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"This isn't a promise, it's a threat": eye movements reveal semantic scope differences in conditional inducements.

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# SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

## Abstract

Participants had their eye-movements recorded as they read vignettes containing implied promises and threats. We observed a reading time penalty when participants read the word "threat" when it anaphorically referred to an implied promise. There was no such penalty when the word "promise" was used to refer to an implied threat. On a later measure of processing we again found a reading time penalty when the word "threat" was used to refer to a promise, but also when the word "promise" was used to refer to a threat. These results suggest that anaphoric processing of such expressions is driven initially by sensitivity to the semantic scope differences of "threats" versus "promises". A threat can be understood as a type of promise, but a promise cannot be understood as a type of threat. However, this effect was short lived; readers were ultimately sensitive to mismatched meaning, regardless of speech act performed.

Key Words: conditionals; speech acts; inducements; experimental pragmatics; discourse processing

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### Introduction

Arguably, the ease with which people mentally represent hypothetical situations is a defining aspect of human cognition (Cosmides & Tooby, 2000). Hypothetical situations are often communicated using conditional statements (e.g., *If I win the lottery, then I will buy a sports car*). Recently, there has been a concerted effort to investigate the moment-by-moment processes associated with the comprehension of conditionals and their integration into a reader's ongoing discourse model. This research has involved the utilization of temporally sensitive measures of comprehension such as eye-tracking (e.g., Ferguson & Sanford, 2008; Haigh, Ferguson, & Stewart, 2014; Stewart, Haigh & Ferguson, 2013) and electroencephalography (e.g., Bonnefond & Van der Henst, 2013; Nieuwland, 2013). The emerging consensus is that a number of sources of information communicated by a conditional are extracted rapidly as comprehension unfolds in real-time.

Conditionals can be stated in such a way that their meaning is explicit, such as a mother saying to her son “if you wash my car, then I promise I'll give you extra pocket money”. However, the same meaning can be communicated in the absence of the performative verb (e.g., *promise*) as with the example “if you wash my car, then I'll give you extra pocket money.” In these cases conditionals convey their meaning in an implicit manner (Holtgraves, 2008). Indeed, as Searle and Vanderveken (1985) note, threats usually (indeed almost always) lack the performative verb. For instance, consider how anomalous the following sounds; “if you stay out late again, then I threaten I'll ground you”. The successful comprehension of conditionals lacking a performative verb requires readers to be sensitive to a range of pragmatic factors.

One form of information used to determine the meaning of a conditional, detailed in the theory of utility conditionals (Bonnefon, 2009), is decision-theoretic in nature. According to this view, conditionals can be described in terms of the utility they provide the speaker and

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the addressee. For example, a conditional promise uttered by a parent to a child (e.g., *if you wash my car, then I'll give you extra pocket money*) provides a consequent that has positive utility for the addressee (i.e., receiving extra pocket money). In contrast, a conditional threat (e.g., *if you stay out late again, then I'll ground you*) provides a consequent that has negative utility for the addressee (assuming the addressee would not want to be grounded). Common to both conditional promises and threats is the need for the speaker to have control over the consequent event (i.e., being in a position to grant the child extra pocket money, or to ground them). Both the degree of speaker control and the utility to the hearer associated with a conditional are captured in a conditional's *utility grid* (Bonnefon, 2009). This framework has recently been expanded upon by Bonnefon, Haigh, and Stewart (2013) who propose that conditionals are interpreted with the help of pre-existing *utility templates* (e.g., the Social Contract template). Utility conditionals that do not fit a preexisting template are often reinterpreted so as to conform to one of these templates.

A limited number of studies have examined the extent to which readers are sensitive to utility based information as conditionals are processed. Stewart et al. (2013) examined how readers process conditional promises and threats in contexts in which the speaker either did, or did not have, control over the consequent event (e.g., the editor of a journal versus a junior colleague promising a scientist that they will publish the scientist's article). Analysis of eye movement data indicated that when conditional promises were encountered in contexts where the speaker did *not* have control over the consequent event (and was thus not in a position to utter a promise), there were more regressive eye movements and an increase in processing times associated with reading the consequent clause. This provides strong evidence that speaker control informs comprehension when conditionals are read.

