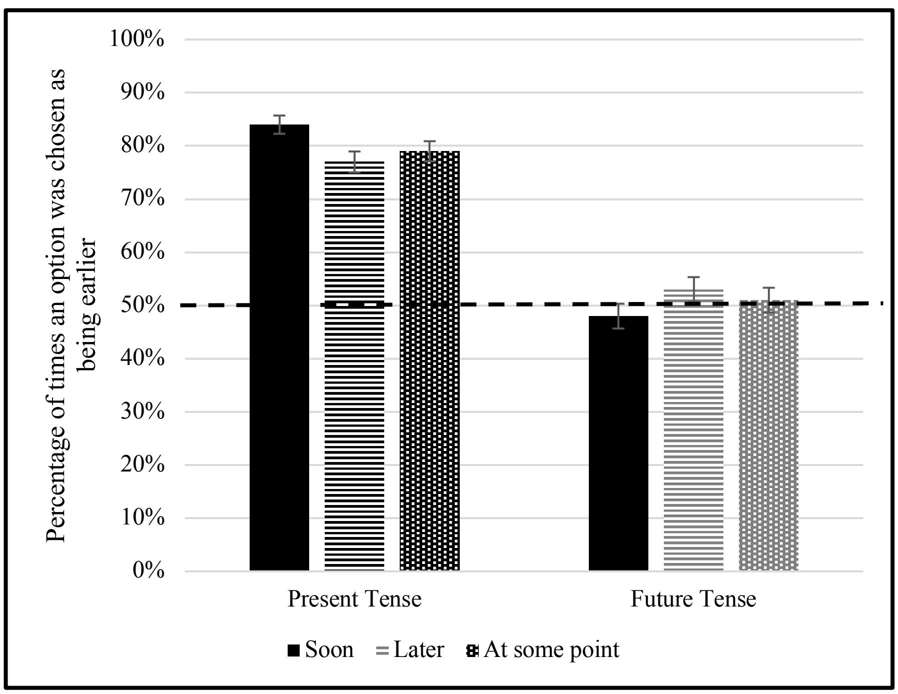

Figure 4a: The average percentage of times participants chose the option expressed in the present tense vs. future tense, split by ambiguous word

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

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, over 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' vs. '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 non-informative 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).

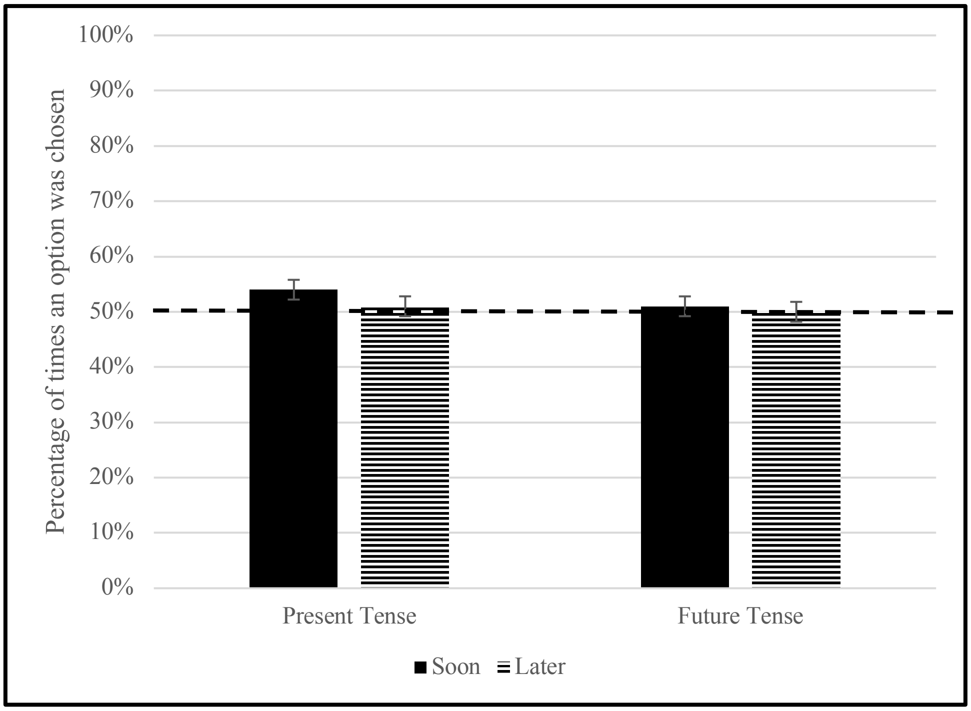

Figure 4b: The average percentage of times participants chose the option expressed in present vs. future tense, split by ambiguous word.

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 pre-tests (see Appendix B) which identified two pairs of words as yielding very similar estimates of which occurred earlier: 'promptly' (52%) vs. 'quickly' (48%, t(76)=-0.34, p=.73); and 'someday' (47%) vs. 'eventually' (53%, t(46)=-0.43, 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 pre-test, 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 p's<.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, over 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': $\beta=.07$, $t(112)=3.91$, $p<.001$) .

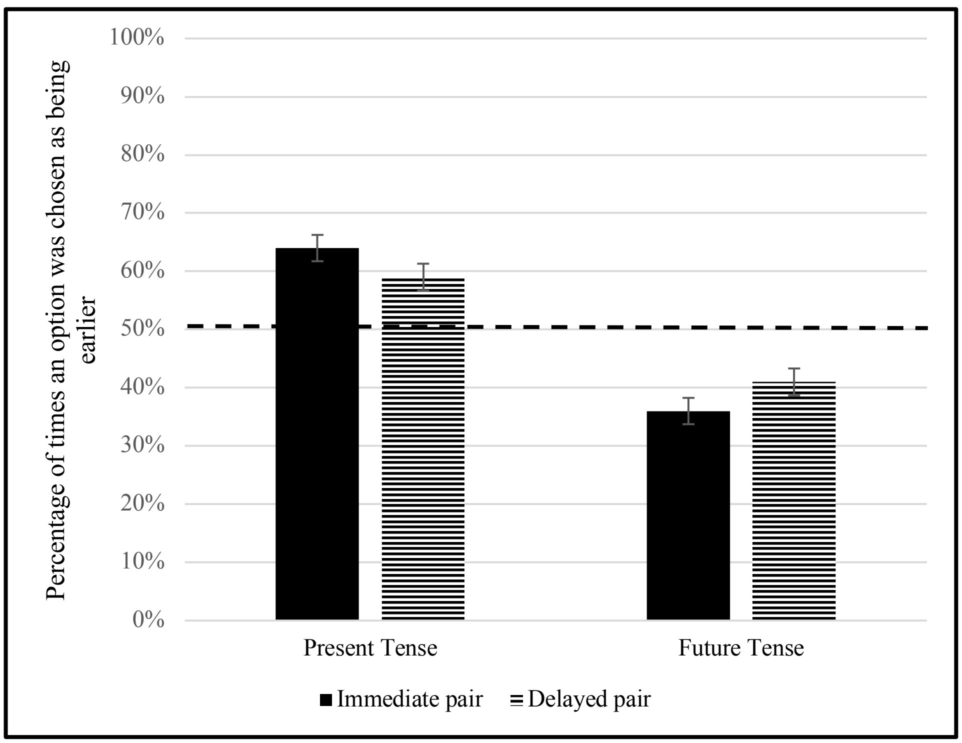

Figure 5a: The average percentage of times participants chose the option expressed in the present tense vs. future tense, split by ambiguous word pair

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, over 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 vs. 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 (β=.02, $t(200)$=1.23, p=.220), and in trials with small (β=.03, $t(200)$=1.44, p=.151) or large (β=-.001, $t(200)$=-.41, p=.684) monetary differences (interaction between tense and monetary difference: β=.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 pre-test results, respondents did not prefer options described with one ambiguous timing word over the other (β=-.03, $t(200)$=-.79, p=.433).

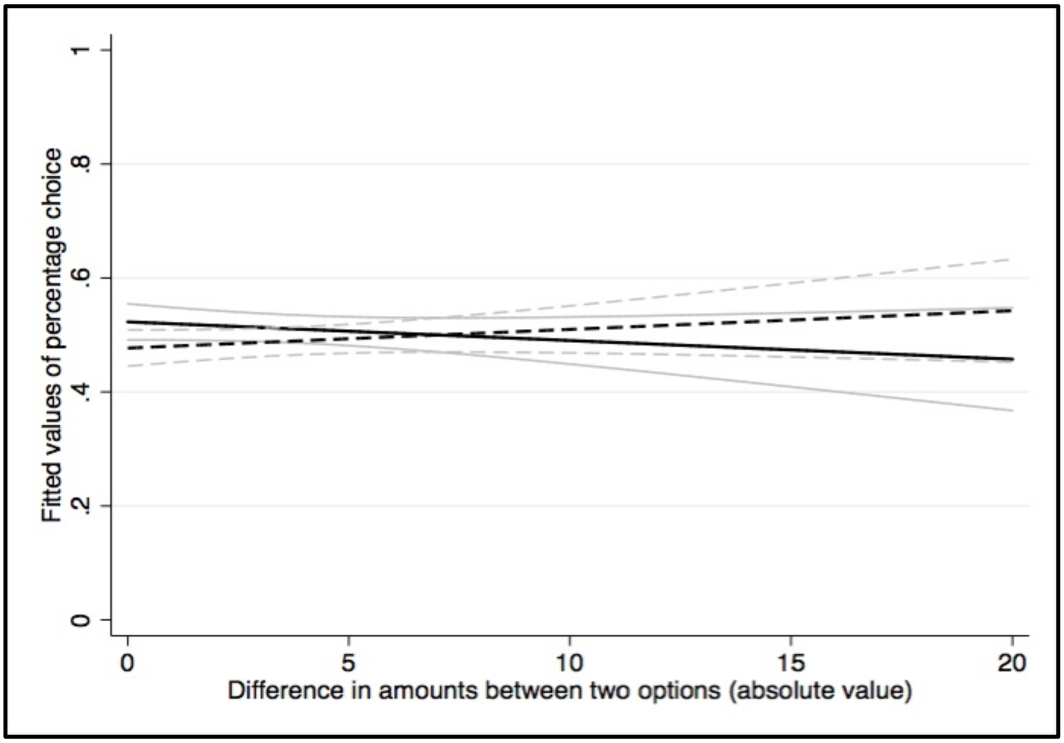

Figure 5b.1: The fitted values of percentage of times participants chose the option expressed in the present tense vs. the future tense over the absolute value of differences in monetary amounts between options (promptly vs. quickly). The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% Confidence Intervals.

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 (β=-.02, t(201)=-2.08, p=.039), and specifically when differences in amounts were small (β=-.05, t(201)=-2.72, p=.007). However, no difference was found when the amounts were large (β=.004, t(201)=.23, p=.821) and the interaction between tense and monetary difference between the two amounts was also not significant (β=-.003, t(201)=-1.21, p=.226). Figure 5b.2 depicts these differences. Again, consistent with the pre-test results, respondents did not prefer options described with one ambiguous timing word over the other (β=-.08, t(201)=-1.81, p=.071).

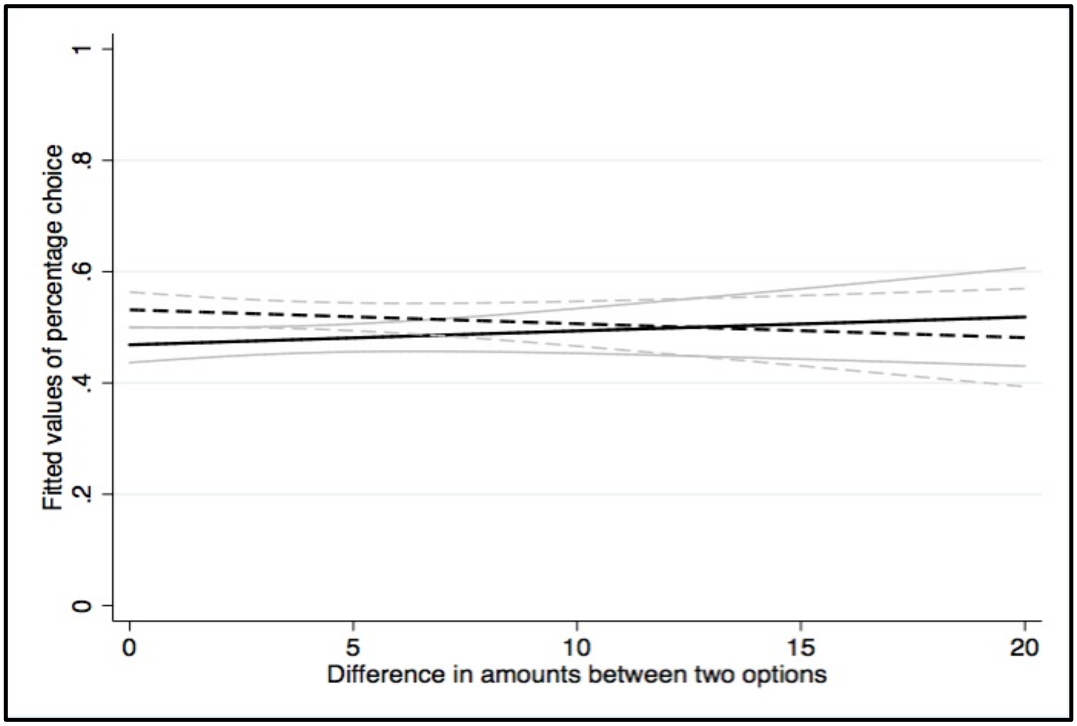

Figure 5b.2: The fitted values of percentage of times participants chose the option expressed in the present tense vs. the future tense over the absolute value of differences in monetary amounts between options (someday vs. eventually). The solid black line represents present tense and the dotted black line represents future tense. The gray bands around both black lines are the 95% Confidence Intervals.

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 *non-timing* 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 post-test, 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 paper, 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) summarizes the earliness inferences in Figure 6 below. 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: $\beta=-.74$, $t(590)=-11.45$, $p<.001$).

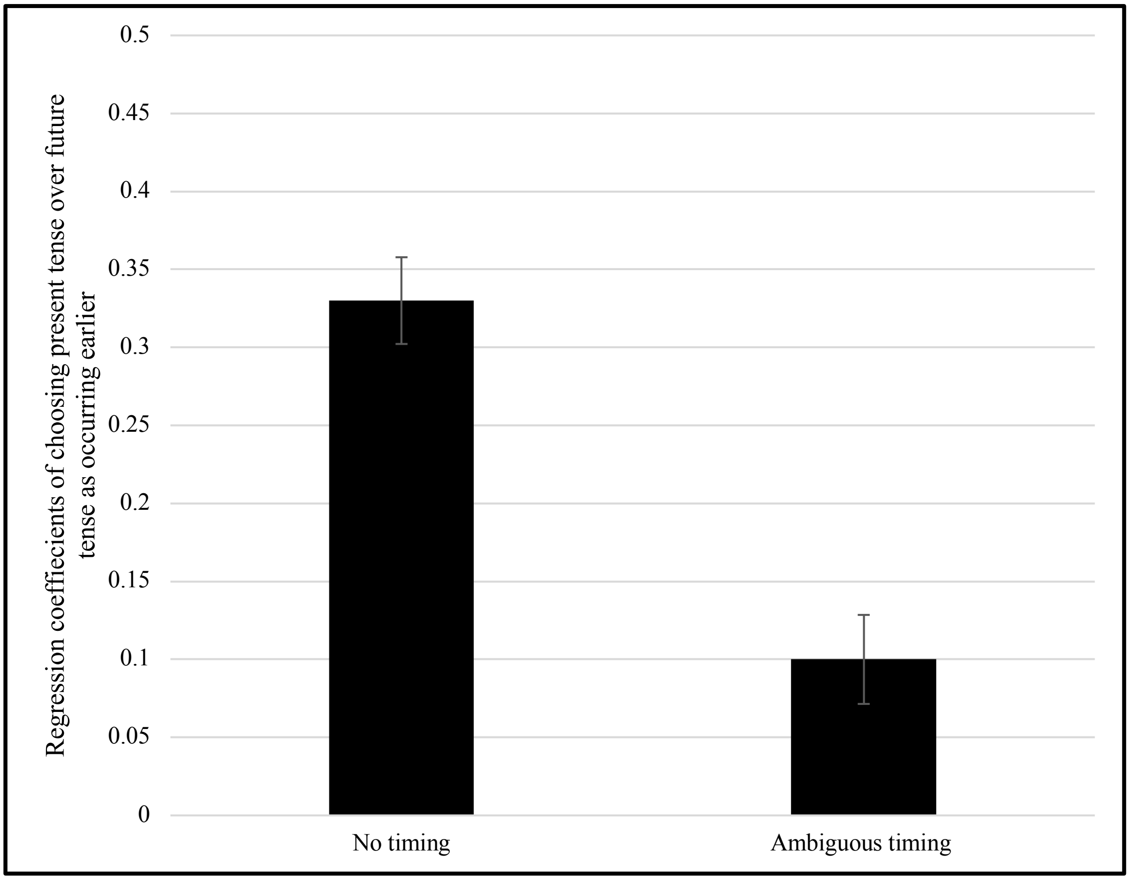

Figure 6: The regression coefficients of present tense (compared to future tense) impacting earliness inferences, by no timing and ambiguous timing conditions.

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 (β=.19, $t(414)=10.05$, $p<.001$) or larger (β=.05, $t(253)=3.01$, $p=.003$), though larger differences in amounts significantly reduced the impact of tense on choice (significant interaction between difference in amounts and tense: β=.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 *p*s>.1), and this was not moderated by differences in amounts (*p*s > .1; see Tables in Appendix A).

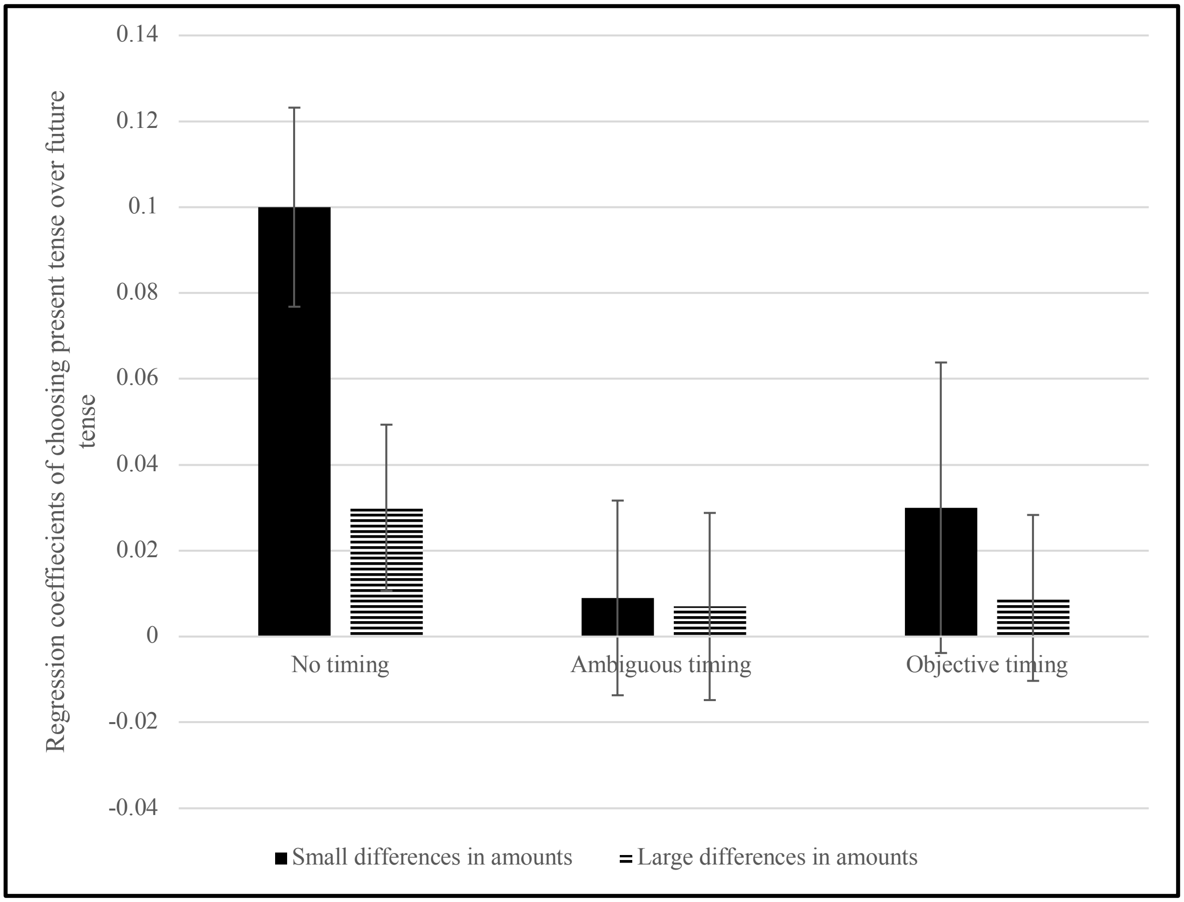

Figure 7: The regression coefficients of present tense (compared to future tense) on intertemporal choices, by timing conditions and size of magnitude differences in amount.

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, since 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 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 (pre-tested 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. While 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, Winters & Chen (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", Özçalışkan et al 2009; poorer performance in non-linguistic spatial reasoning tasks when lacking exposure to spatial language, Gentner et al 2013). Similarly, exposure to and acquisition of separate present vs. 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.

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ESSAY 2

Associations with the Incomprehensible:
Foreign Language Increases Authenticity Perceptions and Preferences

Abstract

Language is pervasive and hence a common factor in people's decision making. Prior research has mostly studied the effects of comprehensible language, language that communicates a literal meaning to consumers – on behavior and attitudes. In this paper, we investigate the potential for language that is incomprehensible to a given consumer to nevertheless impact willingness to pay and choice. In particular, we propose that potentially meaningful incomprehensible language can convey associations beyond literal meaning. Using the domain of foreign language, we demonstrate that adding text in a foreign language unreadable to the consumer to a known native language description of foreign food significantly increases perceptions of authenticity, uniqueness, and quality, resulting in higher valuations and greater likelihood of choice, while holding the country of origin constant. Thus, we show that an incomprehensible cue creates consumer value by instilling feelings of intangible experiences and that those feelings impact decisions. We test our framework using secondary field data as well as experiments, including with consequential choices.

Keywords: Incomprehensible Language; Consumer Choice; Foreign Language; Food Choices; Authenticity

People encounter language cues in most decision contexts. Language, ranging from product descriptions, advertisements, political messaging, and small text-based nudges, is constantly being deployed to inform and influence consumers. A common view is that to be persuaded by these cues, people need to be able to deliberate about them (Petty & Cacioppo 1986). Indeed, multiple semantic cues have been shown to causally impact decisions, such as which news article to read on seeing headlines (Banerjee and Urminsky 2023). It is plausible to therefore assume that for a language-based cue to be effective, it needs to be comprehensible to the recipient. In fact, some theories of pragmatic linguistics contend that if people cannot understand the literal meaning of the cue, then its presence in a decision context might not seem relevant (Sperber & Wilson 2002; Grice 1975) and hence would be ignored.

However, consumers are surrounded by arguably incomprehensible information. Common consumer products often feature lists of ingredients including jargon that means nothing to many consumers. Marketers often tout technical attributes that many consumers are unfamiliar with. Brand names are often invented words with no prior literal meaning. Firms attempting to market to a broad range of consumers, who speak different languages, may include information in more than one language.

How do such cues impact consumer behavior? Research shows that even when people cannot access the literal meaning of words, they may still derive associations from them (Piller, 2003). For example, the congruence of the sound or orthography of a brand name to the properties of the product it is describing (Ramachandran & Hubbard, 2001; D'Onofrio, 2014) can have a meaningful impact on consumers. However, not all incomprehensible cues support inference-making. Meaningful incomprehensible cues – unknown language that helps people infer category or congruity associations – are incorporated differently into decision-making than meaningless incomprehensible cues, that lack clear associations (Holcomb & Neville 1990). Such association-free incomprehensible linguistic cues have been shown to have a negative impact on consumers' quality judgments (Baskin & Liu 2021).

In this paper, we focus on how the use of one prevalent type of incomprehensible but meaningful cue, unknown foreign language, can be beneficial (e.g., in terms of attribute perceptions, willingness to pay and choice) for experiential products of foreign origin. The use of foreign language in marketing foreign foods is a particularly relevant context in which to study the broader question of incomprehensible cues in marketing. The ethnic food market was valued at nearly $39 billion in the U.S., and is projected to reach $62 billion by 2027 ("Ethnic Food Market Size" 2021), making the likelihood that consumer will encounter unknown foreign language in food settings increasingly common. In particular, we focus on restaurant menus, which commonly feature mixed language information. This is an understudied question – prior work investigating the effects of foreign language (Luna & Peracchio 2005, Krishna & Ahluwalia 2008) on consumers has primarily focused on contexts in which it is a comprehensible cue, for example, in bilingual populations. The literature on country of origin effects, on the other hand, does test incomprehensible foreign languages, but in this paper, we show that the effect of such foreign language exists above and beyond the country of origin because of the intangible benefits (authenticity, uniqueness, and quality) people derive from it.

In this paper, we present the results from analyses of 3 secondary datasets (242,168 observations) and 7 pre-registered experimental studies (N=3310), including consequential choices. We find that, holding the cuisine's country of origin constant, people have a higher valuation for and are more likely to choose a restaurant that uses foreign language in their menu descriptions than an English-only menu. This effect holds for both separate and joint evaluations, and is mediated by intangible benefits, specifically authenticity and uniqueness, which contribute to perceived quality. We also discuss individual differences and compare the use of foreign language to other potential cues of foreignness. Data, code, and pre-registrations can be accessed at our OSF repository: https://osf.io/w59ke/?view_only=fc778dbdb3944924a49126279f72c8dd.

Theoretical Development and Proposed Framework

Incomprehensible Linguistic Cues

People use many language-based cues to inform their decisions (Pogacar et al 2018), ranging from objective information in product descriptions, like price and quantity, to even the framing of a message. For example, presence of concrete product attributes like product ratings impact consumer decisions (Filieri 2015), while even a small linguistic manipulation like using the second person pronoun ("you") in reminder texts can be persuasive in a decision to get vaccinated (Buttenheim et al 2022; Milkman et al 2021). Most research on how language cues impact consumers focuses on cues that people can *comprehend* – that is, they understand the literally meaning of the cue.

However, in many cases, individual consumers may not have access to a literal meaning of the cue. As an extreme case, the Bouba-Kiki effect (Ramachandran & Hubbard 2001) shows that even when the name of a product is invented gibberish, how it sounds can affect people's perceptions and liking of the product. Similarly, Baskin & Liu (2021) find that meaningless descriptors enhance price judgments but decreases quality judgments. In these cases, the language significantly impacted consumer attitudes despite being *incomprehensible* (i.e., lacking literal meaning). This suggests that language can impact people's judgments and choices through other means than via comprehension, evaluation and deliberation of the literal meaning.

Meaningful vs Meaningless Incomprehensible Cues

Research suggests an important distinction between how people treat incomprehensible language when they can associate the cue with a meaningful category, compared to when the cue does not prompt clear inferences or associations. The non-word *bouba,* for example, is perceived as having "round" sounds and hence is associated with roundness and preferred as a name for round objects, whereas *kiki* – which has a phonetic association with sharpness – is preferred for sharp objects (Ramachandran & Hubbard, 2001; D'Onofrio, 2014). Not only is there an explicit preference for such matching, people also exhibit quicker processing of such pairs of non-words that are seen as congruent (on a non-literal basis), compared to non-congruent pairs (Parise & Spence, 2012; Kovic, Plunkett & Westerman, 2010; Westbury, 2005). Even though these non-words are not part of any language and are incomprehensible in terms of literal meaning, people's associations make them suitable descriptors for round or sharp objects and hence can be thought of as containing associational or inferred meaning.

The precise mechanisms for this effect have been debated (e.g., symbolic match based on orthography of the words and the shapes; Cuskley et al., 2017 vs. global shape perceptions; Chen et al. 2021). Nevertheless, the literature agrees on the general principle that the language used to describe items can impact people's judgments through their *associations* with the language cue, even if the cue provides them with no literal meaning. On the other hand, incomprehensible cues can lack a clear association, like using the word "zal" with "fried chicken" (Basking & Liu 2021), which could be an ingredient in the food, a style of cooking, a brand name, a place, or many other associations. When such ambiguous cues lack clear associations, they will not convey meaning to the consumer. Thus, even within the category of incomprehensible language, research suggests a distinction between two broad types of incomprehensible linguistic cues – meaningful ones, for which people can make associations of category or congruity in the context, and meaningless ones, for which those associations are difficult, ambiguous, or incongruent.

Processing of Meaningful vs Meaningless Incomprehensible Cues

Incomprehensible words or non-words that have meaningful associations are processed similarly to known words. People have similar reaction times in semantic judgment tasks to such non-words as to real words conveying literal meaning (Bentin 1987; Bentin et al. 1999; Nobre & McCarthy 1994). On the other hand, meaningless incomprehensible words – which have a phonetic/orthographic structure much different than what you expect in a native language (e.g., KSTYNP), and hence are less likely to be associated with a category – were recognized much more quickly as not being real words, compared to meaningful incomprehensible words with associations (Holcomb & Neville 1990). This suggests that because meaningful incomprehensible words trigger associations with similar-seeming actual words, it takes longer for people to recognize them as not being real words. The ease with which associations are formed for non-words impacts marketers' use of language, such as coming up with new brand names. The sound-based (or orthographic) but non-semantic associations with novel brand names can impact whether people perceive it to be a congruent name for the products' properties (Klink 2000, 2003).

This distinction extends to formation of new associations as well. For example, a meaningfully incomprehensible made-up word presented with a picture of, for example, a Dalmatian dog, tended to subsequently be matched with specifically other Dalmatian dogs rather than with other dogs or other animals (Xu & Tenenbaum, 2007). Children are able to form category associations when presented with made-up words that look similar to real words in that category

(Colunga & Smith, 2005). By contrast, made-up words that lack a pre-existing association and are not presented with context that would provide a learnable association are considered non-typical to the category being described, resulting in negative inferences (Baskin & Liu 2021).

Foreign Language as a Meaningful Incomprehensible Cue

Individual consumers often encounter a specific type of incomprehensible but meaningful linguistic cue – actual language, with a literal meaning, that is understood by some *other* consumers, just not by them. We focus on one specific but common case: foreign language. For example, consider a Turkish restaurant in the U.S. that includes both Turkish and English language on their menu, perhaps to also cater to primarily Turkish-reading customers. Non-Turkish-speakers will know that it's a Turkish restaurant with or without the Turkish language on the menu, and the Turkish text will be incomprehensible to them. However, even though those consumers cannot access the literal meaning in Turkish, they may have general associations with Turkish text (*e.g.,* to Turkey as a country, or more specifically to Turkish cuisine, or even specific prior experiences with Turkish culture or cuisine).

This association-based means by which even unintentionally incomprehensible language may impact consumers has been understudied. Specifically, in the context of foreign language, more research on consumer attitudes and choice has focused on contexts in which the foreign language is likely to be a comprehensible cue. Such research has found that foreign language in a product name is salient and stands out to bilinguals, because it looks different than their first language (Harris et al. 1986; Domzal et al. 1995) and thus is processed differently. The salience of foreign language makes it uniquely "marked" (e.g., Markedness Theory, Myers-Scotton 1998, 2000), and people who understand and have positive associations with the foreign language will then prefer ads that include the language (Luna & Peracchio 2005, Krishna & Ahluwalia 2008).

Some papers have argued that the presence of a foreign language primarily impacts consumers familiar with that language by attracting attention (Piller 2001, Domzal et al. 1995, Thoma 2013). This could pique consumer curiosity because of the novelty or incongruity of the foreign language with the rest of the text (Litman 2005, Loewenstein 1994), and this is sometimes a deliberate marketing strategy (e.g., using English words in advertising in Ecuador to attract people's curiosity, Alm 2003).

However, comprehensibility is important to the conclusions in this literature. Research has shown that using comprehensible foreign language in a slogan increases preference (relative to native language) when it is easy to interpret, but this effect is attenuated when the slogan is difficult to interpret (Hornikx et al. 2010). However, in this research, English was used as the foreign language and surveys were conducted on European participants. Given that English is currently a 'global' language, it is not only likely to be generally comprehended, but may also carry unique associations relative to other foreign languages (cf. Alden et al. 1999).

Thus, despite important work in understanding the impact of foreign language on choice, this research has not investigated the influence of foreign language specifically as a literally incomprehensible cue (e.g., among consumers who do not understand the literal meaning). Even when consumers cannot decode the literal meaning, they may still form associations from the mere presence of the foreign language, drawing on their beliefs, attitudes or past experiences (Piller 2003).

<u>Incorporating Incomprehensible Foreign Language Cues into Decision-Making</u>

Linguists have suggested that people engage in a "psycholinguistic guessing game" (Goodman 1967), 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.

That is, processing of some, not all, cues can be seen as good enough to deduce the message behind it (Ferreira & Patson 2007), and when relevant cues seem insufficient, people will attempt to derive meaning from cues they might otherwise ignore. This is consistent with the notion of competition among cues (Banerjee & Urminsky 2022; Kamin 1969; Rescorla and Wagner 1972; Dickinson et al. 1984) such that reliance on a particular cue may depend on the perceived relevance of other cues for decision-making.

However, this understanding of how people process cues leaves unresolved the question at issue here. Some linguists argue that when people only choose a few cues for their decision-making, they will tend to use the ones that are the most relevant (Sperber & Wilson 2002) and hence would be likely to ignore anything that is incomprehensible – like foreign language. In this view, the presence or absence of foreign language would not make a difference unless consumers are deciding in a context that lacks other relevant information. On the other hand, the presence of an incomprehensible cue can be seen as distracting and hard to process (Dufour & Kroll 1995, Kroll & DeGroot 1997), and such cues can negatively impact consumer judgments (Baskin & Liu 2021). We propose a third possibility: foreign language can operate as a meaningful incomprehensible cue, positively impacting consumer choice, because context-specific associations with the language will bolster perceptions of relevant attributes.

Language-Based Associations for Experiential Goods

Consumers' interactions with experiential goods often go beyond the tangible aspects of consumption, involving intangible benefits such as enhanced social relations, reinforcing one's self-identity or reduced comparison to others – all of which can reduce psychological costs and enhance consumer well-being (Gilovich et al. 2015). The greater perceived self-relevance of experiential goods promotes greater satisfaction that is more lasting than from material purchases (Carter & Gilovich 2010; Carter & Gilovich 2012).

The associations that people have with foreign language are often self-relevant and relevant to experiences. Kelly-Holmes (2005) argues that when (comprehensible) foreign language is used in advertising, it denotes an identity to the products, beyond its literal meaning. The salience of such associations follows from the markedness of foreign language in a predominantly English-language context (Krishna & Ahluwalia 2008; Luna & Perachio 2005). Foreign language used in advertising can prompt cultural associations, including ethnocultural stereotypes (Haarmann 1984a, 1984b).

Thus, in experiential consumption settings, people may derive value from intangible perceptions (e.g., prompted by associations with foreign language) which in turn affect their attitudes or choices (Wakefield & Blodgett 1999; Ellis & Rossman 2008). In particular, food is a pervasive type of experiential consumption, that can be not only be directly pleasurable (Cornil & Chandon 2016), but can also involve cognitive and emotional benefits, including communal and cultural meaning (Batat et al., 2019). Language can also be used to convey emotional benefits of food, increasing their appeal (Kronrod et al. 2020).

The Country of Origin Effect

Research on the "country of origin effect" has documented that which country a product is from can impact consumer perceptions and choices. Although research in this area has primarily manipulated literal information about the country of origin (e.g., with "Made in" labels; Kong & Rao 2021), foreign language has also been used (Leclerc et al 1994) to convey the country of origin. When consumers are informed about the country of origin for a product (including by use of foreign language), they rely on their prior beliefs about whether the country has a competitive advantage in producing that product. For example, using Spanish for olive oil led to higher perceived product quality, better product attitudes, and higher intention to purchase than using Spanish for washing machines (Hornikx et al. 2013), the implication being that Spain is considered to have a competitive advantage in making olive oil, but not for making washing machines.

In this literature, when foreign language was used, it conveyed the country of origin (e.g., changing the language of a slogan in an otherwise identical ad without other country of origin information). In such situations, any effect on perceptions or choices may be solely explained by the informational content, such that viewers who recognize the foreign language (even if they do not understand the meaning) infer a different country of origin. However, we argue that incomprehensible foreign language can also provide intangible benefits via associations, over and above any beliefs about the country of origin. In particular, as we discuss next, even when consumers know the country associated with a product (e.g., the country a restaurant's cuisine is from), the additional presence of foreign language may increase perceptions of authenticity, uniqueness, and quality.

<u>The Role of Authenticity, Uniqueness and Quality in Intangible Experiences.</u>

Authenticity and uniqueness are core elements of consumers' appraisal of food, both directly and by contributing to perceived quality. Cues that signal fit to one's expectations of even a fictional experience can convey authenticity (Grayson and Martinec 2004), in an evaluation process that may involve suspension of disbelief (Stern 1994). This illusion of reality can help in creating a sincere story regarding a product, which in turn helps maintain the status of the product brand (Beverland 2005). Thus, authenticity is a generally sought-after intangible consumer benefit (Beverland & Farrelly 2010; Nunes et al. 2021; Han et al. 2021; Morhart et al. 2015; Moulard et al. 2021; Newman & Smith 2016; Reisinger & Steiner 2006) due to consumer's desire to escape from mainstream “inauthentic” consumption culture (Holt 2002; Arnould & Price 2000). Specifically, a key aspect of tourism to foreign countries is people seeking out authentic experiences (Reisinger & Steiner 2006).

Authenticity, as a feature of objects that either are originals themselves or resemble originals (Grayson and Martinec 2004), is closely related to another potential consumer benefit, uniqueness. Fromkin & Snyder (1980) argue that even though people respond to peer pressure by conforming in some ways, they also have a need for uniqueness. In the consumption context, people often acquire material goods that are dissimilar to others’ consumption, in order to distinguish themselves from others in desirable ways (Tian et al. 2001). Even when unique consumption could be seen negatively by others, such consumption will still occur because some consumers place low value on criticism by others (Simonson & Nowlis 2000; Knight & Kim 2007).

In the domain of foreign food, perceptions of a menu as more authentic, increases customer satisfaction, driven in part by consumers’ need for uniqueness (Liu & Matilla 2015; Kim et al. 2016). Beyond the direct appreciation of authenticity and uniqueness in ethnic food (Jang et al. 2012), both perceived authenticity and uniqueness have been shown to increase quality perceptions. Authenticity, in particular, is generally considered an indicator of high-quality (Levyda et al 2019; Smithers et al 2008), such that authentic food is strongly associated with high-quality ingredients (Giorda 2018). Consumer’s quality perceptions of unique goods can also be increased by their need for uniqueness (Zimmer et al. 1999), although items that are considered more unique can also be judged as lower quality, when the reason for uniqueness is not meaningful (Baskin & Liu 2021). Finally, higher perceived quality has been widely documented to relate to higher willingness to pay and likelihood of choice (Gneezy et al 2014; Parasuraman & Grewal 2000; Falahat et al. 2018).

Authenticity has been studied broadly in the prior literature. Different components contributing to consumption or brand authenticity – like the perceived integrity of a brand (Nunes et al. 2021; Morhart et al 2015) or the originality of the formulation or production of a consumer good (Han et al 2021; Nunes et al 2021; Newman & Dhar 2014) – have been identified. In the context of food and dining, local people's endorsements, having a long history of traditional restaurants (Kim et al 2019), atmospherics of the restaurant, like furnishing, music, table setting, paintings, presentation of the food (Jang et al. 2011), and reviews that signal existing knowledge, beliefs of and introspection by the consumer (Le et al 2022) are all cues of authenticity identified in the literature. However, this research has only tested cues of authenticity expressed in comprehensible language (sometimes with visual cues) and has not investigated foreign language as a potential cue of authenticity.

We propose that foreign language is not only a cue of authenticity overlooked by the prior literature, but it potentially has unique effects. Specifically, meaningfully incomprehensible foreign language can convey associations that may be particularly effective at effectively conveying authenticity. Accordingly, we will investigate whether foreign language has distinct effects on consumer decisions, even when other potential cues of authenticity are present.

<u>Boundary Conditions</u>

We propose that inclusion of incomprehensible foreign language can make an option more appealing because of the consumer's positive associations with the language (e.g., authenticity), despite not understanding the literal meaning of the language. Therefore, according to our account, consumers who instead have negative associations with the language should not be positively affected by foreign language. In the context of ethnic food, the foreignness of the unknown foreign language can be undesirable for people either because they negative perceptions of the country in general, of the cuisine in particular, or because they dislike trying new and potentially unfamiliar foods in general (e.g. food neophobia, as opposed to food neophilia, Verbeke & Lopez 2005). Whether such negative attitudes will constitute a meaningful boundary condition in a given consumer context, however, will depend on whether such attitudes are sufficiently prevalent among consumers.

Overview of the Hypotheses and Studies

In this paper, we focus specifically on the use of foreign language (incomprehensible to many consumers) on foreign food restaurant menus as our empirical context. In particular, we focus on the use of foreign language as a congruent cue (since a country is likely to be seen as the most qualified in the context of their own cuisine) that can operate over and above merely conveying a country of origin, as explored in prior research (Leclerc et al 1994; Hornikx et al. 2013). Our general theoretical research question can therefore be expressed as a very practical marketing question: would a restaurant that features the cuisine of a country benefit by adding foreign language to their menu, holding all other information constant?

In typical information processing accounts, the likelihood that language has an effect on a consumer decision depends directly on the likelihood that the language is comprehended (Lim et al 2009, Stewart 1986, Wyer 2002). In this view, when a consumer cannot access the literal meaning of text in a foreign language, the probability of comprehension is low, and the language will not add objective information beyond what is provided by an accompanying English language description. In that case, there should be no difference in the willingness to pay or choice among English-only speakers, between a mixed language menu (that is, Foreign+ English) and an English only menu with the same English text. In fact, to the degree that the incomprehensibility of the foreign language induces feelings of uncertainty or disfluency (due to failed attempts to decode the added objective information being provided by the foreign language), the foreign language would be expected to have negative effects on perceptions and valuation of the menu (Oppenheimer and Alter 2008, Novemsky et al 2007) but could also spark interest (Labroo and Pocheptsova 2016). Thus, consumers might even be predicted to value and choose a mixed language menu *less* than an English only menu (despite potentially being more curious about the mixed language menu).

In contrast with the implications of these established theories, we propose (and subsequently test) three key hypotheses. These hypotheses are instead based on a novel theoretical perspective that takes into account the ability of meaningful incomprehensible cues, particularly incomprehensible foreign language, to prompt potentially beneficial associations in consumers' minds. First, we posit that the use of congruent foreign language will often be beneficial:

H1: For a given foreign food cuisine, consumers will, on average, have a higher willingness to pay and greater likelihood to visit or choose a restaurant featuring that foreign language on their menu, relative to a restaurant with an equivalent English-only menu.

Second, we propose that the benefit of foreign language on a menu can be attributed to specific intangible psychological benefits:

H2a: Restaurants with foreign language on the menu will be seen as more authentic.

H2b: Restaurants with foreign language on the menu will be seen as more unique.

H2c: To the degree foreign language increases perceptions of authenticity and uniqueness, the restaurant will be seen as higher quality.

H2d: The positive effect of foreign language on perceived quality will contribute to higher willingness-to-pay and choice likelihood.

Finally, we propose an important theory-derived necessary condition, at the individual consumer level, for beneficial effects of foreign language:

H3: No beneficial effect of foreign language will occur if the person does not have positive associations to the cue, e.g., due to sufficiently negative perceptions of either foreign food in general, the relevant country, or the specific foreign cuisine.

Next, we test for the correlational relationships predicted by these hypotheses in three large-scale secondary datasets with actual restaurants (Studies 1a – 1c). Then, we test our hypotheses in a series of experimental studies, first by eliciting participants' willingness to pay (Studies 2a-b), and then by testing choices between restaurants (Study 3a-c). We also compare foreign language to another salient foreign cue, nationality and training of the chef in Study 3c. Finally, we test the effect of foreign language in an experimental study with consequential choices between gift certificates to real restaurants (Study 4).

Study 1a: Historic Food Dishes

Using a historical database, we test whether the amount of non-English language in the names of dishes on restaurant menus significantly predicts the price of the dish, averaged over restaurants and over time.

<u>Method</u>

Data was retrieved from the New York Public Library' digitized database ("What's On The Menu" 2019) of historical restaurant menus, from the 1840s to the present. The full dataset of dish names has 422,038 observations and includes the lowest and highest prices for the dish, over the time period and across menus with that dish. Prior to analysis, we dropped observations that were missing both the lowest and highest prices, or that had both the prices set to zero, yielding a final sample size of 176,283. We coded item price as the average of the lowest and highest price for that item.

To determine the degree of non-English language in the dish names, we used the Python package *enchant*, to check whether the words in the name appear in English-language dictionaries or not. For a given dish name, *enchant* returned the number of words in a dish name that was in English, from which we coded the non-English language percentage for each given dish name.
In our approach, originally foreign words that have been incorporated into English are coded as English. For example, the dish name *"Consomme printaniere royal"* was scored as only 33% non-English because "*Consomme*" is now part of the English language dictionary. This approach is consistent with our theorizing because we are interested in people's reactions to foreign language that does not convey literal information to English speakers. A word that has been borrowed from a foreign language but incorporated into English would presumably be comprehensible to many English speakers.

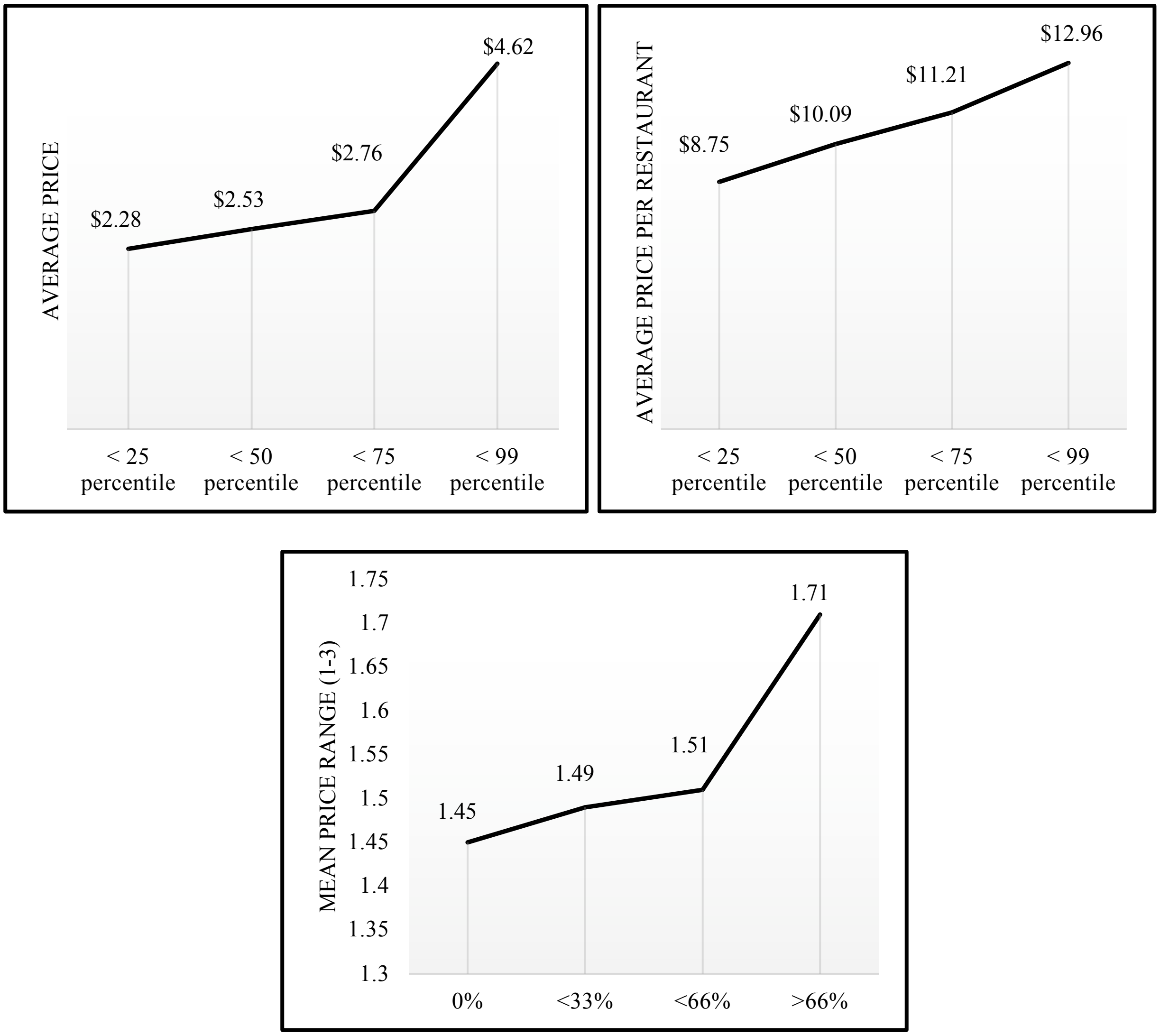

Fig 8: The relationship between percentage of Foreign language in menu items and price in Studies 1a, 1b and 1c.