In a similar vein, Haigh et al. (2014) showed that readers also demonstrate sensitivity to the utility associated with a conditional consequent. Haigh et al. manipulated context so that

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the reader would be biased to expect a consequent of either positive or negative utility for a particular situation. Following one of two contexts (e.g. *The Editor was very impressed by Alan's findings and said that they should be widely publicised.* vs. *The Editor was very critical of Alan's findings and said that they were not valid.*), readers were presented with a conditional where the polarity of the consequent was either positive or negative, making it either a promise or a threat (e.g., *As they parted, the Editor told Alan "if you submit your paper to the Journal of Physics, then I will accept it outright"* vs. *"if you submit your paper to the Journal of Physics, then I will reject it outright".*) Haigh et al. reported disruption to eye movements (increased backwards eye movements and increased fixation durations) during measures of reading whenever the polarity of the utility of the conditional mismatched the expected polarity set up by the prior context. Taken together, the findings of both Stewart et al. (2013) and Haigh et al. (2014) show that readers are sensitive to the utility grid based cues of speaker control and the consequent utility when conditionals are processed.

In addition to conditional promises and threats differing in aspects of their associated utility grids, there is good evidence that pragmatic and semantic differences also exist between them. For example, conditional promises carry a greater obligation to be carried out than threats (Searle & Vanderveken, 1985; Verbrugge, Dieussaert, Schaeken & van Belle, 2004, 2005). This means that a speaker will have a greater commitment after uttering a conditional promise (e.g., *if you wash my car, then I'll give you extra pocket money*) to carry out the consequent action (i.e., giving the hearer extra pocket money) following completion of the antecedent action (i.e., washing their car) than in the case of a threat. The differing obligation of promises and threats may explain why threats can be subsumed within the category of promises, as demonstrated in the colloquialism "That's not a threat, that's a promise." In this particular usage, the speaker is uttering a threat but highlighting the obligation (via the reformulation of the threat as a promise) that the consequent action *will*

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result from the antecedent action; confirming the threat is not hollow. However, the converse does not appear to be the case, as demonstrated by the odd-sounding "That's not a promise, that's a threat." In other words, it does not seem possible to reduce the level of obligation that is typically associated with promises. Promises and threats thus differ in the flexibility of the scope of their meaning and the successful comprehension of conditionals requires the reader to be sensitive to this difference. Throughout this paper, we use *scope* to refer to semantic flexibility rather than to logical scope (Over, Douven, & Verbrugge, 2013).

Below we report the results of an eye-tracking experiment that examines readers' sensitivity to the semantic scope differences between promises and threats. Our understanding of the way in which scope information informs the comprehension of conditionals is unclear, largely due to the lack of research into the topic. This situation is somewhat surprising given the large amount of research on conditionals in the psychology of reasoning and decision making more generally (e.g., Evans, 2008; Johnson-Laird & Byrne, 2002), and also given the prevalence of conditional inducements in so many aspects of our everyday lives (e.g., in the communication of financial information, information about health, and lifestyle choices etc.). To date there has only been one study which has investigated the influence of scope information in the sense of semantic flexibility in the comprehension of conditionals (Haigh, Stewart, Wood & Connell, 2011). Haigh et al. (2011) used self-paced reading to examine how scope information influences anaphoric processing involved in the comprehension of conditional promises and threats (see Example 1).

### Example 1

Ian was at a builder's merchant to buy some paving slabs for a job. He approached the sales assistant intent on getting a good deal. She told him "if you buy in bulk, then I'll give you our trade discount" (Promise) / "if you only buy a

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small amount, then I'll stop your trade discount" (Threat). This promise/This threat helped Ian to make his decision. He thought about it for a while and then placed his order.