Results and Discussion

A regression analysis predicting price based on non-English language percentage revealed a significant effect (ß = 2.51, t(168975)=26.37, p<.001), controlling for the number of menus the dish appeared in over time, and the timing (year when the dish first appeared and when the dish last appeared; for valid year entries only, see Web Appendix for more information).

That is, across time and different menus, the more non-English language in the name of the dish, the higher the average price of the dish, as predicted by H1 (Figure 8). This relationship was robust to other specifications, including predicting either lowest price (ß=2.20, $t(168975)=33.21$, $p<.001$) or highest price (ß=2.83, $t(168975)=18.78$, $p<.001$) recorded for the item. The effect of non-English percentage on price was stronger for more recent menu items (ß=.11, $t(168975)=32.26$, $p<.001$).

This analysis provides initial correlational evidence consistent with our hypothesis that including foreign language in ethnic food names increases the perceived value of the items, compared to using the native language (i.e., English). However, the dataset has limitations – the geographic scope is unknown, it does not include information on the cuisine of each dish, and the information is recorded at the menu item level (averaging across restaurants) rather than at the restaurant level. In particular, due to the lack of information about cuisine, we cannot determine whether (a) the foreign language driving the relationship is actually from foreign cuisines, and (b) whether some words coded as non-English might be portmanteaus or invented words (e.g., *Froyo* is a combination of the words Frozen Yogurt) instead of foreign language. In our next analysis, we use another dataset from multiple major U.S. cities that identifies the cuisine.

Study 1b: The Jurafsky *Allmenus.com* Dataset

We test the correlation between non-English percentage of words in dish names and the price-level of the restaurant offering the dish, overall and specifically for foreign (vs. domestic U.S.) cuisines.

Method

This dataset (Jurafsky 2016) consists of menus downloaded from the website *allmenus.com* in 2011 for restaurants in seven cities: Boston, Chicago, Los Angeles, New York, Philadelphia, San Francisco, and Washington D.C. All observations were confirmed to be restaurants or bars on Yelp (*i.e.*, all delis, grocery stores, and caterers were removed). The dataset is described in detail in Jurafsky et al. (2016) and is an extension of the corpus of Chahuneau et al. (2012).

For each restaurant, the dataset contains the names of the dishes on the menu when downloaded, price-level for the restaurant as a whole (i.e., $, $$, $$$), the price of each of the dishes, and the city. The percentage of non-English language per dish name was calculated exactly as in Study 1a. The dataset included 705 restaurants (59% foreign cuisine) and 65,532 menu items. Across the menu items, item names were coded as 15% non-English, on average.

Results and Discussion

At the restaurant level, the average non-English language percentage across dish names was a significant negative predictor of the price-level of the restaurant ($ß = 2.35$, $t(695)=7.79$, $p<.001$), controlling for city-level fixed effects. This result indicates that the more a restaurant used non-English language in the menu item names, the higher the restaurant's predicted price, as predicted by H1 (Figure 1). We also replicate the effect observed in Study 1a at the level of individual dishes, such that dishes with more non-English in the name had higher prices, clustering by restaurant and controlling for city-level fixed effects ($ß = 1.56$, $t(702)=3.89$, $p<.001$).

Next, we test whether the coefficient of non-English language, at the restaurant level, varies by cuisine. We find a significant interaction between foreign vs. domestic cuisine and non-English language ($ß=1.43$, $t(693)=2.68$, $p=.035$). Specifically, the proportion of non-English language more strongly predicts higher prices for foreign-cuisine restaurants ($ß=2.93$, $t(376)=7.90$, $p<.001$) than for American-cuisine restaurants (ß=1.47, t(311)=2.50, p=.013). These results suggest that, as theorized, the potentially incomprehensible foreign-language cue is most associated with higher prices when it is most congruent with the context (i.e., describing a foreign cuisine). Furthermore, this moderation suggests that the observed overall relationship is unlikely to be explained by menu names coded as containing "non-English" language for reasons other than foreign words (e.g., due to abbreviations like "BLT" or invented words on English-language menus).

The observed relationships between non-English language and prices are consistent with our hypothesis that restaurants using foreign language, specifically in foreign cuisines, are valued more than those using English language, even though foreign language is likely to be an incomprehensible cue for most customers. However, there are some important limitations to these analyses. First, our coding of foreign language thus far is indirect, relying on a failure of the algorithm to identify words as English. Second, since prices are set by the restaurants and reflect a range of (potentially omitted) factors, price is only an indirect proxy for consumer valuation. We collected a novel observational dataset to help address these limitations.

Study 1c: Hand-coded Online Reservation Platform Data

We coded menus from a leading online reservation platform to test for the relationship between non-English language and not only prices, but also consumer evaluations.

Method

Three research assistants, unaware of the hypotheses of the study, coded all the Asian restaurants (N=353) in the platform's seven primary US geographical regions, across 20 U.S. states. For each restaurant, the research assistants collected restaurant name, city, zip code, average customer star rating, price-level of the restaurant (on a three-point scale), top three phrases associated with the restaurant in reviews, and the description provided by the restaurant directly from the webpage for each restaurant.

To determine the degree of foreign language in the menu of each restaurant, instead of relying on an algorithm's coding, we had research assistants code each menu on a 4-point scale (1=No foreign language, 2 =Under a third of the menu has foreign language, 3 =1/3 to 2/3 of the menu has foreign language, 4=More than 2/3rds of the menu has foreign language). They also coded the approximate number of food items per menu (1=Less than 30 items in menu, 2 =Around 30 items in menu, 3=More than 30 items in menu). All the research assistants first coded the same set of "training" menus to ensure consistency.

Finally, to enable us to test for moderation by attitudes towards foreign cultures (H3), we merged in state-level attitude measures from the 2020 American National Election Study. We calculated an average negative attitude score towards Asians and Asian-Americans for each of the 20 relevant states. The questions included in each of these scores were feelings of warmth, perceptions of hard work, perceptions of violence, whether Asian-Americans should be represented in office more, and whether there should be changes to laws against anti-Asian discrimination (refer to ANES 2020 Questionnaire for details). We also created an alternative version of these two scores by removing specifically political questions (i.e., representation in office, change to discrimination laws; see Web Appendix for all results).

<u>Results and Discussion</u>

In a linear regression, more foreign language on the menu significantly predicted a higher price-level of the restaurant (β=.09, $t(332)=2.33$, $p=.02$), controlling for state-level fixed effects. As a direct test of the relationship between use of foreign language and consumer perceptions of the restaurant, we ran a linear regression predicting the average consumer star rating of the restaurant. We found that more foreign language significantly predicted higher customer ratings (ß=.03, t(316)=2.20, p=.029), controlling for state-level fixed effects.

As an additional test of predictions from the proposed mechanism (H2a), we coded for the presence of the word “Authentic” in the top three phrases that diners associated with the restaurant. Consistent with our prediction that ethnic restaurants with more foreign language seem more authentic, more foreign language in the menu significantly predicted a higher likelihood of an “Authentic” tag (ß=.04, t(332)=2.13, p=.034), controlling for state-level fixed effects.

In addition, we tested the prediction from our framework (H3) that the relationship between foreign language and consumer valuation of foreign-cuisine restaurants will depend on consumer attitudes. More foreign language in a menu predicted a higher price range of the restaurant in the subset of states with low (below median) negative attitudes towards Asians and Asian-Americans (ß=.10, t(181)=2.05, p=.042). However, the same relationship was slightly weaker and not significant in the subset of states characterized by above-median negative attitudes towards Asians and Asian-Americans (ß=.08, t(150)=1.21, p=.227). All of the aforementioned regressions controlled for state-level fixed effects. However, while consistent with our framework, this evidence is not conclusive. Testing moderation with a state-level variable provides limited statistical power and the interaction between state-level attitudes and foreign language on restaurant price was not statistically significant (p = .787). Accordingly, we will conduct higher-powered tests of this moderation in our experiments.

The analyses in Studies 1a-c show that the relationship between foreign language use in menus and actual restaurant prices in the field follow the predictions of our framework. Furthermore, more use of foreign language also predicts higher consumer quality ratings and a greater likelihood of being designated by consumers as authentic. The results of these analyses confirm our predicted correlational relationships for real restaurant menus, prices and consumer evaluations. However, the analyses are conducted at the aggregate level (i.e., at the level of restaurants, rather than consumers) and rely on observational data, and therefore cannot establish causality. In the remainder of the paper, we experimentally test our proposed causal framework for the impact of foreign language on consumers' preferences.

Study 2a: Willingness to Pay

In this study, we compare participant's willingness to pay for food from two types of menus from the same foreign cuisine. The first is an English-language-only menu. The second is a mixed language menu, with exactly the same information in English, but which additionally includes foreign language text corresponding to the country of the cuisine. The purpose of this study was to test our prediction that people would be willing to pay more for food from the mixed language menu for a given foreign cuisine.

Method

Participants (N=501, after pre-registered exclusions)[5] recruited from Amazon Mechanical Turk (AMT) were asked to elicit willingness' to pay for items they saw on a menu from a hypothetical restaurant. In this 2x3 between subjects' design, the first factor was manipulated to be the language of the menu – English only or mixed; the second factor was the cuisine of the menu specified to the participants – French, Korean, or Turkish (see Appendix for sample menus). The

1. Studies 2 – 4 were all pre-registered on AsPredicted.com (anonymized links in OSF) and reported sample sizes are after pre-registered exclusions.

willingness to pay for each of the five menu items were averaged as the primary DV. Participants were asked to indicate their perceptions of the authenticity and quality of each item (on 7-point Likert scales; see Appendix for questions), which were also averaged across items. Full stimuli, cleaned data and analysis code for all experimental studies are provided on OSF (https://osf.io/w59ke/?view_only=fc778dbdb3944924a49126279f72c8dd).

To test for participants' cuisine preferences, they were asked about their liking, perceptions of taste and quality about the cuisine, as well as their liking of the country of the cuisine. These measures were followed by a food neophilia scale (adapted from Verbeke & Lopez, 2005), which measures whether people like to try new foods or not (see Appendix for question wording). We included this scale to identify consumers who dislike novel or unique foods in general (as indicated by low scores on the scale), beyond their preferences regarding the specific country or cuisine.

Results and Discussion

Consistent with H1, the average winsorized WTP was significantly higher for the items on the mixed language menus than the items on the English-only menus (Means = \$9.08 vs. \$7.37, $t(499)=3.99$, $p=.001$, $d=.35$) (Fig 9). When split by each of the three cuisines, the same result was significant for two of the cuisines (*French:* Means = \$9.96 vs. \$7.18, $t(165)=3.77$, $p= .002$, $d=.58$; *Korean:* Means = \$8.13 vs. \$6.15, $t(167)=2.72$, $p= .007$, $d=.42$) and directional for one (*Turkish:* Means = \$9.32 vs. \$8.78, $t(163)=.74$, $p= .463$, $d=.11$).

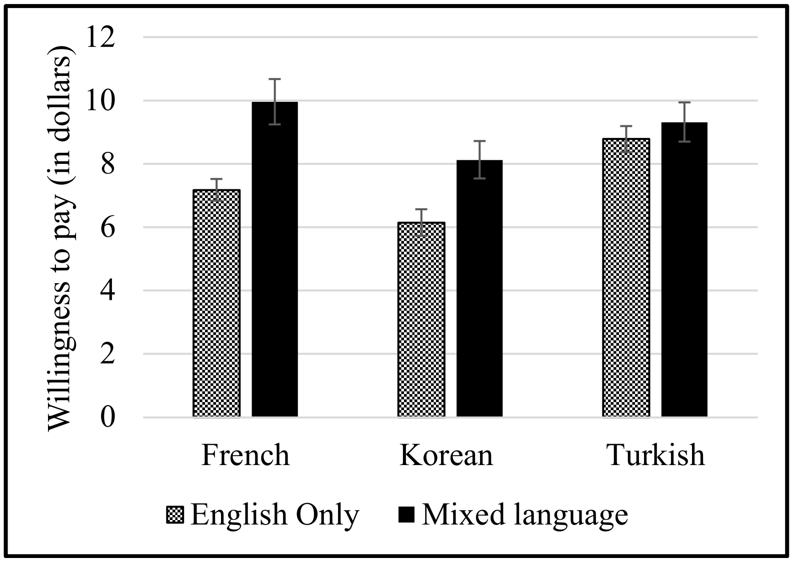

Fig 9: People were willing to pay more for items on the mixed language menus than the English-only menus, split by cuisine

Collapsing across cuisines, we tested whether mixed language menus increased willingness-to-pay via higher perceptions of authenticity and quality. First, we find that a mixed language menu is perceived to be both more authentic (ß=.72, $t(499)=6.40$, $p<.001$) but only directionally higher quality (ß=.11, $t(499)=1.24$, $p=.214$). However, greater authenticity significantly predicted higher quality perceptions (ß=.35, $t(499)=11.23$, $p<.001$), which in turn significantly predicted higher willingness-to-pay (ß=.61, $t(498)=2.91$, $p=.004$) controlling for language. In a serial mediation analysis, the indirect effect of mixed language on willingness-to-pay via authenticity and quality was significant (ß=.15, $p=.017$), accounting for the majority of the experimental effect (91%).

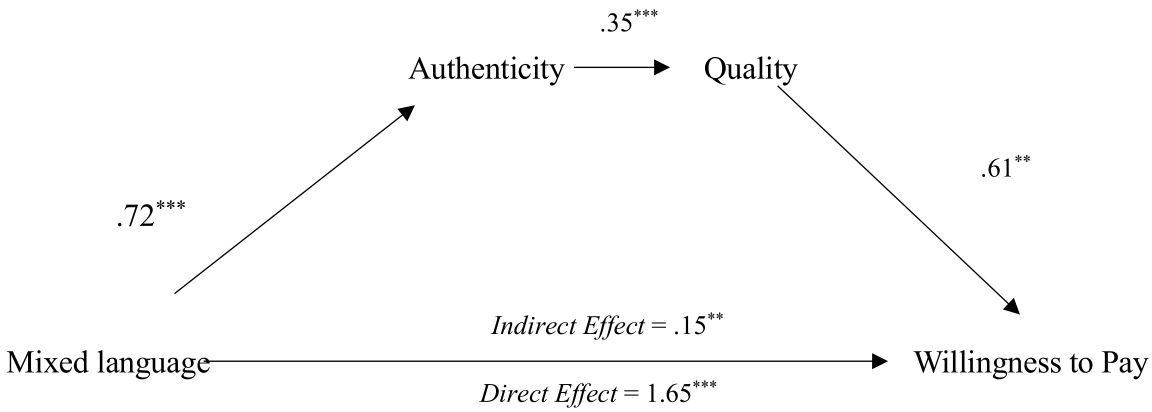

Fig 10: Mediation Model of the effect of Mixed language (vs. English only) menu on Willingness to pay, via perceptions of Authenticity and Quality

Next, we tested potential moderators. We combined the food neophilia items into a single score, and the liking, taste, and overall quality perceptions of the cuisine into another 'cuisine perception' single score (based on confirmatory factor analysis). The means for all the three moderators were significantly greater than the midpoint (all p's<.001), suggesting that our sample generally held favorable views regarding novel foods in general, as well as the relevant countries and cuisines. Per H3, we predict that the positive effect of foreign language should not hold when consumers hold sufficiently negative views.

While in the predicted direction, we did not find significant moderation of the effect by either food neophilia (ß=-.09, t(497)=-.27, p=.790) or cuisine perception (ß=.42, t(497)=1.16, p=.247). We did find that the effect of mixed language menus on higher WTP was significantly stronger among participants with higher liking of the country (ß=.68, t(497)=2.16, p=.032). These moderation analyses therefore provide only partial support for H3, likely due to the relatively high overall ratings on the potential moderators. We report the moderation analyses in all the studies, and reassess the degree of support for H3, using internal meta-analysis, in the General Discussion.

This study provides initial evidence that mixed language menus increase consumer preference for a restaurant. In particular, because the country of origin of each cuisine was specified to participants, the observed impact of unknown foreign language on willingness to pay cannot be explained by the country of origin effect.

One limitation of this study is that the participants lacked any other cues of authenticity that would typically be present when making consumer decisions. Specifically, the location of a restaurant will typically be salient as part of the decision and may be a useful cue. In particularly, consumers may assume that urban locations (that more typically have a diverse population) will have more authentic foreign-cuisine restaurants than rural locations (where there may be less diversity). To both test the robustness of the effect and to compare the specific effect of language to other potential cues of authenticity, in the next study, we included the location of the hypothetical restaurants.

Study 2b: Willingness to Pay, varying restaurant location

In this study, we manipulated restaurant location as a potentially salient indicator of authenticity, to test whether mixed language menus affected willingness-to-pay even when location was known. Specifically, we test whether the benefit of foreign-language is robust to adding another potential cue of authenticity to the context.

<u>Pilot Test</u>

In a separate study (N=402, AMT), we tested whether consumers viewed location as relevant to judging restaurant authenticity. Participants rated how authentic they perceived a Turkish restaurant (on a 7-point Likert scale) in an urban location (Chicago, IL) or in a rural location (Sheboygan, WI). The restaurant in an urban location was perceived as significantly more authentic than the rural restaurant (Mean= 4.77 vs 4.17, t(308)=3.99, p<.001, d=.45).

Method

Participants (N=364, pre-registered) were recruited on AMT for this study. We used a 2 (mixed language vs. English only) X 2 (urban vs. rural) X 3 (French vs Turkish vs Korean cuisine) between subjects design. Each participant saw the same single menu as in Study 2a, except that the location was indicated, and was asked to elicit their willingness to pay for each item on the menu, followed by questions on their perceptions of authenticity and quality for each item, the food neophilia scale and perceptions of the relevant foreign cuisine and country.

Results and Discussion

Overall, we replicated Study 2a across despite specifying location, observing higher willingness to pay for the items on the mixed language menu than for the same items on the English-only menu (Means= \$9.67 vs \$8.06, t(362)=3.93, p<.001, d=.41). Willingness to pay was also higher for urban than rural locations (Means=\$9.33 vs \$8.32, t(362)=-2.43, p=.015, d=.25).

Furthermore, we found that the benefit of the mixed language menu was observed for both locations. Collapsing across cuisines, WTP was higher for the mixed language menu than for the English-only menu, when the restaurants were described as either in an urban location (Means=\$10.13 vs \$8.61, t(192)=2.76, p=.006, d=.40) or in a rural location (Means= \$9.19 vs \$7.38, t(168)=2.99, p=.003, d=.46), with no significant interaction by location type (p=.717). Consistent with H1, this suggests that the effect of mixed language menu is not solely due to the lack of other relevant cues.

Replicating the process findings in Study 2a, items in the mixed language menu were perceived as more authentic (ß=.75, t(362)=5.89, p<.001). Unlike in Study 2a, we find that in this study mixed language menu is also perceived as having significantly higher quality (ß=.25, t(362)=2.32, p<.021). Authenticity in turn predicted higher quality perceptions (ß=.37, t(362)=9.82, p<.001), which predicted higher WTP (ß=.76, t(361)=3.91, p<.001), controlling for language. The overall mediation model was significant (indirect effect: ß=.21 p=.003), consistent with mixed language menus increasing Willingness to Pay via greater perceived authenticity and quality, per H2.

As in Study 2a, the means for all the three potential moderators were significantly above the midpoint (all p's<.001). We again found no moderation of the effect by either food neophilia (ß=-.002, t(360)=-.01, p=.993) or cuisine perception (ß=-.03, t(360)=-.09, p=.925). However, liking of the country of the cuisine significantly moderated the effect (ß=.55, t(360)=2.01, p=.045). This suggests that there is more of a benefit of mixed language menus among people with positive views of the cuisine's country of origin, consistent with H3.

We ran another study (N=432) where the English only menus had a different title for each food item than only the description of the food (the latter was true for this and the remaining studies), for Turkish cuisine, to see if the presence of a title changes the lower willingness to pay for English only menus. Even there, we see that English only menus had lower average willingness to pay than Turkish+English menus ($8.86 vs $10.70, t(219)=2.85, p=.005). English titles were also compared against incongruent foreign language titles (Korean for Turkish cuisine) and Gibberish titles. The average willingness to pay for the items in the English only menu was not significantly different from that of the incongruent foreign language menu ($8.86 vs $11.39, t(206)=-1.37, p=.173). However, it was significantly different from that with gibberish titles ($8.86 vs $10.83, t(216)=-2.59, p=.010), suggesting that another mechanism other than authenticity could be at play here. That is why, from Study 2c onwards, we introduce another mediator in the studies

– uniqueness. Evident from the first test, this study shows that even when there are titles associated with the food items in the English only menu, people are still willing to pay less for it than for congruent mixed language menu. Since willingness-to-pay can be a noisier measure, we re-do this study with choice as DV (reported after Study 3b).

This study replicated the findings of Study 2a, even when another cue of authenticity (restaurant location) was available. That is, we show that foreign language is a robust cue of authenticity and significantly impacts willingness to pay even when another cue of authenticity is present. In the next study, we compare mixed language menus to (and test the robustness of the effect to) another cue of authenticity – the nationality and training of the chef. In addition, we test whether the benefits of mixed language menus extend from willingness-to-pay to intention to visit the restaurant.

Study 2c: Chef biographies and restaurant choice

Prior work has shown that when people are faced with multiple cues in a decision process, they selectively use the cue that seems more directly relevant, regardless of actual informational content (Banerjee & Urminsky 2022). In this study we introduced a different cue of authenticity – the country of origin of the chef – to test which cue (unknown foreign language or foreign chef) is more effective.

<u>Method</u>

Participants were recruited (N=475, pre-registered) from AMT. We restricted the cuisine type to only Turkish, using a 2 (mixed language vs English-only) X 3 (Chef origin: unspecified vs. U.S. vs. Turkish) between-subjects design. The menus were the same as in the prior two studies, except that we added a brief biography of the chef, which either stated that chef was born in and studied in the U.S., was born in and studied in Turkey, or did not specify (see Appendix for stimuli).

Participants were asked about their willingness to pay for each item on the menu, as in the prior studies, and also rated their willingness to go to the hypothetical restaurant. As in the prior studies, we measured perceptions of authenticity and quality, food neophilia, cuisine perceptions and liking of the country of Turkey. In particular, in addition to asking participants to evaluate the authenticity of each restaurant, we also asked them how unique each restaurant was. As discussed in the introduction, uniqueness is also considered to be an intangible experience that can be important to consumer, particularly for experiential goods (Amaldoss & Jain 2005; Zimmer et al. 1999). At the end of the study, as a manipulation check, participants were asked to pick the nationality of the chef in the condition they were assigned to (for Ambiguous chef, the correct answer was 'Don't know/Wasn't mentioned').

Results and Discussion

We replicated higher WTP for the mixed language menu in the control version, where the country of origin and training of the chef was unspecified (Means = \$10.57 vs. \$8.99, $t(131)=2.38$, $p=.019$, $d=.41$) and in the U.S. chef version (Means = \$10.79 vs. \$8.62, $t(159)=3.43$, $p<.001$, $d=.54$). However, we observed a weaker and non-significant benefit of mixed language menus when the chef was born and raised in Turkey (Means =\$10.37 vs. \$9.59, $t(179)=1.30$, $p=.196$, $d=.19$; Fig 11), although the effect for the Turkish chef was not significantly different from the other conditions (interaction $p=.141$). Moreover, WTP for non-Turkish chefs with a mixed menu was at least marginally higher than WTP for the Turkish chef with an English only menu (*Unspecified Chef*: \$10.57 vs \$9.59, $t(159)=1.68$, $p=.094$; *US Chef:* \$10.79 vs \$9.59, $t(178)=2.13$, p=.035). These results suggest that if the restaurant were to use one cue, foreign language is better than foreign chef.

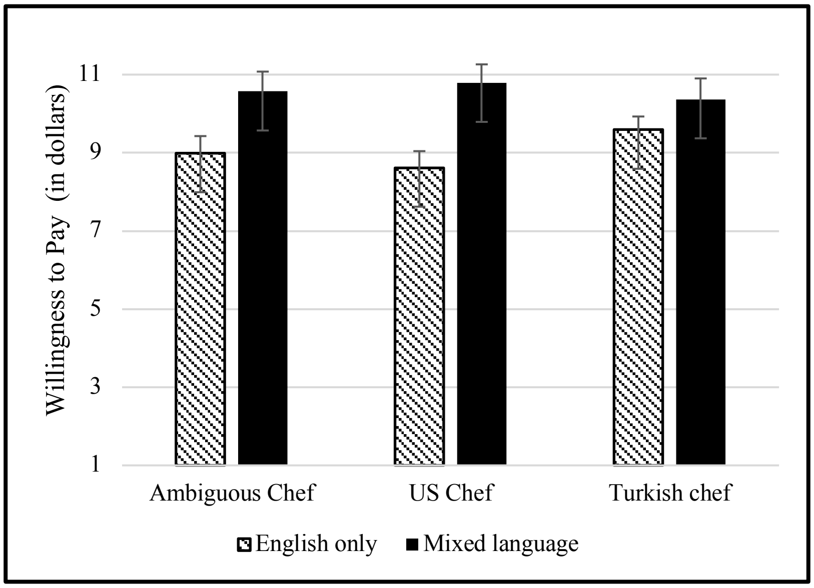

Fig 11: Willingness to pay was higher for mixed language menu than for English only menu for all chefs, but non-significantly for the Turkish one

Averaging across chef biography conditions, perceptions of authenticity, uniqueness, and quality mediated the effect of the menu language on WTP, with all paths significant (all p's<.001) and a significant indirect effect (ß=.37, p<.001), as depicted in Fig. 12.

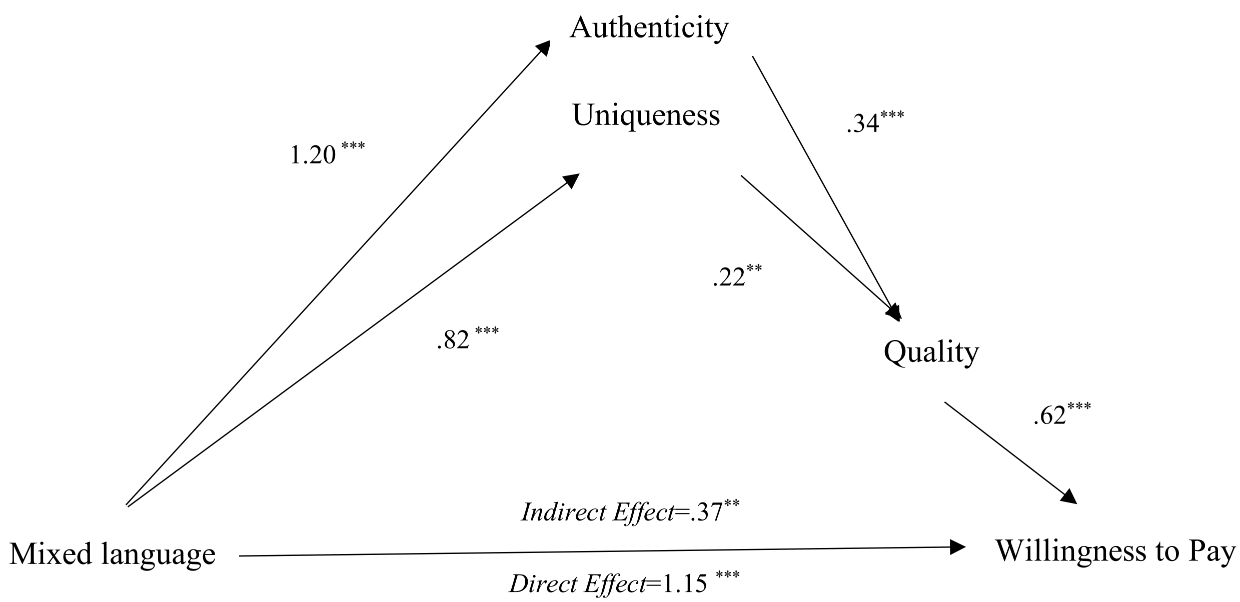

Fig 12: The effect of English only menu on willingness to pay, via perceptions of relative authenticity, uniqueness, and quality

Next, we looked at intentions to visit the restaurant. For both the control (unspecified chef) and U.S. chef biography versions, participants indicated that they would be more willing to go to the restaurant when it had a mixed language menu than when it had an English-only menu (*Unspecified Chef*: 90% vs 68%, z=2.79, p=.005, d=.55; *US Chef:* 92% vs 63%, z=4.18, p<.001, d=.73). However, when the Turkish chef biography was presented, the higher intention to visit a restaurant with a mixed language menu was not significant (77% vs 67%, z=1.39, p=.164, d=.22; Fig. 13), and this effect was marginally significantly different from the other conditions (interaction p=.075)

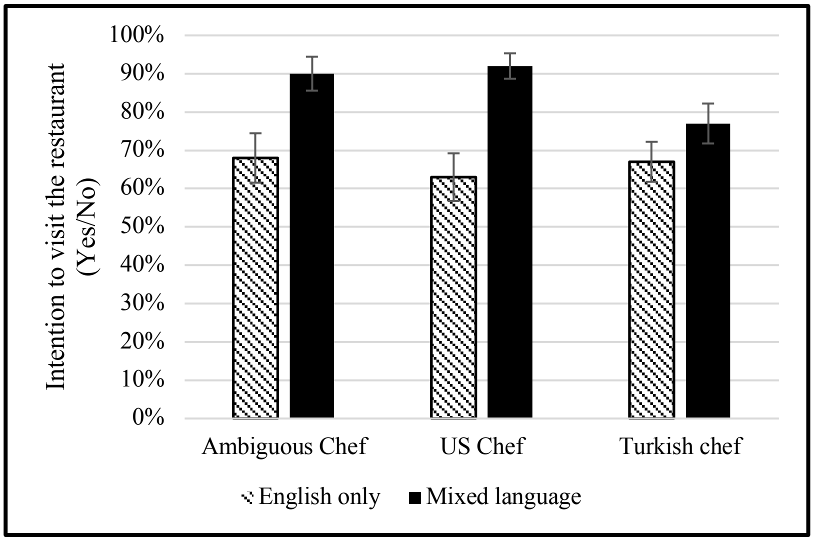

Fig 13: Intention to visit was higher for mixed language menu than for English only menu for all chefs, except Turkish chef

We also find that the mixed language menu has a more positive effect than the Turkish chef, as the sole cue of foreignness. Participants had higher visit intentions for the mixed language menu restaurants (with an unspecified or U.S. chef) than for an English-only menu restaurant with a Turkish chef (*Unspecified Chef*: 90% vs 67%, z=-3.38, p=.007; *US Chef*: 92% vs 67%, z=-4.16, p<.001). This suggests that not only are mixed language menus generally beneficial, the mixed language menu cue may be more effective at driving visit intention than other, potentially more direct, cues of authenticity.

Collapsing across all three types of chefs, the effect of the language of the menu on intention to visit was mediated by authenticity, uniqueness, quality (all p's<.001). The indirect effect was also significant (ß=.10, p<.001), as depicted in Fig. 14.

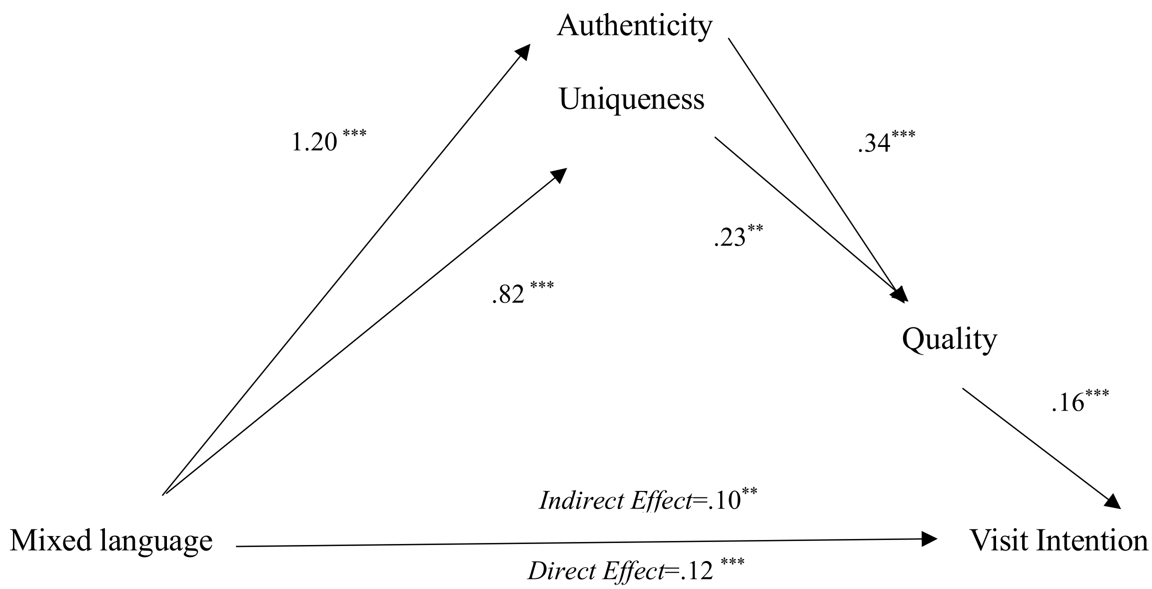

Fig 14: The effect of English only menu on visit intention, via perceptions of relative authenticity, uniqueness, and quality

The means for all three moderators were significantly greater than the midpoint (all p's<.001). For neither of the chefs was there a significant moderation of willingness to pay by liking of Turkey (all p's>.1). However, for food neophilia there was a marginal significant moderation for the ambiguous chef (ß=.93, t(129)=1.77, p=.080) and significant for the Turkish chef (ß=1, t(177)=2.17, p=.031), but not for the US chef (ß=.9, t(157)=1.58, p=.116). For cuisine perception, there was a significant moderation for the ambiguous chef (ß=1.38, t(129)=1.99, p=.048), but not for the other two chefs (both p's>.2). In case of intention to visit, there was also no significant moderation by any moderator for either chef (all p's>.1).

These results suggest that foreign language is a more effective cue then listing a foreign chef. Consistent with the idea of cue-competition, we see that adding a foreign language to the menu of a non-Turkish chef results in higher willingness to pay and intention to visit than having an English only menu with a Turkish chef. We also see that intention to visit the restaurant with a mixed language menu and with a Turkish chef is lower than the equivalent restaurants with the non-Turkish chefs, suggesting that two cues of foreignness might even be undesirable. Thus, in studies 2b and 2c, we show that even when other salient cues of authenticity are present, the effect of foreign language is robust, demonstrating that foreign language is an especially beneficial cue of authenticity.

In Studies 2a – 2c, we tested the effect of varying menu language between-subjects. However, in many cases, consumers choose between two or more restaurants. Therefore, it is important to also test whether mixed language menus as preferred to English-only menus when evaluating both side by side (e.g., in joint evaluation, Hsee 1996).

Study 3a: Choice between restaurants

In this study, we test whether people choose a mixed language-menu restaurant over an English-only menu restaurant of the same foreign cuisine.

<u>Method</u>

We recruited visitors to and residents of a large Midwestern city (N=302, pre-registered) from various locations (e.g., hotel lobbies) in person to take a brief paper and pencil survey. Participants were shown two Turkish cuisine menus differing in color and design (counterbalanced), –a mixed language menu or an equivalent English only menu. Participants could choose one of the two restaurants or indicate indifference. Adding indifference as an option ensures that foreign language is not used only as a trivial tie-breaker. The survey also included briefer versions of the two of the potential moderators, food neophilia and cuisine perception questions (see Appendix), but to keep the survey feasibly short, potential mediators (authenticity, uniqueness, and quality) were not measured.

Results and Discussion

Few participants (22%) were indifferent between the two restaurants. Among the remaining 235 participants, 57% chose the mixed language restaurant. In particular, the first restaurant was more likely to be chosen when it was a mixed language-menu option than when it was the English-only-menu option (Choices = 76% vs. 61%, $z=2.47$, $p=.014$, $d=.33$). A logistic regression model also shows that the effect is robust after controlling for the counterbalancing of color and design of the menus (ß=1.51, $z=2.36$, $p=.018$). Notably, the benefit of mixed language menus was observed in choices between restaurants, even when participants were given the explicit option of remaining indifferent, suggesting that mixed language menus affect preferences and are not just used as a "tie-breaker".

Means for all three potential moderators were significantly greater than the midpoint (all p's$<.001$). Using a linear probability model to predict choice of the first option, and perhaps because the within-subjects comparison provides higher statistical power, we found significant moderation by food neophilia (ß=3.91, $z=2.92$, $p=.004$), and marginally significant moderation by cuisine perception (ß=1.72, $z=1.65$, $p=.099$), such that the positive effect of mixed language menu on choice probability was greater among those who liked trying new foods or had positive perceptions of Turkish cuisine.

Study 3b: Choice between restaurant menus

In this study, we replicated Study 3a across multiple cuisines and included process measures.

Method

We recruited participants (N=685, pre-registered) from AMT for this study. Using a mixed 2X3 design, we varied language (mixed language vs English only) within-subjects, as in Study 3a, and we varied the cuisine (French vs Turkish vs Korean) between-subjects. Participants in this study were shown two menus (mixed language and English-only) for a single cuisine side-by-side (order and menu color and design counterbalanced). Then they were asked to choose between the two, or to indicate indifference. The remaining measures were the same as in Study 2c. In this study, authenticity, uniqueness, and quality perceptions were asked for each menu as a whole, rather than for each menu item.

Results and Discussion

Only 13% of the participants were indifferent between the two options. Among the participants expressing a preference, the majority (65%) chose the mixed language-menu option. In particular, the first option was more likely to be chosen when it was the mixed language option than when it was the English-only option (Choices = 66% vs. 36%, $z=7.70$, $p<.001$, $d=.63$; Fig 15), consistent with Hl. A logistic regression model also shows that the effect is robust after controlling for the counterbalancing of color and design of the menus ($ß=1.24$, $z=7.21$, $p<.001$).

When the first option was mixed language, it was seen as relatively more authentic ($ß=4.10$, $t(683)=29.01$, $p<.001$) and more unique ($ß=2.71$, $t(683)=18.44$, $p<.001$) than the second

(English-only) option. Both higher relative authenticity (ß=.37, t(682)=14.13, p<.001) and uniqueness (ß=.16, t(682)=5.30, p<.001) predicted significantly higher relative quality perceptions. Higher relative quality perceptions, in turn, predicted a higher likelihood of choosing the first restaurant (ß=.15, t(594)=15.62, p<.001), controlling for the language. Not only were the individual paths in this mediation model significant, but we find a significant indirect effect (ß=.33, p<0.001) that fully mediates the effect of menu language on choice. These findings are consistent with our process model, in which mixed language menus are seen as relatively more authentic and unique, and therefore of higher quality, because of which consumers prefer the mixed language menu.

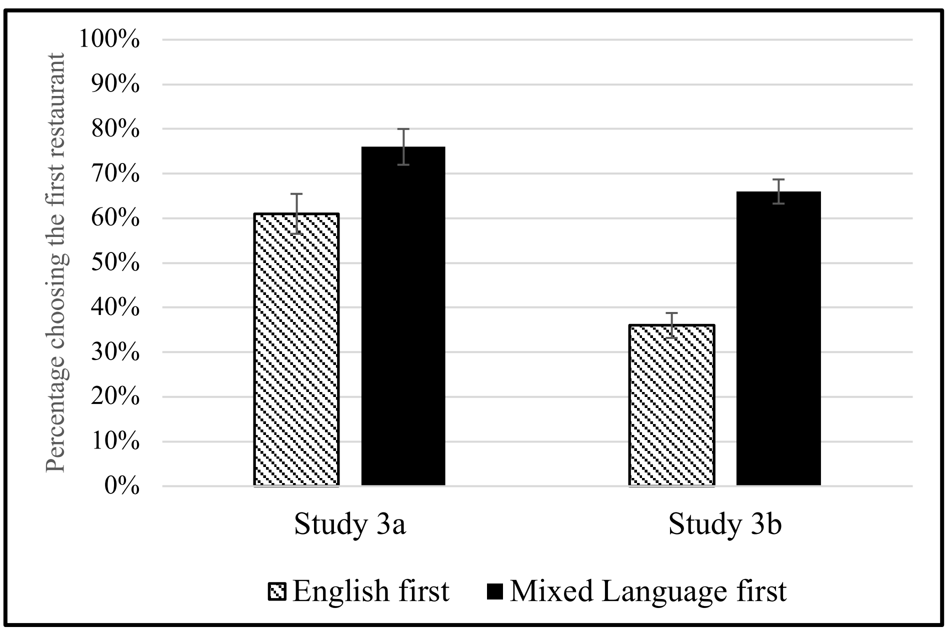

Fig 15: Results from Study 3a and 3b, depicting the choice of the first restaurant option, by when the first option was in mixed language or English only

In this study, the means for all three potential moderators were significantly greater than the midpoint (all p's<.001). Again, we found that the main effect of mixed language menu on choice was moderated by food neophilia (ß=.76, z=5.07, p<.001), cuisine perceptions (ß=.65, z=4.28, p<.001), and liking of the country of the cuisine (ß=.33, z=2.65, p=.008). That is, consumers were more likely to prefer the mixed language menu if they liked trying new foods or had a more positive impression of the cuisine or of the country of the cuisine (consistent with H3). Thus, we found that even with high evaluability, the impact of an incomprehensible foreign language cue replicates, because it increases the intangible benefits of authenticity, uniqueness, and quality. However, it is possible that such intangible benefits only matter for some tiers of restaurants (e.g., high-end). Therefore, to assess the generalizability of our findings, we test for robustness across different tiers of restaurants.

Post-test Study 3b

We ran another choice study (N=351) where the English only menus had a different title for each food item than only the description of the, for Turkish cuisine, to see if the presence of a title changes the lower choice for restaurants with English only menus. The main comparison groups were English only vs congruent foreign language (Turkish+English), English only vs incongruent foreign language (Korean+English), and English only vs gibberish.

We see a significant moderation with Food Neophilia when the comparison is English only vs Turkish+English (congruent) (Interaction $ß=-.33$, $t(86)=-4.13$, $p<.001$). Meaning, when people trying new foods, they prefer the Turkish+English menu over the English only menu, but that reverses when people do not like trying new foods. However, the interactions were not significant for English only vs Korean+English menu or English only vs Gibberish+English menu (both p's> .1). This suggests that regardless of liking or not liking trying new foods, people prefer the fully comprehensible menu over the incongruent semi-incomprehensible menu or the semi-gibberish menu. The same was true for cuisine perceptions, such that people who had higher positive perceptions towards Turkish cuisine preferred the Turkish+English menu over the English only menu, but that reversed when people had lower positive perceptions towards Turkish cuisine

(Interaction ß=-.27, t(86)=-3.38, p=.001). But there was no moderation for English only vs Korean+English menu or English only vs Gibberish+English menu (both p's> .2). Although country perceptions depicted the same pattern of results directionally, the effects were not significant.

Finally, in cases where Turkish+English was preferred over English only menus, we also find a significant mediation by relative authenticity, uniqueness, and quality (as in other studies) (all p's<.001).

Study 3c: Tiers of restaurants

In this study, we test the effect of language on choice by splitting the type of restaurant into three tiers – fine dining, casual dining, and local takeout.

Method

In this study (N=375; pre-registered) participants were recruited from AMT. Using a 2X3 mixed design we varied menu language (Mixed language vs English only) within subjects and the tier of a Turkish restaurant (fine dining vs casual dining vs local takeout) between subjects. As in Study 3a and 3b, participants were asked to choose between an English only menu and a mixed language menu (order and menu color and design counterbalanced) for a given tier of restaurant. We measured authenticity, uniqueness, and quality judgments for each menu, as well as the potential moderators, food-neophilia and cuisine/country perceptions.

Results and Discussion

Only 16% of participants were indifferent between the options. Overall, among those expressing a preference and collapsing across the tiers, 58% of the participants chose the mixed language menu. We find that, in all the tiers, the first menu option was chosen significantly more when it was in mixed language than in English only (*Fine Dining*: 73% vs 34%, $z=4.99$, $p<.001$, $d=.82$; *Casual Dining*: 69% vs 20%, $z=4.87$, $p<.001$, $d=1.04$; *Local Takeout*: 74% vs 48%, $z=2.30$, $p=.021$, $d=.54$). Logistic regression models for each type of restaurant also shows that the effect is robust after controlling for the counterbalancing of color and design of the menus (*Fine Dining*: ß=1.60, $z=4.49$, $p<.001$; *Casual Dining*: ß=2.43, $z=4.35$, $p<.001$; *Local Takeout*: ß=1.14, $z=2.00$, $p=.046$).

None of the tiers significantly differed in perceived authenticity. Collapsing across tiers, we find that when the first option was mixed language, it was seen as relatively more authentic (ß=3.19, $t(368)=17.54$, $p<.001$) and more unique (ß=2.32, $t(368)=13.30$, $p<.001$) than the second (English-only) option. Both higher relative authenticity (ß=.43, $t(367)=11.54$, $p<.001$) and uniqueness (ß=.19, $t(367)=4.52$, $p<.001$) predicted significantly higher relative quality perceptions. Higher relative quality perceptions, in turn, predicted a higher likelihood of choosing the first restaurant (ß=.17, $t(312)=13.88$, $p<.001$), controlling for the language. Not only were the individual paths significant, choice was also significantly mediated by perceptions of authenticity, uniqueness, and quality (all p's$<.003$). The indirect effect of mixed language on the choice of the first menu was also significant (ß = .31, $p<.001$). Means for all three potential moderators were significantly greater than the midpoint (all p's$<.001$). We find significant moderation by food-neophilia (ß=.80, $z=4.54$, $p<.001$) and cuisine perceptions (ß=.43, $z=2.66$, $p=.008$), but not by country perceptions (ß=.13, $z=.96$, $p=.337$).

All the experimental studies till now have tested preferences for hypothetical restaurants. In the final study, we test the effect of mixed language menus on consequential choices involving real restaurants.

Study 4: Real Restaurant Choices

In this study, we test whether the presence of Chinese characters on a sample menu increases choices, when participants choose between gift-certificates for two real Chinese restaurants. Unlike other choice studies, the English content on the two sample menus shown to participants used different wording for similar items as they were a sample of real food items from existing restaurants' menus. Because we anticipated Chinese-speakers in our MBA-student sample, we also asked participants to indicate whether they could read or understand Chinese and excluded those who said they could. We did not do this in the prior studies because existing data suggests that very people in the US speak French (.4%), Korean (.4%), or Turkish (.04%) (per US Census 2009-2013 data).

<u>Method</u>

We recruited MBA students (N=119) from three sections of the same course, in the business school of a major Midwestern university. Two in-person sections were asked to complete paper surveys, while students in the online section took an online version of the survey. Participants were shown two menus and were asked three questions: to choose a $100 gift certificate for one of two real Chinese restaurants in the city, and to indicate whether they could read or understand Chinese and whether English was their native language. Participants were informed that one student in their section would be selected at random to receive the gift certificate they had chosen, and a total of three gift certificates were given out. If the chosen participant was indifferent between the two options, then they would receive a gift card chosen at random.

The sample menus shown to participants were excerpts from the real menus of two well-known Chinese restaurants in the city. We deliberately chose one restaurant which used Chinese characters in its real menu (Restaurant A), and another restaurant that only had English on its menu (Restaurant B). Participants were randomly assigned to one of two types of menus. In our manipulation of interest, we varied whether Restaurant A's menu included the Chinese characters or not. As a result, participants either chose between one restaurant with a mixed language menu and another with an English-only menu or chose between two English-menu-only Chinese restaurants (See Appendix for sample menus). In essence this design tests whether Restaurant A benefits in competing for non-Chinese-speaking customers with Restaurant B, by using a mixed language Chinese-English menu. We also counterbalanced the color and design and order of the menus.

Results and Discussion

Excluding 22 participants who indicated that they could read or understand Chinese, we again replicated the beneficial effect of mixed language menus. Restaurant A was more likely to be chosen (over the English-only Restaurant B) when its menu included Chinese characters compared to when it did not (Choices = 80% vs. 42%, $z=4.16$, $p<.001$, $d=.85$). A logistic regression model also shows that the effect is robust after controlling for the counterbalancing of color and design of the menus ($ß=1.94$, $z=3.82$, $p<.001$).

General Discussion

Using analysis of three secondary field datasets and seven experimental studies (including one with consequential choices), we show that the presence of incomprehensible foreign language in foreign food descriptions positively impacts people's willingness to pay and their likelihood of choice (*e.g.*, compared to an English only description for the *same* foreign food), consistent with

H1. Thus, even when consumers are fully informed about the country of the cuisine (*i.e.*, the country of origin), and despite not knowing the literal meaning of a foreign language cue, consumers are positively affected by the presence of the foreign language.

Furthermore, consistent with H2, the use of incomprehensible foreign language enhances perceptions of authenticity and uniqueness, which in turn leads to higher quality perceptions, that increase willingness to pay, visit intentions and the likelihood of choice. This suggests that an incomprehensible foreign language cue can promote consumer associations, beyond their beliefs about the country of origin of the product.

We also posited that the positive effect of foreign language would no longer hold when consumers have negative attitudes towards either novel foods, or the cuisine or country (H3). Across these three potential moderators, we found mixed evidence in the individual studies. This is likely due to the fact that our sample of participants were generally quite favorable regarding novel foods, and the relevant countries and cuisines. As a more general and statistically powerful test, we conducted an internal meta-analysis of all relevant studies.

Combining the measures, we find highly significant overall moderation by individual differences, such that using mixed language was more beneficial when participants had more positive attitudes ($ß=.23$, $t(2660)=4.75$, $p<.001$). The same moderation was found for each of the three types of measures individually (*Food neophilia*: $ß=.19$, $t(2893)=5.29$, $p<.001$; *Cuisine Perception*: $ß=.16$, $t(2885)=4.30$, $p<.001$; *Country Perception*: $ß=.09$, $t(2660)=2.45$, $p=.014$).

To understand the nature of the relationships, we conducted spotlight analyses, shown in Fig 16. We see that for each of the moderators, mixed language has a positive impact when the moderator is above 1-2 standard deviations below the mean, and there is a non-significant effect otherwise. This suggests that while mixed language is beneficial for the majority of participants, consistent with the robust effects we found across studies, there is no benefit among people with sufficiently negative attitudes towards novel foods, or the relevant cuisine or country, consistent with H3. Notably, we do not find evidence of a reversal among those with negative attitudes, which suggests that, despite meaningful heterogeneity, the risk of mixed language use backfiring is limited.

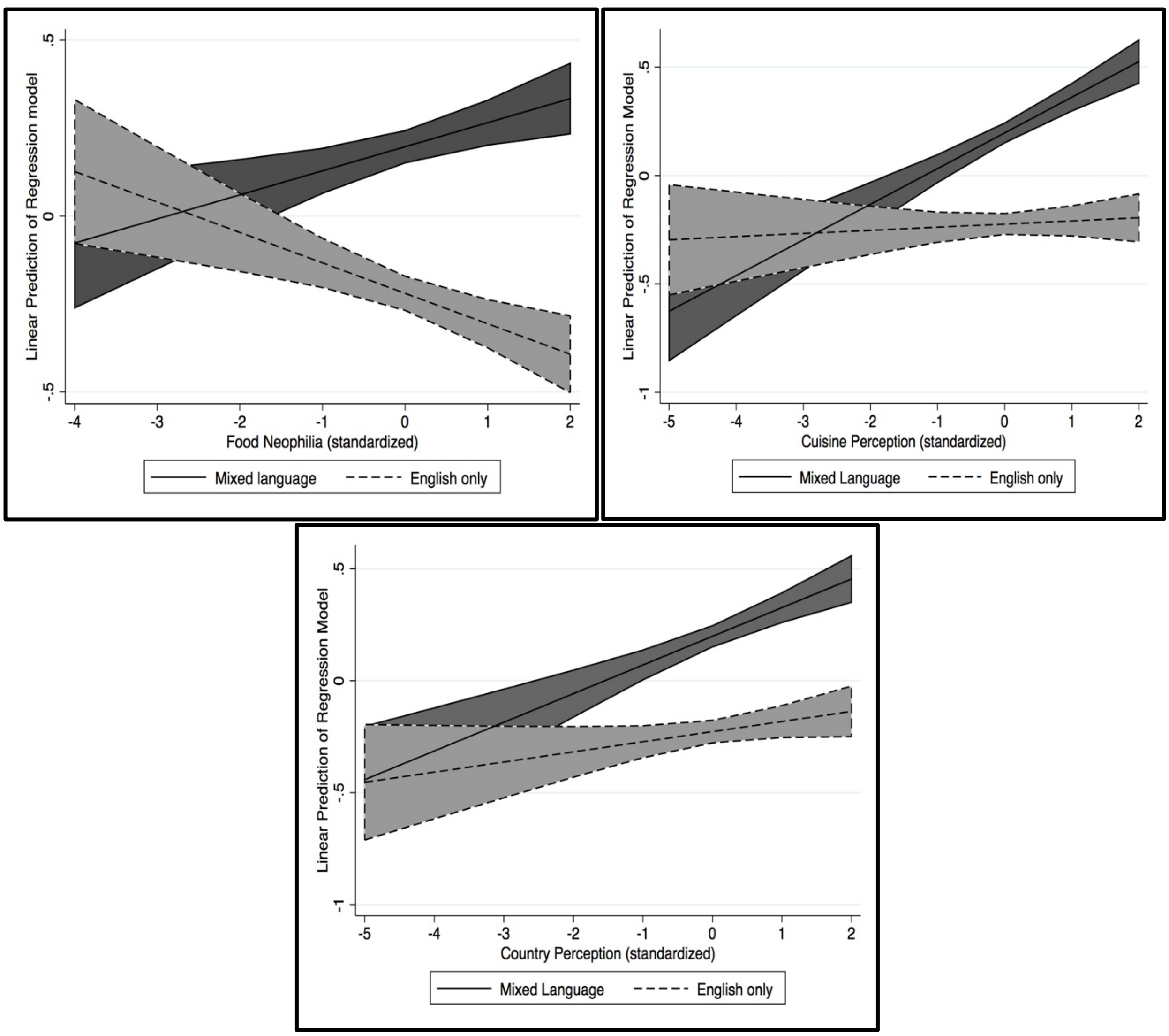

Fig 16: Moderation by Food neophilia, cuisine perception and country perception; meta-analysis

The findings of this paper have broader theoretical implications. First, we provide a demonstration of the potential impact of incomprehensible language on consumers. Although prior research has extensively studied how people process and incorporate comprehensible cues in their decision-making, little is known about the potential effects of non-comprehended language. In this paper, we lay groundwork for future investigations of and the effects of other types of incomprehensible language, and to distinguish between meaningful versus meaningless incomprehensible cues. Second, since the literal meaning of an incomprehensible cue is inaccessible in our context, our findings present novel evidence that key consumer perceptions (authenticity, uniqueness, quality) can be impacted merely by cue-prompted associations in the absence of additional literal information, providing a new perspective on the role of intangible benefits in consumption decisions.

In terms of generality, foreign language is not the only incomprehensible language we encounter on a daily basis. Ingredient information in products (e.g., *Isopropyl Jojobate* in cosmetics), technical attributes of a product (e.g., specifications that people know little to nothing about; Hsee et al. 2008 or scientific and technical attributes of a products), brand names with invented words – all potentially constitute the same category of meaningful incomprehensible language. Applying the approaches in this paper to other contexts in which consumers encounter information that they do not have a literal understanding of may yield additional insights into how consumer preferences are formed.

Our studies represent an initial exploration and do have some notable limitations. First, we have only tested experiential consumption in this paper, and it is possible that intangible benefits are irrelevant in non-experiential goods. It would be beneficial to test these findings in a non-experiential setting. Second, further research contrasting meaningful vs. non-meaningful incomprehensible cues is needed to understand how people process them differently, and to determine what impact they may have on choices. Finally, it is also possible that the perceptions of authenticity and uniqueness towards mixed-language menus reflect the outside world, wherein mixed-language menus are truly more authentic and unique. That is why, investigation and comparisons with the state in the real world will further improve our understanding of the effects.

This paper also has important practical takeaways for marketers. Most directly, our findings suggest that ethnic food settings can benefit from using their respective foreign languages in the menu. This is only predicted to be beneficial when the population does not have sufficiently negative feelings about the cuisine or the country of the cuisine, and are open to trying new foods, but positive attitudes do seem to, in fact, predominate, and the risk of backlash seems low. More generally, our results suggest that marketers who design communications targeting multiple segments and who incorporate segment-specific communications into broader messaging (e.g., adding foreign language to target speakers of that language) should carefully consider the effects on the non-targeted segments as well, whose perceptions and decision might be affected via associations. In this research, we have focused on a context (ethnic restaurants) where such associations are generally positive, but in other contexts that may not be the case. For example, foreign language (not in the domain of food) exists in many of our decision contexts, like government forms. Using this framework, future research can investigate the impact of the presence of foreign language in contexts such as SNAP reminder notifications, on uptake of such a program. Beyond the use of foreign language, our findings suggest that marketers should carefully consider (and ideally experimentally test) the effects of other language used in marketing that may be incomprehensible to some consumers, such as generally unknown product ingredients, technical features or scientific claims.

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ESSAY 3

Ingredient Jargon in Product Information

Abstract

We investigate how people incorporate incomprehensible language in products – like unknown ingredients – in their decision-making. Specifically, we focus on the associations people make when they encounter unknown ingredient names that linguistic-structurally resemble chemical-seeming vs natural- seeming words (including seemingly different but semantically equivalent names for the same substance, as well as non-informative made-up names), and how that affects their choices of products. Initial findings show that people choose products with chemical-seeming ingredients in their descriptions significantly less than products with natural-seeming ingredients, even when the ingredients have the same meaning, or no meaning. However, the effect is more nuanced – chemical-seeming ingredients are seen as more harmful, so in situations where perceived harm is outweighed higher perceived effectiveness, products with chemical-seeming ingredients are chosen more. Using a generative algorithm to create stimuli names, we also find that there are morphological structures in generated chemical-seeming names that people can recognize as "chemical" but that is not the case for generated natural-seeming words, which does not have sufficiently predictive identifying markers. Thus, we show that people make pragmatic inferences about meaningful incomprehensible cues, when semantic meaning is not accessible. And when people have multiple associations, leading to multiple inferences, the most important association in the context of the decision being made is the one that impacts choice.

People may derive associations from words, even when they cannot access their literal meaning (Piller, 2003). For example, the congruence of the sound or orthography of a brand name to the properties of the product it is describing (Ramachandran & Hubbard, 2001; D'Onofrio, 2014) can have a meaningful impact on consumers. However, as discussed in Essay 2, there are two main types of incomprehensible language – meaningful vs meaningless incomprehensible language. Meaningful incomprehensible cues – unknown language that helps people infer category assignments – are incorporated differently into decision-making than meaningless incomprehensible cues, which lack clear assignments (Holcomb & Neville 1990).

Incomprehensible words or non-words that have meaningful associations are processed similarly to known words. People have similar reaction times in semantic judgment tasks to such non-words as to real words conveying literal meaning (Bentin et al. 1999; Nobre & McCarthy 1994). On the other hand, meaningless incomprehensible words (sometimes called "gibberish") – which have a phonetic/orthographic structure much different than what you expect in a native language (e.g., KSTYNP), and hence are less likely to be assigned to a category – were recognized much more quickly as not being real words, compared to meaningful incomprehensible words with associations (Holcomb & Neville 1990).

When exposed to such incomprehensible but meaningful cues, people might categorize them based on similarity or typicality with existing or available knowledge and beliefs (Smith, Shafir, & Osherson 1993; Tversky & Kahneman 1974; Osheron et al. 1990; Sloman 1993), and then judge the cues based on the associations or perceptions that people have of existing items that fall in that category. In this paper, we focus on a different type of meaningful incomprehensible cue than in Essay 2 – ingredients.

Existing literature on judgments about ingredients shows that there exists a bias towards “natural” labels and claims, such that people prefer products described as such (Scott, Rozin, & Small 2020; Simao, Rohden, & Costa Pinto 2022; Andre et al. 2019; Skubisz 2017; Amos et al. 2014). However, in this paper, we test these effects with linguistic cues, using ingredient names only, and not labels or claims. This is important because when an item is labeled as "natural", that not only provides information but also prompts people to consider that attribute. By contrast, the use of ingredient names in this paper also tests where people spontaneously infer chemical or natural associations in the absence of explicit cues to do so. Moreover, we also examine perceptions towards chemical-seeming ingredients – less studied in prior literature – along with natural-seeming ones.

In Essay 2, I showed that an incomprehensible but meaningful cue, unknown foreign language, can be beneficial (e.g., in terms of attribute perceptions, willingness to pay and choice) for experiential products of foreign origin. In this essay, I show that while a meaningful incomprehensible language can have positive impact on choice because of desirable associations, it can also have a negative impact on choice, when it prompts undesirable associations.

Theoretical Development and Framework

Incomprehensible Linguistic Cues

People use many language-based cues to inform their decisions (Pogacar et al 2018), ranging from objective information in product descriptions, like price and quantity, to even the framing of a message. For example, presence of concrete product attributes like product ratings impact consumer decisions (Filieri 2015), while even a small linguistic manipulation like using the second person pronoun ("you") in reminder texts can be persuasive in a decision to get vaccinated (Buttenheim et al 2022; Milkman et al 2021). Most research on how language cues impact consumers focuses on cues that people can *comprehend* – that is, they understand the literally meaning of the cue (Banerjee & Urminsky 2023).

However, in many cases, individual consumers may not have access to a literal meaning of the cue. As an extreme case, the Bouba-Kiki effect (Ramachandran & Hubbard 2001) shows that even when the name of a product is invented gibberish, how it sounds can affect people's perceptions and liking of the product. Similarly, Baskin & Liu (2021) find that clearly meaningless descriptors (e.g., gibberish) enhance price judgments but decreases quality judgments. In these cases, the language significantly impacted consumer attitudes despite being *incomprehensible* (i.e., lacking literal meaning). This suggests that language can impact people's judgments and choices through other means than via comprehension, evaluation and deliberation of the literal meaning.

<u>Meaningful vs Meaningless Incomprehensible Cues</u>

Research suggests an important distinction between how people treat incomprehensible language when they can associate the cue with a meaningful category, compared to when the cue does not prompt clear inferences or associations. The non-word *bouba,* for example, is perceived as having "round" sounds and hence is associated with roundness and preferred as a name for round objects, whereas *kiki* – which has a phonetic association with sharpness – is preferred for sharp objects (Ramachandran & Hubbard, 2001; D'Onofrio, 2014). Not only is there an explicit preference for such matching, people also exhibit quicker processing of such pairs of non-words that are seen as congruent (on a non-literal basis), compared to non-congruent pairs (Parise & Spence, 2012; Kovic, Plunkett & Westerman, 2010; Westbury, 2005). Even though these non-words are not part of any language and are incomprehensible in terms of literal meaning, people's associations make them suitable descriptors for round or sharp objects and hence can be thought of as containing associational or inferred meaning.

The precise mechanisms for this effect have been debated (e.g., symbolic match based on orthography of the words and the shapes; Cuskley et al., 2017 vs. global shape perceptions; Chen et al. 2021). Nevertheless, the literature agrees on the general principle that the language used to describe items can impact people's judgments through their *associations* with the language cue, even if the cue provides them with no literal meaning. On the other hand, incomprehensible cues can lack a clear association, like using the word "zal" with "fried chicken" (Basking & Liu 2021), which could be an ingredient in the food, a style of cooking, a brand name, a place, or many other associations. When such ambiguous cues lack clear associations, they will not convey meaning to the consumer. Thus, even within the category of incomprehensible language, research suggests a distinction between two broad types of incomprehensible linguistic cues – meaningful ones, for which people can make associations of category or congruity in the context, and meaningless ones, for which those associations are difficult, ambiguous, or incongruent.

Processing of Meaningful Incomprehensible Cues

Incomprehensible words or non-words that do have meaningful associations are processed similarly to known words. People have similar reaction times in semantic judgment tasks to such non-words as to real words conveying literal meaning (Bentin 1987; Bentin et al. 1999; Nobre & McCarthy 1994). On the other hand, meaningless incomprehensible words – which have a phonetic/orthographic structure much different than what you expect in a native language (e.g., KSTYNP), and hence are less likely to be associated with a category – were recognized much more quickly as not being real words, compared to meaningful incomprehensible words with associations (Holcomb & Neville 1990). This suggests that because meaningful incomprehensible words trigger associations with similar-seeming actual words, it takes longer for people to recognize them as not being real words. The ease with which associations are formed for non-words impacts marketers' use of language, such as coming up with new brand names. The sound-based (or orthographic) but non-semantic associations with novel brand names can impact whether people perceive it to be a congruent name for the products' properties (Klink 2000, 2003).

This distinction extends to formation of new associations as well. For example, a meaningfully incomprehensible made-up word presented with a picture of, for example, a Dalmatian dog, tended to subsequently be matched with specifically other Dalmatian dogs rather than with other dogs or other animals (Xu & Tenenbaum, 2007). Children are able to form category associations when presented with made-up words that look similar to real words in that category (Colunga & Smith, 2005). By contrast, made-up words that lack a pre-existing association and are not presented with context that would provide a learnable association are considered non-typical to the category being described, resulting in negative inferences (Baskin & Liu 2021).

Category Assignments

After processing potentially meaningful incomprehensible cues, people may also be able to assign them to categories. First, they can assess the probability of the word based on instances that can be brought to mind (i.e., per the availability heuristic, Tversky & Kahneman 1974). That is, if the word looks like other words that they already know, they may consider the word as falling in the same category as the others. Since people are unfamiliar with the incomprehensible word, they can categorize it based on *similarity* and typicality with their existing knowledge and beliefs, as people do when making sense of blank predicates (Smith, Shafir, & Osherson 1993).

According to the similarity-coverage model, Osheron et al. (1990) theorize that when judging a given fact (conclusion item), people consider the similarity between that and the most similar of existing categories (premise categories) as the direct route of transmission. For example, when people are told that cows, lions, and mice have Vitamin Z and have to judge whether bats also do, they use the prior knowledge of the most similar animal to bats in the list (mice, in this case) and agree that bats also have Vitamin Z (Rips 2001). Sloman (1993) theorizes that this process consists of a single-route feature-based similarity theory, in which each of the categories is represented as a set of predicates or features. This approach predicts the strength of the arguments as the proportion of the conclusion category's features that are included in the premise categories (Rips 2001). Rehder & Hastie (2001) investigated the attributes underlying these categories, showing that the central attributes, which had a causal impact on other attributes, generally get more importance in assignment than others.

This prior literature forms in the conceptual basis for the framework of this paper. In this paper, we manipulate incomprehensibility by using ingredients that people are generally unfamiliar with. Unlike the literature on category-based/feature-based inductive inferences mentioned above, we do not provide participants with premise categories, but instead allow them to rely on existing beliefs only.

Naturalness bias

The extant literature on judgment towards ingredients provides evidence that people exhibit a bias towards products described as "natural". Natural claims in products may sometimes also impact people's evaluations and purchase intentions for personal care products, moderated by perceived efficacy, and depending on environmental concerns and perceived safety (Simao, Rohden, Costa Pinto 2022). Natural claims can also invoke different associations towards the product, such as healthiness, positive feelings, and safety (Andre et al. 2019; Skubisz 2017; Amos et al. 2014).

Scott, Rozin, & Small (2020) document a preference for products that are described as natural, as opposed to synthetic, when considering preventative measures. However, this preference reversed for curative measures. Risk and potency were significant mediators for the observed effects, both of which had been theorized in prior literature to be attributes considered in evaluating "natural" (or green) products (Li & Chapman 2012; Rudski et al 2011; Luchs et al. 2010). Such natural labels even increased the consumption of unattractive fruits and vegetables, as the labeling prompted associations of healthiness and tastiness (Wang et al. 2022).

In this paper, we go beyond the aforementioned prior literature which relied on explicit claims, and investigate spontaneous interpretations based on the linguistic aspects of ingredients. That is, we test the impact on evaluations and choice when people see an incomprehensible word that looks like, for example, a natural-seeming ingredient rather than telling them that something is natural. Another distinguishing aspect of this paper is that we also focus on other types of ingredients, specifically chemical-seeming ingredients. This counterfactual case, of chemical-seeming ingredients, has been less studied in the existing literature.

Ingredient distribution in products

We use the cosmetics category to investigate the prevalence of natural-sounding and chemical-sounding ingredients in product descriptions in the real world. This industry is projected to have an annual compound growth rate of 4.75% worldwide, and is predicted to exceed $784.6 billion by 2027 (Roberts 2022).

In a secondary dataset containing descriptions of cosmetic products (downloaded from https://www.kaggle.com/mfsoftworks/cosmetic-products), we find that different categories of cosmetics use chemical vs natural-seeming ingredient names (using coding of identifiable markers and common morphemes/words used in chemical-seeming vs natural-seeming names) to varying degrees. Fig 17 depicts the distribution of such names across different categories of cosmetics. This analysis confirms that both chemical and natural-seeming ingredients commonly occur across different products, and that the prevalence of natural vs chemical-seeming ingredients differ depending on the type of product.

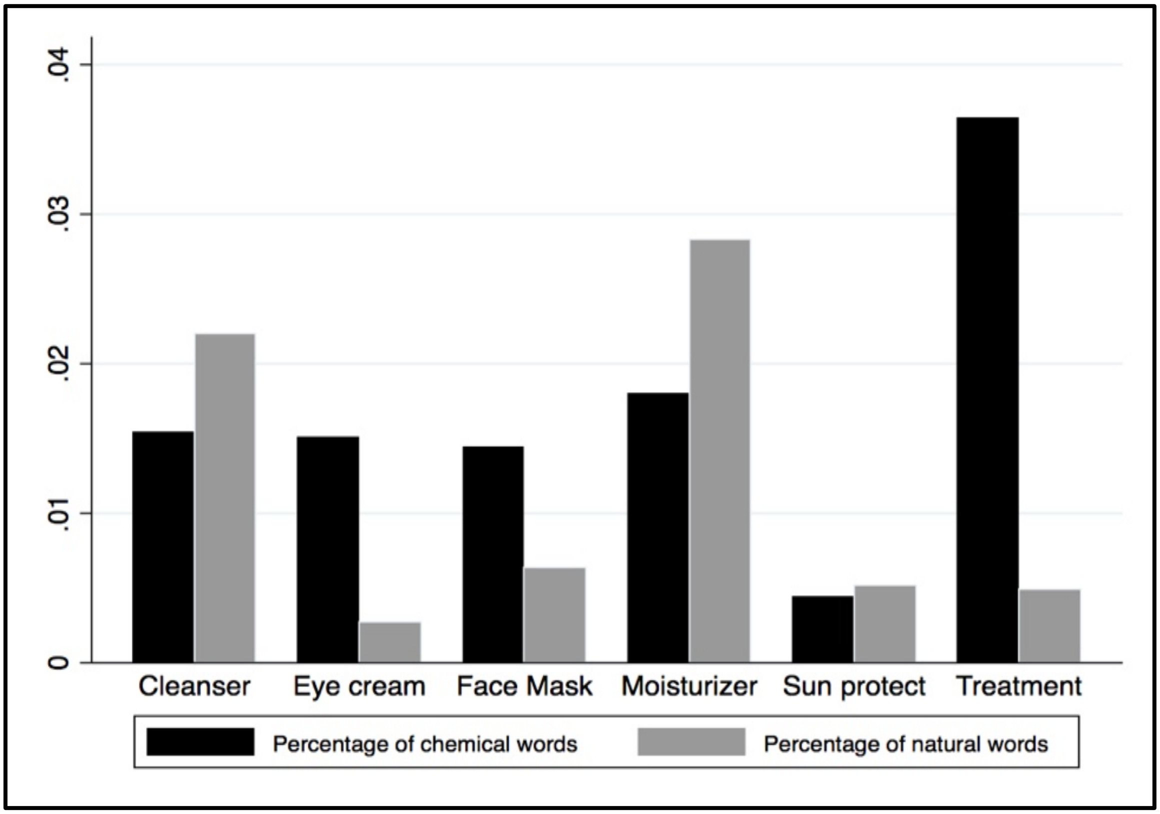


Fig 17: The proportion of Chemical-seeming ingredient names compared to Natural-seeming ingredient names in descriptions of each type of cosmetics.

Proposed Framework and Overview of Studies

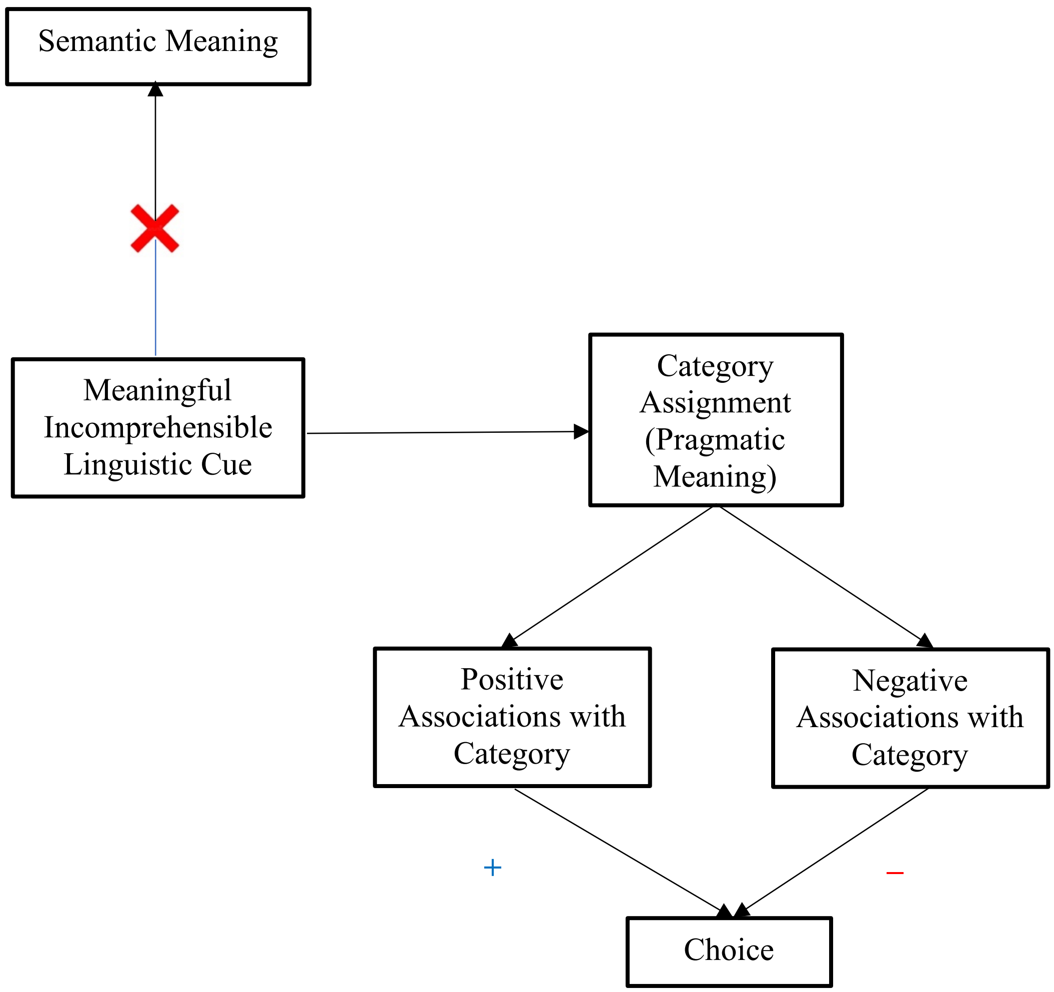


Fig 18. Proposed Framework for how meaningful incomprehensible linguistic cues impact choices

The framework proposed in this paper is depicted in Fig 18. We propose that when people see a meaningful incomprehensible ingredient name, and they do not have access to its semantic (i.e., literal) meaning, they will first categorize it based on their prior knowledge. This categorization is what we will call pragmatic (i.e., inferred) meaning (Grice 1975; Levinson 1983). If they have positive associations with the category then the presence of that name will positively impact choice, but if they have negative associations with the category then the reverse will be true. For example, if people consider an incomprehensible ingredient name as a chemical-seeming name, then they may assume that it is harmful. That negative perception may lead to a negative impact on choice.

Prior research on semantic vs pragmatic meaning has shown that people process the two very differently, and pragmatic associations are realized quickly (Politzer-Ahles et al. 2013). Furthermore, when semantic meaning contradicts pragmatic meaning and only one can be communicated, people choose to communicate the latter instead the former (Zhang & Schwarz 2020). When it comes to comprehension, most prior work has focused on pragmatic meaning of known predicates, and at most, vague predicates – where they find that some contradictions in vague language are found to be acceptable by speakers (Cobreros et al. 2014; Alxatib & Jeffry Pelletier 2011; Serchuk, Hargreaves, & Zach 2011). The prior work on pragmatic meaning, in contrast with work on semantic meaning, has not studied blank predicates or incomprehensible language, making this paper one of the first explorations.

In Studies 1a-b, we test the category assignment portion of the framework, by having participants group ingredient names and name the groups they've defined. Study 2 tests the general idea that people are averse to choosing products that have chemical-sounding ingredient names in the description. Studies 3a-b shows that when the associations consumers have with chemical-sounding ingredients are desirable, the negative effect of chemical-seeming (vs. natural-seeming) ingredients is attenuated. Study 4 finds that the presence of external association cues does not fully attenuate the effect. Finally, in Study 5 we find that when consumers make decisions involving ingredients that have contradictory semantic and pragmatic meaning to them, the reliance on pragmatic inference can lead consumers to prefer inferior and even harmful products.

Study 1a

In this study, we test people's category assignments of meaningful incomprehensible language. Specifically, we test whether they categorize words based on the linguistic cues in the ingredient name rather than actual meaning.

Method

Participants on Prolific (N=499) were shown a list of 12 names (preregistered at aspredicted.org https://aspredicted.org/9WV_SYY). The names were chosen such that each ingredient had a chemical-seeming name, a natural-seeming name, and a Latin (scientific) name. Thus, the 12 names were split into 4 chemical-seeming names, 4 natural-seeming names, and 4 Latin (scientific) names. In actuality, these names described four real ingredients, such that each actual ingredient was represented by one chemical-seeming name, one natural-seeming name and one Latin name. Table 2 displays the names used in the study.

Table 2: Names used in the study, by type of ingredient, and condition

Type of Name	**With identifiable markers**	**Without identifiable markers**
Chemical-seeming	Butylene Glycol, Alpha-linolenic acid, 11-Eicosenoic acid, Indigotindisulfonate sodium	Butylene Glycol, Alpha-linolenic, 11-Eicosenoic, Indigotindisulfonate sodium
Natural-seeming	Mondo Grass Root, Peony Oil, Jojoba Seed Oil, Japanese Indigo Extract	Mondo, Peony, Jojoba, Japanese Indigo
Latin	Ophiopogon japonicus, Paeonia suffruticosa, Simmondsia chinensis, Persicaria tinctoria	Ophiopogon japonicus, Paeonia suffruticosa, Simmondsia chinensis, Persicaria tinctoria

Participants were randomly assigned to one of two conditions. In the "full name" condition, parts of some of the names constituted identifiable markers with semantic meaning (e.g., "acid", "flower"). In the "no-marker names" condition, the identifiable markers were removed from the names that originally had them (See Appendix for more details).

Participants were then asked to assign the 12 names to groups based on similarity. It was left up to the participants to decide what seems similar. They were then asked to write in a name for each of the groups they had created, and to explain what the items in each group they created had in common. After that, they were asked to rate each group they had created on perceptions of harm ("How harmful do you think the items that you sorted in each group are?"), natural-ness

("How natural do you think the items that you sorted in each group are?") and edibility ("How edible do you think the items that you sorted in each group are?").

Results

The results show that a pair of names are much more likely to be grouped together if they are both chemical-seeming (ß=.37, t(498)=25.06, p<.001), natural-seeming (ß=.24, t(498)=19.29, p<.001), or Latin (ß=.49, t(498)=32.45, p<.001), rather than having the same meaning referring to a single actual ingredient (ß= -.15, t(498)= -27.78, p<.001). Moreover, participants also thought that groups that they sorted chemical-seeming names into were more harmful (ß=1.40, t(490)=20.99, p<.001), less natural (ß= -1.68, t(495)= -19.74, p<.001) and less edible (ß= -.85, t(492)= -12.22, p<.001). These associations were different for natural-seeming names, where they were seen as less harmful (ß= -1.28, t(490)= -21.95, p<.001), more natural (ß= 1.22, t(495)= 17.31, p<.001), and more edible (ß= .84, t(492)= 11.66, p<.001). The perceptions for natural-seeming names *mostly* persisted with Latin names – that is, Latin names were seen as less harmful (ß= -.12, t(490)= -2.10, p=.036), more natural (ß= .46, t(495)= 6.30, p<.001), but neither edible nor inedible (ß= .01, t(492)= .20, p=.838). The results held regardless of whether identifiable markers were present or absent in the names.

Discussion

Thus, these results suggest that when meaningful incomprehensible words are presented to people without access to semantic meaning, people rely on morphological structures to categorize names. People also have different perceptions for these categories even though they names across categories shared the same meanings.

These effects persisted with or without identifiable markers in names. However, it is possible that, in this study, removing the identifiable markers did not change the results because, especially for real natural-seeming names, the names were sometimes identifiable by themselves for some participants (e.g., “Peony” instead of “Peony Oil”). That is why in the next study, we generate non-existent chemical-sounding, natural-sounding, and latin-sounding names and repeat the same task.

Study 1b

The aim of this study was to conduct the same test as in Study 1a with generated names and to also measure people’s confidence regarding the semantic meaning vs. pragmatic meaning of the words.

Generative Algorithm

First, we collected lists of existing chemical-seeming (N=1515), natural-seeming (N=4456), and Latin (N=213) names. The lists had names that, sometimes, contained multiple words (*e.g.,* Disodium Benzoate), or words with identifiable markers (*e.g.,* Gutweed Flower). In the former case, we took the second word and added it as its own input word in the list, whereas in the latter case, we dropped the identifiable markers. Using these lists, we trained a Markov Generator [6] to generate 10 letter chemical-sounding words, natural-sounding words, and latin-sounding words. We selected a subset of realistic-seeming words generated by the algorithm for use in this study.

Method

Participants on Prolific (N=229) were shown a list of 12 made-up names – 4 chemical, 4 natural, and 4 Latin names (preregistered at aspredicted.org https://aspredicted.org/gz25p.pdf). Half of the participants were shown names in which we had added identifiable makers (e.g, “Acid” in a

[6] https://towardsdatascience.com/text-generation-with-markov-chains-an-introduction-to-using-markovify-742e6680dc33

chemical-seeming name or “Extract” in a natural-seeming name, etc.) and the remaining half were shown same names without the identifiable markers. The generated Latin names were not given any identifiable markers as they don’t have any in the real world. However, because Latin names include at least two words (generic name, specific name), the generated chemical-seeming and natural-seeming names also had two words (or three with markers). Table 3 displays the names used in this study.

Table 3: Names used in the study, by type of ingredient, and condition

Type of Name	With identifiable markers	Without identifiable markers
Chemical-seeming	Xenylenium Diphoronil Acid, Acetylsulf Cermandium Ethol, Dienzenol Chloromis Alcohol, Hexalcium Cycloldium Acid	Xenylenium Diphoronil, Acetylsulf Cermandium, Dienzenol Chloromis, Hexalcium Cycloldium
Natural-seeming	Oxfishited Yellefisht Root, Sembackchu Terestrill Grass, Apebackbel Loatkatail Oil, Echitailla Wallackbil Extract	Oxfishited Yellefisht, Sembackchu Terestrill, Apebackbel Loatkatail, Echitailla Wallackbil
Latin	Ephustimus Ceaeluscos, Ialuruscea Copisticus, Gettaceros Vennicucum, Balativida Etambranas	Ephustimus Ceaeluscos, Ialuruscea Copisticus, Gettaceros Vennicucum, Balativida Etambranas

Participants were asked to group the 12 names together based on similarity, where it was left up to them decide what seems similar, and were asked to write in a name for each of the groups they created, along with stating what the items in each group had in common. Half the participants were asked to write in a definition and purpose for each name before the sorting task, and the other half were asked to do the same after the task. They were also asked to rate their confidence in their answers to the definition and purpose questions (e.g., "Please rate how confident you feel about you knowing the definitions for each item").

Finally, participants were asked to rate each group they had created on perceptions of natural-ness ("How natural do you think the items that you sorted in each group are?), chemical-ness ("How chemical do you think the items that you sorted in each group are?"), harm and edibility. They were also asked to indicate their confidence in these answers (See Appendix for more details).

Results

When markers were present, pairs of names are much more likely to be grouped together if they were both chemical-seeming (ß=.32, t(116)=10.84, p<.001), or both natural-seeming (ß=.27, t(116)=9.37, p<.001). However, when markers were absent, chemical-seeming words were *less* likely to be grouped together (ß= -.21, t(111)= -13.05, p<.001), but natural-seeming words were still more likely to be grouped together (ß=.33, t(111)=12.80, p<.001). Since Latin did not differ in either conditions, overall Latin words were more likely to be grouped together (ß=.41, t(229)=18.17, p<.001). Results did not change by whether people were asked about the definitions and purpose before or after the sorting task.

Based on the answers that people gave to the open-ended questions about what the groups that they created had in common, it seemed that participants had relied on word endings. The made-up chemical-seeming names had some that ended in letters that were also common as natural-seeming word endings, and some that ended with letters that were also common as Latin word endings. We speculate that names generated to seem like chemical-seeming names were not sorted together due to the presence of other salient morphological cues, rather than lower perceptions of chemical-ness.

We also found evidence for the effect of morphological cues on perceived chemical-ness. All perceptions of chemical-ness/natural-ness, harm, and edibility were collected on bipolar scales, meaning any comparisons shown below are against the *midpoint*. Regardless of presence or absence of markers, participants rated the names generated to seem chemical as chemical (With markers: ß=2.02, t(116)=10.64, p<.001; Without Markers: ß=.27, t(111)=11.07, p<.001), but not natural (With markers: ß=-1.42, t(114)=-7.87, p<.001; Without Markers: ß=-.54, t(109)=-3.60, p<.001). Moreover, participants also considered the names generated to seem natural as natural, regardless of presence or absence of markers (With markers: ß=1.30, t(114)=9.72, p<.001; Without Markers: ß=.39, t(114)=3.71, p<.001), but not chemical (With markers: ß=-1.46, t(115)=-9.61, p<.001; Without Markers: ß=-.79, t(108)=-5.91, p<.001). Similarly, Latin words were seen as natural (ß=.36, t(224)=3.72, p<.001) and not chemical (ß=-.64, t(224)=-5.59, p<.001), although the differences were not as strong.

Participants also rated the chemical-seeming names as harmful, regardless of markers (With markers: ß=1.42, t(114)=9.29, p<.001; Without Markers: ß=.32, t(105)=2.82, p<.001), and as not edible when with markers (ß= -1.24, t(115)= -8.06, p<.001) while edibility was not significantly different from the midpoint without markers (ß= -.17, t(108)= -1.32, p=.191). Natural-seeming names, regardless of markers, were seen as unharmful (With markers: ß=-1.17, t(114)=-9.70, p<.001; Without Markers: ß=-.28, t(105)=-3.27, p=.001), and edible with markers (ß=1.28, t(115)=9.24, p<.001), while edibility was not significant without markers (ß=.06, t(108)=.64, p=.522). On the other hand, Latin names were seen as unharmful (ß=-.31, t(220)=-3.66, p<.001), and edible (ß=.24, t(224)=2.53, p=.012).

We also find that people are much more unconfident about semantic meaning than about the pragmatic (or category-based) meaning, regardless of presence or absence of markers (all p's<.001).

Discussion

This study suggests that participants did not sort chemical-seeming names into their own group when there were no markers, potentially because of other morphological commonness but not because of an absence of associations between morphological characteristics and attribute inference. We see that chemical-seeming names, with or without markers, were seen as chemical but not natural. Moreover, when comparing confidence towards semantic meaning vs pragmatic meaning, people exhibited much higher confidence in the latter than the former. Studies 1a-1b show that people categorize and associate chemical-seeming names differently than natural-seeming (or latin) names, even when the names are made up. In the next studies, we look at how people choose between options with chemical and non-chemical-seeming ingredients.

Study 2

In this study, we test choices between products, based on their descriptions. Specifically, in this study, we test whether people, when choosing between two products, choose the ones with chemical-seeming names vs. natural-seeming names in the descriptions.

Method

In this study, conducted on Prolific (N=703), we use two types of cosmetic products – skincare and makeup – as the domains tested (preregistered at aspredicted.org https://aspredicted.org/5u7qh.pdf). For skincare, we used a night repair skincare product, and for makeup, we used lipstick. In each domain, we presented participants with two product options – one with real chemical-seeming ingredients listed in the description, and the other which instead included natural-seeming names for the same ingredients. They were asked to choose between the two products, where one had chemical-seeming words and the other natural-seeming, and could indicate indifference. For example, for the skincare condition we showed the participants the following:

"*Imagine you are choosing between two night repair skincare products - The Indigo Night Repair, and The Advanced Night Repair. Both their descriptions are below. Indicate which one you would be more willing to purchase, or your indifference between the two.*"

The product descriptions, for example in the skincare condition, were the following, where the chemical vs natural-seeming ingredient names were counterbalanced (and so was the order of each description):

"*A serum-in-moisturizer treatment with Geranyl Acetate, alpha-linolenic acid, Isopropyl Jojobate, y-ethylamine-L-glutamic acid, the Indigo Night Repair visibly calms irritation, strengthens skin's barrier, and balances the skin for a healthy, hydrated glow*"

"The Advanced Night Repair, with Camellia Sinensis Leaf, Jojoba Seed Oil, Peony Oil, and Black Rose Oil, is a next-generation super serum hat visibly reduces multiple signs of aging with fast-repair and youth-generating power"

We also asked participants about their perceptions of harm ("How harmful do you think the following ingredients are?") and effectiveness ("How effective do you think the following ingredients are?") for each of the ingredients in both descriptions that were shown to them on 7-point Likert scales (*Harm*: 1=Not harmful at all, 7=Extremely harmful; Effectiveness: 1=Not effective at all, 7=Extremely effective). Since these were real ingredients, we also asked participants to their rate familiarity ("Are you familiar with the following ingredients, <u>in general</u>?", Yes/No/To an extent). The results reported below are for those participants who were unfamiliar with the ingredients (See Appendix for more details).

<u>Results</u>

Ninety-nine participants (~14%) were indifferent when asked to choose between two products. For both types of cosmetics, the first option was chosen significantly more when the description included natural-seeming names rather than chemical-seeming names (*Skincare*: 71% vs. 29%, $t(68)=3.91$, $p<.001$; *Makeup*: 67% vs. 33%, $t(96)=2.55$, $p=.014$), among participants who were unfamiliar with both types of ingredients and who were not indifferent between the options.

Most importantly, the first option was seen as more harmful than the second when it was the options that was described with chemical-seeming (vs. natural-seeming) names, for both skincare (Means: 1.66 vs. -1.28. $t(44)=6.45$, $p<.001$) and makeup (Means: 1.02 vs. -1.13. $t(52)=5.83$, $p<.001$). However, relative effectiveness did not differ by type of ingredient for any condition (all p's>.3). In a combined overall mediation with both relative harm and relative effectiveness as mediators, we find that the indirect effect was significant and negative due to the relative harm but not relative effectiveness, for the condition of makeup (indirect effect, p=.009) but not for skincare (indirect effect, p=.224).

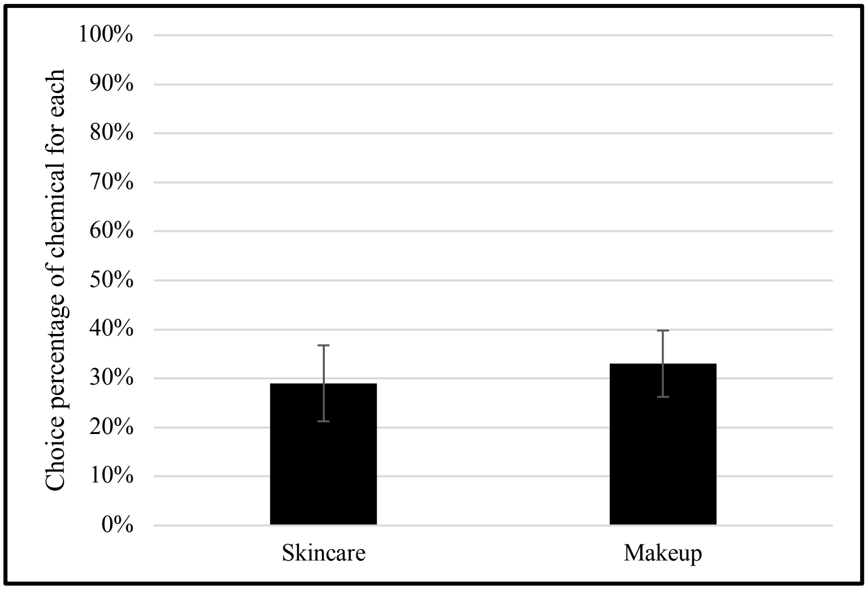


Fig 19: Choice percentage of the first option when its descriptions had chemicals, by type of cosmetics. Error bars represent standard errors. Indifferent people excluded from this graph.

<u>Discussion</u>

In this study, we show that people are, on an average, averse to choosing cosmetic products with chemical-seeming names in the description compared to natural-seeming names for the same ingredients, because the chemical-seeming names are seen as more harmful. We included two products to test whether people might have avoided chemical-seeming ingredients more for lipstick than a skincare product, potentially due to perceptions of effectiveness of chemical-seeming ingredients in skincare products. Even though perceived harm did not mediate the effect for skincare (possibly suggesting that people might not be as concerned with "harmful" ingredients in skincare), mediation via perceived effectiveness was not observed. One possibility is that the desirability of perceived effectiveness may not outweigh the undesirability of perceived harm in skincare. That is why, in the next study, we manipulate the purpose of using a product, such that in one case being harmful could be tolerated because expected effectiveness would be more important.

Study 3a

In this study, we test whether seeing chemicals in the description of a product for which perceived harm may be tolerated because perceived effectiveness will be more desirable reverses the effect exhibited in Study 2. Generated names were used in this study, which were first pretested.

Pretest

In a pretest conducted on Prolific (N=196), we took 20 generated chemical-seeming and natural-seeming words each and asked participants to rate how chemical and how natural each of the words seemed, using their own understanding of the two terms. Each participant either only saw the list of generated chemical-seeming words or natural-seeming words. The perceptions of chemical-ness and natural-ness were recorded on 7-point Likert scales (*Chemical-ness*: 1=Very Not Chemical, 7=Very Chemical; *Natural-ness*: 1=Very Unnatural, 7=Very Natural). That is, perceptions below the midpoint of the scale (4) would mean that the words are seen as not chemical (or not natural). Generated chemical-seeming words (without any identifying markers) were seen as more chemical than not (Mean=5.12, $t(97)=11.67$, $p<.001$), and as much more chemical than the generated natural-seeming words (Means= 5.12 vs 4.04, $t(194)=7.02$, $p<.001$). However, the generated natural-seeming names (without any identifying markers) were seen as *less* natural than not (Mean=3.53, $t(97)=11.67$, $p<.001$), but were still seen as more natural than the generated chemical-seeming words (Means= 3.53 vs 3.11, $t(193)=2.79$, $p=.006$). These results suggest that without identifying markers, chemical-seeming names are still recognizable but the same is not true for natural-seeming names, meaning that the morphological structure of chemical-seeming names are recognizable even if they are made-up but there is no stable morphological structure for natural-seeming names that are recognizable without markers.