Haigh et al. (2011) found evidence of an asymmetric processing penalty. When the anaphoric phrase "this threat" in the penultimate sentence was used to refer to a conditional promise there was a processing penalty (i.e., a slowdown in reading); however, when the phrase "this promise" was used to refer to a conditional threat there was no such penalty. This asymmetric effect emerged relatively late (several words after the anaphoric expression) and suggests that readers are ultimately sensitive to the fact that promises have greater flexibility than threats (and thus promises are able to encompass threats, but not *vice versa*).

### Experiment

Stewart et al. (2013) and Haigh et al. (2014) examined eye movements (and showed *rapid* sensitivity to utility based factors), while the results of Haigh et al. (2011) are based on word-by-word self-paced reading (and showed *delayed* sensitivity to semantic scope factors). Arguably, self-paced reading is a somewhat unnatural form of reading as it does not allow re-reading of text. We cannot therefore be sure as to whether the delayed influence of semantic scope information relates to the method, or genuinely reflects the possibility that this information has a delayed influence on conditional comprehension. Additionally, a number of materials used in the experiment of Haigh et al. (2011), involved anaphoric expressions such as "promises like this". With this kind of anaphoric phrase, anaphoric processing can only proceed upon the last word of the phrase. Although the critical analysis region in Haigh et al. was the word "promise" or "threat", it was only after this region of text that these longer anaphoric expressions could be understood. Combined with the self-paced reading method, it

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is possible then that the nature of some of these materials may have influenced aspects of the reported effect (e.g., an apparent delaying in processing related to the conditional meaning). In the experiment below we examine materials substantially improved to those looked at by Haigh et al. (2011), in a more naturalistic reading context and by tracking eye movements to examine how readers process (mis)matching nouns such as "promise" in the anaphoric phrase "this promise" following conditional inducements (see Example 1).

If the effects reported by Haigh et al. (2011) arose because of a sensitivity to semantic scope differences between promises and threats (rather than because of factors related to the word-by-word self-paced reading method and the way in which the anaphoric expressions were constructed) then we would expect the same asymmetry to emerge using eye tracking. Additionally, from Stewart et al., (2013) and from Haigh et al. (2014) we know that readers are sensitive to utility based factors during reading. From these results we might therefore instead expect a symmetrical effect such that a conditional threat referred to as a promise and a conditional promise referred to as a threat will both cause a slow-down in reading. It is also possible that rather than only one of these effects emerging, we have a situation where both patterns of effects emerge, but at different points in time (which may have been undetectable by Haigh et al. (2011) using a coarse-grained word-by-word self-paced reading method). If the asymmetry related to semantic scope emerges before the utility-driven symmetrical effect, then it would support a position whereby the comprehension of conditionals is driven initially by sensitivity to their semantic functions. However, if the symmetrical effect related to utility is found to arise before the asymmetrical effect related to semantic scope, then it would support a position whereby comprehension of conditionals is initially driven by simple utility (mis)matching, with sensitivity to the differences in the semantic scope of promise versus threats occurring subsequently.

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## Method

### *Participants*

Forty native English speakers from the University of Manchester were recruited via opportunity sampling. The experiment lasted around 45 minutes and each participant was compensated with £5.

### *Design and Materials*

The experimental items were 32 vignettes (see Appendix). Each vignette was five sentences long. The first two sentences provided context. The third sentence contained the conditional. This sentence was manipulated so that the speaker uttered either a conditional promise or a conditional threat. Following this, the conditional speech act was anaphorically referenced as either a "promise" or a "threat" (e.g., "This promise..." vs. "This threat..."). The fifth sentence then contained additional contextual information. Participants were instructed that during the experiment they should read at their normal rate for comprehension.

This resulted in a 2 (Conditional Meaning) x 2 (Anaphoric Meaning) repeated measures design, with four conditions (see Table 1).

\*\*\*INSERT TABLE 1 HERE\*\*\*

There were four versions of each item (128 permutations in total). These versions were divided into four presentation lists using a Latin-square repeated measures design. Ten participants were assigned to each list. The lists contained 32 experimental items interspersed with 32 filler items. Comprehension questions followed 25% of the items. Mean accuracy to the comprehension questions was at 88%.