Method

Although the generated natural-seeming names were not seen as natural in the pretest, we still use some of them as control names in descriptions in this study and we consider these names neutral names for the purpose of this study. We recruited participants from Prolific (N=409) and presented them with a purchase-decision scenario (preregistered at aspredicted.org https://aspredicted.org/gz25p.pdf). Half of the participants, were told that they were looking to purchase a cleaning product to clean and maintain their marble table top dining table ("Imagine that you are looking to purchase a cleaning product to clean and maintain your dining table top that is made of marble"), while the other half were told that they were looking to purchase a cleaning product to clean and scrub their dirty toilet ("Imagine that you are looking to purchase a cleaning product to scrub and maintain your toilet from getting dirty"). The expectation was that perceived harm would be relatively less important than perceived effectiveness in the toilet condition, and the reverse would be the case in the table condition. People were then asked to choose between two products, one with generated chemical-seeming ingredient names and the other with generated natural-seeming (neutral) names in their descriptions, or to indicate indifference between the two. Participants then rated perceived harm and perceived effectiveness for each of the products (See Appendix for more details).

Results

One hundred and ninety-five (~48%) participants indicated indifference between the two options. Among those who were not indifferent, choice of the first product was significantly lower when it had made-up chemicals in the table (39%) condition than in the toilet (57%) condition (interaction ß= -.28, t(210)= -2.06, p=.041). That is, people were more likely to choose a product described with chemical-seeming names over a product described with natural-seeming names when considering a cleaning product for their dirty toilets than when they were considering the same for maintaining their marble table top. Also, the first option was seen as more harmful when it had chemical-seeming names, in both conditions, than when it had natural-seeming (neutral) names (Means: .14 vs -.11, t(403)=2.59, p=.01), and also more effective than them (Means: .12 vs -.21, t(407)=3.35, p=.001).

The overall joint mediation by perceived harm and perceived effectiveness was not significant in the table condition (p=.736). Although, overall mediation was not significant (p=.123) in the toilet condition, two opposing significant paths were detected – relative effectiveness had a positive indirect effect of .12 and relative harm had a negative indirect effect of -.04. That is, in the toilet condition (but not the table condition), people were more likely to choose the product with chemical-seeming names, while significant perceptions of both relative harm and effectiveness were detected.

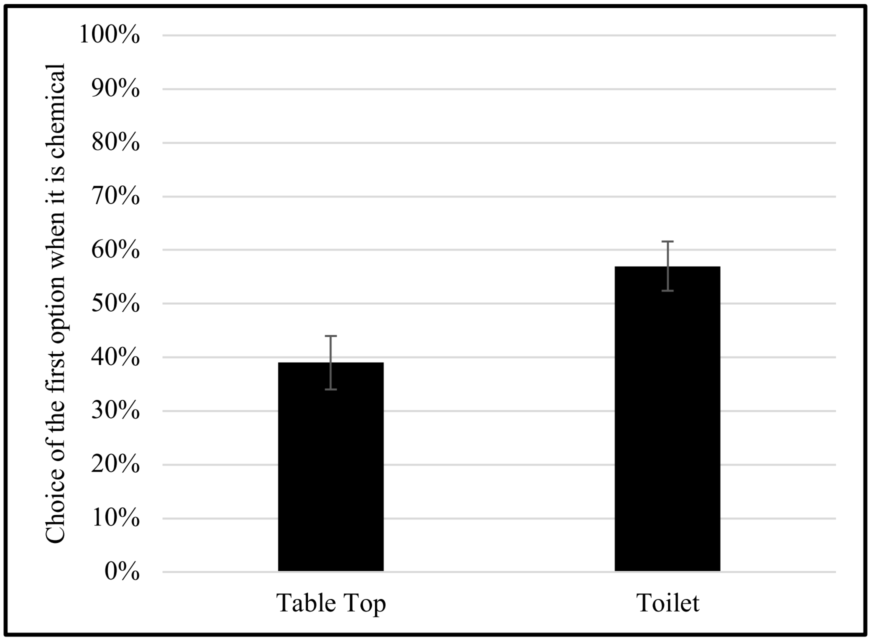


Fig 20: Choice percentage of the first option when its descriptions had chemicals, by type of usage goal. Error bars represent standard errors. Indifferent people excluded from this graph.

Discussion

Overall, the results suggest that when the presence of a chemical-seeming ingredient might be beneficial, chemical aversion is reduced. The mediation results show that chemical-seeming name products are chosen more in the toilet condition than the table one because they are seen as more effective. Thus, even if perceived to be harmful, chemical-seeming names can be seen as beneficial when the product calls for it. In the next study, instead of comparing context-dependent reasons for purchasing a product, we measure heterogeneity in consumers' relevant goals before presenting them with the choice.

Study 3b

In this study, we repeat Study 3a, except that we measure people's goals instead of manipulating the purpose of the cleaning product. In this study, we also use Latin names as comparison group against chemical-seeming names, and that is why (like Study 1b) use two-word names for every condition. All names were first pre-tested.

<u>Pretest</u>

We first conducted another pre-test of two-word generated natural, chemical, and Latin names on Prolific (N=299). To maintain uniformity across conditions, we used two-word names for each of the generated names because having two words was a necessary condition for Latin names. None of the names used in the pretest had identifiable markers. Participants only saw one set of names (i.e., chemical-seeming or natural-seeming or Latin) and were asked about their perception of chemical-ness or natural-ness for each of them. We also asked about their perceptions of gibberish-ness in this study. The perceptions of chemical-ness, natural-ness, and gibberish-ness were recorded on 7-point Likert scales (*Chemical-ness*: 1=Very Not Chemical, 7=Very Chemical; *Natural-ness*: 1=Very Unnatural, 7=Very Natural; *Gibberish-ness:* 1=Very Made-Up, 7=Very Real). That is, perceptions below the midpoint of the scale (4) would mean that the words are seen as not chemical (or not natural). For gibberish-ness, perceptions below the midpoint (4) would mean that the words are seen as more made-up, and above the midpoint would mean that the words are seen as more real.

As in the previous pretest, we find that generated chemical-seeming words were seen as very chemical (Mean= 5.42, t(98)=10.56, p<.001). However, natural-seeming names were not seen as natural – that is, people thought they was more unnatural and hence the mean was lower than the midpoint (4) of the scale (Mean= 3.33, t(99)= -4.71, p<.001). Latin names, on the other hand, were neither seen as natural (Mean= 4.05, t(99)= .45, p=.657), nor chemical (Mean= 3.51, t(99)= -3.85, p<.001).

However, natural-seeming names were seen as more natural than chemical-seeming names (Means: 3.33 vs 2.90, t(197)=-2.20, p=.028), and chemical-seeming names were seen as more chemical than the natural-seeming names (Means: 5.42 vs 3.10, $t(197)=12.29$, $p<.001$). Latin names, on the other hand, were seen as *more* natural than the natural-seeming names (Means: 4.05 vs 3.33, $t(198)= 3.97$, $p<.001$), but less chemical than chemical-seeming names (Means: 3.51 vs 5.42, $t(197)= -10.33$, $p<.001$). Most importantly, chemical-seeming names were seen as less made-up than both natural-seeming names (Means: 3.40 vs 2.25, $t(197)= 5.36$, $p<.001$) and Latin names (Means: 3.40 vs 3.00, $t(197)= 2.00$, $p=.047$).

The results from this pretest suggest that people have stronger pragmatic inferences from generated chemical-seeming names than from generated natural-seeming and Latin names, again providing further evidence that the morphological components of the generated chemical-seeming names are more easily recognizable than those of the generated natural-seeming names or Latin names. That is why, from this study onwards we consider chemical-seeming names the main incomprehensible cues of interest while other names are just considered neutral or non-chemical-seeming ingredients used for comparison.

Method

We recruited participants from Prolific (N=430) and asked them which of two reasons was more important to them when purchasing a cleaning product: (1) Selecting a product that was the most effective, or (2) Selecting a product that had the least harmful ingredients (preregistered at aspredicted.org https://aspredicted.org/3c9kg.pdf). The expectation was that when people care more about effectiveness, then perceived harm should impact their decision less than perceived effectiveness of the products, and the opposite would hold among those who said they cared more about harmful ingredients.

People were then asked to choose between two products with either generated chemical-seeming or natural-seeming (neutral)/ natural-seeming (neutral) with identifiable markers/Latin names in their descriptions, or indicate indifference between the two. Then they were asked to rate perceived harm and perceived effectiveness for each of the products (See Appendix for more details).

Results

One hundred and ninety-three (~45%) participants indicated indifference between the two options. Overall, participants preferred the product with non-chemical-seeming ingredient names, as shown in Fig. 21. However, among those who were not indifferent, participants who had an effectiveness goal were more likely to choose the product that had made-up chemical-seeming names in its description (Interaction ß= .36, t(233)= 2.62, p=.009), compared to those who had a harm-avoidance goal.

When splitting the data into the type of the other ingredient being used in the options, the effect held when chemical-seeming names were being compared to natural-seeming (neutral) names with markers (Interaction ß= .59, t(96)= 3.00, p=.003). The directional effect still held for natural-seeming (neutral) names without markers (Interaction ß= .20, t(64)= .76, p=.452) and for Latin names (Interaction ß= .34, t(65)= 1.23, p=.221), but they were not significant.

Overall, the first option was seen as more harmful when its descriptions had chemical-seeming names than non-chemical-seeming names, when the goal was selecting the least harmful ingredients (Means: 1.59 vs -.97, t(139)=7.78, p<.001), and when the goal was effectiveness (Means: .86 vs -.98, t(287)=9.06, p<.001). Also, overall, the first option was seen as more effective when the it had chemical-seeming names in its description than non-chemical-seeming names both when the goal was selecting the least harmful ingredients (Means: .63 vs -.39, t(139)=4.75, p<.001), and when the goal was effectiveness (Means: .39 vs -.53, t(287)=6.32, p<.001).

Overall, when the goal was effectiveness, although individual paths were detected in the mediation, where relative effectiveness had a positive indirect effect of .23 and relative harm had a negative indirect effect of -.20, the overall indirect effect was not a significant (.676). On the other hand, when the goal was choosing the least harmful ingredients, overall negative indirect effect of -.42 was significant (p<.001) due to relative harm (-.48).

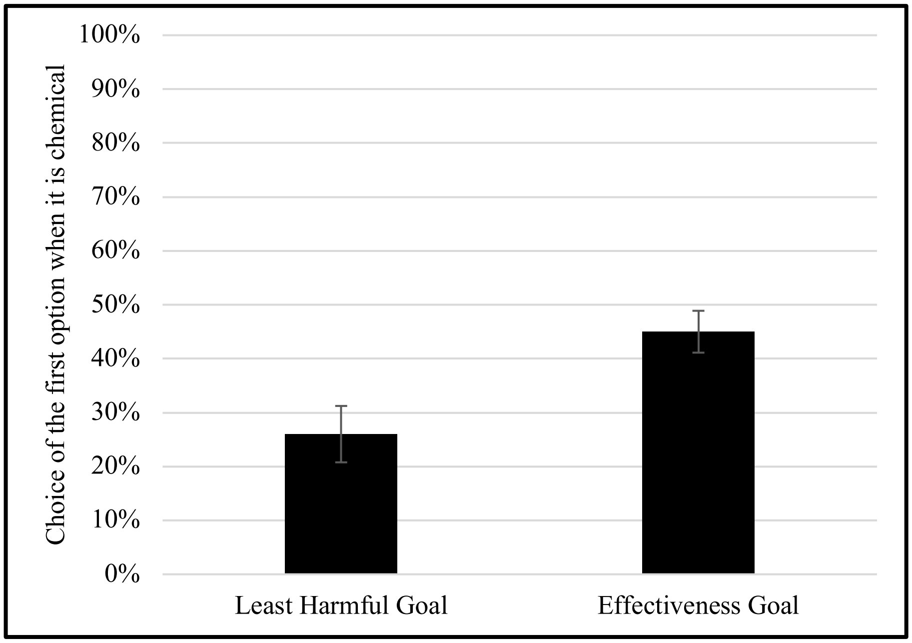


Fig 21: Choice percentage of the first option when its descriptions had chemicals, by type of goal. Error bars represent standard errors. Indifferent people excluded from this graph.

<u>Discussion</u>

The results suggest that consumers preference for products with less vs. more chemical-seeming names depends on the goal that they have when considering buying a cleaning product,. When the goal is to get the most effective product, the presence of chemical-seeming ingredients might be more desirable, and chemical aversion is reduced.

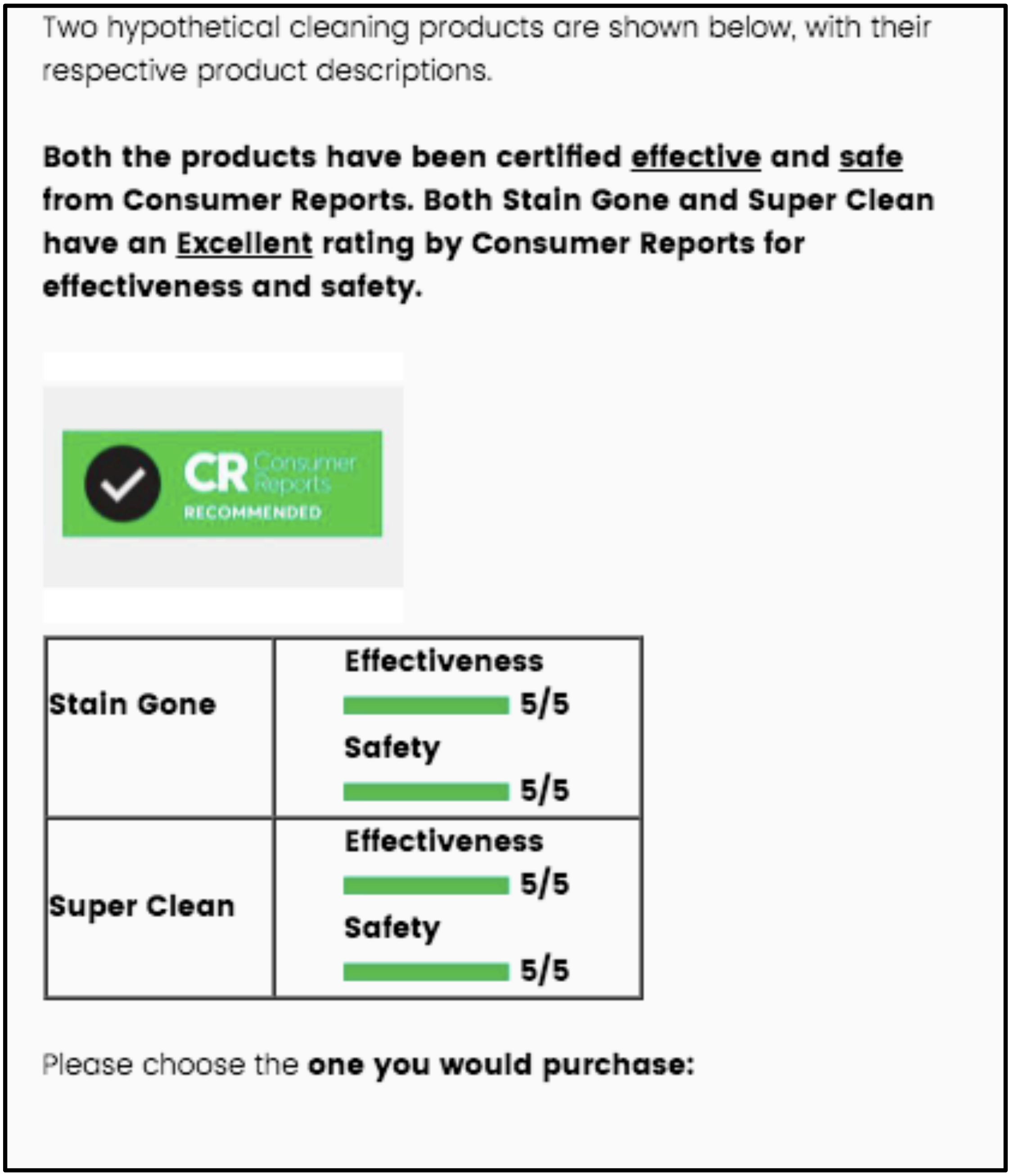
Although chemical-seeming ingredients were seen as both more harmful and more effective in both conditions, perceived harm only mediated the choice of products with chemical-seeming ingredients when the goal was to get the least harmful ingredients, but perceived effectiveness mediated the choice of products when the goal was selecting the most effective product. Thus, people seem to tolerate perceived harm when their goal values perceived effectiveness more, but they do not care about perceived effectiveness when their goal is to reduce harm. These results suggest that the impact on product choices of associations with incomprehensible ingredients (e.g., the inferred pragmatic meaning) depends on the goals that people have.

Study 4

In this study, we test whether preferences between products with chemical-seeming and non-chemical-seeming ingredients, as seen in Study 3, is attenuated when external cues of effectiveness and safety are present.

Method

As in Study 3b, we recruited participants from Prolific (N=1200) and asked them which of the two reasons was more important to them when purchasing a cleaning product: (1) Selecting a product that was the most effective, or (2) Selecting a product that had the least harmful ingredients (preregistered at aspredicted.org https://aspredicted.org/hb3ib.pdf). Participants were then asked to choose between two products, one with generated chemical-seeming ingredient names and the other with either natural-seeming (neutral), natural-seeming (neutral)with markers, or Latin ingredient names in the descriptions, or to indicate indifference between the two. For half the participants (the external information condition), the choice question also included a section that said that both the products were certified effective and safe by Consumer Reports (as depicted in Image 1), which was not presented to the other half of participants (the control condition).



Two hypothetical cleaning products are shown below, with their respective product descriptions.

Both the products have been certified effective and safe from Consumer Reports. Both Stain Gone and Super Clean have an Excellent rating by Consumer Reports for effectiveness and safety.

Stain Gone	**Effectiveness** **5/5** **Safety** **5/5**
Super Clean	**Effectiveness** **5/5** **Safety** **5/5**

Please choose the **one you would purchase:**

Image 1: The description when Consumer Reports certification was present

We screened out the ~44% of participants who were indifferent between the two products. This left us with 688 responses after other exclusions (duplicated IPAddresses, failed attention checks). Participants who passed the screener (i.e., did not indicate indifference between the products) were asked about perceived harm, perceived effectiveness, perceived foreignness (“Please rate how Foreign or English you think the ingredient names in each are. That is, do you think they are real words in some other language but not in English?") and perceived gibberish-ness ("Please rate how made up or real you think the ingredient names in each are. That is, do you think the ingredient names are real words in some language or are they NOT real words in any language?") for each of the products (See Appendix for more details).

Results

Choice of the product that had made-up chemical-seeming names in its description was positively related to people's goal being effectiveness of the product (Interaction ß= .60, t(681)= 5.90, p<.001), but was not significantly affected by inclusion of the Consumer Reports certification (Interaction ß= .14, t(681)= 1.34, p=.181). That is, people considering buying a cleaning product were more likely to choose a product described with chemical-seeming names when their goal was effectiveness. However, the addition of the external cue did not seem to significantly change the impact on choice of chemical-seeming names.

However, the three-way interaction of whether chemical-seeming names were in the first option, whether the goal was effectiveness, and whether the Consumer Reports certification was present or not was significant (Interaction ß= -.30, t(681)= -2.60 p=.009). This suggests that the relationship between stated goal and degree of chemical aversion was impacted by the external information. Fig 22a shows that when the certification was absent, there was less chemical aversion among those with an effectiveness goal than those with a harm-reduction goal. However, when the certification was present, the difference was reduced (Fig 22b).

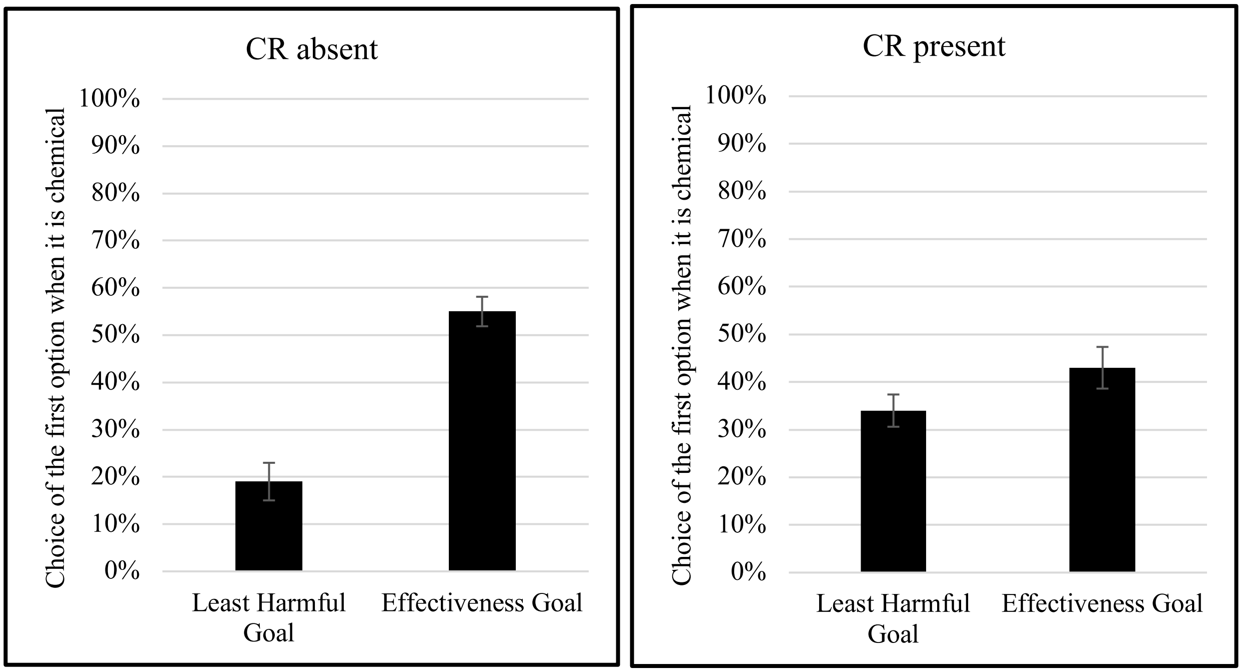


Fig 22a: Choice of first option, by whether the first option had chemical-seeming names and by goal, when certification was absent. **Fig 22b:** Choice of first option, by whether the first option had chemical-seeming names and by goal, when certification was present. Error bars represent standard errors. Indifferent people excluded from this graph.

Overall, the first option was seen as more harmful than the second option when it contained generated chemical-seeming ingredients (ß= 2.86, t(686)= 17.22, p<.001), and as more effective (ß= 1.33, t(686)= 11.97, p<.001). For perceived harm, these results held regardless of goal both when Consumer Reports certification was absent (all p's<.001) and when it was present (all p's<.001). That suggests that even with an external cue of safety, people still considered chemical-seeming names to be relatively more harmful than non-chemical-seeming names. Similarly, for perceived effectiveness, people considered the first option to be more effective than the second when it had chemical-seeming names, in all conditions (all p's<.001). Again, this suggests that even with an external cue of safety, people still considered chemical-seeming names to be relatively more effective than non-chemical-seeming names.

When Consumer Reports certification was absent and people cared about reducing harm, the overall negative indirect effect of -.45 was significant ($p<.001$) due to the indirect effect of relative harm (-.42). When people cared about effectiveness of the product, the overall positive indirect effect (.09) was marginally significant ($p=.073$), due to the indirect effect of relative effectiveness (.25).

When Consumer Reports certification was present and people cared about reducing harm, the overall negative indirect effect of -.23 was significant ($p<.001$) due to the indirect effect of relative harm (-.32). When people cared about effectiveness of the product, the overall indirect effect was not significant ($p=.122$).

Finally, the first option was seen as less foreign than the second when the first had chemical-seeming names ($p<.001$). Similarly, the first option was seen as less made-up than the second when the first had chemical-seeming names ($p<.001$). This suggests that chemical-seeming names are not only recognized more as chemical (as depicted in prior studies) but they are also seen as English, and real words.

Discussion

The results from this study mostly replicate the results from Study 3b. Most importantly, they indicate that even when external cues of effectiveness and safety are mentioned, people still show chemical aversion, regardless of their goals. That happens because, despite having an external cue about safety and effectiveness, people still think that chemicals are more harmful than non-chemicals and that feeling is stronger than the feelings of higher effectiveness.

In the next study, we test whether the association of chemical-seeming ingredients with the pragmatic inference of chemical-ness can cause consumers to choose a harmful option when they do not understand the semantic meaning of ingredients.

Study 5

In this study, we provide participants with ingredients that have contradictory semantic and pragmatic meaning, such that the less chemical-seeming ingredients according to pragmatic meaning actually are in fact more harmful than the more chemical-seeming ingredients, which in fact are certified as organic food ingredients.

Method

We picked 3 real natural-sounding ingredients that are actually toxic and unsafe for consumption (Belladona, Oleander, Ephedra), and 3 chemical-sounding ones that are naturally occurring and healthy to eat (Xinomavro, Zabuton, Zanthoxylum) (preregistered at aspredicted.org https://aspredicted.org/yp6rs.pdf). A pre-test (N=201) confirmed that people thought that the ingredients selected as chemical-seeming did sound chemical (4.99, $t(100)=8.39$, $p<.001$), and that the natural-seeming ones sounded natural (4.89, $t(99)=7.96$, $p<.001$).

In the main study, we asked people to choose between two chips brands – one of which had the 3 chemical-seeming ingredient names along with potato and salt in the ingredient list, and another that had the 3 natural-seeming ingredient names along with potato and salt in the ingredient list. They could also indicate indifference. Then, they rated the perceived harm and healthiness ("Please rate how unhealthy or healthy you think each of these two products are") for each option. Finally, we also asked if they were familiar with any of the ingredients shown. We report the results for those that said that they were unfamiliar with *all* the ingredients (~43% of the participants) (See Appendix for more details).

Results

Eighty-six people (~43%) indicated that they were indifferent. Among those who were indifferent and unfamiliar with the ingredients, the results show that when the first option had chemical-seeming ingredients, it was chosen less than when it was natural-sounding (21% vs 69%, $t(88)=-5.04$, $p<.001$). The first chips option was seen as more harmful than the second one when it had chemical-seeming names in the ingredient list (.58 vs -.73, $t(136)=5.81$, $p<.001$). Similarly, the first chips option was seen as less healthy than the second one when it had chemical-seeming names in the ingredient list (.77 vs -.76, $t(136)=6.57$, $p<.001$). No significant overall mediation was found ($p=.240$).

In a replication of the study (preregistered at aspredicted.org https://aspredicted.org/tj68k.pdf). with a different food type (cereals) (N=392), where 158 (~40%) participants indicated indifference, we find the same effect such that the first option was chosen significantly more when it was natural-sounding (63% vs 33%, $t(74)=2.62$, $p=.011$) than chemical-sounding (See Appendix for more details).

Discussion

In this study, we show that pragmatic inferences can lead to mistaken decisions when the semantic meaning is not known. We replicate the effect in a second study, in a different food category.

General Discussion

In this paper, we propose a theoretical model for how people incorporate meaningful incomprehensible language in their decisions. We posit that since the access to semantic meaning is blocked for incomprehensible cues, people assign unknown ingredients to categories based on morphological associations, thus relying on pragmatic meaning. If people have stronger positive associations with the category then the cue will have a positive impact on their decisions. Conversely, if they have stronger negative associations with the category then the cue will have a negative impact on their decisions.

In Study 1a, we find that people sort identical ingredients represented either as chemical-seeming names, natural-seeming names, or Latin names into the respective pragmatic rather than semantic categories, regardless of whether identifiable markers were present or not. The groups into which people categorized the chemical-seeming names were seen as more harmful, less natural-seeming and less edible than the groups into which people categorized natural-seeming or Latin names. Study 1a, thus, provides evidence for the categorization phase (pragmatic meaning) of the proposed framework, and also documents positive and negative associations, as depicted in the framework.

In Study 1b, we repeat the same task but with generated chemical, natural, and Latin names, with identifiable markers in one condition and without in another. Although we do not find strong evidence for sorting by the type of name (specifically for chemicals) in condition without markers, we still see strong associations with the names. That is, regardless of presence of markers, chemical-seeming names were seen as more harmful, and less edible than natural-seeming and Latin names. Most importantly, people exhibited strong pragmatic inferences, such that they thought that the chemical-seeming names were more chemical than the natural-seeming or Latin names, and the natural-seeming names were more natural than the chemical-seeming names. When looking at confidence about the chemical-ness and natural-ness inferences, we find that people are much more confident about these pragmatic meanings than definitions and purposes, which form the semantic meanings. This study, establishes that people do make pragmatic inferences, and are confident about the inferred pragmatic meaning, more so than for semantic meaning.

Study 2 finds that, in the domain of cosmetics, people are more likely to choose products with real natural-seeming names in the descriptions than products with chemical-seeming names for the same ingredients, because the chemical-seeming names seem more harmful.

In Study 3a and 3b, we use generated chemical-seeming, natural-seeming, and Latin names to test if different goals for a given product can change the preference regarding products with chemical-seeming names in them. In two pretests we show that generated chemical-seeming names (without any identifying marker) were the only names whose pragmatic meanings were strong, that is, they were recognized as chemical. Generated natural-seeming names and Latin names were not seen as natural, but they were still seen as more natural than the chemical-seeming ones. Thus, it seemed that people draw stronger inferences from the morphological structure of chemical-seeming names than for natural-seeming names. Natural-seeming and Latin names were used as different control ingredients in these two studies.

In Study 3a, where we manipulated the goal of a cleaning product, we find that the choice of products with chemical-seeming names increases when the goal was to scrub a dirty toilet rather than maintain a marble table top. In Study 3b, we measured people's goals about a cleaning product and found that when people cared more about buying an effective cleaning product, they chose the product with chemical-seeming names more often than when their goal was buying a product with the least harmful ingredients. Thus, these two studies suggest that when it seems that positive associations are more important than negative associations with the names, there is a positive impact on choice.

In Study 4, we test whether an external cue of effectiveness and safety can attenuate the different effects across goals, and we find partial evidence, depending on the goal. Finally, in Study 5, we show that such pragmatic inferences can lead to harmful decisions. Overall, only two primary mediators were tested in the studies (perceived harm for negative association and perceived edibility/effectiveness/healthiness for positive associations). Given the inconsistent mediation evidence across the studies, it is important to note that other potential mediators may matter be involved in these decisions. Future research on the relevant set of mediators would be important for a complete exploration of the proposed framework.

Although prior research has extensively studied how people process and incorporate comprehensible cues in their decision-making, much less is known about the potential effects of incomprehensible language. We use the domain of ingredients to study the effect that different meaningful incomprehensible cues have on evaluations and choice. Although there is prior research on “natural” bias in the domain of ingredients, in our studies, we leave the category assignment of ingredients up to people by manipulating the morphological structure of ingredients, thus allowing them to make their own pragmatic inferences when they cannot access semantic meaning. Moreover, across the studies, we find that people make more reliable pragmatic inferences from chemical-seeming ingredient names, because there exist morphological structures in chemical-seeming names that people can recognize more easily than any such structure in natural-seeming names.

This paper proposes a framework for understanding evaluations and resulting choices between products described using incomprehensible language. The strongest finding in this paper was that chemical aversion is very robust, and can sometimes be reversed when its perceived benefits are more important than the harm. However, the associations discussed in the paper are not an exhaustive list of mediators as we found mixed evidence of mediation across the studies.

Although this paper used ingredients as the domain in which to investigate incomprehensible language, there are many other types of incomprehensible language encountered by consumers. The impact of scientific language, another type of frequently incomprehensible language, on people’s beliefs about climate change and/or other environmental or disease related issues can also be another direction for future research.

This paper also has important practical takeaways for marketers. The findings suggest that marketing products which mention ingredients in their names or descriptions can benefit from understanding the pragmatic inferences people draw from those ingredients, even when they have no idea about the semantic meaning. As previously depicted in Fig 1, the cosmetics industry, for example, uses the names of chemical-seeming ingredients quite often in their product descriptions. The results of this paper suggest that that might be a mistake, since chemical-seeming names are often seen as harmful. This can switch for another product domain, where the associations made with the chemical-seeming names can be seen as desirable, like buying a cleaning product for effectiveness. That is why, understanding the mechanisms of how consumers incorporate and use incomprehensible language in their decisions, will not only help researchers but also marketers.

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APPENDICES

APPENDIX A

Supplemental Statistical Materials (Essay 1)

Variable List used in Regressions

Variable	Description
dP	Present1-Present2. 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 Present1=1 and Present2=0. Therefore, dP=Present1- Present2=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	Neutral1-Neutral2. 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 Neutral1=1 and Neutral2=0. Therefore, dN=Neutral1- Neutral2=1-0=1. Conversely, if the second option had neutral tense and not the first option, dN=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.

Study 1A

Regression 1A: 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).

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.3310484	0.0141823	23.34	0.000	0.3031147	0.358982
dN	- 0.1762097	0.0148567	-11.86	0.000	- 0.2054717	-0.1469477
constant	0.5229839	0.0085735	61	0.000	0.5060974	0.5398704

Study 1B

Regression 1B.1: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.1313126	0.0138443	9.48	0.000	0.1040664	0.1585587
dN	-0.0898723	0.0155695	-5.77	0.000	-0.1205136	-0.0592309
dMoney	0.0072897	0.0148225	0.49	0.623	-0.0218814	0.0364609
constant	0.4820995	0.0113559	42.45	0.000	0.4597507	0.5044484

Regression 1B.2: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.2284378	0.021889	10.44	0.000	0.1853552	0.2715204
dN	-0.1025122	0.0259069	-3.96	0.000	-0.1535031	-0.0515212
constant	0.4865283	0.0180311	26.98	0.000	0.4510388	0.5220178

Regression 1B.3: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0781425	0.0164297	4.76	0.000	0.0458083	0.1104768
dN	-0.0849833	0.019018	-4.47	0.000	-0.1224114	-0.0475552
constant	0.4796191	0.0122714	39.08	0.000	0.4554686	0.5037696

Replication of 1B with larger difference in amounts

Regression 1B.4: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.1188228	0.0223569	5.31	0.000	0.0747201	0.1629255
dMoney	0.0040097	0.0035683	1.12	0.263	-0.0030294	0.0110488
constant	0.5271042	0.0156547	33.67	0.000	0.4962228	0.5579855

Study 2A

Regression 2A: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0103935	0.0094033	1.11	0.271	-0.0082398	0.0290268
dN	0.0090324	0.0077696	1.16	0.248	-0.0063636	0.0244284
dMoney	0.0609779	0.0216842	2.81	0.006	0.0180092	0.1039467
D	0.0058131	0.0174092	0.33	0.739	-0.0286843	0.0403105
constant	0.624793	0.1535518	4.07	0.000	0.3205198	0.9290662

Study 2B

Regression 2B.1: 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).

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.020514	0.0146835	1.4	0.163	-0.008289	0.0493171

Delay	0.1449767	0.0184163	7.87	0.000	0.1088514	0.181102
Hidden Zero	-0.1689475	0.0183926	-9.19	0.000	-0.2050263	-0.1328687
constant	0.2330158	0.016185	14.4	0.000	0.2012675	0.2647641

Regression 2B.2: 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).

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0204763	0.0225996	0.91	0.365	-0.0238921	0.0648447
Hidden Zero	-0.2148287	0.0289106	-7.43	0.000	-0.2715871	-0.1580704
constant	0.4007123	0.0224446	17.85	0.000	0.3566483	0.4447763

Regression 2B.3: 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).

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0210994	0.0188104	1.12	0.262	-0.0158293	0.0580282
Hidden Zero	-0.1234432	0.0227141	-5.43	0.000	-0.1680357	-0.0788507
constant	0.2101069	0.018793	11.18	0.000	0.1732123	0.2470014

Regression 2B.4: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0330047	0.0187629	1.76	0.079	-0.0038311	0.0698406
Delay	0.099113	0.0222385	4.46	0.000	0.0554537	0.1427723
constant	0.0866314	0.0127408	6.8	0.000	0.0616184	0.1116444

Regression 2B.5: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0085332	0.0225918	0.38	0.706	-0.0358194	0.0528859
Delay	0.1904733	0.029262	6.51	0.000	0.1330255	0.2479211
constant	0.2101414	0.0187885	11.18	0.000	0.1732554	0.2470274

Regression 2B.6: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.025798	0.0164848	1.56	0.118	-0.0065385	0.0581344
Delay	0.1221279	0.0205275	5.95	0.000	0.0818613	0.1623945
Hidden Zero	-0.1890783	0.0204935	-9.23	0.000	-0.2292781	-0.1488785
constant	0.2438176	0.0186542	13.07	0.000	0.2072256	0.2804095

Regression 2B.7: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	

dP	0.0152301	0.0171289	0.89	0.374	-0.0183698	0.04883
Delay	0.1678255	0.0213186	7.87	0.000	0.1260071	0.209644
Hidden	-0.1488167	0.0212854	-6.99	0.000	-0.1905699	-0.1070636
Zero						
constant	0.2222141	0.0181343	12.25	0.000	0.1866421	0.2577861

Study 3

Regression 3.1: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.0427338	0.0081003	5.28	0.000	0.0267815	0.0586861
dN	-0.1286055	0.0129352	-9.94	0.000	-0.1540795	-0.1031316
dMoney	-0.0001644	0.0007452	-0.22	0.826	-0.001632	0.0013032
constant	0.4962379	0.0092856	53.44	0.000	0.4779514	0.5145244

Regression 3.2: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.0714985	0.0164278	4.35	0.000	0.0391464	0.1038506
dN	-0.1277668	0.0129158	-9.89	0.000	-0.1532024	-0.1023312
dMoney	-0.0001806	0.0007489	-0.24	0.81	-0.0016554	0.0012943
dpXdMoney	0.0026239	0.0011937	2.2	0.029	0.000273	0.0049748
constant	0.4962385	0.0092884	53.43	0.000	0.4779465	0.5145305

Regression 3.3: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.0029714	0.0094896	0.31	0.755	-0.0158026	0.0217454
dN	0.0012031	0.0152891	0.08	0.937	-0.0290446	0.0314509
D	0.0066717	0.0122604	0.54	0.587	-0.0175841	0.0309274
dMoney	0.0001642	0.0008843	0.19	0.853	-0.0015852	0.0019136
constant	0.4364496	0.1115307	3.91	0.000	0.2157994	0.6570998

Regression 3.4: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0223393	0.0146826	1.52	0.131	-0.0067085	0.0513871
dN	0.0015954	0.0151332	0.11	0.916	-0.0283438	0.0315346
D	0.0188123	0.0180338	1.04	0.299	-0.0168653	0.05449
dMoney	-0.0088362	0.0102637	-0.86	0.391	-0.0291417	0.0114693
dpXdMoney	0.0017096	0.0012796	1.34	0.184	-0.0008219	0.0042412
DXdMoney	0.0010047	0.0011588	0.87	0.388	-0.0012879	0.0032973
constant	0.3272502	0.1606581	2.04	0.044	0.0094074	0.645093

Regression 3.5: 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").

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0158246	0.0124545	1.27	0.206	-0.0088224	0.0404716
dN	0.0040146	0.014633	0.27	0.784	-0.0249436	0.0329728
earlier	0.0308088	0.0357663	0.86	0.391	-0.0399715	0.1015892
dMoney	-0.0012474	0.0010873	-1.15	0.253	-0.0033991	0.0009043
constant	0.4851554	0.0163623	29.65	0.000	0.4527749	0.5175359

Regression 3.6: 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").

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.0212787	0.0202766	1.05	0.296	-0.018848	0.0614055
dN	0.0073188	0.0132563	0.55	0.582	-0.0189149	0.0335525
earlier	-0.1692944	0.0455467	-3.72	0.000	-0.25943	-0.0791587
dMoney	-0.0004818	0.0009316	-0.52	0.606	-0.0023254	0.0013619
dpXdMoney	0.0011517	0.0014601	0.79	0.432	-0.0017378	0.0040412
earlierXdMoney	-0.0188325	0.0029339	-6.42	0.000	-0.0246385	-0.0130265
constant	0.4947847	0.0152466	32.45	0.000	0.4646121	0.5249573

Regression 3.7: 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").

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	-0.0014683	0.0076188	-0.19	0.847	-0.0165256	0.013589
dN	0.0198413	0.0117312	1.69	0.093	-0.0033437	0.0430263
earlier	-0.1904129	0.0323722	-5.88	0.000	-0.2543916	-0.1264341
dMoney	-0.0007507	0.0011217	-0.67	0.504	-0.0029676	0.0014661
constant	0.4781049	0.0108269	44.16	0.000	0.4567072	0.4995026

Regression 3.8: 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").

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0214436	0.0111197	1.93	0.056	-0.0005329	0.04342
dN	0.0219289	0.009915	2.21	0.029	0.0023334	0.0415244
earlier	-0.4088197	0.035764	-11.43	0.000	-0.4795018	-0.3381377
dMoney	-0.0009772	0.000919	-1.06	0.289	-0.0027935	0.0008392
dpXdMoney	0.002227	0.0011273	1.98	0.05	-9.62E-07	0.004455
earlierXdMoney	-0.0215508	0.0027786	-7.76	0.000	-0.0270422	-0.0160593
constant	0.4778867	0.0099623	47.97	0.000	0.4581977	0.4975756

Regression 3.9: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0909011	0.0117085	7.76	0.000	0.0679106	0.1138916
dN	-0.0439352	0.0074345	-5.91	0.000	-0.0585334	-0.029337
dMoney	-0.0004431	0.0004581	-0.97	0.334	-0.0013426	0.0004564
objective time	-0.0040057	0.0084497	-0.47	0.636	-0.0205974	0.012586
ambiguous time	-0.0062027	0.0072817	-0.85	0.395	-0.0205009	0.0080956
dpXdMoney	0.0018399	0.0006514	2.82	0.005	0.0005608	0.0031189
dpXobjective	-0.0823971	0.0118784	-6.94	0.000	-0.1057212	-0.059073
dpXambiguous	-0.0839932	0.0113786	-7.38	0.000	-0.1063359	-0.0616505
constant	0.493308	0.0063898	77.2	0.000	0.4807612	0.5058547

Study 4A

Regression 4a.1: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.4782609	0.052253	9.15	0.000	0.3753028	0.5812189
dN	-0.0782609	0.028478	-2.75	0.006	-0.1343733	-0.0221484
constant	0.3217391	0.0344124	9.35	0.000	0.2539338	0.3895445

Regression 4a.2: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.273913	0.0588273	4.66	0.000	0.158001	0.389825
dN	-0.1608696	0.0311773	-5.16	0.000	-0.2223006	-0.0994386
constant	0.4173913	0.0370089	11.28	0.000	0.3444699	0.4903128

Regression 4a.3: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dP	0.2391304	0.0594879	4.02	0.000	0.1219169	0.356344
dN	-0.1869565	0.0305333	-6.12	0.000	-0.2471187	-0.1267943
constant	0.4608696	0.0373207	12.35	0.000	0.3873336	0.5344055

Study 4B

Regression 4b.1: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0169116	0.0199482	0.85	0.397	-0.0224024	0.0562256
dN	-0.3286382	0.0222099	-14.8	0.000	-0.3724096	-0.2848667
dMoney	0.0011164	0.017771	0.06	0.95	-0.0339068	0.0361396
constant	0.5031826	0.0155896	32.28	0.000	0.4724585	0.5339066

Regression 4b.2: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0037348	0.0214378	0.17	0.862	-0.0385149	0.0459846
dN	-0.2787307	0.0241134	-11.56	0.000	-0.3262536	-0.2312078
dMoney	0.0243707	0.0181549	1.34	0.181	-0.011409	0.0601505
constant	0.478711	0.0156781	30.53	0.000	0.4478125	0.5096095

Pretest Study 5a: Earliness Inferences of Immediate vs. 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 – Eg., "Which of the two statements do you think would occur earlier? – "You will get $20 promptly" vs. "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

Study 5a

Regression 5a.1: 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").

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0877581	0.0194395	4.51	0.000	0.0492413	0.126275
dN	-0.109882	0.0186732	-5.88	0.000	-0.1468805	-0.0728835
constant	0.5103245	0.0104905	48.65	0.000	0.489539	0.53111

Regression 5a.2: 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").

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.070059	0.0179009	3.91	0.000	0.0345906	0.1055273
dN	-0.0634218	0.0190521	-3.33	0.001	-0.1011712	-0.0256725
constant	0.5110619	0.0156729	32.61	0.000	0.4800081	0.5421158

Study 5b

Regression 5b.1: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0160237	0.0130214	1.23	0.22	-0.009653	0.0417005
dMoney	0.0309093	0.0021534	14.35	0.000	0.0266631	0.0351555
constant	0.5208305	0.0130244	39.99	0.000	0.4951478	0.5465133

Regression 5b.2: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.028552	0.0198031	1.44	0.151	-0.0104977	0.0676016
constant	0.511052	0.0198031	25.81	0.000	0.4720023	0.5501016

Regression 5b.3: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	-0.0075619	0.0185306	-0.41	0.684	-0.0441023	0.0289785
constant	0.5199381	0.0185306	28.06	0.000	0.4833977	0.5564785

Regression 5b.4: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0160946	0.0130249	1.24	0.218	-0.0095892	0.0417784
dMoney	0.0309153	0.0021479	14.39	0.000	0.0266799	0.0351507

dpXdMoney	0.0004043	0.0021479	0.19	0.851	-0.0038311	0.0046397
constant	0.5209039	0.0130249	39.99	0.000	0.4952201	0.5465877

Regression 5b.5: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	-0.0227086	0.0109129	-2.08	0.039	-0.0442271	-0.0011902
dMoney	0.0190996	0.0023964	7.97	0.000	0.0143742	0.023825
constant	0.5143821	0.010906	47.17	0.000	0.4928772	0.535887

Regression 5b.6: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	-0.0462618	0.0170069	-2.72	0.007	-0.0797967	-0.0127269
constant	0.5258536	0.0170069	30.92	0.000	0.4923187	0.5593885

Regression 5b.7: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dP	0.0038265	0.0169064	0.23	0.821	-0.0295102	0.0371632
constant	0.5038265	0.0169064	29.8	0.000	0.4704898	0.5371632

Regression 5b.8: 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.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
dp	-0.0226184	0.0109463	-2.07	0.040	-0.0442026	-0.0010341
dMoney	0.0188419	0.0024095	7.82	0.000	0.0140909	0.023593
dpXdMoney	-0.0029248	0.0024095	-1.21	0.226	-0.0076759	0.0018262
constant	0.5146166	0.0109463	47.01	0.000	0.4930324	0.5362009

Regression 5b.9: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
promptly_first	-0.0323383	0.041166	-0.79	0.433	-0.1135135	0.0488368
constant	0.5223881	0.0267125	19.56	0.000	0.4697138	0.5750623

Regression 5b.10: 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".

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
someday_first	-0.0816832	0.045078	-1.81	0.071	-0.1705697	0.0072034
constant	0.5544554	0.0278271	19.93	0.000	0.499585	0.6093258

<u>Post-test Study 5b</u>

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. Eg., "Which of the following do you think is more likely to occur? – "You get $20" vs. "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 vs. eventually, the option with the future tense ("will get") was chosen significantly more than the option with present tense ("get"). This post-test 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 to "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".

Meta-Analysis

Regression 6.1: 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.

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.5343213	0.0228906	23.34	0.000	0.4892356	0.5794069
dn_std	-0.2287234	0.0192843	-11.86	0.000	-0.266706	-0.1907408
constant	0.1298268	0.0171213	7.58	0.000	0.0961044	0.1635492

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

Regression 6.2: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.1590986	0.0234951	6.77	0.000	0.1128854	0.2053117
dn_std	-0.2014923	0.015856	-12.71	0.000	-0.2326799	-0.1703048
study 4a	0.0878763	0.0382169	2.3	0.022	0.0127066	0.163046
constant	0.0822503	0.0215938	3.81	0.000	0.0397768	0.1247237

Regression 6.3: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.909544	0.0514053	17.69	0.000	0.8085844	1.010504
dn_std	-0.2559544	0.0416561	-6.14	0.000	-0.3377667	-0.1741421
timing_info	-0.0246129	0.0275406	-0.89	0.372	-0.0787024	0.0294766
dpXtime_std	-0.7378978	0.0644545	-11.45	0.000	-0.864486	-0.6113097
dnXtime_std	0.0527327	0.0483027	1.09	0.275	-0.0421335	0.1475989
study 4a	0.0878763	0.0381972	2.3	0.022	0.0128572	0.1628954
constant	0.1313738	0.0405404	3.24	0.001	0.0517528	0.2109947

Regression 7.1: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.1918177	0.0190907	10.05	0.000	0.1542909	0.2293444
dn_std	-0.1271532	0.0175246	-7.26	0.000	-0.1616016	-0.0927048
study 1b	-0.0066329	0.0322553	-0.21	0.837	-0.0700374	0.0567716
constant	0.0336147	0.0229472	1.46	0.144	-0.0114928	0.0787223

Regression 7.2: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.0479625	0.0159339	3.01	0.003	0.0165825	0.0793425
dn_std	-0.1663411	0.0201712	-8.25	0.000	-0.2060659	-0.1266163
constant	0.0622842	0.0116032	5.37	0.000	0.039433	0.0851354

Regression 7.3: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.0146181	0.0186713	0.78	0.434	-0.0220997	0.051336
dn_std	-0.2683904	0.0204752	-13.11	0.000	-0.3086557	-0.2281251
study 3	0.018693	0.0337445	0.55	0.580	-0.0476669	0.085053
constant	0.0338713	0.024532	1.38	0.168	-0.0143718	0.0821144

Regression 7.4: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.0109686	0.0179469	0.61	0.542	-0.0243674	0.0463047
dn_std	0.0102816	0.0191549	0.54	0.592	-0.027433	0.0479962
constant	0.0302979	0.0175646	1.72	0.086	-0.0042854	0.0648812

Regression 7.5: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.0409645	0.0278566	1.47	0.143	-0.0140273	0.0959563
dn_std	0.0488334	0.0246846	1.98	0.050	0.0001035	0.0975633
study 2a	-0.1776898	0.1039291	-1.71	0.089	-0.3828562	0.0274766
constant	0.0717623	0.0334233	2.15	0.033	0.0057814	0.1377433

Regression 7.6: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.0152756	0.0159096	0.96	0.337	-0.0159303	0.0464814
dn_std	-0.0046548	0.0163427	-0.28	0.776	-0.03671	0.0274004
study 2b	-0.2352159	0.0862352	-2.73	0.006	-0.4043614	-0.0660705
study 3	0.299275	0.0873075	3.43	0.001	0.1280262	0.4705237
constant	-0.2717259	0.0840397	-3.23	0.001	-0.436565	-0.1068868

Regression 7.7: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf.	Interval]
dp_std	0.1821631	0.0179573	10.14	0.000	0.1468897	0.2174365
dn_std	-0.1354643	0.0165529	-8.18	0.000	-0.1679788	-0.1029497
dMoney_std	-0.001162	0.018068	-0.06	0.949	-0.0366526	0.0343287
dpXdMoney_std	0.0758139	0.0150925	5.02	0.000	0.0461678	0.1054599
dnXdMoney_std	0.0065835	0.0129238	0.51	0.611	-0.0188025	0.0319695
study 1b	-0.0311984	0.0291499	-1.07	0.285	-0.088457	0.0260603
constant	0.0577452	0.0177714	3.25	0.001	0.0228371	0.0926534

Regression 7.8: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf.	Interval]
dp_std	0.0227325	0.0171911	1.32	0.187	-0.0110443	0.0565092
dn_std	-0.2408195	0.0190186	-12.66	0.000	-0.2781868	-0.2034522
dMoney_std	-0.020036	0.0180087	-1.11	0.266	-0.055419	0.0153471
dpXdMoney_std	0.015413	0.0154022	1	0.317	-0.0148488	0.0456748
dnXdMoney_std	-0.1179758	0.0149481	-7.89	0.000	-0.1473455	-0.0886061
study 3	-0.0153636	0.0314939	-0.49	0.626	-0.0772422	0.046515
constant	0.0352376	0.0245863	1.43	0.152	-0.0130691	0.0835443

Regression 7.9: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.0145003	0.0108482	1.34	0.182	-0.0067778	0.0357784
dn_std	-0.001354	0.0141081	-0.1	0.924	-0.0290263	0.0263182
dMoney_std	0.0165642	0.0207098	0.8	0.424	-0.0240569	0.0571853
dpXdMoney_std	0.0104865	0.0092826	1.13	0.259	-0.0077208	0.0286937
dnXdMoney_std	-0.0098573	0.0160729	-0.61	0.540	-0.0413834	0.0216689
study 2a	0.3279438	0.0955418	3.43	0.001	0.1405442	0.5153435
study 3	0.5931335	0.0590548	10.04	0.000	0.4773009	0.7089662
constant	-0.5371013	0.042042	-12.78	0.000	-0.6195643	-0.4546383

Regression 7.10: 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).

	Coef.	Std. Error	t	P>|t|	[95% Conf. Interval]	
dp_std	0.2228746	0.0224234	9.94	0.000	0.1789023	0.2668469
dn_std	-0.2506283	0.0213924	-11.72	0.000	-0.2925788	-0.2086777
dMoney_std	-0.0057347	0.0109668	-0.52	0.601	-0.0272407	0.0157713
timing_info	-0.004846	0.0080392	-0.6	0.547	-0.0206109	0.010919
dpXtime_std	-0.1544815	0.0188831	-8.18	0.000	-0.1915112	-0.1174518
dpXdMoney_std	0.0310738	0.0071319	4.36	0.000	0.0170882	0.0450595
dnXtime_std	0.1084108	0.0173573	6.25	0.000	0.0743731	0.1424485
dnXdMoney_std	-0.0509517	0.008527	-5.98	0.000	-0.0676732	-0.0342302
study 1b	0.2235986	0.0861496	2.6	0.010	0.0546592	0.392538
study 2b	-0.2801362	0.0869403	-3.22	0.001	-0.4506264	-0.1096461
study 3	0.2480298	0.0824425	3.01	0.003	0.0863599	0.4096997
study 4b	0.2459118	0.0855152	2.88	0.004	0.0782165	0.4136072
constant	-0.1992521	0.0850288	-2.34	0.019	-0.3659936	-0.0325106

Power Analysis

All the studies were highly powered to detect relevant effects. Studies 1A and 1B had over 99% power to detect the effects observed in (Falk et al 2018) or r=.32. In fact, Studies 1A and 1B had over 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 3 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, 5 trials per ambiguous timing word) and Study 5B (N=201 per condition, 8 trials).

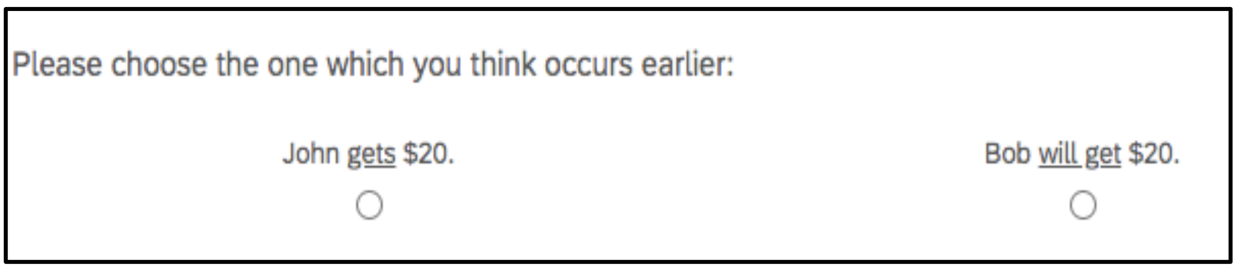
Appendix B

Sample questions (Essay 1)

Study 1a

Overview: The study included 10 earliness inference questions, where only the tense form was changed between options within subjects. We tested 5 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”).

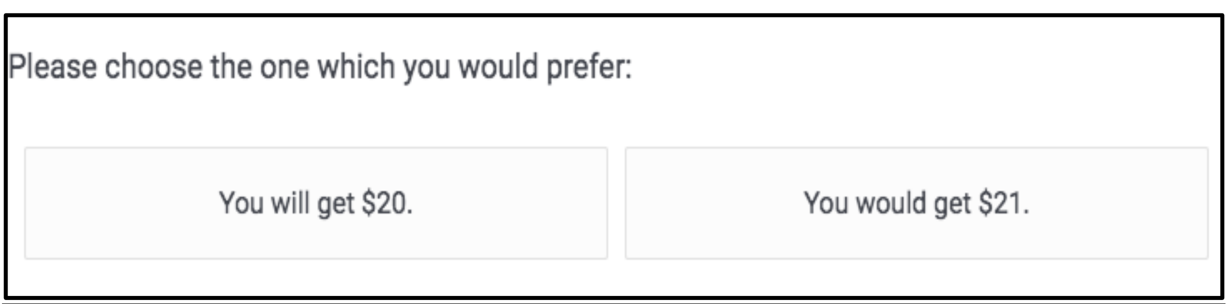
Sample Question: The other pairs tested were “will get” vs. “would get”; “will get” vs. “is getting”; “will get” vs. “is going to get”; “gets” vs. “would get”; “gets” vs. “is getting”; “gets” vs. “is going to get”; “is getting” vs. “would get”; “is getting” vs. “is going to get”; “is going to get” vs. “would get”.



Study 1b

Overview: The study included 10 choice questions, where the tense form was changed between options within subjects. We tested 5 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 $19-21 for *each* option.

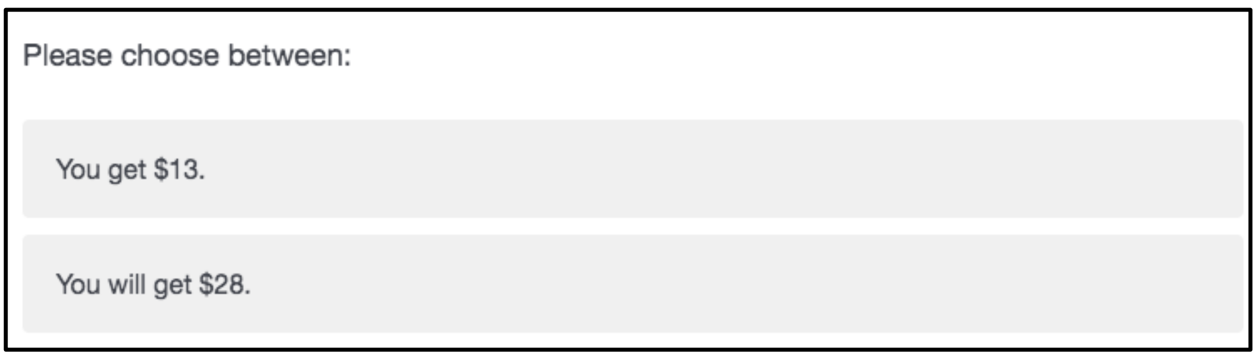
Sample Question: The other tense pairs tested were “get” vs. “will get”; “will get” vs. “are getting”; “will get” vs. “are going to get”; “gets” vs. “would get”; “gets” vs. “are getting”; “gets” vs. “are going to get”; “are getting” vs. “would get”; “are getting” vs. “are going to get”; “are going to get” vs. “would get”. For each option, the amount could be $19, $20, or $21.



Replication of Study 1b

Methods: In this replication, participants (N=189, after exclusions) were recruited from AMT, made a series of 8 hypothetical test choices between two options, out of which 4 questions were test trials (i.e. tense differed between the options) and 4 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).



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 $3-6 MORE than its corresponding sooner-smaller amount. E.g., If the sooner-smaller was $10, the later larger would be something between $13-16 (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".

Please choose between:

- You will get $11 today.
- You get $15 in 6 days.

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

Please choose between:

- You are getting $13 today.
- You are going to get $19 in 7 days.

Study 2b

Overview: The study included 20 conditions in a 5(tense-display) x 2(date vs. delay format) x 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”.

Please choose between the two hypothetical options below:

- You are getting $30 today.
- You are getting $50 in six weeks.

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”.

Please choose between the two hypothetical options below:

- ◯ You are getting $30 today.
- ◯ You are going to get $50 in six weeks.

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

Please choose between the two hypothetical options below:

- ◯ $30 today.
- ◯ $50 in six weeks.

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

Sample Question Second Factor (delay):

Please choose between the two hypothetical options below:

- ◯ You are getting $30 today.
- ◯ You are getting $50 in six weeks.

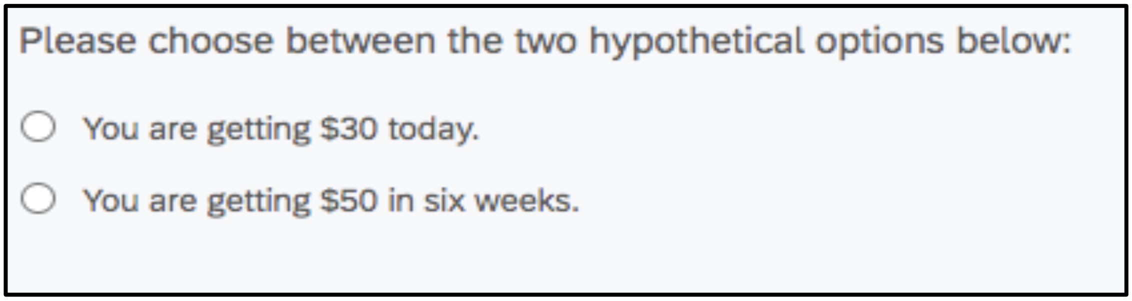
Sample Question Second Factor (date):

Please choose between the two hypothetical options below:

- ◯ You are getting $30 on September 2nd.
- ◯ You are going to get $50 on October 14th.

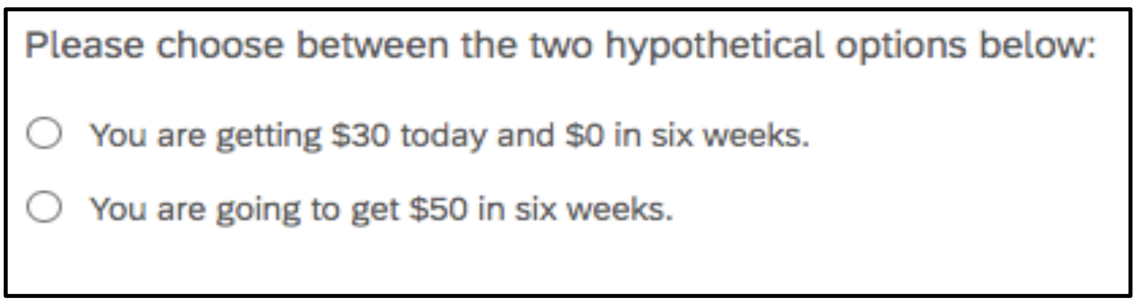
Types, Third Factor (standard vs. hidden zero): Hidden zero highlighted with choice or not.

Sample Question Third Factor (standard):


Please choose between the two hypothetical options below:

- ○ You are getting $30 today.
- ○ You are getting $50 in six weeks.

Sample Question Third Factor (hidden zero):


Please choose between the two hypothetical options below:

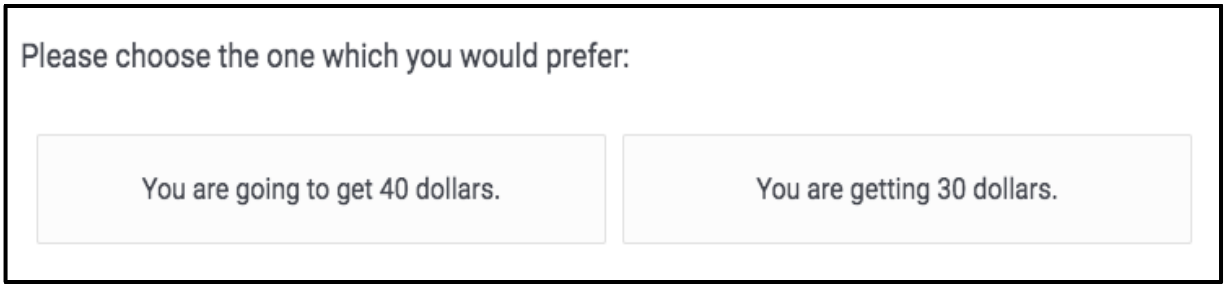
- ○ You are getting $30 today and $0 in six weeks.
- ○ You are going to get $50 in six weeks.

Study 3

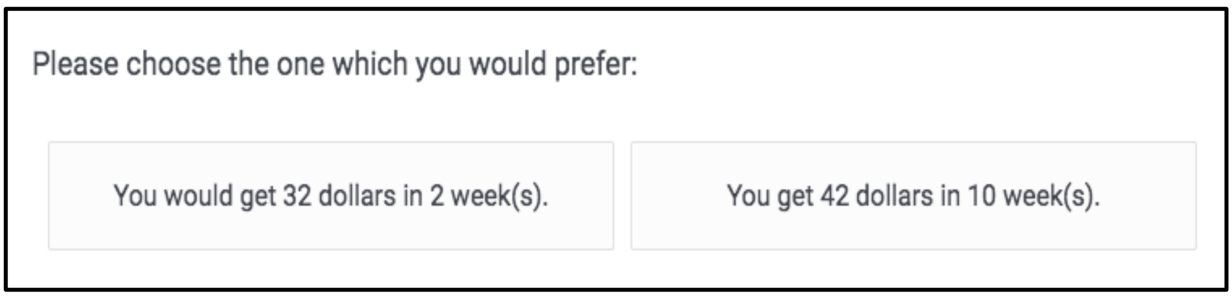
Overview: This study had four main conditions, displayed between subjects – one with no timing information, one with objective timing information, one with ambiguous timing information ("soon" vs. "later"), and the last with another type of ambiguous timing information ("now" vs. "at some point"). Each 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:

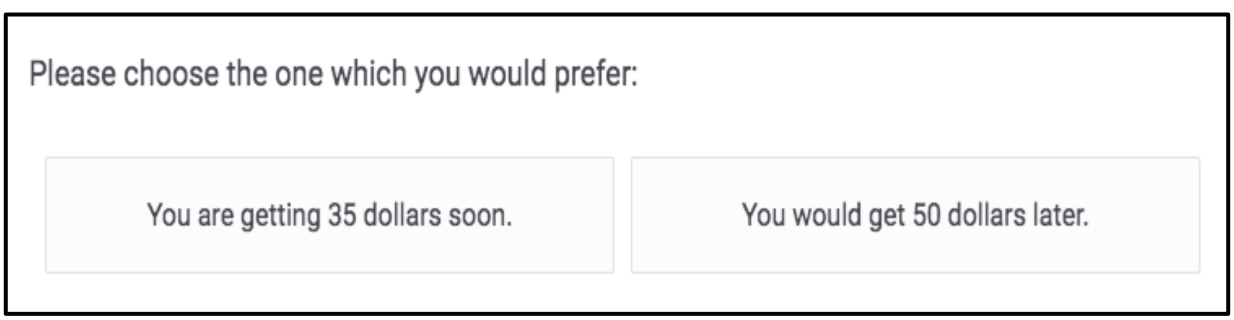
No timing information: The other tense pairs tested were "get" vs. "will get"; "will get" vs. "are getting"; "will get" vs. "are going to get"; "will get" vs. "would get"; "get" vs. "would get"; "get" vs. "are getting"; "get" vs. "are going to get"; "are getting" vs. "would get"; "are going to get" vs.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



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



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



Ambiguous timing information (now vs. at some point): The other tense pairs tested were "get" vs. "will get"; "will get" vs. "are getting"; "will get" vs. "are going to get";

"will get" vs. "would get"; "get" vs. "are going to get"; "get" vs. "would get"; "are going to get" vs. "would get"; "are getting" vs. "would get" ; "are going to get" vs. "are getting". Order of tenses, and "now" vs. "at some point" counterbalanced between the two options.

Please choose the one which you would prefer:

You get 30 dollars now.	You are getting 36 dollars at some point.

Study 4a

Overview: The study included 9 earliness inference questions, where only 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"). 3 of the 9 questions had the ambiguous word "soon" in both options, 3 had "later" in both options, and the remaining 3 had "at some point" in both options.

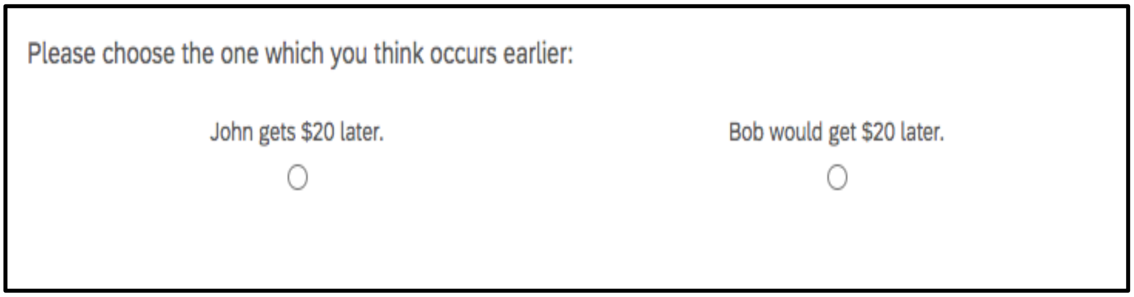
Sample Question:

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

Please choose the one which you think occurs earlier:

John gets $20 soon.	Bob will get $20 soon.

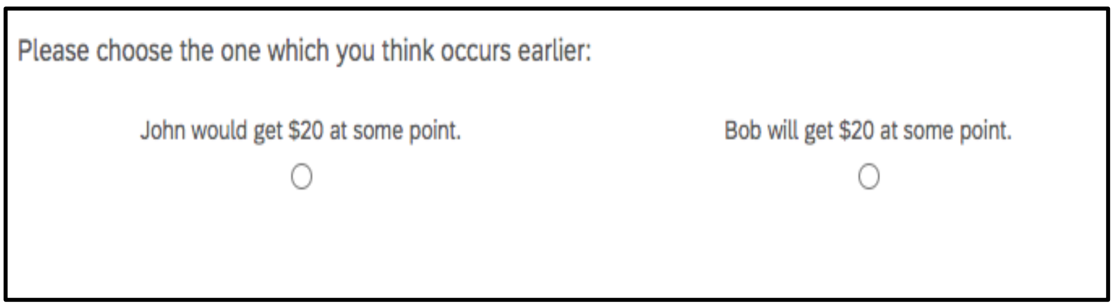
Later in both options: The other pairs tested were "will get" vs. "would get"; "gets" vs. "will get". Tense order counterbalanced between both options.


Please choose the one which you think occurs earlier:

John gets $20 later.

Bob would get $20 later.

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


Please choose the one which you think occurs earlier:

John would get $20 at some point.

Bob will get $20 at some point.

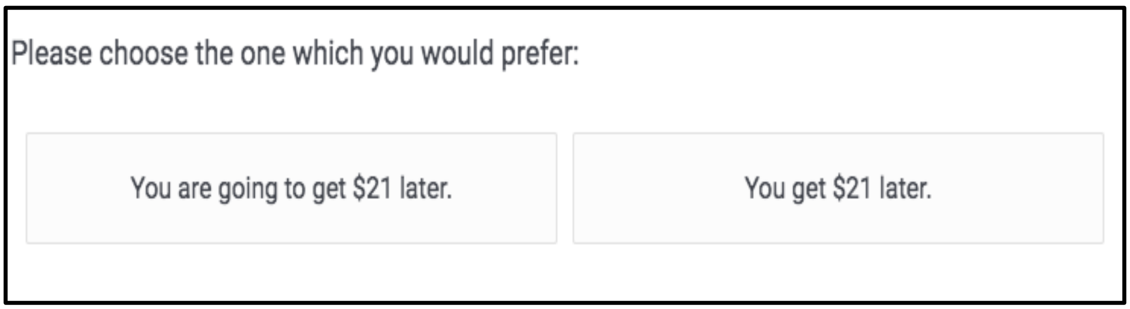
Study 4b

Overview: The study included 10 choice questions, where the tense form was changed between options within subjects. We tested all the 5 tense forms. Five of the 10 questions had the ambiguous word "soon" in both options and the other 5 had "later" in both options.

Sample Question:

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

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

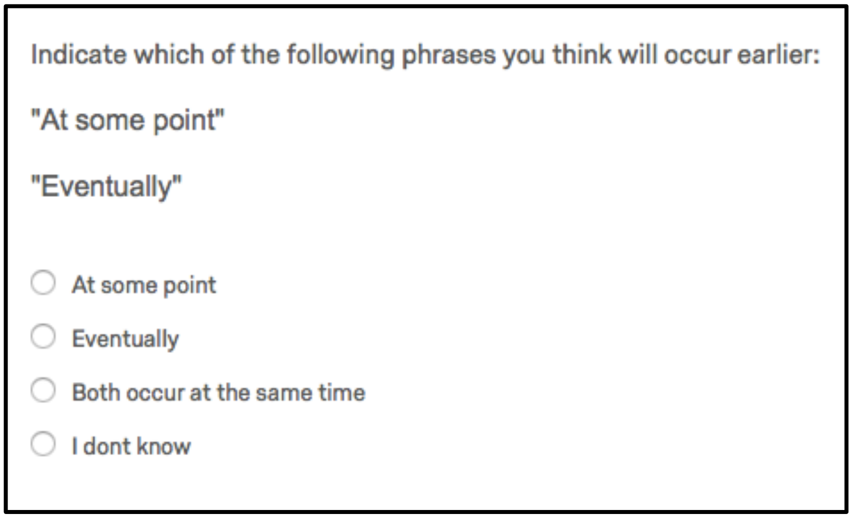


Pretest for Study 5a – Similar Meaning Ambiguous Word Pairs

Methods: In these two pre-tests 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 pre-tests 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” vs. “Eventually”; “At some point” vs. “Someday”.

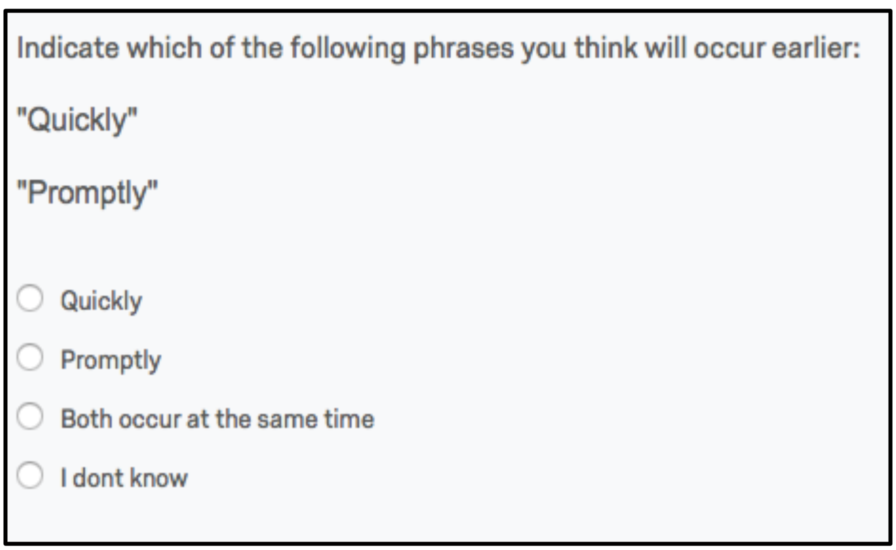

Indicate which of the following phrases you think will occur earlier:

"At some point"

"Eventually"

- At some point
- Eventually
- Both occur at the same time
- I dont know

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


Indicate which of the following phrases you think will occur earlier:

"Quickly"

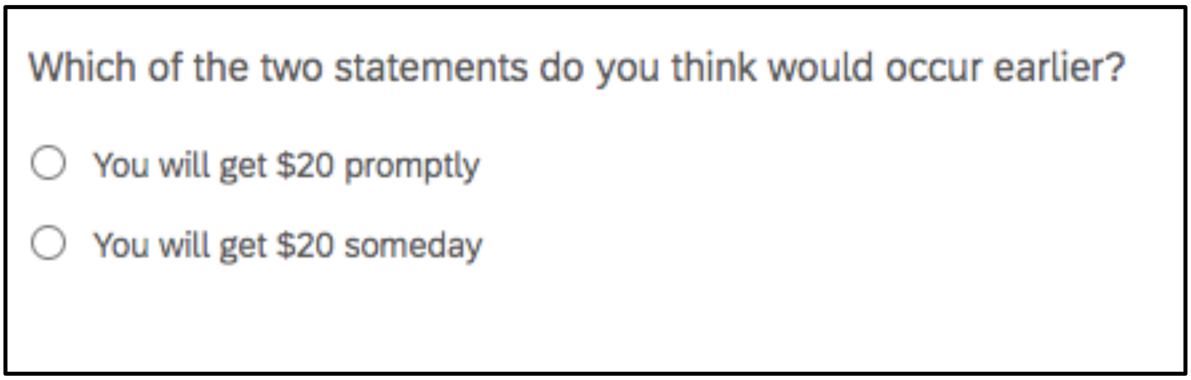
"Promptly"

- Quickly
- Promptly
- Both occur at the same time
- I dont know

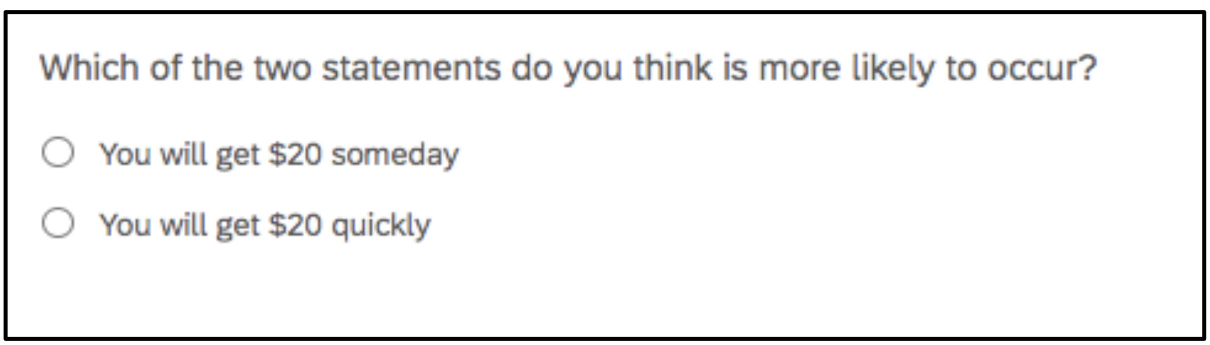
Pretest for Study 5a: Earliness and Likelihood Inferences for Immediate vs. Delayed Pair of Ambiguous Words

Methods: In this pre-test (N=240, after exclusions), we recruited participants from AMT to test whether the immediate ambiguous word pair chosen from the last pre-test ("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).

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



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

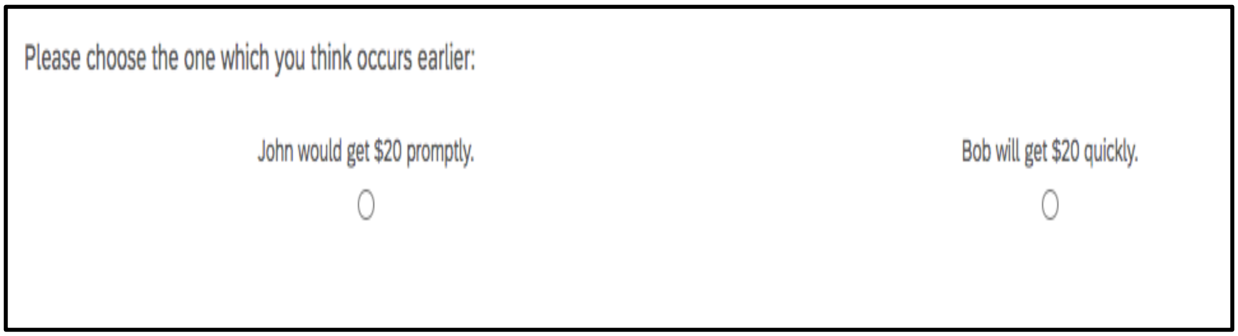


<u>Study 5a</u>

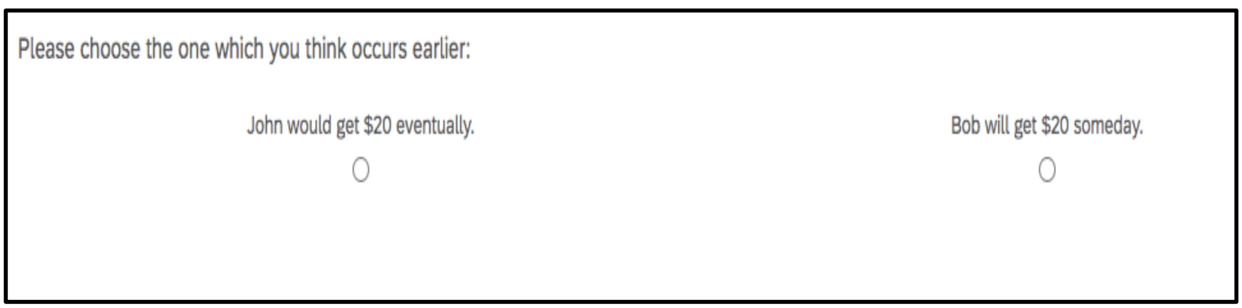
Overview: The study included 24 earliness inference questions, where the tense form was changed between options within subjects. We tested 3 total tense forms – one present tense form ("get"), one future tense form ("will get"), and one neutral tense form ("would get"). Twelve out of the 24 questions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

Sample Questions

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



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



<u>Study 5b</u>

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 vs. Quickly, small differences:

Please choose between:

You will get $21 quickly.

You get $20 promptly.

Promptly vs. Quickly, large differences:

Please choose between:

You get $29 promptly.

You will get $26 quickly.

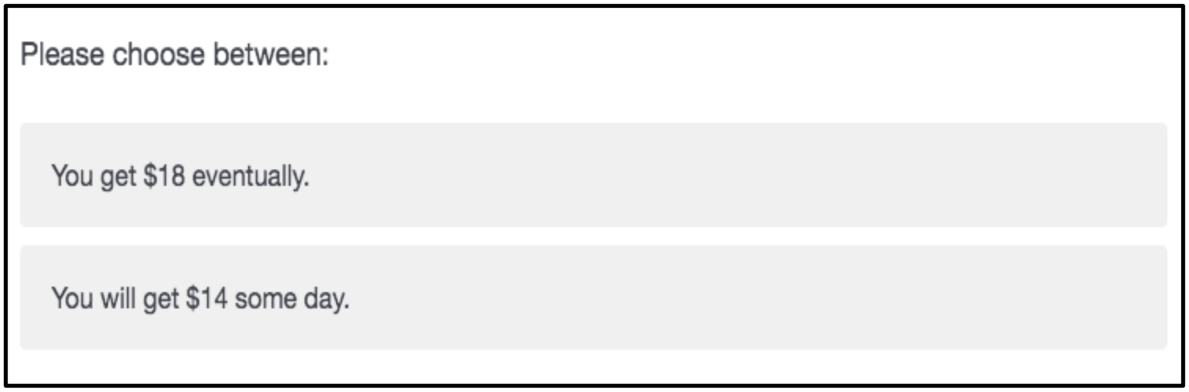
Someday vs. Eventually, small differences:

Please choose between:

You get $21 some day.

You will get $20 eventually.

Someday vs. Eventually, large differences:



Please choose between:

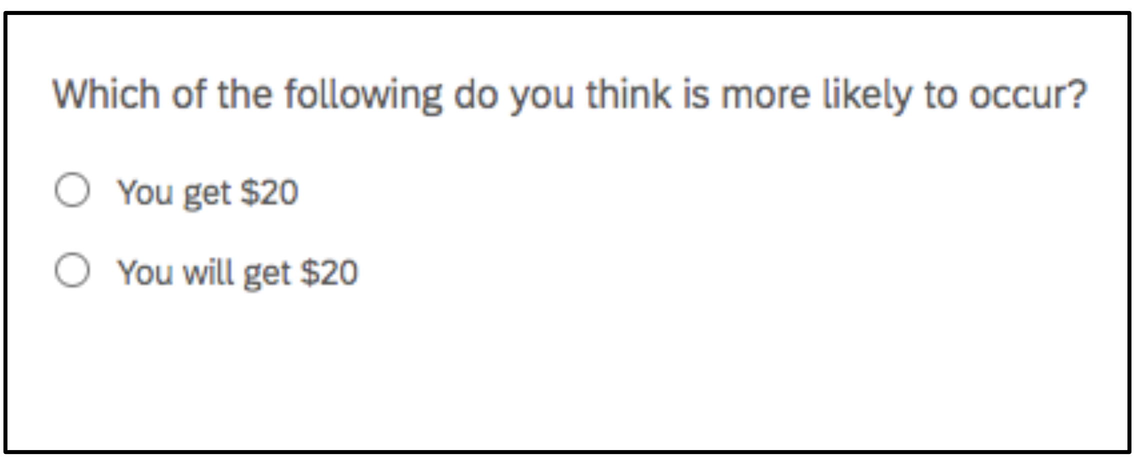
You get $18 eventually.

You will get $14 some day.

<u>Post-Test for Study 5b: Likelihood inferences of future tense compared to present and neutral tenses</u>

Overview: In this post-test (N=128, after exclusions), participants were recruited from AMT to test whether the future tense is seen as more likely to occur compared to 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’ vs. ‘would get’, order counterbalanced



Which of the following do you think is more likely to occur?

○ You get $20

○ You will get $20

APPENDIX C

Supplementary Statistical Materials (Essay 2)

The analyses in the paper and some analyses not mentioned in the paper but relevant to the studies have been included in this appendix.

Note: *In the tables and regressions from Study 2 onwards, the main predictor variable is English only was 1=when the menu was only in English, 0 = Menu was in mixed language. In the paper, the signs of the estimates have been reversed in order to write the paper as the impact of mixed language on DV. So, in these regressions, you will see a difference in the sign of the coefficients because they are coded in the opposite way in our data.*

Study 1a

Summary statistics of English language percentage across the four price percentiles

	Average English Percentage
Below 25th percentile price	74%
Below 50th percentile price	71%
Below 75th percentile price	68%
Below 99th percentile price	67%

Regression W1a.1: Regression of average price on non-English language percentage, controlling for number of menus the dish appeared in over time, and the average of the year when the dish first appeared and last appeared.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Non- English Percentage	2.498201	0.0952771	26.22	0.000	-2.684942	-2.31146
Average Year	0.0568541	0.0010264	55.39	0.000	0.0548423	0.0588659
Menus Appeared	0.0343508	0.0007975	43.07	0.000	0.0327877	0.0359139
constant	-105.4261	1.970279	-53.51	0.000	-109.2878	-101.5644

Regression W1a.2: Regression of lowest price on non-English language percentage, controlling for number of menus the dish appeared in over time, and the average of the year when the dish first appeared and last appeared.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Non-English Percentage	2.277686	0.0664307	34.29	0.000	-2.407888	-2.147483
Average Year	0.0624996	0.0007157	87.33	0.000	0.0610969	0.0639023
Menus Appeared	-0.0039291	0.0005561	-7.07	0.000	-0.0050189	-0.0028393
constant	-116.9807	1.373751	-85.15	0.000	-119.6732	-114.2881

Regression W1a.3: Regression of highest price on non-English language percentage, controlling for number of menus the dish appeared in over time, and the average of the year when the dish first appeared and last appeared.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Non-English Percentage	2.718717	0.1504831	18.07	0.000	-3.01366	-2.423773
Average Year	0.0512086	0.0016212	31.59	0.000	0.0480311	0.0543861
Menus Appeared	0.0726308	0.0012596	57.66	0.000	0.070162	0.0750995
constant	-93.87156	3.111908	-30.17	0.000	-99.97083	-87.77229

Regression W1a.1: Regression of average price on non-English language percentage, controlling for number of menus the dish appeared in over time, and the average of the year when the dish first appeared and last appeared, and the interaction of the average year and non-English percentage.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Non-English Percentage	-218.3172	6.845215	-31.89	0.000	-231.7337	-204.9008
Average Year	0.0234364	0.0014561	16.1	0.000	0.0205826	0.0262903
Interaction of year and non-English percentage	0.1147884	0.0035581	32.26	0.000	0.1078147	0.1217622
Menus Appeared	0.0342267	0.0007951	43.05	0.000	0.0326684	0.0357851
constant	-43.53064	2.807988	-15.5	0.000	-49.03423	-38.02704

<u>**Study 1b**</u>

Summary statistics of dataset across the four price ranges

	$	$$	$$$	$$$
Average number of dishes PER restaurant	117	92	59	45
Average English language PER restaurant	87%	85%	81%	77%
Average number of foreign cuisines	110	200	62	13
Total number of restaurants	224	345	109	25

Regression W1b.1: Regression of Price tag of restaurant on Average non-English percentage of the food items of the restaurant, controlling for city-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Average non-English % per restaurant	2.353963	0.302319	7.79	0.000	-2.947531	-1.760395
city_ID						
chicago	-0.3871077	0.1338481	-2.89	0.004	-0.6499028	-0.1243126
la	0.3317815	0.1716825	1.93	0.054	-0.0052971	0.6688601
nyc	0.206128	0.0987272	2.09	0.037	0.0122887	0.3999674
philadelphia	-0.0304688	0.1302493	-0.23	0.815	-0.2861981	0.2252605
sf	-0.1211133	0.1121875	-1.08	0.281	-0.3413803	0.0991537
washington	0.2998343	0.1326728	2.26	0.024	0.0393468	0.5603218
constant	3.829246	0.2753108	13.91	0.000	3.288705	4.369786

Regression W1b.2: Regression of Price per item of a restaurant on non-English percentage of each food item of the restaurant, clustering over restaurants and controlling for city-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Non-English percentage of each dish name	1.558411	0.4008883	3.89	0.00	-2.345495	-0.7713277
city_ID						
chicago	-2.118241	0.5955878	-3.56	0.00	-3.287587	-0.9488939
la	2.078812	1.076545	1.93	0.054	-0.0348223	4.192447
nyc	0.503053	0.5289134	0.95	0.342	-0.5353886	1.541495
philadelphia	-0.44609	0.5685675	-0.78	0.433	-1.562386	0.6702065
sf	-0.5469696	0.7084341	-0.77	0.44	-1.937873	0.8439339
washington	1.998503	0.7850839	2.55	0.011	0.4571098	3.539897
constant	10.67924	0.5856928	18.23	0.00	9.529324	11.82916

Regression W1b.3: Regression of Price tag of restaurant on Average non-English percentage of the food items of the restaurant, whether the cuisine of the restaurant was foreign or not, the interaction between foreign cuisine and average non-English percentage, controlling for city-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Average non-English % per restaurant	1.478076	0.5510125	2.68	0.007	-2.55993	-0.3962222
foreign	1.190188	0.586137	2.03	0.043	0.0393704	2.341005
Interaction of foreign and Avg. non-English %	1.433571	0.6769611	2.12	0.035	-2.762712	-0.1044306
city_ID						
chicago	-0.4069809	0.1343791	-3.03	0.003	-0.6708199	-0.143142
la	0.3041	0.1717787	1.77	0.077	-0.0331691	0.6413691
nyc	0.2090032	0.0987538	2.12	0.035	0.0151107	0.4028957
philadelphia	-0.0275845	0.1304933	-0.21	0.833	-0.2837941	0.228625
sf	-0.1199417	0.1122317	-1.07	0.286	-0.3402966	0.1004132
washington	0.3069595	0.1327643	2.31	0.021	0.046291	0.567628
constant	3.079846	0.4927596	6.25	0.000	2.112365	4.047327

Regression W1b.4: Regression of Price tag of restaurant on Average non-English percentage of the food items of the restaurant, for foreign cuisine only, controlling for city-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Average non-English % per restaurant	2.932858	0.3710965	7.9	0.000	-3.662542	-2.203173
city_ID						
chicago	-0.4735722	0.177933	-2.66	0.008	-0.8234407	-0.1237038
la	0.3966474	0.2466083	1.61	0.109	-0.0882568	0.8815516
nyc	0.2476852	0.1414495	1.75	0.081	-0.0304461	0.5258164
philadelphia	0.1675048	0.174156	0.96	0.337	-0.1749371	0.5099466
sf	-0.1507903	0.1557665	-0.97	0.334	-0.4570729	0.1554923
washington	0.1598412	0.1788171	0.89	0.372	-0.1917656	0.511448
constant	4.272429	0.3376818	12.65	0.000	3.608447	4.93641

Regression W1b.5: Regression of Price tag of restaurant on Average non-English percentage of the food items of the restaurant, for non-foreign cuisine only, controlling for city-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Average non-English % per restaurant	1.465086	0.5864711	2.5	0.013	-2.619039	-0.3111334
city_ID						
chicago	-0.2873954	0.2095656	-1.37	0.171	-0.6997411	0.1249503
la	0.2312081	0.2410232	0.96	0.338	-0.2430342	0.7054504
nyc	0.1699754	0.1393118	1.22	0.223	-0.1041375	0.4440884
philadelphia	-0.3079416	0.2008392	-1.53	0.126	-0.7031169	0.0872338
sf	-0.0694968	0.1644044	-0.42	0.673	-0.3929823	0.2539887
washington	0.5131881	0.20062	2.56	0.011	0.1184439	0.9079322
constant	3.079106	0.5287635	5.82	0.000	2.0387	4.119512

Study 1c

Summary statistics of dataset across the three price ranges

	$	$$	$$$
Mean of Foreign Language in menu (out of 4)	2.13	2.34	2.29
Mean Star Rating (out of 5)	4.5	4.53	4.65
Number of Restaurants	202	123	28

Regression W1c.1: Regression of price level of restaurant by degree of foreign language, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0916233	0.039262	2.33	0.020	0.0143897	0.1688569
State_ID						
CO	0.3529836	0.2243482	1.57	0.117	-0.0883396	0.7943067
CT	0.3428032	0.3714234	0.92	0.357	-0.3878369	1.073443
DC	-0.0210712	0.1813643	-0.12	0.908	-0.3778393	0.3356968
FL	0.3838436	0.1385342	2.77	0.006	0.1113281	0.656359
GA	-0.0037282	0.1764795	-0.02	0.983	-0.3508872	0.3434308
IL	0.2116223	0.1454539	1.45	0.147	-0.0745051	0.4977498
MA	-0.0144392	0.1821133	-0.08	0.937	-0.3726807	0.3438022
MI	0.4795835	0.3250954	1.48	0.141	-0.1599232	1.11909
NJ	0.4791907	0.2142929	2.24	0.026	0.0576476	0.9007337
NV	0.5248175	0.1727021	3.04	0.003	0.1850891	0.8645458
NY	0.3048805	0.1091262	2.79	0.006	0.0902146	0.5195465
OR	-0.0210712	0.3715935	-0.06	0.955	-0.7520458	0.7099033
PA	0.2367823	0.1685112	1.41	0.161	-0.094702	0.5682666
RI	-0.3238635	0.3714234	-0.87	0.384	-1.054504	0.4067766
SC	-0.3849457	0.633658	-0.61	0.544	-1.631437	0.8615451
TX	0.2066777	0.1378857	1.5	0.135	-0.0645622	0.4779175
VA	-0.3849457	0.4519885	-0.85	0.395	-1.274068	0.5041767
WA	-0.0024847	0.2145475	-0.01	0.991	-0.4245285	0.4195591
WI	0.2066777	0.451569	0.46	0.647	-0.6816195	1.094975
constant	1.110076	0.1231932	9.01	0.000	0.867738	1.352413