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### *Procedure*

An Eyelink 1000 in the desktop mount configuration was used to record eye movements. Head position was stabilised using a chin and forehead rest. Viewing was binocular and recordings were sampled from the right eye at 1,000Hz. The vignettes were presented in size 22 Arial font on a LCD monitor 60 centimeters from the participants' eyes. Each character subtended 0.741° of visual arc. The eye-tracker was calibrated using nine fixation points. Participants were instructed to read at their normal reading rate for comprehension. Each trial appeared after the participant fixated on a gaze trigger. After reading the vignette participants pressed a button on a handheld controller to reveal either a comprehension question or the next trial.

### Results

We analysed two regions of interest (see Figures 1 and 2). The critical region was the anaphoric noun (i.e., "promise" or "threat"). The post-critical region was the remainder of the sentence. An automatic procedure pooled fixations shorter than 80 msec. with adjacent fixations. It also excluded fixations that were shorter than 40 msec. if they were not within three characters of another fixation and truncated fixations longer than 1,200 msec.

We analysed four processing measures (see below for definitions). The first two provide information about processing as a region of text is first encountered (1-2), with the third containing information from both early and intermediate processing. The final (4) accounts for both early and later processes, as a region of text is revisited. Table 1 displays mean values for each measure in each condition and region.

1. *First pass reading time* is the sum of all the fixation durations in msec. from the eye first entering the region until first exiting either to the left or right.

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2. *First pass regressions out* is the percentage of trials in which regressive saccades were made from the current most rightward fixation into an earlier region.
3. *Regression path reading time* is the sum of all fixation durations in msec. from the eye first entering a region until first exiting the region to the right (including all re-reading of previously read text).
4. *Total reading time* is the sum of all fixation durations in a region in msec.

Analyses of effects in each region were performed by fitting linear mixed models (Baayen, Davidson, & Bates, 2008) to the reading time measures of first pass, regression path and total time. Any significant interactions were followed up with pairwise comparisons conducted with the lsmeans package (Lenth & Hervé, 2015) for the reading time measures (i.e., first pass, regression path and total time). For the binomial measure of first pass regressions out we used logit mixed models as recommended by Jaeger (2008). Any significant interactions here were followed by pairwise comparisons made using further logit mixed models.

The models created in this experiment used Conditional Meaning, Anaphoric Meaning and the interaction between these factors as fixed factors, with subjects and items as crossed random factors (Baayen, Davidson, & Bates, 2008). Following Barr, Levy, Scheepers, and Tily (2013) we used the maximal random effects structure where possible: random intercepts for subjects and items, as well as by-subject and by-item random slopes on all factors in the model. For the binomial first pass regressions out measure for the critical region separate by subjects and by items logit mixed models were constructed as the model that included both subject and item random effects failed to converge. These models used only Conditional Meaning as a random slope. On the post-critical region, the regressions out measure involved random intercepts for both subjects and items, but only Conditional Meaning random slopes.

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The regressions out pairwise contrast models included both subjects and items as random intercepts with Conditional Meaning random slopes.

The analysis was carried out using R (R Development Core Team, 2015). Within R, we used the lme4 package (Bates, Maechler, Bolker, & Walker 2015) to fit the linear mixed models for the reading time measures, and the glmer function in the lme4 package with Laplace approximation for the regressions out measure. When presenting the results of the linear and logit mixed models results we report regression coefficients ( $b$ ), standard errors, and  $t$ -values (for duration measures) or  $z$ -values (for the binomial measure). We use restricted maximum likelihood estimation for the reporting of linear mixed model parameters, and maximum likelihood estimation for the reporting of logit mixed model parameters. For comparisons of linear mixed models, we use maximum likelihood estimation. Following Barr et al. (2013), we used deviation coding for each our two experimental factors. Absolute values of the  $t$ -value and  $z$ -value greater than or equal to 1.96 indicate an effect that is significant at approximately the .05 alpha level. For the pairwise comparisons on the reading time measures (first pass, regression path and total time) we report the  $t$ -values and Bonferroni corrected  $p$ -values corrected for the two theoretically motivated comparisons. Degrees of freedom are approximated using the Kenward-Roger method. The key comparisons were always between *lexically identical* regions of text. The means for each eye movement measure (calculated over subjects) for the critical region are displayed in Figure 1, and for the post-critical region in Figure 2. The results of the linear mixed models are reported in Tables 2 and 3.

\*\*\*INSERT FIGURE 1 HERE\*\*\*

\*\*\*INSERT FIGURE 2 HERE\*\*\*

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\*\*\*INSERT TABLE 2 HERE\*\*\*

\*\*\*INSERT TABLE 3 HERE\*\*\*

### *Critical Region*

On first pass and regression path times we found no effects of Conditional Meaning or Anaphoric Meaning, and no interaction between the two. On first pass regressions out we found only an effect of Anaphoric Meaning such that there were more regressions out of this region when it was the noun "threat" than when it was the noun "promise" (23% vs. 16%, see Table 2 for parameter values). On the total time measure, there was an interaction between Conditional Meaning and Anaphoric Meaning. Pairwise comparisons with Bonferroni corrected p-values showed that this interaction was *symmetrical*. There was a significant penalty when "threat" was used to refer to a conditional promise relative to when it referred to a conditional threat ( $t(20.22) = 2.41, p = .051$ ). There was also a penalty when the anaphoric noun "promise" was used to refer to a conditional threat ( $t(18.03) = 2.55, p = .040$ ).

### *Post-Critical Region*

On the post-critical region we observed an asymmetric interaction on measures of first pass regressions out, regression path and total time. After reading the anaphoric noun "threat" when it was used to refer to a conditional promise (relative to when it was used to refer to a conditional threat) there was disruption to reading that emerged on these three measures: first pass regressions out:  $b = 0.79, SE = 0.20, z = 3.93$ ; regression path:  $t(23.20) = 4.13, p = .001$ ; total time:  $t(20.61) = 2.41, p = .051$ . There was no similar disruption on these measures

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following reading of the anaphoric noun "promise" when it was used to refer to a conditional threat (relative to a conditional promise): first pass regressions out:  $b = 0.17$ , SE = 0.20,  $z = 0.86$ ; regression path:  $t(19.29) = 0.45$ ,  $p = 1$ ; total time:  $t(21.93) = 0.76$ ,  $p = .906$ .

### *Critical vs. Post-Critical Regressions Out Comparison*

To establish whether the difference in the pattern of the regressions out data for the critical vs. post-critical region is statistically significant, we constructed a logit mixed model that included Region (Critical vs. Post-Critical) as a fixed factor in addition to the fixed factors Conditional Meaning and Anaphoric Meaning. We compared this model using the likelihood ratio test with the model that did not include the fixed factor Region. Due to a failure to converge when subjects and items random effects were included in the same model, we constructed one model with subject random effects, and one model with item random effects. Including Region improved model fit (by subjects:  $\chi^2(4) = 164.76$ ,  $p < .001$ ; by items:  $\chi^2(4) = 157.53$ ,  $p < .001$ ) indicating that the interaction between Conditional Meaning and Anaphoric Meaning varies as a function of Region.

### *Critical vs. Post-Critical Regression Path Comparison*

To establish whether the difference in the pattern of regression path data for the critical vs. post-critical region is statistically significant, we constructed a linear mixed model that included Region (Critical vs. Post-Critical) as a fixed factor in addition to the fixed factors Conditional Meaning and Anaphoric Meaning. We compared this model using the likelihood ratio test with the model that did not include the fixed factor Region. Including Region improved model fit ( $\chi^2(4) = 1,431$ ,  $p < .001$ ) indicating that the interaction between Conditional Meaning and Anaphoric Meaning varies as a function of Region.