Regression W1c.2: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.1188598	0.040121	2.96	0.003	0.0399311	0.1977885
Approx. no. of food items	-0.0885477	0.0481176	-1.84	0.067	-0.1832078	0.0061124
State_ID						
CO	0.3657194	0.2221735	1.65	0.101	-0.0713553	0.8027941
CT	0.3328355	0.3677553	0.91	0.366	-0.3906375	1.056308
DC	0.018914	0.1803929	0.1	0.917	-0.3359672	0.3737952
FL	0.4132794	0.1376738	3	0.003	0.1424383	0.6841205
GA	0.0494503	0.1760876	0.28	0.779	-0.2969611	0.3958618
IL	0.1955548	0.1469193	1.33	0.184	-0.0934749	0.4845844
MA	0.0178193	0.1806664	0.1	0.921	-0.3375998	0.3732384
MI	0.4633668	0.3224953	1.44	0.152	-0.1710678	1.097801
NJ	0.5321142	0.2132333	2.5	0.013	0.1126273	0.9516011
NV	0.5431611	0.1712097	3.17	0.002	0.2063458	0.8799765
NY	0.3357483	0.1087794	3.09	0.002	0.1217501	0.5497464
OR	-0.0401178	0.3679905	-0.11	0.913	-0.7640536	0.683818
PA	0.2430856	0.1670808	1.45	0.147	-0.085607	0.5717783
RI	-0.3245234	0.4481624	-0.72	0.470	-1.206179	0.5571319
SC	-0.413071	0.6270668	-0.66	0.511	-1.646679	0.820537
TX	0.239187	0.1399789	1.71	0.088	-0.036189	0.514563
VA	-0.3245234	0.4481624	-0.72	0.470	-1.206179	0.5571319
WA	0.0293218	0.2126549	0.14	0.89	-0.3890273	0.447671
WI	0.2500626	0.4469976	0.56	0.576	-0.6293014	1.129427
constant	1.233587	0.1547845	7.97	0.000	0.9290846	1.53809

Regression W1c.3: Regression of star rating of restaurant by degree of foreign language, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0348001	0.0158365	2.2	0.029	0.0036417	0.0659584
State_ID						
CO	0.0597341	0.0885267	0.67	0.500	-0.1144422	0.2339105
CT	0.0669786	0.1460067	0.46	0.647	-0.2202895	0.3542466
DC	-0.0462786	0.0737736	-0.63	0.531	-0.1914282	0.098871
FL	0.0358186	0.0557461	0.64	0.521	-0.0738619	0.145499
GA	0.0449519	0.0717045	0.63	0.531	-0.0961266	0.1860305
IL	0.1277946	0.0594914	2.15	0.032	0.0107453	0.2448439
MA	-0.0634481	0.0721431	-0.88	0.380	-0.2053896	0.0784935
MI	-0.0127214	0.1279367	-0.1	0.921	-0.2644367	0.238994
NJ	-0.3051214	0.0931535	-3.28	0.001	-0.4884009	-0.1218419
NV	0.0412374	0.0684499	0.6	0.547	-0.0934378	0.1759126
NY	-0.0461214	0.0441523	-1.04	0.297	-0.132991	0.0407482
OR	-0.2562215	0.1775382	-1.44	0.15	-0.6055278	0.0930849
PA	-0.0533103	0.0667863	-0.8	0.425	-0.1847124	0.0780918
RI	0.0669786	0.1460067	0.46	0.647	-0.2202895	0.3542466
SC	0.2437785	0.2487341	0.98	0.328	-0.2456057	0.7331628
TX	0.0516496	0.0554779	0.93	0.353	-0.0575032	0.1608023
VA	-0.1062215	0.1775382	-0.6	0.55	-0.4555278	0.2430849
WA	-0.1449014	0.0847223	-1.71	0.088	-0.3115925	0.0217897
WI	0.0785786	0.1774121	0.44	0.658	-0.2704795	0.4276367
constant	4.451821	0.0504123	88.31	0	4.352635	4.551007

Regression W1c.4: Regression of star rating of restaurant by degree of foreign language and approximate number of food items in the menu, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0295863	0.0154583	1.91	0.057	-0.0008294	0.0600019
Approx. no. of food items	-0.0107781	0.0185136	-0.58	0.561	-0.0472054	0.0256491
State_ID						
CO	0.0582595	0.0841698	0.69	0.489	-0.1073527	0.2238717
CT	0.0636881	0.1388993	0.46	0.647	-0.2096097	0.3369859
DC	-0.0398842	0.0705374	-0.57	0.572	-0.1786733	0.098905
FL	0.0373724	0.0530971	0.7	0.482	-0.0671012	0.1418461
GA	0.0481517	0.0686388	0.7	0.483	-0.0869017	0.1832052
IL	0.1178058	0.0576949	2.04	0.042	0.0042856	0.2313261
MA	-0.0655789	0.0686546	-0.96	0.340	-0.2006635	0.0695056
MI	-0.0217478	0.1218948	-0.18	0.859	-0.2615875	0.218092
NJ	-0.3007627	0.0890616	-3.38	0.001	-0.4760001	-0.1255254
NV	0.0390518	0.0650853	0.6	0.549	-0.0890099	0.1671135
NY	-0.0462293	0.0421144	-1.1	0.273	-0.1290934	0.0366349
OR	-0.250647	0.1688234	-1.48	0.139	-0.5828233	0.0815294
PA	-0.0550941	0.0635167	-0.87	0.386	-0.1800693	0.0698812
RI	0.2047421	0.169224	1.21	0.227	-0.1282224	0.5377066
SC	0.243964	0.2365825	1.03	0.303	-0.221535	0.7094629
TX	0.0966076	0.0534554	1.81	0.072	-0.008571	0.2017862
VA	-0.0952579	0.169224	-0.56	0.574	-0.4282224	0.2377066
WA	-0.1450972	0.0806213	-1.8	0.073	-0.3037273	0.013533
WI	0.0789393	0.1687667	0.47	0.640	-0.2531254	0.411004
constant	4.488834	0.0598124	75.05	0.000	4.371147	4.60652

Regression W1c.5: Regression of whether 'authentic' appeared in the top three phrases about the restaurant by degree of foreign language, controlling for State-level fixed effects.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Degree of foreign language	0.039828	0.0186928	2.13	0.034	0.0030567	0.0765994
State_ID						
CO	0.0189169	0.1068134	0.18	0.860	-0.1911996	0.2290334
CT	0.2367138	0.1768368	1.34	0.182	-0.1111481	0.5845757
DC	0.0901045	0.0863486	1.04	0.297	-0.0797548	0.2599637
FL	0.0315562	0.0659569	0.48	0.633	-0.09819	0.1613024
GA	-0.0933005	0.0840229	-1.11	0.268	-0.2585849	0.0719838
IL	0.0218671	0.0692514	0.32	0.752	-0.1143598	0.158094
MA	0.0553002	0.0867052	0.64	0.524	-0.1152606	0.225861
MI	-0.0733865	0.1547798	-0.47	0.636	-0.3778593	0.2310862
NJ	0.0047081	0.1020261	0.05	0.963	-0.195991	0.2054071
NV	-0.0268628	0.0822245	-0.33	0.744	-0.1886094	0.1348838
NY	0.0069453	0.0519556	0.13	0.894	-0.0952583	0.109149
OR	-0.1098955	0.1769178	-0.62	0.535	-0.4579167	0.2381256
PA	-0.0388513	0.0802291	-0.48	0.629	-0.1966729	0.1189702
RI	-0.0966195	0.1768368	-0.55	0.585	-0.4444814	0.2512423
SC	-0.1231716	0.3016881	-0.41	0.683	-0.7166329	0.4702898
TX	0.0104065	0.0656482	0.16	0.874	-0.1187324	0.1395453
VA	0.3768284	0.2151943	1.75	0.081	-0.0464877	0.8001446
WA	-0.0873263	0.1021473	-0.85	0.393	-0.2882638	0.1136111
WI	0.4166565	0.2149945	1.94	0.053	-0.0062668	0.8395798
constant	0.0036875	0.058653	0.06	0.950	-0.1116908	0.1190658

Regression W1c.6: Regression of whether 'authentic' appeared in the top three phrases about the restaurant by degree of foreign language and approximate number of food items in the menu, controlling for State-level fixed effects.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0395327	0.0194837	2.03	0.043	0.0012031	0.0778623
Approx. no. of food items	-0.0019999	0.023367	-0.09	0.932	-0.0479691	0.0439692
State_ID						
CO	0.0180169	0.1078926	0.17	0.867	-0.1942367	0.2302706
CT	0.2354022	0.1785905	1.32	0.188	-0.1159331	0.5867375
DC	0.0902246	0.087603	1.03	0.304	-0.082114	0.2625631
FL	0.0311542	0.0668576	0.47	0.642	-0.1003726	0.1626809
GA	-0.0932618	0.0855122	-1.09	0.276	-0.2614872	0.0749637
IL	0.0241824	0.0713475	0.34	0.735	-0.1161771	0.1645419
MA	0.0545174	0.0877358	0.62	0.535	-0.1180823	0.2271172
MI	-0.0753704	0.1566112	-0.48	0.631	-0.3834665	0.2327258
NJ	0.0047866	0.103551	0.05	0.963	-0.198926	0.2084992
NV	-0.0277849	0.0831434	-0.33	0.738	-0.1913503	0.1357804
NY	0.006351	0.0528258	0.12	0.904	-0.0975715	0.1102735
OR	-0.1111087	0.1787048	-0.62	0.535	-0.4626688	0.2404514
PA	-0.039846	0.0811383	-0.49	0.624	-0.1994668	0.1197748
RI	-0.1222863	0.2176381	-0.56	0.575	-0.5504386	0.305866
SC	-0.1242863	0.3045182	-0.41	0.683	-0.723355	0.4747825
TX	0.0135442	0.067977	0.2	0.842	-0.1201848	0.1472732
VA	0.3777137	0.2176381	1.74	0.084	-0.0504386	0.805866
WA	-0.0879069	0.1032702	-0.85	0.395	-0.2910669	0.1152532
WI	0.4162464	0.2170725	1.92	0.056	-0.0107932	0.843286
constant	0.009688	0.075167	0.13	0.898	-0.1381855	0.1575615

Regression W1c.7: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for less than median levels of negative attitude towards Asians, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.1236016	0.0634269	1.95	0.053	-0.0018372	0.2490404
State_ID						
DC	-0.3745339	0.4040463	-0.93	0.356	-1.173613	0.4245454
FL	0.0403527	0.3857505	0.1	0.917	-0.7225431	0.8032484
NV	0.1907926	0.3998966	0.48	0.634	-0.6000798	0.981665
NY	-0.0307204	0.3760004	-0.08	0.935	-0.7743334	0.7128927
SC	-0.7490677	0.7378862	-1.02	0.312	-2.20838	0.7102441
VA	-0.7490677	0.5839247	-1.28	0.202	-1.903891	0.4057556
constant	1.378263	0.396957	3.47	0.001	0.5932042	2.163322

Regression W1c.8: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for above median levels of negative attitude towards Asians, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0707122	0.0500097	1.41	0.159	-0.0279141	0.1693385
State_ID						
CO	0.349746	0.2222555	1.57	0.117	-0.0885732	0.7880652
GA	-0.0063849	0.174837	-0.04	0.971	-0.3511882	0.3384183
IL	0.2068358	0.1442422	1.43	0.153	-0.0776303	0.4913018
MA	-0.0251119	0.1810839	-0.14	0.890	-0.3822349	0.3320111
MI	0.4664712	0.3225889	1.45	0.150	-0.1697197	1.102662
NJ	0.4775795	0.2122569	2.25	0.026	0.0589789	0.89618
OR	-0.015015	0.3681516	-0.04	0.968	-0.741062	0.711032
PA	0.2347064	0.1669285	1.41	0.161	-0.0945002	0.563913
RI	-0.3247776	0.3678731	-0.88	0.378	-1.050275	0.4007201
TX	0.1987931	0.1370805	1.45	0.149	-0.0715489	0.4691352
WA	-0.0082781	0.2126737	-0.04	0.969	-0.4277006	0.4111445
WI	0.1987931	0.4474066	0.44	0.657	-0.6835558	1.081142
constant	1.159782	0.1430902	8.11	0.000	0.8775883	1.441977

Regression W1c.9: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for <u>less than median levels of negative attitude towards Asians & Asian-Americans</u>, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.1018695	0.0496651	2.05	0.042	0.0038724	0.1998667
State_ID						
CT	0.3432511	0.3599252	0.95	0.342	-0.3669378	1.05344
FL	0.3840711	0.1342464	2.86	0.005	0.1191819	0.6489604
NV	0.5280781	0.1676625	3.15	0.002	0.1972536	0.8589025
NY	0.3076362	0.1060951	2.9	0.004	0.0982939	0.5169785
SC	-0.3913286	0.614359	-0.64	0.525	-1.603555	0.8208982
VA	-0.3913286	0.4384441	-0.89	0.373	-1.256448	0.4737905
constant	1.08572	0.1414553	7.68	0.000	0.8066065	1.364833

Regression W1c.10: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for <u>above median levels of negative attitude towards Asians & Asian-Americans</u>, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0770699	0.0634663	1.21	0.227	-0.0483335	0.2024734
State_ID						
DC	-0.3675866	0.2765917	-1.33	0.186	-0.9141056	0.1789323
GA	-0.3563075	0.2719118	-1.31	0.192	-0.8935795	0.1809645
IL	-0.1424393	0.2512201	-0.57	0.572	-0.6388263	0.3539478
MA	-0.3725974	0.2760734	-1.35	0.179	-0.9180923	0.1728976
MI	0.1197275	0.3932921	0.3	0.761	-0.6573805	0.8968354
NJ	0.127339	0.299878	0.42	0.672	-0.4651915	0.7198695
OR	-0.3675866	0.4359632	-0.84	0.400	-1.229009	0.4938354
PA	-0.1153928	0.2664358	-0.43	0.666	-0.6418447	0.4110591
RI	-0.67523	0.4351069	-1.55	0.123	-1.53496	0.1845
TX	-0.14954	0.246625	-0.61	0.545	-0.6368477	0.3377677
WA	-0.357247	0.2999377	-1.19	0.236	-0.9498954	0.2354014
WI	-0.14954	0.510336	-0.29	0.770	-1.157916	0.8588355
constant	1.4954	0.2592456	5.77	0.000	0.9831553	2.007645

Regression W1c.11: Regression of price level of restaurant by degree of foreign language, negative attitude towards Asians, and their interaction.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Degree of foreign language	0.0681508	0.03902	1.75	0.082	-0.0085931	0.1448947
Neg. Attitude towards Asians	0.7280927	2.893185	0.25	0.801	-4.962178	6.418364
Interaction of foreign and neg. attitude	-0.7791385	1.188106	-0.66	0.512	-3.115887	1.55761
constant	1.354168	0.09276	14.6	0.000	1.171729	1.536607

Regression W1c.12: Regression of price level of restaurant by degree of foreign language, negative attitude towards Asians & Asian-Americans, and their interaction.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Degree of foreign language	0.0667937	0.0426232	1.57	0.118	-0.0170369	0.1506243
Neg. Attitude towards Asians & Asian-Americans	0.4802876	4.178688	0.11	0.909	-7.738292	8.698867
Interaction foreign and neg. attitude	-0.494835	1.825772	-0.27	0.787	-4.085735	3.096065
constant	1.35437	0.0995879	13.6	0.000	1.158502	1.550238

Regression W1c.13: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for less than median levels of negative attitude towards Asians not including political questions, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Degree of foreign language	0.1090937	0.0487571	2.24	0.026	0.0129347	0.2052526
State_ID						
CT	0.3435669	0.3595642	0.96	0.341	-0.3655671	1.052701
DC	-0.026131	0.1757949	-0.15	0.882	-0.3728344	0.3205725
FL	0.3842316	0.1341117	2.87	0.005	0.1197359	0.6487273
NV	0.530377	0.167469	3.17	0.002	0.200094	0.8606599
NY	0.309579	0.10596	2.92	0.004	0.1006044	0.5185537
SC	-0.3958288	0.6137166	-0.64	0.520	-1.606203	0.8145455
VA	-0.3958288	0.4379673	-0.9	0.367	-1.25959	0.467932
constant	1.068548	0.1396153	7.65	0.000	0.7931979	1.343898

Regression W1c.14: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for above median levels of negative attitude towards Asians not including political questions, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0645625	0.0655999	0.98	0.327	-0.0651653	0.1942904
State_ID						
GA	-0.3559601	0.2738725	-1.3	0.196	-0.8975596	0.1856395
IL	-0.1433657	0.2530337	-0.57	0.572	-0.6437552	0.3570237
MA	-0.3770444	0.2781132	-1.36	0.177	-0.9270301	0.1729413
MI	0.1138212	0.3961888	0.29	0.774	-0.6696661	0.8973085
NJ	0.1283118	0.3020422	0.42	0.672	-0.468995	0.7256186
OR	-0.3620278	0.4391552	-0.82	0.411	-1.230484	0.5064284
PA	-0.1146979	0.268358	-0.43	0.670	-0.6453921	0.4159963
RI	-0.6738403	0.438247	-1.54	0.126	-1.5405	0.1928197
TX	-0.1523194	0.2484247	-0.61	0.541	-0.6435944	0.3389555
WA	-0.3587757	0.3021055	-1.19	0.237	-0.9562077	0.2386563
WI	-0.1523194	0.5140258	-0.3	0.767	-1.168837	0.8641978
constant	1.523194	0.2631595	5.79	0.000	1.00278	2.043608

Regression W1c.15: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for less than median levels of negative attitude towards Asians & Asian Americans not including political questions, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.1018695	0.0496651	2.05	0.042	0.0038724	0.1998667
State_ID						
CT	0.3432511	0.3599252	0.95	0.342	-0.3669378	1.05344
FL	0.3840711	0.1342464	2.86	0.005	0.1191819	0.6489604
NV	0.5280781	0.1676625	3.15	0.002	0.1972536	0.8589025
NY	0.3076362	0.1060951	2.9	0.004	0.0982939	0.5169785
SC	-0.3913286	0.614359	-0.64	0.525	-1.603555	0.8208982
VA	-0.3913286	0.4384441	-0.89	0.373	-1.256448	0.4737905
constant	1.08572	0.1414553	7.68	0.000	0.8066065	1.364833

Regression W1c.16: Regression of price level of restaurant by degree of foreign language and approximate number of food items in the menu for above median levels of negative attitude towards Asians & Asian Americans not including political questions, controlling for State-level fixed effects

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Degree of foreign language	0.0770699	0.0634663	1.21	0.227	-0.0483335	0.2024734
State_ID						
DC	-0.3675866	0.2765917	-1.33	0.186	-0.9141056	0.1789323
GA	-0.3563075	0.2719118	-1.31	0.192	-0.8935795	0.1809645
IL	-0.1424393	0.2512201	-0.57	0.572	-0.6388263	0.3539478
MA	-0.3725974	0.2760734	-1.35	0.179	-0.9180923	0.1728976
MI	0.1197275	0.3932921	0.3	0.761	-0.6573805	0.8968354
NJ	0.127339	0.299878	0.42	0.672	-0.4651915	0.7198695
OR	-0.3675866	0.4359632	-0.84	0.400	-1.229009	0.4938354
PA	-0.1153928	0.2664358	-0.43	0.666	-0.6418447	0.4110591
RI	-0.67523	0.4351069	-1.55	0.123	-1.53496	0.1845
TX	-0.14954	0.246625	-0.61	0.545	-0.6368477	0.3377677
WA	-0.357247	0.2999377	-1.19	0.236	-0.9498954	0.2354014
WI	-0.14954	0.510336	-0.29	0.770	-1.157916	0.8588355
constant	1.4954	0.2592456	5.77	0.000	0.9831553	2.007645

Regression W1c.17: Regression of price level of restaurant by degree of foreign language, negative attitude towards Asians without the political questions, and their interaction.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Degree of foreign language	0.0696218	0.0389733	1.79	0.075	-0.0070303	0.1462739
Neg. Attitude towards Asians no politics	1.207413	2.187094	0.55	0.581	-3.09413	5.508955
Interaction	-0.7948921	0.8666659	-0.92	0.360	-2.499437	0.9096531
constant	1.350995	0.0927878	14.56	0.000	1.168501	1.533489

Regression W1c.17: Regression of price level of restaurant by degree of foreign language, negative attitude towards Asians & Asian Americans without the political questions, and their interaction.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Degree of foreign language	0.0629396	0.0440725	1.43	0.154	-0.0237414	0.1496207
Neg. Attitude towards Asians & Asian Americans no politics	1.699692	4.224387	0.4	0.688	-6.608766	10.00815
Interaction	-0.8078961	1.813473	-0.45	0.656	-4.374608	2.758816
constant	1.366141	0.1028403	13.28	0.000	1.163876	1.568405

Study 2a

Regression W2a.1: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, food neophilia, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-2.153667	1.676421	-1.28	0.200	-5.447412	1.140078
Food neophilia	-0.0117139	0.2262033	-0.05	0.959	-0.4561465	0.4327188
Interaction between English only and food neophilia	0.0863228	0.3245257	0.27	0.790	-0.5512886	0.7239342
constant	9.142833	1.160091	7.88	0.000	6.863547	11.42212

Regression W2a.2: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, liking of the country, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	1.676202	1.65698	1.01	0.312	-1.579347	4.931751
Liking of country	0.7247461	0.226454	3.2	0.001	0.2798209	1.169671
Interaction between English only and liking of country	-0.684346	0.3175059	-2.16	0.032	-1.308165	-0.0605267
constant	5.482274	1.166975	4.7	0.000	3.189462	7.775087

Regression W2a.3: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, liking of the cuisine, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	0.3074102	1.908765	0.16	0.872	-3.442833	4.057654
Liking of cuisine	0.8917044	0.2489677	3.58	0.000	0.4025455	1.380863
Interaction between English only and liking of cuisine	-0.4202036	0.3627251	-1.16	0.247	-1.132867	0.29246
constant	4.598065	1.28957	3.57	0.000	2.064385	7.131746

Mediation Paths (Direct and Indirect effects)

Note: We use SEM function on Stata for the mediation

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
authentic <-						
englishonly	**-.7164635**	**.1109012**	**-6.46**	**0.000**	**-.9338257**	**-.4991012**
quality <-						
authentic	**.3510283**	**.0375392**	**9.35**	**0.000**	**.2774528**	**.4246038**
englishonly	**0**	(no path)				
wtp_win <-						
authentic	**0**	(no path)				
quality	**.6131973**	**.2376038**	**2.58**	**0.010**	**.1475024**	**1.078892**
englishonly	**-1.650986**	**.4314481**	**-3.83**	**0.000**	**-2.496609**	**-.8053636**

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
authentic <-						
englishonly	**0**	(no path)				
quality <-						
authentic	**0**	(no path)				
englishonly	**-.251499**	**.0455098**	**-5.53**	**0.000**	**-.3406965**	**-.1623014**
wtp_win <-						
authentic	**.2152496**	**.0867248**	**2.48**	**0.013**	**.0452721**	**.385227**
quality	**0**	(no path)				
englishonly	**-.1542185**	**.0668925**	**-2.31**	**0.021**	**-.2853253**	**-.0231116**

Study 2b

Regression W2b.1: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, whether the location was urban or not, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-1.814981	0.5956726	-3.05	0.002	-2.986416	-0.6435455
Urban	0.9356117	0.5786719	1.62	0.107	-0.2023903	2.073614
Interaction between English only and Urban	0.2957508	0.8162081	0.36	0.717	-1.309384	1.900886
constant	9.193932	0.4137043	22.22	0.000	8.380351	10.0075

Regression W2b.2: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, food neophilia, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-1.610573	1.500232	-1.07	0.284	-4.560892	1.339746
Food neophilia	0.3030686	0.2150095	1.41	0.160	-0.1197639	0.7259011
Interaction between English only and food neophilia	0.002484	0.2925246	0.01	0.993	-0.5727877	0.5777557
constant	8.170933	1.103892	7.4	0.000	6.000046	10.34182

Regression W2b.3: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, liking of the country, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	1.185022	1.406641	0.84	0.400	-1.581244	3.951289
Liking of country	0.7419908	0.1969903	3.77	0.000	0.3545944	1.129387
Interaction between English only and liking of country	-0.5546813	0.2757163	-2.01	0.045	-1.096898	-0.0124643
constant	5.978668	1.021484	5.85	0.000	3.969844	7.987493

Regression W2b.4: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, liking of the cuisine, and their interaction

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-1.704783	1.730227	-0.99	0.325	-5.107405	1.69784
Liking of cuisine	0.3342379	0.2378152	1.41	0.161	-0.1334437	0.8019195
Interaction between English only and liking of cuisine	0.0310704	0.329562	0.09	0.925	-0.617038	0.6791789
constant	7.93781	1.267687	6.26	0.000	5.444807	10.43081

Mediation Paths (Direct and Indirect effects)

Note: We use SEM function on Stata for the mediation

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
authentic <-						
englishonly	**-.7518358**	**.1271667**	**-5.91**	**0.000**	**-1.001078**	**-.5025936**
quality <-						
authentic	**.3734742**	**.0431129**	**8.66**	**0.000**	**.2889745**	**.457974**
englishonly	**0**	(no path)				
wtp_win <-						
authentic	**0**	(no path)				
quality	**.7647246**	**.1845502**	**4.14**	**0.000**	**.4030128**	**1.126436**
englishonly	**-1.419324**	**.4272906**	**-3.32**	**0.001**	**-2.256798**	**-.5818498**

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
authentic <-						
englishonly	**0**	(no path)				
quality <-						
authentic	**0**	(no path)				
englishonly	**-.2807913**	**.058572**	**-4.79**	**0.000**	**-.3955902**	**-.1659923**
wtp_win <-						
authentic	**.2856049**	**.0789254**	**3.62**	**0.000**	**.130914**	**.4402959**
quality	**0**	(no path)				
englishonly	**-.214728**	**.0708131**	**-3.03**	**0.002**	**-.3535191**	**-.0759369**

Study 2c

Regression W2c.1: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, food neophilia, and their interaction, for US chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
English only	2.499861	3.025163	0.83	0.410	-3.475408	8.475131
Food neophilia	0.6824159	0.439352	1.55	0.122	-0.1853873	1.550219
Interaction between English only and food neophilia	-0.8996688	0.5698252	-1.58	0.116	-2.025181	0.2258437
constant	7.247383	2.324732	3.12	0.002	2.655597	11.83917

Regression W2c.2: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, cuisine perception, and their interaction, for US chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
English only	0.4444683	3.165691	0.14	0.889	-5.80837	6.697307
Liking of cuisine	0.4088947	0.4242155	0.96	0.337	-0.4290112	1.246801
Interaction between English only and liking of cuisine	-0.5085894	0.6105122	-0.83	0.406	-1.714467	0.6972878
constant	8.671238	2.244174	3.86	0.000	4.23857	13.10391

Regression W2c.3: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, country perception, and their interaction, for US chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
English only	-5.595001	2.281352	-2.45	0.015	-10.1011	-1.0889
Liking of country	-0.3150044	0.3549048	-0.89	0.376	-1.016009	0.3859998
Interaction between English only and liking of country	0.7750681	0.4925412	1.57	0.118	-0.197794	1.74793
constant	12.23334	1.687482	7.25	0.000	8.900241	15.56643

Regression W2c.4: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, food neophilia, and their interaction, for Ambiguous chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-6.524558	2.873185	-2.27	0.025	-12.20922	-0.839892
Food neophilia	-0.4644864	0.3792763	-1.22	0.223	-1.214894	0.285921
Interaction between English only and food neophilia	0.9339813	0.5285198	1.77	0.080	-0.1117082	1.979671
constant	13.0041	2.043533	6.36	0.000	8.960917	17.04728

Regression W2c.5: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, cuisine perception, and their interaction, for Ambiguous chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-8.585505	3.616538	-2.37	0.019	-15.74091	-1.430096
Liking of cuisine	-0.1022974	0.4516657	-0.23	0.821	-0.9959291	0.7913343
Interaction between English only and liking of cuisine	1.382024	0.6937649	1.99	0.048	0.0093927	2.754654
constant	11.10905	2.408256	4.61	0.000	6.344259	15.87385

Regression W2c.6: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, country perception, and their interaction, for Ambiguous chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	-3.349055	2.630538	-1.27	0.205	-8.553639	1.855528
Liking of country	0.0776556	0.3900587	0.2	0.843	-0.6940851	0.8493962
Interaction between English only and liking of country	0.4038132	0.5651899	0.71	0.476	-0.7144287	1.522055
constant	10.21762	1.861143	5.49	0.000	6.535301	13.89993

Regression W2c.7: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, food neophilia, and their interaction, for Turkish chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	4.219583	2.396515	1.76	0.080	-0.5098361	8.949003
Food neophilia	0.6930367	0.3415551	2.03	0.044	0.0189924	1.367081
Interaction between English only and food neophilia	-1.002943	0.4616019	-2.17	0.031	-1.913894	-0.0919911
constant	6.958795	1.742471	3.99	0.000	3.520104	10.39749

Regression W2c.8: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, cuisine perception, and their interaction, for Turkish chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	2.358764	2.817553	0.84	0.404	-3.201557	7.919084
Liking of cuisine	0.2972183	0.4014966	0.74	0.460	-0.4951181	1.089555
Interaction between English only and liking of cuisine	- 0.6344845	0.554975	-1.14	0.254	-1.729704	0.4607349
constant	8.912038	2.027293	4.4	0.000	4.911262	12.91281

Regression W2c.9: Regression of winsorized Willingness to Pay, by whether the menu was English only or not, country perception, and their interaction, for Turkish chef.

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
English only	1.224333	2.293579	0.53	0.594	-3.301947	5.750613
Liking of country	0.1594626	0.3570519	0.45	0.656	-0.5451639	0.8640892
Interaction between English only and liking of country	-0.4291696	0.4759385	-0.9	0.368	-1.368414	0.5100747
constant	9.651038	1.68279	5.74	0.000	6.330124	12.97195

Regression W2c.10: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, food neophilia, and their interaction, for US chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	1.698614	3.127051	0.54	0.587	-4.430293	7.827521
Food neophilia	1.526721	0.6621399	2.31	0.021	0.2289507	2.824491
Interaction between English only and food neophilia	-0.8710635	0.7167597	-1.22	0.224	-2.275887	0.5337596
constant	-4.555838	2.776375	-1.64	0.101	-9.997433	0.8857577

Regression W2c.11: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, cuisine perception, and their interaction, for US chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	-0.6724089	3.260267	-0.21	0.837	-7.062414	5.717596
Liking of cuisine	1.677914	0.6140609	2.73	0.006	0.474377	2.881451
Interaction between English only and liking of cuisine	-0.3712272	0.7267042	-0.51	0.609	-1.795541	1.053087
constant	-5.25143	2.64781	-1.98	0.047	-10.44104	-0.061818

Regression W2c.12: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, country perception, and their interaction, for US chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	-0.6955047	1.619472	-0.43	0.668	-3.869612	2.478603
Liking of country	0.7063928	0.3463779	2.04	0.041	0.0275046	1.385281
Interaction between English only and liking of country	-0.3314409	0.4023762	-0.82	0.410	-1.120084	0.4572019
constant	-0.4050038	1.337756	-0.3	0.762	-3.026957	2.21695

Regression W2c.13: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, food neophilia, and their interaction, for Ambiguous chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	2.058815	2.365803	0.87	0.384	-2.578074	6.695703
Food neophilia	1.005072	0.4079973	2.46	0.014	0.2054123	1.804732
Interaction between English only and food neophilia	-0.7530883	0.4944351	-1.52	0.128	-1.722163	0.2159866
constant	-2.667717	1.808515	-1.48	0.140	-6.212341	0.8769073

Regression W2c.14: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, cuisine perception, and their interaction, for Ambiguous chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	14.29236	11.76254	1.22	0.224	-8.761804	37.34652
Liking of cuisine	5.683704	2.769588	2.05	0.040	0.2554112	11.112
Interaction between English only and liking of cuisine	-3.825802	2.825859	-1.35	0.176	-9.364384	1.71278
constant	-22.90829	11.42146	-2.01	0.045	-45.29394	-0.5226433

Regression W2c.15: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, country perception, and their interaction, for Ambiguous chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	-3.094201	2.41189	-1.28	0.200	-7.821419	1.633017
Liking of country	0.5690787	0.4160183	1.37	0.171	-0.2463022	1.384459
Interaction between English only and liking of country	0.3853424	0.5610615	0.69	0.492	-0.7143179	1.485003
constant	-0.3325279	1.773629	-0.19	0.851	-3.808776	3.14372

Regression W2c.16: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, food neophilia, and their interaction, for Turkish chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	1.037962	1.768028	0.59	0.557	-2.42731	4.503234
Food neophilia	0.9194086	0.2996188	3.07	0.002	0.3321666	1.506651
Interaction between english only and food neophilia	- 0.3738357	0.3654095	-1.02	0.306	-1.090025	0.3423537
constant	-3.133401	1.396767	-2.24	0.025	-5.871015	-0.395787

Regression W2c.17: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, cuisine perception, and their interaction, for Turkish chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	-0.1278805	2.5808	-0.05	0.960	-5.186156	4.930395
Liking of cuisine	1.501173	0.4395638	3.42	0.001	0.6396438	2.362702
Interaction between English only and liking of cuisine	-0.1839815	0.5553864	-0.33	0.740	-1.272519	0.9045558
constant	-5.70585	1.956491	-2.92	0.004	-9.540501	-1.871199

Regression W2c.18: Logistic Regression of intention to visit (yes/no), by whether the menu was English only or not, country perception, and their interaction, for Turkish chef.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	1.68375	1.59409	1.06	0.291	-1.440608	4.808109
Liking of country	0.7839052	0.302287	2.59	0.010	0.1914336	1.376377
Interaction between English only and liking of country	-0.5302322	0.3569141	-1.49	0.137	-1.229771	0.1693065
constant	-2.208141	1.294237	-1.71	0.088	-4.744799	0.3285158

Overall Mediation Paths (Direct and Indirect effects) for Willingness to Pay

Note: We use SEM function on Stata for the mediation

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
unique <-						
englishonly	-.8154431	.1347287	-6.05	0.000	-1.079506	-.5513797
authentic <-						
englishonly	-1.196365	.1218949	-9.81	0.000	-1.435274	-.9574553
quality <-						
unique	.2194988	.0370514	5.92	0.000	.1468795	.2921182
authentic	.3448809	.0377853	9.13	0.000	.2708229	.4189388
englishonly	0	(no path)				
wtp_win <-						
unique	0	(no path)				
authentic	0	(no path)				
quality	.6191069	.1309248	4.73	0.000	.362499	.8757147
englishonly	-1.148919	.385723	-2.98	0.003	-1.904923	-.3929163

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
unique <-						
englishonly	0	(no path)				
authentic <-						
englishonly	0	(no path)				
quality <-						
unique	0	(no path)				
authentic	0	(no path)				
englishonly	-.5915922	.074024	-7.99	0.000	-.7366764	-.4465079
wtp_win <-						
unique	.1358932	.0377464	3.60	0.000	.0619116	.2098749
authentic	.2135181	.0525343	4.06	0.000	.1105528	.3164834
quality	0	(no path)				
englishonly	-.3662588	.0951686	-3.85	0.000	-.5527858	-.1797317

Overall Mediation Paths (Direct and Indirect effects) for Intent to Visit
Note: We use SEM function on Stata for the mediation

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
unique <-						
englishonly	-.8128118	.14963	-5.43	0.000	-1.106081	-.5195424
authentic <-						
englishonly	-1.209637	.1329217	-9.10	0.000	-1.470159	-.9491154
quality <-						
unique	.2320616	.0436952	5.31	0.000	.1464205	.3177027
authentic	.3400148	.0456423	7.45	0.000	.2505576	.429472
englishonly	0	(no path)				
intention_yn <-						
unique	0	(no path)				
authentic	0	(no path)				
quality	.1615365	.0147196	10.97	0.000	.1326865	.1903864
englishonly	-.1192492	.0405646	-2.94	0.003	-.1987544	-.0397441

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
unique <-						
englishonly	0	(no path)				
authentic <-						
englishonly	0	(no path)				
quality <-						
unique	0	(no path)				
authentic	0	(no path)				
englishonly	-.599917	.0915967	-6.55	0.000	-.7794433	-.4203907
intention_yn <-						
unique	.0374864	.0077593	4.83	0.000	.0222785	.0526944
authentic	.0549248	.009626	5.71	0.000	.0360581	.0737914
quality	0	(no path)				
englishonly	-.0969085	.018256	-5.31	0.000	-.1326895	-.0611275

Study 3a

Regression W3a.1: Logistic Regression of choice of first restaurant, by whether the first menu was English only or not, food neophilia, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English only	6.779346	2.578629	2.63	0.009	1.725327	11.83336
Food neophilia	2.613793	0.9889124	2.64	0.008	0.6755601	4.552026
Interaction between English only and food neophilia	-3.912849	1.340792	-2.92	0.004	-6.540753	-1.284945
constant	-3.861845	1.895219	-2.04	0.042	-7.576406	-0.147284

Regression W3a.2: Logistic Regression of choice of first restaurant, by whether the first menu was English only or not, cuisine perception, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	2.453468	2.008562	1.22	0.222	-1.48324	6.390176
Liking of cuisine	1.909543	0.7718024	2.47	0.013	0.3968375	3.422247
Interaction between English first and liking of cuisine	-1.719499	1.041307	-1.65	0.099	-3.760422	0.3214245
constant	-2.420368	1.481782	-1.63	0.102	-5.324608	0.483872

Study 3b

Regression W3b.1: Logistic Regression of choice of first restaurant, by whether the first menu was English only or not, food neophilia, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	2.296307	0.7125848	3.22	0.001	0.8996666	3.692948
Food neophilia	0.3509821	0.1012446	3.47	0.001	0.1525464	0.5494178
Interaction between English first and food neophilia	-0.7600814	0.1500015	-5.07	0.000	-1.054079	-0.4660839
constant	-0.9432632	0.4799422	-1.97	0.049	-1.883933	-0.0025938

Regression W3b.2: Logistic Regression of choice of first restaurant, by whether the first menu was English only or not, country perception, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	0.3887651	0.6338818	0.61	0.540	-0.8536204	1.631151
Liking of country	0.2600111	0.0896515	2.9	0.004	0.0842973	0.4357248
Interaction between English first and liking of country	-0.3315409	0.1249547	-2.65	0.008	-0.5764475	-0.0866343
constant	-0.5884252	0.4497726	-1.31	0.191	-1.469963	0.2931129

Regression W3b.3: Logistic Regression of choice of first restaurant, by whether the first menu was English only or not, cuisine perception, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	2.155906	0.804302	2.68	0.007	0.5795033	3.732309
Liking of cuisine	0.3152671	0.1049096	3.01	0.003	0.1096481	0.5208861
Interaction between English first and liking of cuisine	-0.6549094	0.1530587	-4.28	0.000	-0.954899	-0.3549198
constant	-0.9511658	0.5518178	-1.72	0.085	-2.032709	0.1303771

Mediation Paths (Direct and Indirect effects)

Note: We use SEM function on Stata for the mediation

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_unique <-						
englishfirst	**-2.878681**	**.1606708**	**-17.92**	**0.000**	**-3.19359**	**-2.563772**
relative_authentic <-						
englishfirst	**-4.243243**	**.1540721**	**-27.54**	**0.000**	**-4.545219**	**-3.941267**
relative_quality <-						
relative_unique	**.1311456**	**.0417605**	**3.14**	**0.002**	**.0492966**	**.2129947**
relative_authentic	**.4084364**	**.0346222**	**11.80**	**0.000**	**.340578**	**.4762947**
englishfirst	**0**	(no path)				
choice_restaurant1 <-						
relative_unique	**0**	(no path)				
relative_authentic	**0**	(no path)				
relative_quality	**.1548795**	**.0084485**	**18.33**	**0.000**	**.1383207**	**.1714383**
englishfirst	**-.0032758**	**.0395399**	**-0.08**	**0.934**	**-.0807725**	**.0742209**

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_unique <-						
englishfirst	**0**	(no path)				
relative_authentic <-						
englishfirst	**0**	(no path)				
relative_quality <-						
relative_unique	**0**	(no path)				
relative_authentic	**0**	(no path)				
englishfirst	**-2.110621**	**.1213184**	**-17.40**	**0.000**	**-2.348401**	**-1.872842**
choice_restaurant1 <-						
relative_unique	**.0203118**	**.0064476**	**3.15**	**0.002**	**.0076747**	**.0329489**
relative_authentic	**.0632584**	**.0061507**	**10.28**	**0.000**	**.0512033**	**.0753136**
relative_quality	**0**	(no path)				
englishfirst	**-.326892**	**.0204572**	**-15.98**	**0.000**	**-.3669874**	**-.2867966**

Post-test Study 3b

Regression W3b_post.1: Regression of choice of first restaurant, by whether the first menu was English only or not, food neophilia, and their interaction, when the mixed language was Turkish+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	1.4328834	.3749786	3.82	.0002503	.6874505	2.1783162	***
food_neophilia	.1889068	.0547127	3.45	.0008632	.0801416	.297672	***
englishXfood	-.3353378	.0812107	-4.13	.000084	-.4967793	-.1738963	***
Constant	-.3559175	.2545045	-1.40	.165567	-.8618557	.1500206	

Mean dependent var	0.4555556	SD dependent var	0.5008108
R-squared	0.1753668	Number of obs	90
F-test	6.0962618	Prob > F	0.0008236
Akaike crit. (AIC)	120.5750197	Bayesian crit. (BIC)	130.5742583

**** p<.01, ** p<.05, * p<.1*

Regression W3b_post.2: Regression of choice of first restaurant, by whether the first menu was English only or not, food neophilia, and their interaction, when the mixed language was Korean+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	.6114743	.2897801	2.11	.0375029	.0361091	1.1868394	**
food_neophilia	-.0168313	.0422658	-0.40	.6913676	-.100751	.0670884	
englishXfood	.0059088	.0628411	0.09	.9252876	-.1188637	.1306813	
Constant	.2779994	.1941289	1.43	.1554508	-.1074482	.6634469	

Mean dependent var	0.4897959	SD dependent var	0.5024660
R-squared	0.4033272	Number of obs	98
F-test	21.1800919	Prob > F	0.0000000
Akaike crit. (AIC)	99.6084168	Bayesian crit. (BIC)	109.9482867

**** p<.01, ** p<.05, * p<.1*

Regression W3b_post.3: Regression of choice of first restaurant, by whether the first menu was English only or not, food neophilia, and their interaction, when the mixed language was Gibberish+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	1.1075395	.2758235	4.02	.0001129	.5605087	1.6545703	***
food_neophilia	.0164648	.0456888	0.36	.7193102	-.0741482	.1070778	
englishXfood	-.0804013	.0606037	-1.33	.1875509	-.2005944	.0397919	
Constant	.0253131	.2073266	0.12	.9030633	-.3858704	.4364966	

Mean dependent var	0.5607477	SD dependent var	0.4986315
R-squared	0.5528492	Number of obs	107
F-test	42.4491135	Prob > F	0.0000000
Akaike crit. (AIC)	75.6081859	Bayesian crit. (BIC)	86.2995012

**** p<.01, ** p<.05, * p<.1*

Regression W3b_post.4: Regression of choice of first restaurant, by whether the first menu was English only or not, cuisine perceptions, and their interaction, when the mixed language was Turkish+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	1.2868863	.4105657	3.13	.0023558	.4707087	2.1030639	***
cuisine_perceptions	.1957157	.056879	3.44	.0008969	.082644	.3087873	***
englishXcuisine	-.2707055	.0801545	-3.38	.0011012	-.4300474	-.1113637	***
Constant	-.4917235	.2938071	-1.67	.0978377	-1.0757927	.0923458	*

Mean dependent var	0.4555556	SD dependent var	0.5008108
R-squared	0.1400021	Number of obs	90
F-test	4.6667490	Prob > F	0.0045401
Akaike crit. (AIC)	124.3542259	Bayesian crit. (BIC)	134.3534646

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression W3b_post.5: Regression of choice of first restaurant, by whether the first menu was English only or not, cuisine perceptions, and their interaction, when the mixed language was Korean+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	.5454101	.2969621	1.84	.0694245	-.0442151	1.1350352	*
cuisine_perceptions	-.0060967	.0370461	-0.16	.8696359	-.0796526	.0674592	
englishXcuisine	.0190062	.0592549	0.32	.74911	-.0986459	.1366582	
Constant	.2329075	.1853982	1.26	.2121365	-.1352049	.6010199	

Mean dependent var	0.4897959	SD dependent var	0.5024660
R-squared	0.4026377	Number of obs	98
F-test	21.1194802	Prob > F	0.0000000
Akaike crit. (AIC)	99.7215950	Bayesian crit. (BIC)	110.0614649

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression W3b_post.6: Regression of choice of first restaurant, by whether the first menu was English only or not, cuisine perceptions, and their interaction, when the mixed language was Gibberish+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	1.1276312	.3386183	3.33	.0012057	.4560615	1.7992008	***
cuisine_perceptions	.0424691	.0495241	0.86	.3931356	-.0557503	.1406884	
englishXcuisine	-.0759355	.0668949	-1.14	.2589486	-.2086057	.0567347	
Constant	-.1182371	.2572055	-0.46	.6467013	-.6283436	.3918695	

Mean dependent var	0.5607477	SD dependent var	0.4986315
R-squared	0.5467642	Number of obs	107
F-test	41.4182607	Prob > F	0.0000000
Akaike crit. (AIC)	77.0544588	Bayesian crit. (BIC)	87.7457741

**** p<.01, ** p<.05, * p<.1*

Regression W3b_post.7: Regression of choice of first restaurant, by whether the first menu was English only or not, country perceptions, and their interaction, when the mixed language was Turkish+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	-.2408334	.3857305	-0.62	.5340462	-1.0076404	.5259735	
country_perceptions	-.019084	.0593836	-0.32	.7487114	-.1371346	.0989666	
englishXcountry	.0411521	.0857136	0.48	.6323674	-.129241	.2115452	
Constant	.5687023	.2616829	2.17	.0325109	.048494	1.0889106	**

Mean dependent var	0.4555556	SD dependent var	0.5008108
R-squared	0.0066378	Number of obs	90
F-test	0.1915554	Prob > F	0.9018888
Akaike crit. (AIC)	137.3291138	Bayesian crit. (BIC)	147.3283525

**** p<.01, ** p<.05, * p<.1*

Regression W3b_post.7: Regression of choice of first restaurant, by whether the first menu was English only or not, country perceptions, and their interaction, when the mixed language was Korean+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	.760299	.3054754	2.49	.0145726	.1537705	1.3668276	**
country_perceptions	.0384395	.039908	0.96	.3379178	-.0407989	.1176778	
englishXcountry	-.0279865	.0674397	-0.41	.6790982	-.1618897	.1059167	
Constant	.0349971	.1831233	0.19	.8488497	-.3285985	.3985928	

Mean dependent var	0.4897959	SD dependent var	0.5024660
R-squared	0.4080457	Number of obs	98
F-test	21.5986770	Prob > F	0.0000000
Akaike crit. (AIC)	98.8303546	Bayesian crit. (BIC)	109.1702245

******* *p<.01, ** p<.05, * p<.1*

Regression W3b_post.8: Regression of choice of first restaurant, by whether the first menu was English only or not, country perceptions, and their interaction, when the mixed language was Gibberish+English. *Note:* Indifferent responses are missing values in this regression.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
englishfirst	.5862374	.2746681	2.13	.0351871	.041498	1.1309769	**
country_perceptions	-.0533881	.0493463	-1.08	.2818201	-.1512548	.0444786	
englishXcountry	.0348808	.0580067	0.60	.5489453	-.0801618	.1499235	
Constant	.3449692	.2347666	1.47	.1447685	-.120635	.8105734	

Mean dependent var	0.5607477	SD dependent var	0.4986315
R-squared	0.5478469	Number of obs	107
F-test	41.5996486	Prob > F	0.0000000
Akaike crit. (AIC)	76.7985525	Bayesian crit. (BIC)	87.4898678

**** p<.01, ** p<.05, * p<.1*

Study 3c

Regression W3c.1: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	2.584578	0.828432	3.12	0.002	0.9608813	4.208275
Food neophilia	0.1416174	0.1029872	1.38	0.169	-0.0602337	0.3434686
Interaction between English first and food neophilia	-0.8013814	0.1764281	-4.54	0.000	-1.147174	-0.4555887
constant	0.0007757	0.4780465	0	0.999	-0.9361783	0.9377297

Regression W3c.2: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	-1.729964	0.6541524	-2.64	0.008	-3.01208	-0.4478491
Liking of country	-0.0904356	0.096109	-0.94	0.347	-0.2788059	0.0979346
Interaction between English first and liking of country	0.1303251	0.1357254	0.96	0.337	-0.1356919	0.396342
constant	1.050651	0.4593857	2.29	0.022	0.1502714	1.95103

Regression W3c.3: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	0.9827105	0.8164076	1.2	0.229	-0.6174191	2.58284
Liking of cuisine	0.3047731	0.1110624	2.74	0.006	0.0870948	0.5224513
Interaction between English first and liking of cuisine	-0.4314529	0.1619003	-2.66	0.008	-0.7487716	-0.1141341
constant	-0.8383558	0.5475988	-1.53	0.126	-1.91163	0.2349181

Regression W3c.3: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, by correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	2.285738	1.111986	2.06	0.040	0.1062846	4.465191
Food neophilia	0.127694	0.1368638	0.93	0.351	-0.1405541	0.395942
Interaction between English first and food neophilia	-0.8447444	0.2375398	-3.56	0.000	-1.310314	-0.379175
constant	0.3741795	0.6332496	0.59	0.555	-0.8669668	1.615326

Regression W3c.4: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, by correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	0.4204897	1.107268	0.38	0.704	-1.749717	2.590696
Liking of cuisine	0.1994202	0.1514941	1.32	0.188	-0.0975028	0.4963432
Interaction between English first and liking of cuisine	-0.4225913	0.2234159	-1.89	0.059	-0.8604784	0.0152958
constant	-0.0093658	0.7393918	-0.01	0.990	-1.458547	1.439815

Regression W3c.5: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, by correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	-1.182648	0.8694915	-1.36	0.174	-2.88682	0.5215245
Liking of country	-0.1050297	0.132249	-0.79	0.427	-0.3642329	0.1541736
Interaction between English first and liking of country	-0.1016271	0.1888448	-0.54	0.59	-0.471756	0.2685019
constant	1.408586	0.6125739	2.3	0.021	0.2079636	2.609209

Regression W3c.6: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, for fine dining. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	3.22907	1.457139	2.22	0.027	0.3731299	6.085011
Food neophilia	0.3169695	0.1956226	1.62	0.105	-0.0664437	0.7003827
Interaction between English first and food neophilia	-0.9868464	0.3123664	-3.16	0.002	-1.599073	-0.3746194
constant	-0.562187	0.9023329	-0.62	0.533	-2.330727	1.206353

Regression W3c.7: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, for casual dining. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	1.874078	1.488352	1.26	0.208	-1.043038	4.791193
Food neophilia	0.1347147	0.1609107	0.84	0.402	-0.1806645	0.4500939
Interaction between English first and food neophilia	-0.7085864	0.3166645	-2.24	0.025	-1.329237	-0.0879354
constant	-0.2511946	0.7464356	-0.34	0.736	-1.714182	1.211792

Regression W3c.8: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, for local takeout. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	2.262424	1.44276	1.57	0.117	-0.5653336	5.090181
Food neophilia	-0.0325056	0.1900833	-0.17	0.864	-0.405062	0.3400508
Interaction between English first and food neophilia	-0.6539287	0.3041463	-2.15	0.032	-1.250045	-0.0578129
constant	0.870721	0.8908303	0.98	0.328	-0.8752743	2.616716

Regression W3c.9: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, for fine dining. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	0.1420823	1.285339	0.11	0.912	-2.377136	2.661301
Liking of cuisine	0.0239898	0.1800316	0.13	0.894	-0.3288657	0.3768453
Interaction between English first and liking of cuisine	-0.3130421	0.272493	-1.15	0.251	-0.8471187	0.2210345
constant	0.7565172	0.8481429	0.89	0.372	-0.9058123	2.418847

Regression W3c.10: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, for casual dining. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	-0.8122812	1.562859	-0.52	0.603	-3.875429	2.250867
Liking of cuisine	0.1392981	0.178378	0.780	0.435	-0.2103164	0.4889125
Interaction between English first and liking of cuisine	-0.1270377	0.3008666	-0.42	0.673	-0.7167254	0.46265
constant	-0.3319941	0.8955226	-0.37	0.711	-2.087186	1.423198

Regression W3c.11: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, for local takeout. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	0.8710978	1.401646	0.62	0.534	-1.876077	3.618273
Liking of cuisine	0.3617471	0.2025043	1.79	0.074	-0.0351541	0.7586482
Interaction between English first and liking of cuisine	-0.3448994	0.2773637	-1.24	0.214	-0.8885223	0.1987235
constant	-1.030977	0.9919399	-1.04	0.299	-2.975143	0.9131894

Regression W3c.12: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, for fine dining. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	0.1420823	1.285339	0.11	0.912	-2.377136	2.661301
Liking of country	0.0239898	0.1800316	0.13	0.894	-0.3288657	0.3768453
Interaction between English first and liking of country	-0.3130421	0.272493	-1.15	0.251	-0.8471187	0.2210345
constant	0.7565172	0.8481429	0.89	0.372	-0.9058123	2.418847

Regression W3c.13: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, for casual dining. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	-2.340353	1.140548	-2.05	0.040	-4.575787	-0.1049198
Liking of country	-0.0313442	0.1509131	-0.21	0.835	-0.3271285	0.2644402
Interaction between English first and liking of country	0.1966403	0.2334376	0.84	0.400	-0.260889	0.6541696
constant	0.4900748	0.7172901	0.68	0.494	-0.915788	1.895938

Regression W3c.14: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, for local takeout. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	-2.626081	1.135543	-2.31	0.021	-4.851704	-0.4004577
Liking of country	-0.2807995	0.176948	-1.59	0.113	-0.6276111	0.0660122
Interaction between English first and liking of country	0.3930051	0.2322232	1.69	0.091	-0.062144	0.8481542
constant	2.024924	0.8597603	2.36	0.019	0.3398247	3.710023

Regression W3c.15: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, for fine dining and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	2.356454	1.568086	1.5	0.133	-0.7169389	5.429846
Food neophilia	0.2643938	0.2155902	1.23	0.220	-0.1581552	0.6869428
Interaction between English first and food neophilia	-0.8598948	0.3342683	-2.57	0.010	-1.515049	-0.204741
constant	-0.2291981	1.002759	-0.23	0.819	-2.194569	1.736173

Regression W3c.16: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, for casual dining and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	4.258081	2.528851	1.68	0.092	-0.698376	9.214538
Food neophilia	0.2287812	0.2324768	0.98	0.325	-0.226865	0.6844273
Interaction between English first and food neophilia	-1.39159	0.5463521	-2.55	0.011	-2.46242	-0.3207591
constant	-0.228822	1.076523	-0.21	0.832	-2.338768	1.881124

Regression W3c.17: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, food neophilia, and their interaction, for local takeout and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	0.2182089	2.317697	0.09	0.925	-4.324394	4.760812
Food neophilia	-0.2480822	0.3057544	-0.81	0.417	-0.8473498	0.3511854
Interaction between English first and food neophilia	-0.282817	0.4943928	-0.57	0.567	-1.251809	0.6861751
constant	2.167491	1.428007	1.52	0.129	-0.6313516	4.966335

Regression W3c.18: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, for fine dining and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	1.770972	1.57291	1.13	0.26	-1.311874	4.853818
Liking of cuisine	0.3703945	0.2253727	1.64	0.1	-0.0713278	0.8121168
Interaction between English first and liking of cuisine	-0.7030314	0.3216245	-2.19	0.029	-1.333404	-0.0726589
constant	-0.8155087	1.098857	-0.74	0.458	-2.969229	1.338211

Regression W3c.19: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, for casual dining and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	0.4616631	2.364353	0.2	0.845	-4.172384	5.09571
Liking of cuisine	0.2172939	0.2610753	0.83	0.405	-0.2944043	0.7289921
Interaction between English first and liking of cuisine	-0.5459855	0.4773856	-1.14	0.253	-1.481644	0.3896731
constant	-0.2353203	1.26584	-0.19	0.853	-2.716322	2.245681

Regression W3c.20: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, cuisine perception, and their interaction, for local takeout and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	-2.72238	2.449005	-1.11	0.266	-7.522342	2.077583
Liking of cuisine	-0.251689	0.3533713	-0.71	0.476	-0.944284	0.4409061
Interaction between English first and liking of cuisine	0.3272155	0.4832112	0.68	0.498	-0.6198609	1.274292
constant	2.279449	1.758284	1.3	0.195	-1.166724	5.725621

Regression W3c.21: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, for fine dining and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	0.1137288	1.462452	0.08	0.938	-2.752625	2.980082
Liking of country	-0.0258769	0.2094156	-0.12	0.902	-0.436324	0.3845702
Interaction between English first and liking of country	-0.3855513	0.3156355	-1.22	0.222	-1.004186	0.233083
constant	1.091774	0.9860669	1.11	0.268	-0.8408817	3.024429

Regression W3c.22: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, for casual dining and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
English first	-2.83837	1.67819	-1.69	0.091	-6.127563	0.4508228
Liking of country	0.0124206	0.2251977	0.06	0.956	-0.4289587	0.4537999
Interaction between English first and liking of country	0.1347145	0.3585068	0.38	0.707	-0.5679459	0.8373749
constant	0.7442025	0.9734679	0.76	0.445	-1.16376	2.652165

Regression W3c.23: Logistic Regression of choice of first restaurant, by whether the first menu was English first or not, country perception, and their interaction, for local takeout and correct recall. *Note:* Indifferent responses are missing values in this regression.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
English first	-2.120449	1.707794	-1.24	0.214	-5.467663	1.226765
Liking of country	-0.4292634	0.2761118	-1.55	0.12	-0.9704327	0.1119058
Interaction between English first and liking of country	0.2064317	0.3608859	0.57	0.567	-0.5008918	0.9137551
constant	3.011352	1.343753	2.24	0.025	0.3776443	5.64506

Overall Mediation Paths (Direct and Indirect effects)
Note: We use SEM function on Stata for the mediation

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_unique <-						
englishfirst	-2.515812	.2018268	-12.47	0.000	-2.911385	-2.120239
relative_authentic <-						
englishfirst	-3.423781	.204963	-16.70	0.000	-3.825501	-3.022061
relative_quality <-						
relative_unique	.1968021	.0609183	3.23	0.001	.0774045	.3161997
relative_authentic	.4480176	.0527133	8.50	0.000	.3447014	.5513339
englishfirst	0	(no path)				
choice_firstrestaurant <-						
relative_unique	0	(no path)				
relative_authentic	0	(no path)				
relative_quality	.1546951	.0134506	11.50	0.000	.1283324	.1810577
englishfirst	-.0812651	.0597554	-1.36	0.174	-.1983836	.0358534

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_unique <-						
englishfirst	**0**	(no path)				
relative_authentic <-						
englishfirst	**0**	(no path)				
relative_quality <-						
relative_unique	**0**	(no path)				
relative_authentic	**0**	(no path)				
englishfirst	**-2.029031**	**.1580447**	**-12.84**	**0.000**	**-2.338793**	**-1.719269**
choice_firstrestaurant <-						
relative_unique	**.0304443**	**.0093233**	**3.27**	**0.001**	**.0121711**	**.0487176**
relative_authentic	**.0693061**	**.0095961**	**7.22**	**0.000**	**.0504981**	**.0881142**
relative_quality	**0**	(no path)				
englishfirst	**-.3138812**	**.0288756**	**-10.87**	**0.000**	**-.3704763**	**-.2572861**

Study 4

Regression W4.1: Logistic Regression of choice of restaurant A, by whether the its own menu had Chinese characters in it or not (i.e., was in mixed language or English only), whether Restaurant B was the first option or not, and whether the color beige in menu was first or not, for those who could not read or understand Chinese at all.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Without Chinese characters	-1.940763	0.5081273	-3.82	0.000	-2.936674	-0.9448515
RestaurantB first	-0.0865431	0.4721233	-0.18	0.855	-1.011888	0.8388016
beige first	-1.148889	0.4947752	-2.32	0.020	-2.118631	-0.1791477
constant	2.125764	0.5407723	3.93	0.000	1.06587	3.18565

Regression W4.2: Logistic Regression of choice of restaurant A, by whether the its own menu had Chinese characters in it or not (i.e., was in mixed language or English only), whether Restaurant B was the first option or not, and whether the color beige in menu was first or not, for those who could not read or understand Chinese at all, and whose native language was English.

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Without Chinese characters	-1.787473	0.5540826	-3.23	0.001	-2.873455	-0.7014906
RestaurantB first	-0.2360537	0.5227799	-0.45	0.652	-1.260684	0.788576
beige first	-0.9710009	0.539413	-1.8	0.072	-2.028231	0.0862291
constant	2.085263	0.5803125	3.59	0.000	0.9478714	3.222655

Meta-Analysis of all Experimental studies

Regression W5.1: Regression of Standardized DV (standardized and collected from all studies, so a combination of WTP, and choice studies), on English (standardized), standardized composite score of the three moderators called individual difference, their interaction, and a study-level fixed effects

dv_std	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
english	-.456	.037	-12.17	0	-.53	-.383
individual_difference	.206	.034	6.11	0	.14	.272
Interaction	-.234	.049	-4.75	0	-.33	-.137
Study : base 1	0	.	.	.	.	.
2	-.019	.067	-0.28	.78	-.149	.112
3	-.018	.059	-0.30	.762	-.133	.097
5	-.023	.061	-0.37	.709	-.142	.096
12	-.011	.057	-0.20	.842	-.123	.1
Constant	.243	.047	5.13	0	.15	.336

Regression W5.2: Regression of Standardized DV (standardized and collected from all studies, so a combination of WTP, and choice studies), on English (standardized), standardized composite score of food neophilia, their standardized interaction, and a study-level fixed effects

dv_std	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
english	-.443	.036	-12.29	0	-.514	-.372
foodneophilia_std	.105	.025	4.17	0	.056	.154
Interaction	-.191	.036	-5.29	0	-.262	-.12
Study : base 1	0	.	.	.	.	.
2	-.011	.067	-0.16	.871	-.142	.12
3	-.013	.059	-0.23	.819	-.129	.102
4	-.016	.077	-0.20	.84	-.166	.135
5	-.015	.061	-0.24	.808	-.134	.105
12	-.006	.057	-0.10	.92	-.117	.106
Constant	.234	.047	4.94	0	.141	.326

Regression W5.3: Regression of Standardized DV (standardized and collected from all studies, so a combination of WTP, and choice studies), on English (standardized), standardized composite score of cuisine perception, their standardized interaction, and a study-level fixed effects

dv_std	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
english	-.448	.036	-12.45	0	-.519	-.378
cuisine_perception_stdd	.162	.025	6.45	0	.113	.211
Interaction	-.157	.036	-4.30	0	-.228	-.085
Study : base 1	0	.	.	.	.	.
2	-.018	.067	-0.27	.788	-.149	.113
3	-.018	.059	-0.30	.764	-.133	.097
4	-.008	.078	-0.10	.918	-.16	.144
5	-.026	.061	-0.42	.674	-.145	.093
12	-.011	.057	-0.20	.844	-.123	.1
Constant	.239	.047	5.07	0	.146	.331

Regression W5.4: Regression of Standardized DV (standardized and collected from all studies, so a combination of WTP, and choice studies), on English (standardized), standardized composite score of country perception, their standardized interaction, and a study-level fixed effects

dv_std	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
english	-.456	.038	-12.14	0	-.53	-.383
country_perception_std	.122	.027	4.57	0	.069	.174
Interaction	-.092	.038	-2.45	.014	-.166	-.019
Study : base 1	0	.	.	.	.	.
2	-.012	.067	-0.17	.863	-.143	.12
3	-.013	.059	-0.23	.82	-.129	.102
5	-.023	.061	-0.38	.707	-.142	.096
12	-.006	.057	-0.10	.923	-.117	.106
Constant	.239	.048	5.03	0	.146	.332

APPENDIX D

Sample Questions (Essay 2)

Sample Menus used for Willingness to Pay and Choice Studies

(*Note: All Menu colors and style were counterbalanced between the two language types*)

Turkish Restaurant Menus

English Only **Mixed Language (Turkish+English)**

French Restaurant Menus

English Only **Mixed Language (French+English)**

Korean Restaurant Menus

English Only **Mixed Language (Korean+English)**

Sample Questions

Willingness to Pay (Studies 2a-c)

How much do you think you would be *willing to pay* for each item from the menu? (please enter the amount in dollars)

- Pommes De Frittes:
- Souple a l'oignon:
- Sole meuniere:
- Pot-au-feu:
- Clafoutis:

<u>Choice Between Menus (Studies 3a-c; Study 4)</u>

Out of the two Korean restaurants whose menus you saw, which one would you choose to go to?

<u>Authenticity (Studies 2a-c; Studies 3b-c)</u>

How authentic do you think the Korean restaurant is (menu below)? (1 = not authentic at all, 7 = very authentic)

(Other variations included asking "How authentically Korean do you think the restaurant is?")

<u>Uniqueness (Studies 2c, 3b & 3c)</u>

How unique do you think the Turkish restaurant is (menu below)? (1 = not unique at all, 7 = very unique)

<u>Quality (Studies 2a-c; Studies 3b-c)</u>

How good do you think the quality of the Turkish restaurant is (menu below)? (1 = not good quality at all, 7 = very good quality)

<u>Food Neophilia (Studies 2a-c; Studies 3b-c)</u>

1. I am constantly sampling new and different foods? (1 = not at all true, 7 = completely true)
2. I don't trust new foods (1 = not at all true, 7 = completely true)
3. If I don't know what is in the food, I won't try it (1 = not at all true, 7 = completely true)
4. I like foods from different countries (1 = not at all true, 7 = completely true)
5. New food looks too weird to eat (1 = not at all true, 7 = completely true)
6. At dinner parties, I will try a new food (1 = not at all true, 7 = completely true)
7. I am afraid to eat things I have never had before (1 = not at all true, 7 = completely true)
8. I am very particular about foods I will eat (1 = not at all true, 7 = completely true)
9. I will eat almost anything (1 = not at all true, 7 = completely true)
10. I like to try new food restaurants (1 = not at all true, 7 = completely true)

Cuisine Perceptions (Studies 2a-c; Studies 3b-c)

1. Please rate your liking of Turkish cuisine overall (1 = do not like at all, 7 = like a lot)
2. How good do you think Turkish cuisine's quality is overall? (1 = very poor quality, 7 = very good quality)
3. How good do you think Turkish cuisine tastes overall? (1 = tastes very poor, 7 = tastes very good)

Country Perceptions (Studies 2a-c; Studies 3b-c)

Please rate your liking of Turkey, as a country, overall (1 = do not like at all, 7 = like very much)

Chef Biographies (Study 2c)

US Chef

Our chef credits his mother and grandmothers for his love of cooking. Growing up with his brothers, parents and grandparents all under one roof, he rarely went out for meals. Instead, everyone was welcomed into the kitchen to cook. Once he turned 19, our chef attended the Arizona Culinary Institute to pursue his career in the field of food. Upon graduation he spent the next 10 years working in various restaurants all across the United States. Finally, he joined our restaurant as the executive chef 4 years ago and has elevated our menu ever since.

Unspecified Chef

Our chef credits his mother and grandmothers for his love of cooking. Growing up with his brothers, parents and grandparents all under one roof, he rarely went out for meals. Instead, everyone was welcomed into the kitchen to cook. Once he turned 19, our chef attended culinary school to pursue his career in the field of food. Upon graduation he spent the next 10 years working in various restaurants. Finally, he joined our restaurant as the executive chef 4 years ago and has elevated our menu ever since.

Turkish Chef

Our chef credits his mother and grandmothers for his love of cooking. Growing up with his brothers, parents and grandparents all under one roof, he rarely went out for meals. Instead, everyone was welcomed into the kitchen to cook. Once he turned 19, our chef attended the Istanbul Culinary Institute to pursue his career in the field of food. Upon graduation he spent the next 10 years working in various restaurants all across Turkey. Finally, he joined our restaurant as the executive chef 4 years ago and has elevated our menu ever since.

Brief Versions of questions (Study 3a)

Food Neophilia

Do you trust new foods? (Yes/No)
Do you like foods from different countries? (Yes/No)

Cuisine Perception

Do you think Turkish cuisine is good? (Yes/No)

Real Choice Study (Study 4)
Sample Menus

The menus below were the main manipulation. In some conditions the menu of the left was one of the options and in some cases the menu on the right was one of the options. Notice, the menu of the left is the same as the one on the right, without the Chinese characters. The color and design of the menus were **counterbalanced.**

The other menu was always the one below

APPENDIX E

Supplementary Statistical Materials (Essay 3)

Study 1a

Regression 1a.1: Regression of whether a pair was present or not, by whether both names of the pair were chemical or not. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_chemical	.3715431	.0148267	25.06	0	.3424124	.4006737	***
Constant	.2289913	.0061706	37.11	0	.2168677	.2411149	***

Mean dependent var	0.2627680	SD dependent var	0.4401441
R-squared	0.0588920	Number of obs	32934
F-test	627.9535737	Prob > F	0.0000000
Akaike crit. (AIC)	37411.8589703	Bayesian crit. (BIC)	37428.6634919

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.2: Regression of whether a pair was present or not, by whether both names of the pair were natural or not. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_natural	.2389112	.0123865	19.29	0	.2145749	.2632474	***
Constant	.2410488	.0062878	38.34	0	.228695	.2534026	***

Mean dependent var	0.2627680	SD dependent var	0.4401441
R-squared	0.0243507	Number of obs	32934
F-test	372.0284850	Prob > F	0.0000000
Akaike crit. (AIC)	38598.9761506	Bayesian crit. (BIC)	38615.7806722

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.3: Regression of whether a pair was present or not, by whether both names of the pair were latin or not. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_latin	.4869071	.0150068	32.45	0	.4574228	.5163915	***
Constant	.2185037	.0061252	35.67	0	.2064693	.2305381	***

Mean dependent var	0.2627680	SD dependent var	0.4401441
R-squared	0.1011417	Number of obs	32934
F-test	1052.7330061	Prob > F	0.0000000
Akaike crit. (AIC)	35899.1177520	Bayesian crit. (BIC)	35915.9222737

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.4: Regression of whether a pair was present or not, by whether both names of the pair had the same meaning or not. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_same_meaning	-.1490945	.0053672	-27.78	0	-.1596396	-.1385494	***
Constant	.289876	.0061489	47.14	0	.277795	.3019571	***

Mean dependent var	0.2627680	SD dependent var	0.4401441
R-squared	0.0170700	Number of obs	32934
F-test	771.6728299	Prob > F	0.0000000
Akaike crit. (AIC)	38843.8295559	Bayesian crit. (BIC)	38860.6340776

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.5: Regression of whether a pair was present or not, by whether both names of the pair were chemical or not, without identifiable markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_chemical	.4362667	.0204985	21.28	0	.3958942	.4766392	***
Constant	.2264	.0080615	28.08	0	.2105227	.2422773	***

Mean dependent var	0.2660606	SD dependent var	0.4419097
R-squared	0.0805523	Number of obs	16500
F-test	452.9613961	Prob > F	0.0000000
Akaike crit. (AIC)	18492.8271613	Bayesian crit. (BIC)	18508.2493926

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.6: Regression of whether a pair was present or not, by whether both names of the pair were natural or not, without identifiable markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_natural	.2265333	.0167178	13.55	0	.1936071	.2594596	***
Constant	.2454667	.0081885	29.98	0	.229339	.2615943	***

Mean dependent var	0.2660606	SD dependent var	0.4419097
R-squared	0.0217189	Number of obs	16500
F-test	183.6151697	Prob > F	0.0000000
Akaike crit. (AIC)	19516.2210089	Bayesian crit. (BIC)	19531.6432402

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.7: Regression of whether a pair was present or not, by whether both names of the pair had the same meaning or not, without identifiable markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_same_meaning	-.1605926	.0067665	-23.73	0	-.1739195	-.1472657	***
Constant	.2952593	.0082283	35.88	0	.2790533	.3114653	***

Mean dependent var	0.2660606	SD dependent var	0.4419097
R-squared	0.0196471	Number of obs	16500
F-test	563.2730622	Prob > F	0.0000000
Akaike crit. (AIC)	19551.1287361	Bayesian crit. (BIC)	19566.5509674

**** p<.01, ** p<.05, * p<.1*

Regression 1a.8: Regression of whether a pair was present or not, by whether both names of the pair were chemical or not, with identifiable markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_chemical	.3065596	.0206666	14.83	0	.2658552	.347264	***
Constant	.231593	.0093629	24.74	0	.213152	.2500341	***

Mean dependent var	0.2594621	SD dependent var	0.4383528
R-squared	0.0404225	Number of obs	16434
F-test	220.0350897	Prob > F	0.0000000
Akaike crit. (AIC)	18855.3057295	Bayesian crit. (BIC)	18870.7199448

**** p<.01, ** p<.05, * p<.1*

Regression 1a.9: Regression of whether a pair was present or not, by whether both names of the pair were natural or not, with identifiable markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_natural	.2513387	.018288	13.74	0	.2153191	.2873583	***
Constant	.2366131	.0095579	24.76	0	.2177881	.2554382	***

Mean dependent var	0.2594621	SD dependent var	0.4383528
R-squared	0.0271714	Number of obs	16434
F-test	188.8799595	Prob > F	0.0000000
Akaike crit. (AIC)	19080.6951183	Bayesian crit. (BIC)	19096.1093336

**** p<.01, ** p<.05, * p<.1*

Regression 1a.10: Regression of whether a pair was present or not, by whether both names of the pair had the same meaning or not, with identifiable markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_same_meaning	-.1375502	.0082885	-16.60	0	-.1538749	-.1212255	***
Constant	.2844712	.0091471	31.10	0	.2664552	.3024872	***

Mean dependent var	0.2594621	SD dependent var	0.4383528
R-squared	0.0146483	Number of obs	16434
F-test	275.4073025	Prob > F	0.0000000
Akaike crit. (AIC)	19290.8973040	Bayesian crit. (BIC)	19306.3115193

**** p<.01, ** p<.05, * p<.1*

Regression 1a.11: Regression of harm perceptions of group by chemical. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	1.4042027	.0668828	20.99	0	1.2727904	1.5356151	***
Constant	2.3823606	.0554179	42.99	0	2.2734746	2.4912465	***

Mean dependent var	2.8516408	SD dependent var	1.7997696
R-squared	0.1354718	Number of obs	5790
F-test	440.7895866	Prob > F	0.0000000
Akaike crit. (AIC)	22396.5371927	Bayesian crit. (BIC)	22409.8649678

**** p<.01, ** p<.05, * p<.1*

Regression 1a.12: Regression of harm perceptions of group by natural. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-1.2827842	.0584441	-21.95	0	-1.3976161	-1.1679523	***
Constant	3.2796786	.0619383	52.95	0	3.1579812	3.401376	***

Mean dependent var	2.8516408	SD dependent var	1.7997696
R-squared	0.1129693	Number of obs	5790
F-test	481.7553555	Prob > F	0.0000000
Akaike crit. (AIC)	22545.3151310	Bayesian crit. (BIC)	22558.6429062

**** p<.01, ** p<.05, * p<.1*

Regression 1a.13: Regression of harm perceptions of group by latin. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
latin	-.1227923	.0583802	-2.10	.035946 9	-.2374987	-.0080859	**
Constant	2.8924231	.0516318	56.02	0	2.790976	2.9938702	***

Mean dependent var	2.8516408	SD dependent var	1.7997696
R-squared	0.0010327	Number of obs	5790
F-test	4.4239598	Prob > F	0.0359469
Akaike crit. (AIC)	23233.4131015	Bayesian crit. (BIC)	23246.7408766

**** p<.01, ** p<.05, * p<.1*

Regression 1a.14: Regression of harm perceptions of group by chemical, without markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	1.4945416	.0928797	16.09	0	1.3116008	1.6774824	***
Constant	2.2203302	.0781658	28.41	0	2.0663706	2.3742899	***

Mean dependent var	2.7205630	SD dependent var	1.7672364
R-squared	0.1593137	Number of obs	2913
F-test	258.9254693	Prob > F	0.0000000
Akaike crit. (AIC)	11081.6463678	Bayesian crit. (BIC)	11093.6002453

**** p<.01, ** p<.05, * p<.1*

Regression 1a.15: Regression of harm perceptions of group by natural, without markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-1.183341	.0764207	-15.48	0	-1.3338634	-1.0328185	***
Constant	3.1141975	.0845319	36.84	0	2.9476988	3.2806962	***

Mean dependent var	2.7205630	SD dependent var	1.7672364
R-squared	0.0995678	Number of obs	2913
F-test	239.7713557	Prob > F	0.0000000
Akaike crit. (AIC)	11281.6424351	Bayesian crit. (BIC)	11293.5963126

**** p<.01, ** p<.05, * p<.1*

Regression 1a.16: Regression of harm perceptions of group by chemical, with markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	1.3132091	.0962476	13.64	0	1.1236231	1.5027951	***
Constant	2.5461659	.0774449	32.88	0	2.393617	2.6987148	***

Mean dependent var	2.9843587	SD dependent var	1.8228476
R-squared	0.1154334	Number of obs	2877
F-test	186.1608080	Prob > F	0.0000000
Akaike crit. (AIC)	11269.3874152	Bayesian crit. (BIC)	11281.3164220

**** p<.01, ** p<.05, * p<.1*

Regression 1a.17: Regression of harm perceptions of group by natural, with markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-1.3844097	.0882753	-15.68	0	-1.5582922	-1.2105272	***
Constant	3.4477534	.0896051	38.48	0	3.2712516	3.6242552	***

Mean dependent var	2.9843587	SD dependent var	1.8228476
R-squared	0.1284896	Number of obs	2877
F-test	245.9520971	Prob > F	0.0000000
Akaike crit. (AIC)	11226.6065147	Bayesian crit. (BIC)	11238.5355215

**** p<.01, ** p<.05, * p<.1*

Regression 1a.18: Regression of naturalness perceptions of group by chemical. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-1.6775661	.0849763	-19.74	0	-1.8445247	-1.5106075	***
Constant	5.0761317	.0674886	75.21	0	4.9435323	5.2087311	***

Mean dependent var	4.5154110	SD dependent var	2.1028778
R-squared	0.1416400	Number of obs	5840
F-test	389.7302944	Prob > F	0.0000000
Akaike crit. (AIC)	24366.0721225	Bayesian crit. (BIC)	24379.4170946

**** p<.01, ** p<.05, * p<.1*

Regression 1a.19: Regression of naturalness perceptions of group by natural. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	1.2185133	.0703785	17.31	0	1.0802359	1.3567907	***
Constant	4.1091703	.0676666	60.73	0	3.9762212	4.2421194	***

Mean dependent var	4.5154110	SD dependent var	2.1028778
R-squared	0.0746331	Number of obs	5840
F-test	299.7649073	Prob > F	0.0000000
Akaike crit. (AIC)	24805.0458063	Bayesian crit. (BIC)	24818.3907785

**** p<.01, ** p<.05, * p<.1*

Regression 1a.20: Regression of naturalness perceptions of group by latin. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
latin	.4619145	.0733272	6.30	0	.3178436	.6059854	***
Constant	4.3618877	.0582413	74.89	0	4.247457	4.4763183	***

Mean dependent var	4.5154110	SD dependent var	2.1028778
R-squared	0.0107084	Number of obs	5840
F-test	39.6819760	Prob > F	0.0000000
Akaike crit. (AIC)	25195.1512680	Bayesian crit. (BIC)	25208.4962401

**** p<.01, ** p<.05, * p<.1*

Regression 1a.21: Regression of naturalness perceptions of group by chemical, without markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-1.8129052	.1215416	-14.92	0	-2.0522954	-1.573515	***
Constant	5.0708376	.1030583	49.20	0	4.8678526	5.2738227	***

Mean dependent var	4.4623841	SD dependent var	2.2036857
R-squared	0.1509617	Number of obs	2911
F-test	222.4846455	Prob > F	0.0000000
Akaike crit. (AIC)	12387.8162800	Bayesian crit. (BIC)	12399.7687839

**** p<.01, ** p<.05, * p<.1*

Regression 1a.22: Regression of naturalness perceptions of group by natural, without markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	1.1457176	.096787	11.84	0	.9550845	1.3363508	***
Constant	4.0817901	.0989024	41.27	0	3.8869905	4.2765897	***

Mean dependent var	4.4623841	SD dependent var	2.2036857
R-squared	0.0599851	Number of obs	2911
F-test	140.1267039	Prob > F	0.0000000
Akaike crit. (AIC)	12684.1310475	Bayesian crit. (BIC)	12696.0835514

*** *p<.01, ** p<.05, * p<.1*

Regression 1a.23: Regression of naturalness perceptions of group by chemical, with markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-1.5418844	.118448	-13.02	0	-1.7751813	-1.3085874	***
Constant	5.0813715	.0875601	58.03	0	4.9089118	5.2538313	***

Mean dependent var	4.5681120	SD dependent var	1.9966384
R-squared	0.1324779	Number of obs	2929
F-test	169.4525166	Prob > F	0.0000000
Akaike crit. (AIC)	11949.4905932	Bayesian crit. (BIC)	11961.4554259

*** *p<.01, ** p<.05, * p<.1*

Regression 1a.24: Regression of naturalness perceptions of group by natural, with markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	1.2900504	.102168	12.63	0	1.0888188	1.491282	***
Constant	4.1364802	.092567	44.69	0	3.9541589	4.3188016	***

Mean dependent var	4.5681120	SD dependent var	1.9966384
R-squared	0.0929741	Number of obs	2929
F-test	159.4349765	Prob > F	0.0000000
Akaike crit. (AIC)	12079.9191034	Bayesian crit. (BIC)	12091.8839361

*** *p<.01, ** p<.05, * p<.1*

Regression 1a.25: Regression of edibility perceptions of group by chemical. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95%	Interval]	Sig

					Conf		
chemical	-.8531789	.0698052	-12.22	0	-.990332	-.7160259	***
Constant	3.372807	.0700819	48.13	0	3.2351103	3.5105038	***

Mean dependent var	3.0886098	SD dependent var	1.9501341
R-squared	0.0425269	Number of obs	5812
F-test	149.3842606	Prob > F	0.0000000
Akaike crit. (AIC)	24007.8132057	Bayesian crit. (BIC)	24021.1485658

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.26: Regression of edibility perceptions of group by natural. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	.8387185	.0719603	11.66	0	.6973312	.9801059	***
Constant	2.8082192	.0639264	43.93	0	2.6826168	2.9338215	***

Mean dependent var	3.0886098	SD dependent var	1.9501341
R-squared	0.0411717	Number of obs	5812
F-test	135.8459714	Prob > F	0.0000000
Akaike crit. (AIC)	24016.0338845	Bayesian crit. (BIC)	24029.3692445

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.27: Regression of edibility perceptions of group by latin. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
latin	.0129581	.0635385	0.20	.8384843	-.1118821	.1377983	
Constant	3.0843001	.0638224	48.33	0	2.9589019	3.2096982	***

Mean dependent var	3.0886098	SD dependent var	1.9501341
R-squared	0.0000098	Number of obs	5812
F-test	0.0415918	Prob > F	0.8384843
Akaike crit. (AIC)	24260.3322331	Bayesian crit. (BIC)	24273.6675931

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1a.28: Regression of edibility perceptions of group by chemical, without markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-.6512961	.1014668	-6.42	0	-.8511587	-.4514335	***
Constant	3.1221294	.0951366	32.82	0	2.9347357	3.3095232	***

Mean dependent var	2.9047288	SD dependent var	1.8746729
R-squared	0.0268501	Number of obs	2876
F-test	41.2011337	Prob > F	0.0000000
Akaike crit. (AIC)	11701.2112195	Bayesian crit. (BIC)	11713.1395309

**** p<.01, ** p<.05, * p<.1*

Regression 1a.29: Regression of edibility perceptions of group by natural, without markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	.5088857	.0966468	5.27	3.000e-07	.3185172	.6992542	***
Constant	2.7348643	.0892682	30.64	0	2.5590298	2.9106988	***

Mean dependent var	2.9047288	SD dependent var	1.8746729
R-squared	0.0163919	Number of obs	2876
F-test	27.7246191	Prob > F	0.0000003
Akaike crit. (AIC)	11731.9539661	Bayesian crit. (BIC)	11743.8822775

**** p<.01, ** p<.05, * p<.1*

Regression 1a.30: Regression of edibility perceptions of group by chemical, with markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-1.0502342	.0945205	-11.11	0	-1.2364031	-.8640653	***
Constant	3.6178571	.1004979	36.00	0	3.419915	3.8157993	***

Mean dependent var	3.2687330	SD dependent var	2.0053565
R-squared	0.0608879	Number of obs	2936
F-test	123.4583987	Prob > F	0.0000000
Akaike crit. (AIC)	12236.4321397	Bayesian crit. (BIC)	12248.4017464

**** p<.01, ** p<.05, * p<.1*

Regression 1a.31: Regression of edibility perceptions of group by natural, with markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig

natural	1.1605074	.1024115	11.33	0	.9587962	1.3622187	***
Constant	2.8801843	.0914274	31.50	0	2.7001075	3.0602612	***

Mean dependent var	3.2687330	SD dependent var	2.0053565
R-squared	0.0746112	Number of obs	2936
F-test	128.4098276	Prob > F	0.0000000
Akaike crit. (AIC)	12193.2114386	Bayesian crit. (BIC)	12205.1810454

**** p<.01, ** p<.05, * p<.1*

Study 1b

Regression 1b.1: Regression of whether a pair was present or not, by whether both names of the pair were chemical or not, with markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_chemical	.3176638	.0293136	10.84	0	.2596046	.3757231	***
Constant	.2179487	.015339	14.21	0	.1875679	.2483295	***

Mean dependent var	0.2468272	SD dependent var	0.4311933
R-squared	0.0448603	Number of obs	7722
F-test	117.4350793	Prob > F	0.0000000
Akaike crit. (AIC)	8571.1892843	Bayesian crit. (BIC)	8585.0929417

**** p<.01, ** p<.05, * p<.1*

Regression 1b.2: Regression of whether a pair was present or not, by whether both names of the pair were natural or not, with markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_natural	.2737892	.0292045	9.37	0	.2159461	.3316323	***
Constant	.2219373	.0156553	14.18	0	.19093	.2529446	***

Mean dependent var	0.2468272	SD dependent var	0.4311933
R-squared	0.0333242	Number of obs	7722
F-test	87.8889427	Prob > F	0.0000000
Akaike crit. (AIC)	8663.8966170	Bayesian crit. (BIC)	8677.8002744

**** p<.01, ** p<.05, * p<.1*

Regression 1b.3: Regression of whether a pair was present or not, by whether both names of the pair were chemical or not, without markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig

both_chemical	-.2139881	.0163914	-13.05	0	-.2464687	-.1815074	***
Constant	.2139881	.0163914	13.05	0	.1815074	.2464687	***

Mean dependent var	0.1945346	SD dependent var	0.3958688
R-squared	0.0241518	Number of obs	7392
F-test	.	Prob > F	.
Akaike crit. (AIC)	7097.9404260	Bayesian crit. (BIC)	7104.8485797

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1b.4: Regression of whether a pair was present or not, by whether both names of the pair were natural or not, without markers. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_natural	.3278274	.0256148	12.80	0	.2770699	.3785849	***
Constant	.1647321	.0140642	11.71	0	.1368629	.1926013	***

Mean dependent var	0.1945346	SD dependent var	0.3958688
R-squared	0.0566841	Number of obs	7392
F-test	163.7976419	Prob > F	0.0000000
Akaike crit. (AIC)	6849.3088120	Bayesian crit. (BIC)	6863.1251193

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1b.4: Regression of whether a pair was present or not, by whether both names of the pair were latin or not. Clustered by person standard errors.

pair_present	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
both_latin	.4131004	.0227304	18.17	0	.368312	.4578889	***
Constant	.1836972	.0107041	17.16	0	.1626057	.2047888	***

Mean dependent var	0.2212518	SD dependent var	0.4151034
R-squared	0.0818544	Number of obs	15114
F-test	330.2920242	Prob > F	0.0000000
Akaike crit. (AIC)	15026.6578134	Bayesian crit. (BIC)	15041.9045669

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1b.5: Regression chemical-ness perceptions, by whether name was chemical or not, with markers. Clustered by person standard errors.

chemicalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	2.0218682	.1899612	10.64	0	1.6455915	2.3981448	***
Constant	3.6318115	.1599963	22.70	0	3.3148896	3.9487333	***

Mean dependent var	4.4504820	SD dependent var	2.1587139
R-squared	0.2115615	Number of obs	1141
F-test	113.2858526	Prob > F	0.0000000
Akaike crit. (AIC)	4725.8283754	Bayesian crit. (BIC)	4735.9076961

**** p<.01, ** p<.05, * p<.1*

Regression 1b.6: Regression chemical-ness perceptions, by whether name was chemical or not, without markers. Clustered by person standard errors.

chemicalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	1.0907998	.1801353	6.06	0	.7337404	1.4478593	***
Constant	3.7305459	.1907618	19.56	0	3.352423	4.1086688	***

Mean dependent var	4.0944272	SD dependent var	2.2119456
R-squared	0.0541044	Number of obs	1292
F-test	36.6684361	Prob > F	0.0000000
Akaike crit. (AIC)	5649.0382007	Bayesian crit. (BIC)	5659.3660941

**** p<.01, ** p<.05, * p<.1*

Regression 1b.7: Regression natural-ness perceptions, by whether name was chemical or not, with markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-1.4169833	.1799546	-7.87	0	-1.773472	-1.0604946	***
Constant	4.4648094	.1652641	27.02	0	4.1374225	4.7921963	***

Mean dependent var	3.8940455	SD dependent var	2.1108998
R-squared	0.1084887	Number of obs	1142
F-test	62.0016768	Prob > F	0.0000000
Akaike crit. (AIC)	4819.1201194	Bayesian crit. (BIC)	4829.2011922

**** p<.01, ** p<.05, * p<.1*

Regression 1b.8: Regression natural-ness perceptions, by whether name was chemical or not, without markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig

chemical	-.5418343	.150305	-3.60	.0004741	-.8397649	-.2439036	***
Constant	3.7543054	.1899964	19.76	0	3.3776996	4.1309112	***

Mean dependent var	3.5743865	SD dependent var	2.0975417
R-squared	0.0148114	Number of obs	1304
F-test	12.9952874	Prob > F	0.0004741
Akaike crit. (AIC)	5616.0506139	Bayesian crit. (BIC)	5626.3969974

**** p<.01, ** p<.05, * p<.1*

Regression 1b.9: Regression natural-ness perceptions, by whether name was natural or not, with markers. Clustered by person standard errors.

chemicalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	1.0907998	.1801353	6.06	0	.7337404	1.4478593	***
Constant	3.7305459	.1907618	19.56	0	3.352423	4.1086688	***

Mean dependent var	4.0944272	SD dependent var	2.2119456
R-squared	0.0541044	Number of obs	1292
F-test	36.6684361	Prob > F	0.0000000
Akaike crit. (AIC)	5649.0382007	Bayesian crit. (BIC)	5659.3660941

**** p<.01, ** p<.05, * p<.1*

Regression 1b.10: Regression natural-ness perceptions, by whether name was natural or not, without markers. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-.5418343	.150305	-3.60	.0004741	-.8397649	-.2439036	***
Constant	3.7543054	.1899964	19.76	0	3.3776996	4.1309112	***

Mean dependent var	3.5743865	SD dependent var	2.0975417
R-squared	0.0148114	Number of obs	1304
F-test	12.9952874	Prob > F	0.0004741
Akaike crit. (AIC)	5616.0506139	Bayesian crit. (BIC)	5626.3969974

**** p<.01, ** p<.05, * p<.1*

Regression 1b.11: Regression chemical-ness perceptions, by whether name was natural or not, with markers. Clustered by person standard errors.

chemicalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-1.4604396	.1519702	-9.61	0	-1.7614633	-1.1594158	***

Constant	4.7461538	.1200183	39.55	0	4.5084206	4.9838871	***

Mean dependent var	4.4504820	SD dependent var	2.1587139
R-squared	0.0739673	Number of obs	1141
F-test	92.3528346	Prob > F	0.0000000
Akaike crit. (AIC)	4909.3641385	Bayesian crit. (BIC)	4919.4434592

*** *p<.01, ** p<.05, * p<.1*

Regression 1b.12: Regression chemical-ness perceptions, by whether name was natural or not, without markers. Clustered by person standard errors.

chemicalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-.7910609	.1338205	-5.91	0	-1.0563164	-.5258055	***
Constant	4.3564815	.1624876	26.81	0	4.0344029	4.67856	***

Mean dependent var	4.0944272	SD dependent var	2.2119456
R-squared	0.0283557	Number of obs	1292
F-test	34.9441569	Prob > F	0.0000000
Akaike crit. (AIC)	5683.7383146	Bayesian crit. (BIC)	5694.0662079

*** *p<.01, ** p<.05, * p<.1*

Regression 1b.13: Regression natural-ness perceptions, by whether name was latin or not. Clustered by person standard errors.

naturalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
latin	.3646268	.0978925	3.72	.0002477	.171714	.5575396	***
Constant	3.5914047	.1124411	31.94	0	3.3698217	3.8129878	***

Mean dependent var	3.7236304	SD dependent var	2.1093980
R-squared	0.0069090	Number of obs	2446
F-test	13.8738840	Prob > F	0.0002477
Akaike crit. (AIC)	10578.8906079	Bayesian crit. (BIC)	10590.4950266

*** *p<.01, ** p<.05, * p<.1*

Regression 1b.14: Regression chemical-ness perceptions, by whether name was latin or not. Clustered by person standard errors.

chemicalness	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
latin	-.6428957	.1150467	-5.59	1.000e-07	-.869608	-.4161834	***

Constant	4.494201	.1054659	42.61	0	4.2863689	4.7020332	***

Mean dependent var	4.2614057	SD dependent var	2.1939047
R-squared	0.0198430	Number of obs	2433
F-test	31.2271652	Prob > F	0.0000001
Akaike crit. (AIC)	10681.9243972	Bayesian crit. (BIC)	10693.5181579

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1b.15: Regression harm perceptions, by whether name was chemical or not, with markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	1.4210311	.152932	9.29	0	1.118074	1.7239882	***
Constant	3.1127379	.1393271	22.34	0	2.8367321	3.3887438	***

Mean dependent var	3.6838879	SD dependent var	1.8692782
R-squared	0.1390404	Number of obs	1142
F-test	86.3396907	Prob > F	0.0000000
Akaike crit. (AIC)	4501.6506816	Bayesian crit. (BIC)	4511.7317544

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1b.16: Regression harm perceptions, by whether name was chemical or not, without markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	.3204379	.1136988	2.82	.0057705	.0949943	.5458816	***
Constant	3.1617473	.1465706	21.57	0	2.871125	3.4523697	***

Mean dependent var	3.2681388	SD dependent var	1.7251638
R-squared	0.0076577	Number of obs	1268
F-test	7.9428514	Prob > F	0.0057705
Akaike crit. (AIC)	4974.6169940	Bayesian crit. (BIC)	4984.9073862

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 1b.17: Regression edibility perceptions, by whether name was chemical or not, with markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-1.2423479	.1541509	-8.06	0	-1.5476913	-.9370046	***

Constant	3.309593	.1440806	22.97	0	3.0241972	3.5949889	***

Mean dependent var	2.8111401	SD dependent var	1.8912087
R-squared	0.1037612	Number of obs	1149
F-test	64.9522339	Prob > F	0.0000000
Akaike crit. (AIC)	4602.1718797	Bayesian crit. (BIC)	4612.2651743

**** p<.01, ** p<.05, * p<.1*

Regression 1b.18: Regression edibility perceptions, by whether name was chemical or not, without markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical	-.1569696	.1192348	-1.32	.1908015	-.3933136	.0793743	
Constant	2.8128588	.1501641	18.73	0	2.5152075	3.1105101	***

Mean dependent var	2.7607362	SD dependent var	1.8332961
R-squared	0.0016272	Number of obs	1304
F-test	1.7331077	Prob > F	0.1908015
Akaike crit. (AIC)	5282.2168190	Bayesian crit. (BIC)	5292.5632025

**** p<.01, ** p<.05, * p<.1*

Regression 1b.19: Regression harm perceptions, by whether name was natural or not, with markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-1.166849	.120303	-9.70	0	-1.4051684	-.9285296	***
Constant	3.916849	.1237417	31.65	0	3.6717177	4.1619804	***

Mean dependent var	3.6838879	SD dependent var	1.8692782
R-squared	0.0623176	Number of obs	1142
F-test	94.0754270	Prob > F	0.0000000
Akaike crit. (AIC)	4599.1360131	Bayesian crit. (BIC)	4609.2170859

**** p<.01, ** p<.05, * p<.1*

Regression 1b.20: Regression harm perceptions, by whether name was natural or not, without markers. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	-.2752839	.0840699	-3.27	.0014343	-.441979	-.1085889	***

Constant	3.3601896	.1390184	24.17	0	3.0845418	3.6358374	***

Mean dependent var	3.2681388	SD dependent var	1.7251638
R-squared	0.0056717	Number of obs	1268
F-test	10.7221226	Prob > F	0.0014343
Akaike crit. (AIC)	4977.1521010	Bayesian crit. (BIC)	4987.4424933

**** p<.01, ** p<.05, * p<.1*

Regression 1b.21: Regression edibility perceptions, by whether name was natural or not, with markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	1.2790067	.1384464	9.24	0	1.004771	1.5532424	***
Constant	2.5528899	.119941	21.28	0	2.3153097	2.79047	***

Mean dependent var	2.8111401	SD dependent var	1.8912087
R-squared	0.0737670	Number of obs	1149
F-test	85.3458117	Prob > F	0.0000000
Akaike crit. (AIC)	4639.9957316	Bayesian crit. (BIC)	4650.0890261

**** p<.01, ** p<.05, * p<.1*

Regression 1b.22: Regression edibility perceptions, by whether name was natural or not, without markers. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
natural	.063121	.0981593	0.64	.521557	-.1314477	.2576896	
Constant	2.7396313	.1432395	19.13	0	2.4557059	3.0235568	***

Mean dependent var	2.7607362	SD dependent var	1.8332961
R-squared	0.0002640	Number of obs	1304
F-test	0.4135087	Prob > F	0.5215570
Akaike crit. (AIC)	5283.9961103	Bayesian crit. (BIC)	5294.3424938

**** p<.01, ** p<.05, * p<.1*

Regression 1b.23: Regression harm perceptions, by whether name was latin or not. Clustered by person standard errors.

harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig

latin	-.3106752	.0848555	-3.66	.0003144	-.477909	-.1434415	***
Constant	3.578329	.0958201	37.34	0	3.3894863	3.7671717	***

Mean dependent var	3.4651452	SD dependent var	1.8064931
R-squared	0.0068524	Number of obs	2410
F-test	13.4045747	Prob > F	0.0003144
Akaike crit. (AIC)	9676.1999789	Bayesian crit. (BIC)	9687.7747429

**** p<.01, ** p<.05, * p<.1*

Regression 1b.23: Regression edibility perceptions, by whether name was latin or not. Clustered by person standard errors.

edible	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
latin	.2382036	.0943053	2.53	.0122322	.0523646	.4240426	**
Constant	2.6978233	.0956071	28.22	0	2.5094188	2.8862278	***

Mean dependent var	2.7843457	SD dependent var	1.8604362
R-squared	0.0037932	Number of obs	2453
F-test	6.3800604	Prob > F	0.0122322
Akaike crit. (AIC)	10000.6885581	Bayesian crit. (BIC)	10012.2986922

**** p<.01, ** p<.05, * p<.1*

T-test for confidence in definitions of chemical words and confidence in their chemical-ness, with markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Definition(1) vs Chemicalness(2)	117	1.705	4.0855000	-2.3803419	.241	-9.9	0

T-test for confidence in definitions of natural words and confidence in their natural-ness, with markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Definition(1) vs Naturalness(2)	117	1.7095	3.8720000	-2.1623932	.2345	-9.25	0

T-test for confidence in purpose of chemical words and confidence in their chemical-ness, with markers

	obs	Mean1	Mean2	dif	diff St	t value	p value

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Purpose(1) vs Chemicalness(2)	117	1.654	4.0855000	-2.4316239	.2145	-11.35	0

T-test for confidence in purpose of natural words and confidence in their natural-ness, with markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Purpose(1) vs Naturalness (2)	117	1.705	3.8720000	-2.1666667	.2075	-10.45	0

Table 1b.5: T-test for confidence in definitions of chemical words and confidence in their chemical-ness, without markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Definition(1) vs Chemicalness(2)	112	1.288	2.9285000	-1.640625	.2245	-7.3	0

T-test for confidence in definitions of natural words and confidence in their natural-ness, without markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Definition(1) vs Naturalness(2)	112	1.2655	2.3480000	-1.0825893	.1905	-5.7	0

T-test for confidence in purpose of chemical words and confidence in their chemical-ness, without markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Purpose(1) vs Chemicalness(2)	112	1.3325	2.9285000	-1.5959821	.2025	-7.9	0

T-test for confidence in purpose of natural words and confidence in their natural-ness, without markers

	obs	Mean1	Mean2	dif	diff St Err	t value	p value

Purpose(1) vs Naturalness (2)	112	1.277	2.3480000	-1.0714286	.1735	-6.15	0

<u>Study 2</u>

T-test for choice of chemical vs choice of natural when it was a skincare product, for people that were not indifferent and those that were not familiar with the ingredients.

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Choice Chem vs Choice Nat	35	.2855	0.7145000	-.4285714	.155	-2.75	.009

T-test for choice of chemical vs choice of natural when it was a makeup product, for people that were not indifferent and those that were not familiar with the ingredients.

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Choice Chem vs Choice Nat	49	.3265	0.6735000	-.3469388	.1355	-2.55	.0135

T-test for harm perceptions for chemical vs natural when it was a skincare product, for people that were not indifferent and those that were not familiar with the ingredients.

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Harm Chem vs Harm Nat	46	2.9785	1.5055000	1.4728261	.2275	6.45	0

T-test for harm perceptions for chemical vs natural when it was a makeup product, for people that were not indifferent and those that were not familiar with the ingredients.

	obs	Mean1	Mean2	dif	diff St Err	t value	p value
Harm Chem vs Harm Nat	54	2.736	1.6620000	1.0740741	.1825	5.9	0

T-test for effectiveness perceptions for chemical vs natural when it was a skincare product, for people that were not indifferent and those that were not familiar with the ingredients.

	obs	Mean2	dif	diff	t	p

		Mean1			St Err	value	value
Effective Chem vs Effective Nat	46	4.299	4.4510000	-.1521739	.1725	-.9	.382

T-test for effectiveness perceptions for chemical vs natural when it was a makeup product, for people that were not indifferent and those that were not familiar with the ingredients.

	obs	Mean1	Mean2	dif	St Err	t value	p value
Effective Chem vs Effective Nat	54	4.528	4.5970000	-.0694444	.1785	-.4	.699

Mediation– Makeup
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemfirst	**2.085417**	**.3652487**	**5.71**	**0.000**	**1.369542**	**2.801291**
relative_effective <-						
chemfirst	**-.1391667**	**.3843318**	**-0.36**	**0.717**	**-.8924432**	**.6141099**
choice_first <-						
relative_harm	**-.1150301**	**.0421539**	**-2.73**	**0.006**	**-.1976502**	**-.0324101**
relative_effective	**-.0376586**	**.0446487**	**-0.84**	**0.399**	**-.1251686**	**.0498513**
chemfirst	**-.1136884**	**.1840665**	**-0.62**	**0.537**	**-.4744522**	**.2470754**

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemfirst	**0**	(no path)				
relative_effective <-						
chemfirst	**0**	(no path)				
choice_first <-						
relative_harm	**0**	(no path)				
relative_effective	**0**	(no path)				
chemfirst	**-.2346449**	**.0926285**	**-2.53**	**0.011**	**-.4161935**	**-.0530963**

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemfirst	3.031863	.5104121	5.94	0.000	2.031473	4.032252
relative_effective <-						
chemfirst	-.0130719	.3866559	-0.03	0.973	-.7709036	.7447598
choice_first <-						
relative_harm	-.0599455	.0485765	-1.23	0.217	-.1551538	.0352627
relative_effective	.1826202	.0698236	2.62	0.009	.0457685	.319472
chemfirst	-.2472387	.2246684	-1.10	0.271	-.6875807	.1931033

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemfirst	0	(no path)				
relative_effective <-						
chemfirst	0	(no path)				
choice_first <-						
relative_harm	0	(no path)				
relative_effective	0	(no path)				
chemfirst	-.1841339	.1551379	-1.19	0.235	-.4881986	.1199309

<u>Pretest for Study 3a</u>

Ttest of Chemicalness perceptions for chemical names, against midpoint of scale (4)

	obs	Mean	St Err	t value	p value
Chemicalness (Chemical names)	98	5.118	0.0960000	11.6675	0

Ttest of Chemicalness perceptions for natural vs chemical names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Chemicalness Natural names (1) vs. Chemicalness Chemical names (2)	98	98	4.0385000	5.118	-1.0795	.1535	-7	0

Ttest of Naturalness perceptions for natural names, against midpoint of scale (4)

	obs	Mean	St Err	t value	p value
Naturalness (Natural names)	98	3.9225	0.1145000	-.677	.5

Ttest of Naturalness perceptions for natural vs chemical names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Naturalness Natural names (1) vs. Naturalness Chemical names (2)	98	98	3.9225000	3.6785	.2445	.1625	1.5	.134

Study 3a

Regression 3a: Regression choice of chemical, by whether the cleaning product was supposed to be used on a table or not.

choice_chemical	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
table	-.180897	.0678419	-2.67	.0082569	-.3146281	-.0471659	***
Constant	.5726496	.0456748	12.54	0	.4826146	.6626846	***

Mean dependent var	0.4906542	SD dependent var	0.5010848
R-squared	0.0324492	Number of obs	214
F-test	7.1099510	Prob > F	0.0082569
Akaike crit. (AIC)	307.5046184	Bayesian crit. (BIC)	314.2365704

*** *p*<.01, ** *p*<.05, * *p*<.1

Ttest of Harm perceptions of chemical names vs natural names

	obs	Mean1	Mean2	dif	dif St Err	t value	p value
Harm Chem vs Harm Nat	409	5.2345	5.1100000	.1246944	.0485	2.6	.01

Ttest of Effectiveness perceptions of chemical names vs natural names

	obs	Mean1	Mean2	dif	dif St Err	t value	p value
Effective Chem vs Effective Nat	409	6.775	6.6065000	.1687042	.05	3.35	.001

Mediation - Table
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm_staingone <-						
chemical_staingone	.3481781	.2897954	1.20	0.230	-.2198104	.9161666
relative_effec_staingone <-						
chemical_staingone	.3873144	.2965676	1.31	0.192	-.1939474	.9685763
choice_staingone <-						
relative_harm_staingone	-.0892917	.0342279	-2.61	0.009	-.1563772	-.0222061
relative_effec_staingone	.1258556	.0408659	3.08	0.002	.0457598	.2059513
chemical_staingone	-.198493	.0909056	-2.18	0.029	-.3766648	-.0203212

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm_staingone <-						
chemical_staingone	0	(no path)				
relative_effec_staingone <-						
chemical_staingone	0	(no path)				
choice_staingone <-						
relative_harm_staingone	0	(no path)				
relative_effec_staingone	0	(no path)				
chemical_staingone	.0176563	.0550032	0.32	0.748	-.0901481	.1254606

Mediation - Toilet
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm_staingone <-						
chemical_staingone	.4011718	.193841	2.07	0.038	.0212503	.7810932
relative_effec_staingone <-						
chemical_staingone	.4958372	.2371292	2.09	0.037	.0310725	.9606019
choice_staingone <-						
relative_harm_staingone	-.0856885	.0373555	-2.29	0.022	-.1589039	-.0124731
relative_effec_staingone	.2342519	.0360321	6.50	0.000	.1636303	.3048735
chemical_staingone	.0172074	.0807436	0.21	0.831	-.1410471	.1754619

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm_staingone <-						
chemical_staingone	0	(no path)				
relative_effec_staingone <-						
chemical_staingone	0	(no path)				
choice_staingone <-						
relative_harm_staingone	0	(no path)				
relative_effec_staingone	0	(no path)				
chemical_staingone	.081775	.0526299	1.55	0.120	-.0213777	.1849277

Pretest Study 3b

Ttest of Chemicalness perceptions for chemical names, against midpoint of scale (4)

	obs	Mean	St Err	t value	p value
Chemicalness (Chemical names)	99	5.4165	0.1340000	10.5635	0

Ttest of Naturalness perceptions for natural names, against midpoint of scale (4)

	obs	Mean	St Err	t value	p value
Naturalness (Natural names)	100	3.3325	0.1420000	-4.705	0

Ttest of Naturalness perceptions for latin names, against midpoint of scale (4)

	obs	Mean	St Err	t value	p value
Naturalness (Latin names)	100	4.05	0.1125000	.4455	.657

Ttest of Chemicalness perceptions for latin names, against midpoint of scale (4)

	obs	Mean	St Err	t value	p value
Chemicalness (Latin names)	100	3.5125	0.1265000	-3.8505	0

Ttest of Naturalness perceptions for chemical vs natural names

	obs1	obs2	Mean1	Mean2	dif	dif St Err	t value	p value
Naturalness Chemical names (1) vs. Naturalness Natural names (2)	99	100	2.9015000	3.3325	-.431	.1955	-2.2	.029

Ttest of Chemicalness perceptions for natural vs chemical names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Chemicalness Natural names (1) vs. Chemicalness Chemical names (2)	100	99	3.0975000	5.4165	-2.319	.189	-12.3	0

Ttest of Naturalness perceptions for latin vs natural names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Naturalness Latin names (1) vs. Naturalness Natural names (2)	100	100	4.0500000	3.3325	.7175	.181	3.95	0

Ttest of Chemicalness perceptions for latin vs chemical names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Chemicalness Latin names (1) vs. Chemicalness Chemical names (2)	100	99	3.5125000	5.4165	-1.904	.1845	-10.35	0

Ttest of Made-up vs Real perceptions for natural vs chemical names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Real-ness Natural names (1) vs. Real-ness Chemical names (2)	100	99	2.2450000	3.4015	-1.1565	.2155	-5.35	0

Ttest of Made-up vs Real perceptions for natural vs chemical names

	obs1	obs2	Mean1	Mean 2	dif	dif St Err	t value	p value
Real-ness Latin names (1) vs. Real-ness Chemical names (2)	100	99	2.9975000	3.4015	-.404	.2025	-2	.047

Study 3b

Regression 3b.1: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, and their interaction

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	-.4662005	.1144961	-4.07	.000064	-.6917805	-.2406205	***
goal_effective	-.1902834	.0953507	-2.00	.04714	-.378143	-.0024238	**
interaction	.3591632	.1372063	2.62	.0094327	.0888397	.6294868	***
Constant	.7692308	.0775142	9.92	0	.6165124	.9219492	***

Mean dependent var	0.5316456	SD dependent var	0.5000536
R-squared	0.0747940	Number of obs	237
F-test	6.2786032	Prob > F	0.0004093
Akaike crit. (AIC)	332.6497146	Bayesian crit. (BIC)	346.5219552

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 3b.2: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, and their interaction, whe the other ingredient was natural (neutral) with markers.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	-.7568627	.1612668	-4.69	8.900e-06	-1.0769748	-.4367507	***
goal_effective	-.3037037	.1466011	-2.07	.0409817	-.5947046	-.0127028	**
interaction	.5906477	.1968181	3.00	.0034292	.1999669	.9813286	***
Constant	.9333333	.1175424	7.94	0	.7000136	1.1666531	***

Mean dependent var	0.5300000	SD dependent var	0.5016136
R-squared	0.2013111	Number of obs	100
F-test	8.0656640	Prob > F	0.0000757
Akaike crit. (AIC)	130.3192405	Bayesian crit. (BIC)	140.7399212

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 3b.3: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, and their interaction, whe the other ingredient was natural (neutral) without markers.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	.0222222	.2131597	0.10	.9172958	-.4036132	.4480577	
goal_effective	-.2208333	.1816944	-1.22	.2286741	-.5838097	.142143	
interaction	.2009921	.2655918	0.76	.4519643	-.3295886	.7315727	
Constant	.5333333	.1305331	4.09	.0001247	.2725634	.7941032	***

Mean dependent var	0.4852941	SD dependent var	0.5034996
R-squared	0.0369704	Number of obs	68
F-test	0.8189795	Prob > F	0.4881473
Akaike crit. (AIC)	104.0871392	Bayesian crit. (BIC)	112.9651700

**** p<.01, ** p<.05, * p<.1*

Regression 3b.4: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, and their interaction, whe the other ingredient was latin (neutral).

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	-.6031746	.2376178	-2.54	.0135399	-1.07773	-.1286192	**
goal_effective	-.2222222	.177311	-1.25	.2145894	-.5763367	.1318922	
interaction	.3365079	.2726081	1.23	.2214973	-.207928	.8809438	
Constant	.8888889	.1571694	5.66	4.000e-07	.575	1.2027778	***

Mean dependent var	0.5797101	SD dependent var	0.4972216
R-squared	0.1404269	Number of obs	69
F-test	3.5396449	Prob > F	0.0193470
Akaike crit. (AIC)	95.9418730	Bayesian crit. (BIC)	104.8782990

**** p<.01, ** p<.05, * p<.1*

Ttest of Harm perceptions of first option, by whether first option was chemical names or not, if goal was effectiveness

	obs1	obs2	Mean1	Mean2	dif	dif St Err	t value	p value
Harm (Chemical First vs Not)	130	159	4.5690000	5.4275	-.8585	.1825	-4.7	0

Ttest of Harm perceptions of first option, by whether first option was chemical names or not, if goal was selecting the product with the least harmful ingredients

	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
Harm (Chemical First vs Not)	77	64	4.6365000	6.125	-1.4885	.2455	-6.05	0

Ttest of Effectiveness perceptions of first option, by whether first option was chemical names or not, if goal was effectiveness

	obs1	obs2	Mean1	Mean2	dif	dif St Err	t value	p value
Effectiveness (Chemical First vs Not)	130	159	6.3075000	6.7925	-.485	.1465	-3.3	.001

Ttest of Effectiveness perceptions of first option, by whether first option was chemical names or not, if goal was selecting the product with the least harmful ingredients

	obs1	obs2	Mean1	Mean2	dif	dif St Err	t value	p value
Effectiveness (Chemical First vs Not)	77	64	6.4805000	6.9845	-.504	.16	-3.15	.002

Mediation - When goal was effectiveness
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	2.523802	.293336	8.60	0.000	1.948875	3.09873
relative_effectiveness <-						
chemical_first	1.122413	.2194536	5.11	0.000	.6922917	1.552534
choice_first <-						
relative_harm	-.0784581	.0178613	-4.39	0.000	-.1134656	-.0434507
relative_effectiveness	.1988064	.0225498	8.82	0.000	.1546096	.2430033
chemical_first	-.1321673	.0857855	-1.54	0.123	-.3003039	.0359693

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	0	(no path)				
relative_effectiveness <-						
chemical_first	0	(no path)				
choice_first <-						
relative_harm	0	(no path)				
relative_effectiveness	0	(no path)				
chemical_first	.02513	.0585649	0.43	0.668	-.089655	.1399151

Mediation - when goal was selecting the least harmful ingredients
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemical_first	3.682984	.5297924	6.95	0.000	2.64461	4.721358
relative_effectiveness <-						
chemical_first	1.382284	.3672094	3.76	0.000	.6625672	2.102002
choice_first <-						
relative_harm	-.1295561	.0199286	-6.50	0.000	-.1686155	-.0904968
relative_effectiveness	.0416066	.037972	1.10	0.273	-.0328172	.1160303
chemical_first	-.0465594	.1376587	-0.34	0.735	-.3163656	.2232467

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemical_first	0	(no path)				
relative_effectiveness <-						
chemical_first	0	(no path)				
choice_first <-						
relative_harm	0	(no path)				
relative_effectiveness	0	(no path)				
chemical_first	-.419641	.0870612	-4.82	0.000	-.5902779	-.2490041

Study 4

Regression 4.1: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, their interaction, when Consumer Reports was absent.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	-.6181818	.0955887	-6.47	0	-.8061824	-.4301812	***
goal_effective	-.3820896	.0756822	-5.05	7.000e-07	-.5309387	-.2332404	***
chemXgoal	.7126681	.1124719	6.34	0	.4914623	.9338738	***
Constant	.8	.0637258	12.55	0	.6746663	.9253337	***

Mean dependent var	0.480226	SD dependent var	0.500316
R-squared	0.115296	Number of obs	354
F-test	15.204132	Prob > F	0.000000
Akaike crit. (AIC)	477.940543	Bayesian crit. (BIC)	493.417731

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 4.2: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, their interaction, when Consumer Reports was present.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	-.3132428	.0899942	-3.48	.0005673	-.4902774	-.1362081	***
goal_effective	-.1464747	.0805523	-1.82	.0699124	-.3049354	.011986	*
chemXgoal	.1791767	.1121365	1.60	.1110346	-.0414158	.3997692	
Constant	.6842105	.0649586	10.53	0	.5564253	.8119958	***

Mean dependent var	0.488024	SD dependent var	0.500607
R-squared	0.048902	Number of obs	334
F-test	5.655802	Prob > F	0.000866
Akaike crit. (AIC)	475.890797	Bayesian crit. (BIC)	491.135361

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 4.3: Regression choice of first option, by whether the first option was chemical or not, by whether the goal was effectiveness or not, when Consumer Reports was present or not, the two interactions with whether the first option was chemical or not, and then their three-way interaction.

choice_first	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	-.5367733	.0898019	-5.98	0	-.7130951	-.3604515	***
goal_effective	-.2672671	.0553342	-4.83	1.700e-06	-.3759132	-.1586209	***
CR	.0441712	.0516873	0.85	.3930813	-.0573144	.1456567	
chemXgoal	.5978456	.1013885	5.90	0	.398774	.7969171	***
chemXcr	.1449784	.1082632	1.34	.1809755	-.0675914	.3575482	
chemXgoalXcr	-.2978765	.114502	-2.60	.0094835	-.522696	-.0730571	***
Constant	.7185915	.0526437	13.65	0	.615228	.8219549	***

Mean dependent var	0.484012	SD dependent var	0.500108
R-squared	0.076963	Number of obs	688
F-test	9.463709	Prob > F	0.000000
Akaike crit. (AIC)	956.885590	Bayesian crit. (BIC)	988.622112

**** p<.01, ** p<.05, * p<.1*

Regression 4.4: Regression relative harm perceptions of the first option compared to the second, by whether the first option was chemical or not.

relative_harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	2.8628247	.1662935	17.22	0	2.5363193	3.1893301	***
Constant	-1.5056818	.1162119	-12.96	0	-1.7338556	-1.277508	***

Mean dependent var	-0.107558	SD dependent var	2.607246
R-squared	0.301691	Number of obs	688
F-test	296.373120	Prob > F	0.000000
Akaike crit. (AIC)	3027.015396	Bayesian crit. (BIC)	3036.082974

**** p<.01, ** p<.05, * p<.1*

Regression 4.5: Regression relative harm perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was effectiveness and Consumer Reports was absent.

relative_harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	2.6602319	.2655051	10.02	0	2.1373501	3.1831137	***
Constant	-1.4701493	.1828923	-8.04	0	-1.8303347	-1.1099638	***

Mean dependent var	-0.207843	SD dependent var	2.497230
R-squared	0.284078	Number of obs	255
F-test	100.390616	Prob > F	0.000000
Akaike crit. (AIC)	1108.182557	Bayesian crit. (BIC)	1115.265084

**** p<.01, ** p<.05, * p<.1*

Regression 4.6: Regression relative harm perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was reducing harm and Consumer Reports was absent.

relative_harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	4.1681818	.4613712	9.03	0	3.2524877	5.0838759	***
Constant	-2.2363636	.3075808	-7.27	0	-2.8468264	-1.6259009	***

Mean dependent var	-0.383838	SD dependent var	3.079581
R-squared	0.456945	Number of obs	99
F-test	81.619204	Prob > F	0.000000
Akaike crit. (AIC)	446.209878	Bayesian crit. (BIC)	451.400117

**** p<.01, ** p<.05, * p<.1*

Regression 4.7: Regression relative harm perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was effectiveness and Consumer Reports was present.

relative_harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	2.7896832	.3030314	9.21	0	2.1923587	3.3870077	***
Constant	-1.3584906	.2157653	-6.30	0	-1.7837994	-.9331818	***

Mean dependent var	0.055814	SD dependent var	2.620311
R-squared	0.284632	Number of obs	215
F-test	84.749000	Prob > F	0.000000
Akaike crit. (AIC)	955.341096	Bayesian crit. (BIC)	962.082372

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 4.8: Regression relative harm perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was reducing harm and Consumer Reports was present.

relative_harm	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	2.303056	.3835955	6.00	0	1.5433653	3.0627468	***
Constant	-1.1578947	.2768827	-4.18	.0000561	-1.7062465	-.609543	***

Mean dependent var	0.042017	SD dependent var	2.380696
R-squared	0.235526	Number of obs	119
F-test	36.046410	Prob > F	0.000000
Akaike crit. (AIC)	515.183097	Bayesian crit. (BIC)	520.741344

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 4.9: Regression relative effectiveness perceptions of the first option compared to the second, by whether the first option was chemical or not.

relative_effective	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	1.33171	.1112918	11.97	0	1.1131966	1.5502233	***
Constant	-.7215909	.0777747	-9.28	0	-.874296	-.5688858	***

Mean dependent var	-0.071221	SD dependent var	1.603086
R-squared	0.172680	Number of obs	688
F-test	143.183599	Prob > F	0.000000
Akaike crit. (AIC)	2474.414832	Bayesian crit. (BIC)	2483.482410

**** p<.01, ** p<.05, * p<.1*

Regression 4.10: Regression relative effectiveness perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was effectiveness and Consumer Reports was absent.

relative_effective	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	1.6832984	.2047151	8.22	0	1.2801355	2.0864613	***
Constant	-.9477612	.1410173	-6.72	0	-1.2254786	-.6700438	***

Mean dependent var	-0.149020	SD dependent var	1.833994
R-squared	0.210884	Number of obs	255
F-test	67.611772	Prob > F	0.000000
Akaike crit. (AIC)	975.575010	Bayesian crit. (BIC)	982.657537

**** p<.01, ** p<.05, * p<.1*

Regression 4.11: Regression relative effectiveness perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was reducing harm and Consumer Reports was absent.

relative_effective	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	1.0954545	.251941	4.35	.0000339	.5954214	1.5954877	***
Constant	-.5272727	.1679607	-3.14	.0022445	-.8606282	-.1939173	***

Mean dependent var	-0.040404	SD dependent var	1.354653
R-squared	0.163112	Number of obs	99
F-test	18.905624	Prob > F	0.000034
Akaike crit. (AIC)	326.418300	Bayesian crit. (BIC)	331.608539

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 4.12: Regression relative effectiveness perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was effectiveness and Consumer Reports was present.

relative_effective	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	1.1476545	.1877085	6.11	0	.7776503	1.5176587	***
Constant	-.6981132	.1336527	-5.22	4.000e-07	-.9615647	-.4346617	***

Mean dependent var	-0.116279	SD dependent var	1.488418
R-squared	0.149298	Number of obs	215
F-test	37.381315	Prob > F	0.000000
Akaike crit. (AIC)	749.394194	Bayesian crit. (BIC)	756.135470

*** *p*<.01, ** *p*<.05, * *p*<.1

Regression 4.13: Regression relative effectiveness perceptions of the first option compared to the second, by whether the first option was chemical or not, when the goal was reducing harm and Consumer Reports was present.

relative_effective	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
chemical_first	1.098472	.2478497	4.43	.0000212	.6076187	1.5893253	***
Constant	-.4210526	.1789002	-2.35	.0202625	-.775355	-.0667502	**

Mean dependent var	0.151261	SD dependent var	1.453451
R-squared	0.143752	Number of obs	119
F-test	19.642703	Prob > F	0.000021
Akaike crit. (AIC)	411.232753	Bayesian crit. (BIC)	416.791000

**** p<.01, ** p<.05, * p<.1*

Mediation - when goal was effectiveness and Consumer Report certification was present (Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	**2.789683**	**.2981642**	**9.36**	**0.000**	**2.205292**	**3.374074**
relative_effective <-						
chemical_first	**1.147654**	**.1842216**	**6.23**	**0.000**	**.7865868**	**1.508722**
choice_first <-						
relative_harm	**-.0889042**	**.0109664**	**-8.11**	**0.000**	**-.1103978**	**-.0674105**
relative_effective	**.1490973**	**.0205544**	**7.25**	**0.000**	**.1088115**	**.1893831**
chemical_first	**-.0571639**	**.0726403**	**-0.79**	**0.431**	**-.1995362**	**.0852085**

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	**0**	(no path)				
relative_effective <-						
chemical_first	**0**	(no path)				
choice_first <-						
relative_harm	**0**	(no path)				
relative_effective	**0**	(no path)				
chemical_first	**-.0769023**	**.0488156**	**-1.58**	**0.115**	**-.1725792**	**.0187746**

Mediation - when goal was selecting the least harmful ingredients and Consumer Report certification was present
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemical_first	2.303056	.3700545	6.22	0.000	1.577763	3.02835
relative_effective <-						
chemical_first	1.098472	.2363628	4.65	0.000	.6352094	1.561735
choice_first <-						
relative_harm	-.1432775	.0143992	-9.95	0.000	-.1714995	-.1150555
relative_effective	.0937431	.0240871	3.89	0.000	.0465332	.1409529
chemical_first	-.0862409	.0896608	-0.96	0.336	-.2619728	.0894911

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf. Interval]	
Structural						
relative_harm <-						
chemical_first	0	(no path)				
relative_effective <-						
chemical_first	0	(no path)				
choice_first <-						
relative_harm	0	(no path)				
relative_effective	0	(no path)				
chemical_first	-.2270019	.0593946	-3.82	0.000	-.3434131	-.1105907

Mediation - when goal was effectiveness and Consumer Report certification was absent (Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	2.660232	.2587122	10.28	0.000	2.153165	3.167299
relative_effective <-						
chemical_first	1.683298	.2071504	8.13	0.000	1.277291	2.089306
choice_first <-						
relative_harm	-.0620058	.0129461	-4.79	0.000	-.0873796	-.036632
relative_effective	.1533377	.016059	9.55	0.000	.1218626	.1848127
chemical_first	.001323	.0706081	0.02	0.985	-.1370663	.1397123

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	0	(no path)				
relative_effective <-						
chemical_first	0	(no path)				
choice_first <-						
relative_harm	0	(no path)				
relative_effective	0	(no path)				
chemical_first	.0931633	.0501273	1.86	0.063	-.0050845	.191411

Mediation - when goal was selecting the least harmful ingredients and Consumer Report certification was absent
(Using the SEM function in Stata)

Direct effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	4.168182	.4561797	9.14	0.000	3.274086	5.062278
relative_effective <-						
chemical_first	1.095455	.2694489	4.07	0.000	.5673444	1.623565
choice_first <-						
relative_harm	-.1008241	.0153914	-6.55	0.000	-.1309906	-.0706575
relative_effective	-.0242837	.0296214	-0.82	0.412	-.0823407	.0337732
chemical_first	-.171327	.116538	-1.47	0.142	-.3997374	.0570833

Indirect effects

	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
Structural						
relative_harm <-						
chemical_first	0	(no path)				
relative_effective <-						
chemical_first	0	(no path)				
choice_first <-						
relative_harm	0	(no path)				
relative_effective	0	(no path)				
chemical_first	-.4468548	.0655255	-6.82	0.000	-.5752824	-.3184272

Study 5

T-test of choice of first option by whether it was chemical or not

	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
choice first	48	42	0.6875000	.2145	.473	.094	5.05	0

T-test of relative harm of the first option compared to the second, by whether it was chemical or not

	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
relative harm	71	67	-0.7325000	.582	-1.3145	.2265	-5.8	0

T-test of relative healthiness of the first option compared to the second, by whether it was chemical or not

	obs1	obs2	Mean1	Mean2	dif	St Err	t value	p value
relative healthy	71	67	0.7745000	-.761	1.536	.234	6.55	0

Replication of Study 5

Setup:

- Goal: Participants were asked about whether they care more about tastiness or healthiness when buying cereal.
- Participants were shown two cereal brands with either real non-harmful chemical-sounding ingredients or real harmful natural-sounding ingredients.

Tasks:

- Choose between the two options, or indicate indifference.
- Rate each product on perceived harm/healthiness/tastiness (7-point Likert Scale)

Overall Results

- Choice of first option when it was chemical, when goals was healthiness: 31%, t(50)=2.95, p=.005
- Choice of first option when it was chemical, when goals was tastiness: 38%, t(98)=2.45, p=.016,
- Interaction not significant p=.571

Mediation

- For those that cared about healthiness, overall indirect effect (-.199) using the three mediators (harm/healthiness/tastiness), was marginally significant (p=.068), out of which:
    - Relative harm's effect: .11
    - Relative healthiness's effect=-.32
    - Relative tastiness's effect=.012

- For those that cared about tastiness, overall indirect effect (-.057) using the three mediators (harm/healthiness/tastiness), was not significant (p=.545)

APPENDIX F

Sample Questions (Essay 3)

Study 1a

Categorization Task with markers

Here is the list of the same items as before. Please categorize these items in groups based on their **similarity**.

Please use your own discretion and judgment when grouping the items by similarity. Whatever you feel is similar, you can group together.

You can use as many or as few groups as you want.

You may not know some of the words in the list. We request you to please not look them up and just go with your intuition.

Items

Butylene glycol

Alpha-linolenic acid

11-Eicosenoic acid

Indigotindisulfonate sodium

Mondo Grass Root

Peony Oil

Jojoba Seed Oil

Japanese Indigo Extract

Ophiopogon japonicus

Paeonia suffruticosa

Simmondsia Chinensis

Persicaria tinctoria

Group 1

Group 2

Group 3

Group 4

Group 5

Group 6

Categorization Task without markers

Please categorize these items in groups based on their **similarity**.

Please use your own discretion and judgment when grouping the items by similarity. Whatever you feel is similar, you can group together.

You can use as many or as few groups as you want.

You may not know some of the words in the list. We request you to please not look them up and just go with your intuition.

Items	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Butylene glycol						
Alpha-linolenic						
11-Eicosenoic						
Indigotindisulfonate sodium						
Mondo						
Peony						
Jojoba						
Japanese Indigo						
Ophiopogon japonicus						
Paeonia suffruticosa						
Simmondsia Chinensis						
Persicaria tinctoria						

Harm

How harmful do you think the items that you sorted in each group are? If you didn't use a group, please click the N/A option for that group. (1=Not at all harmful, 7=Extremely harmful)

Naturalness

How natural do you think the items that you sorted in each group are? If you didn't use a group, please click the N/A option for that group. (1=Not at all natural, 7=All natural)

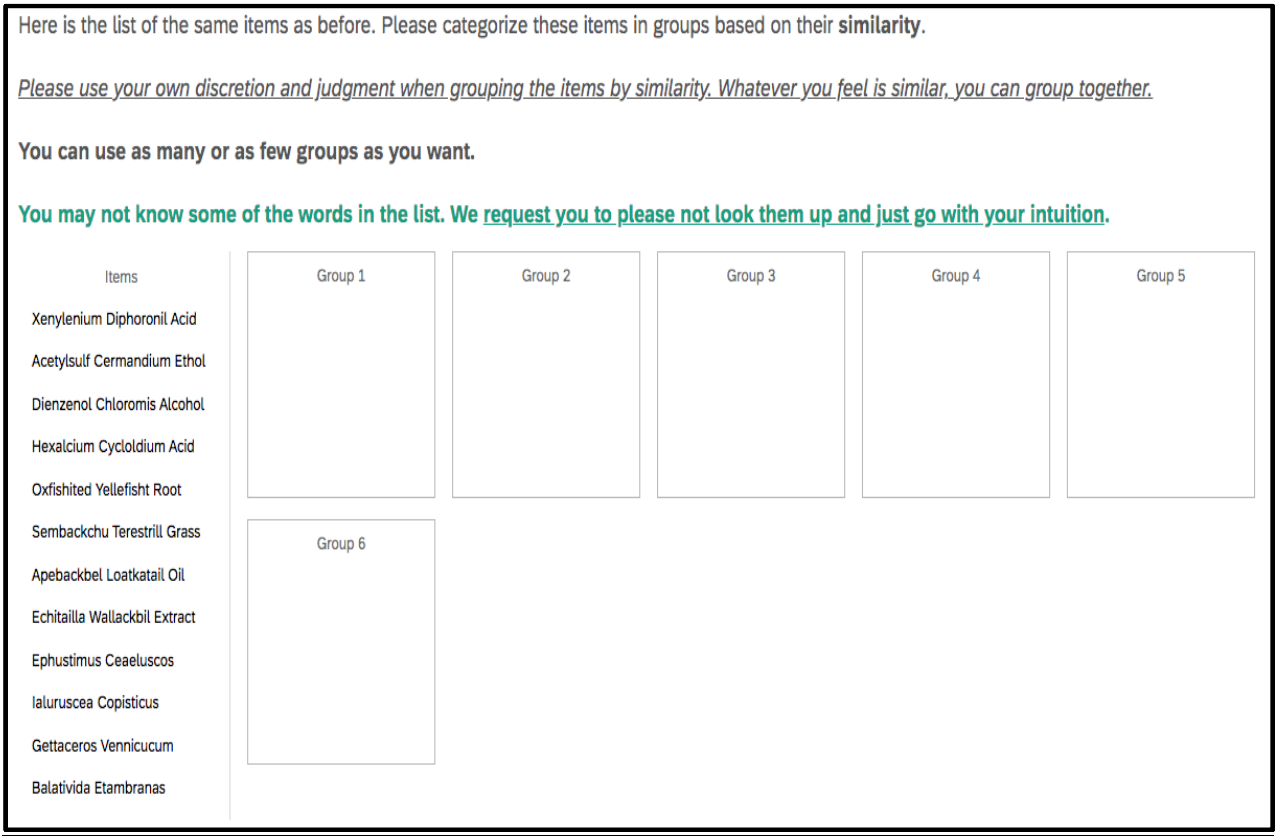
Edible

How edible do you think the items that you sorted in each group are? If you didn't use a group, please click the N/A option for that group. (1=Very inedible, 7=Very edible)

Study 1b

Note: Most questions were the same as the questions in 1a. Below are questions which were either new or had major changes.

Categorization Task with markers



Here is the list of the same items as before. Please categorize these items in groups based on their **similarity**.

Please use your own discretion and judgment when grouping the items by similarity. Whatever you feel is similar, you can group together.

You can use as many or as few groups as you want.

You may not know some of the words in the list. We request you to please not look them up and just go with your intuition.

Items

- Xenylenium Diphoronil Acid
- Acetylsulf Cermandium Ethol
- Dienzenol Chloromis Alcohol
- Hexalcium Cycloldium Acid
- Oxfishited Yellefisht Root
- Sembackchu Terestrill Grass
- Apebackbel Loatkatail Oil
- Echitailla Wallackbil Extract
- Ephustimus Ceaeluscos
- Ialuruscea Copisticus
- Gettaceros Vennicucum
- Balativida Etambranas

Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6

Categorization Task without markers

Please categorize these items in groups based on their **similarity**.

Please use your own discretion and judgment when grouping the items by similarity. Whatever you feel is similar, you can group together.

You can use as many or as few groups as you want.

You may not know some of the words in the list. We request you to please not look them up and just go with your intuition.

Items

Xenylenium Diphoronil

Acetylsulf Cermandium

Dienzenol Chloromis

Hexalcium Cycloldium

Oxfishited Yellefisht

Sembackchu Terestrill

Apebackbel Loatkatail

Echitailla Wallackbil

Ephustimus Ceaeluscos

Ialuruscea Copisticus

Gettaceros Vennicucum

Balativida Etambranas

Group 1

Group 2

Group 3

Group 4

Group 5

Group 6

Definition and confidence about definition

Please write in the dictionary definition of each of them. If you do not know the definition, please type "Check" under "Don't Know".

We request you to please not look up the definition for any of this and just go with what you actually know.

	Definition	Don't Know
Xenylenium Diphoronil Acid		
Acetylsulf Cermandium Ethol		
Dienzenol Chloromis Alcohol		
Hexalcium Cycloldium Acid		
Oxfishited Yellefisht Root		
Sembackchu Terestrill Grass		
Apebackbel Loatkatail Oil		
Echitailla Wallackbil Extract		
Ephustimus Ceaeluscos		
Ialuruscea Copisticus		
Gettaceros Vennicucum		
Balativida Etambranas		

Q52 | definition_confidence

Please rate how confident you feel about you knowing the definitions for each item.

	Very unconfident	Moderately unconfident	Slightly unconfident	Neither unconfident nor confident	Slightly confident	Moderately confident	Very confident
Xenylenium Diphoronil Acid	○	○	○	○	○	○	○
Acetylsulf Cermandium Ethol	○	○	○	○	○	○	○
Dienzenol Chloromis Alcohol	○	○	○	○	○	○	○
Hexalcium Cycloldium Acid	○	○	○	○	○	○	○
Oxfishited Yellefisht Root	○	○	○	○	○	○	○
Sembackchu Terestrill Grass	○	○	○	○	○	○	○
Apebackbel Loatkatail Oil	○	○	○	○	○	○	○
Echitailla Wallackbil Extract	○	○	○	○	○	○	○
Ephustimus Ceaeluscos	○	○	○	○	○	○	○
Ialuruscea Copisticus	○	○	○	○	○	○	○
Gettaceros Vennicucum	○	○	○	○	○	○	○
Balativida Etambranas	○	○	○	○	○	○	○

Purpose and confidence about purpose

Please write what you think the purpose of each of the item is. You may not know the actual answer but please try to give your best estimate.

We request you to please not look up the purpose for any of this and just go with what you feel like it is.

	Purpose
Xenylenium Diphoronil Acid	
Acetylsulf Cermandium Ethol	
Dienzenol Chloromis Alcohol	
Hexalcium Cycloldium Acid	
Oxfishited Yellefisht Root	
Sembackchu Terestrill Grass	
Apebackbel Loatkatail Oil	
Echitailla Wallackbil Extract	
Ephustimus Ceaeluscos	
Ialuruscea Copisticus	
Gettaceros Vennicucum	
Balativida Etambranas	

Q36 purpose_confidence

Please rate how confident you feel about you knowing the purpose for each item.

	Very unconfident	Moderately unconfident	Slightly unconfident	Neither unconfident nor confident	Slightly confident	Moderately confident	Very confident
Xenylenium Diphoronil Acid	○	○	○	○	○	○	○
Acetylsulf Cermandium Ethol	○	○	○	○	○	○	○
Dienzenol Chloromis Alcohol	○	○	○	○	○	○	○
Hexalcium Cycloldium Acid	○	○	○	○	○	○	○
Oxfishited Yellefisht Root	○	○	○	○	○	○	○
Sembackchu Terestrill Grass	○	○	○	○	○	○	○
Apebackbel Loatkatail Oil	○	○	○	○	○	○	○
Echitailla Wallackbil Extract	○	○	○	○	○	○	○
Ephustimus Ceaeluscos	○	○	○	○	○	○	○
Ialuruscea Copisticus	○	○	○	○	○	○	○
Gettaceros Vennicucum	○	○	○	○	○	○	○
Balativida Etambranas	○	○	○	○	○	○	○

<u>Chemicalness</u>

How <u>chemical</u> do you think the items that you sorted in each group are? If you didn't use a group, please click the N/A option for that group. (1=Not at all chemical, 7=Fully Chemical)

<u>Confidence about perceptions of harm/naturalness/chemicalness/edibility</u>

How <u>confident</u> are you about your judgments above, regarding harm/naturalness/chemicalness/edibility, for each group? If you didn't use a group, please click the N/A option for that group. (1=Very unconfident. 7=Confident)

<u>Study 2</u>
<u>Note: Order and names of products counterbalanced</u>

Imagine you are choosing between two lipsticks - Scarlet Rouge, and Abbie Maroon Red.

Both their descriptions are below. Indicate which one you would be more willing to purchase, or your indifference between the two.

I would prefer:

Scarlet Rouge, with ***Camellia Sinensis Leaf, Jojoba Seed Oil, Peony Oil, and Black Rose Oil,*** is a luxurious lipstick that creates a powerfully-sophisticated look of unadulterated color. Formulated with a luxurious, velvet-matte finish, Lip Color Matte smooths comfortably onto the lips in a spectrum of richly-pigmented hues from sensuous pink neutrals to alluring bolds. ○	Abbie Maroon Red, with ***Geranyl Acetate, α-linolenic acid, Isopropyl Jojobate, γ-ethylamine-L-glutamic acid,*** is a lipstick that provides long-lasting shine and 24 hours hydration. The lipstick helps nourish the lips while delivering high-shine color. Moisturizes, and provides long-lasting hydration with a subtle yet visible lip-plumping and smoothing effect. ○	**Indifferent between the two** ○

Harm

How harmful do you think the following ingredients are? (1=Not harmful at all; 7=Extremely harmful)

Effectiveness

How effective do you think the following ingredients are? (1=Not effective at all; 7=Extremely effective)

Familiarity

(1) Are you familiar with the following ingredients, in general? (Yes, No, To an extent)
(2) Are you familiar with the purpose/use of the following ingredients in cosmetics? (Yes, No, To an extent)
(3) Are you familiar with how the purpose/use of the following ingredients is similar to or different from other ingredients usually present in cosmetics? (Yes, No, To an extent)

Study 3a

Note: Most questions were the same as the questions in 2. Below are questions which were either new or had major changes.

Manipulation

Table Top Cleaning

Imagine that you are looking to purchase a **cleaning product to clean and maintain your dining table top that is made of marble.**

In the next page, you will be shown a question where you will have to choose between two cleaning products after reading their descriptions.

For your convenience, we are going to repeat the first sentence from this section in your subsequent tasks.

Toilet Cleaning

Imagine that you are looking to purchase a **cleaning product to scrub and maintain your toilet from getting dirty.**

In the next page, you will be shown a question where you will have to choose between two cleaning products after reading their descriptions.

For your convenience, we are going to repeat the first sentence from this section in your subsequent tasks.

Choice (Note: Order and names of products counterbalanced)

Two hypothetical cleaning products are shown below, with their respective product descriptions. Please choose the one you would purchase:

Super Clean	Stain Gone	
"Formulated with **Diphoronil** and **Acetylsulf**, our all purpose cleaner breaks down difficult stains and grime. Clinically proven **Dienzenol** cleans all dirty surfaces without damaging it. Also added is **Yttranonim** that results in immediate shine and spot-free appearance of all surfaces."	"Our all purpose cleaner's formulas, with **Oxfishited** and **Sembackchu** deliver a powerful clean on grease and grime, including **Apebackbel** which also makes it non-damaging. This formula with **Echitailla** is concentrated and hardworking, while leaving a shiny surface."	**Indifferent between the two options**
○	○	○

Study 3b

Note: Most questions were the same as the questions in 3a. Below are questions which were either new or had major changes.

Imagine that you are looking to purchase a **cleaning product.**

When deciding to buy a cleaning product, which out of the two options is <u>more important</u> to you?

○ Selecting a product with the least harmful ingredients

○ Selecting a product that is the most effective

Study 4

Note: Most questions were the same as the questions in 3b. Below are questions which were either new or had major changes.

Choice with Consumer Reports certification

You indicated that when buying a cleaning product you care more about **Selecting a product that is the most effective.**

Two hypothetical cleaning products are shown below, with their respective product descriptions.

Both the products have been certified effective and safe from Consumer Reports. Both Super Clean and Stain Gone have an Excellent rating by Consumer Reports for effectiveness and safety.

CR Consumer Reports RECOMMENDED

Super Clean	**Effectiveness** 5/5 **Safety** 5/5
Stain Gone	**Effectiveness** 5/5 **Safety** 5/5

Please choose the **one you would purchase:**

Super Clean	**Stain Gone**	
"Our all purpose cleaner's formulas, with **Xenylenium Diphoronii** and **Acetylsulf Cermandium** deliver a powerful clean on grease and grime, including **Dienzenol Chloromis** which also makes it non-damaging. This formula with **Hexalcium Cycloidium** is concentrated and hardworking, while leaving a shiny surface."	"Formulated with **Ephustimus Ceaeluscos** and **Ialuruscea Copisticus**, our all purpose cleaner breaks down difficult stains and grime. Clinically proven **Gettaceros Vennicucum** cleans all dirty surfaces without damaging it. Also added is **Balativida Etambranas** that results in immediate shine and spot-free appearance of all surfaces."	**Indifferent between the two options**
○	○	○