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### *Critical vs. Post-Critical Total Time Comparison*

To establish whether the difference in the pattern of the total time data for the critical vs. post-critical region is statistically significant, we constructed a linear mixed model that included Region (Critical vs. Post-Critical) as a fixed factor in addition to the fixed factors Conditional Meaning and Anaphoric Meaning. We compared this model using the likelihood ratio test with the model that did not include the fixed factor Region. Including Region improved model fit ( $\chi^2(4) = 1,834, p < .001$ ) indicating that the interaction between Conditional Meaning and Anaphoric Meaning varies as a function of Region.

### Discussion

On initial reading of the critical region, we found no evidence of sensitivity to either utility (which would have resulted in a symmetrical effect) or to semantic scope differences between promises and threats (which would have resulted in an asymmetrical effect). On the post-critical region, we found evidence that readers are sensitive to semantic scope differences (thus replicating the effects of Haigh et al., 2011). We found strong evidence of a processing cost on regressions out, regression path and the total time measure on the region of text after the anaphoric noun "threat" when it appeared in the context of a conditional promise (relative to when it appeared in the context of a conditional threat). As with Haigh et al., we found no statistically robust evidence of a penalty following reading the anaphoric noun "promise" when it appeared following a conditional threat.

Crucially, and in contrast to Haigh et al. (2011), we found a *different* pattern of effects on total time spent on the anaphoric noun *itself*. As no effect was found on measures of early reading on this region (i.e., first pass, regressions out and regression path time), we can be confident that this effect is driven by *re-reading* of the critical region *following* reading of subsequent text. On total time on the anaphoric noun, we found a slow down for cases where

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the meaning of the anaphoric noun mismatched the preceding conditional meaning (i.e., where there was a utility mismatch between anaphoric noun and the preceding conditional). The noun "promise" was read slowly following a conditional threat (relative to when it followed a conditional promise), and the noun "threat" was read slowly following a conditional promise (relative to when it followed a conditional threat). Analysis revealed that this symmetry on total time spent on the critical anaphoric noun was statistically different from the asymmetry associated with the total time spent on the post-critical region. It can best be explained by an account in which processing is informed first by semantic scope in terms of what a "promise" can refer to (such that conditional threats can be referred to as "promises"). This is compatible with an account whereby readers are sensitive to (and able to utilize) their knowledge that the semantic scope of "promises" is broader than that of "threats" (and thus "promises" can subsume "threats"). Sensitivity to the utility (mis)match between the anaphoric noun and the conditional meaning emerged *after* sensitivity to semantic scope. This stands in contrast to the sensitivity to utility that was demonstrated by Haigh et al. (2014). As the analysis regions examined by Haigh et al. (2014) were much longer than a single word (indeed, they were an entire clause), it is possible that the utility effect previously reported emerged towards the end of reading the critical regions of text (and thus was a late effect). The pattern of effects in the analysis regions we report above suggests that sensitivity to the semantic differences between conditional promises and threats *precedes* sensitivity to utility. If readers had been sensitive to utility when the anaphoric noun was first read, then we would have observed a robust effect of utility (mis)matching on initial reading of the critical region. We found no evidence to support this. Rather, the evidence of sensitivity to utility (mis)matching emerged on total time reading this critical region, and after the sensitivity to the semantic scope of promises versus threats emerged.

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As highlighted by Evans (2005), research in the area of conditionals needs to recognise the communicative function that conditionals play in everyday situations. We propose that examining the comprehension of contextualised conditionals using processing measures with high spatial and temporal accuracy of the kind we report above is one way in which research in the area of conditionals may proceed. A complete understanding of how conditionals are processed and represented requires linking together time course approaches with broader theoretical advances associated with the pragmatic function of conditionals (e.g., Verbrugge et al., 2004, 2005). In conjunction with previous work (e.g., Haigh et al., 2014; Stewart et al., 2013) the results above demonstrate the value of eye-tracking to examine how readers understand conditional statements. This approach is consistent with recent proposals in the field of experimental pragmatics (e.g., Levinson, 2000; Noveck & Reboul, 2008). According to the experimental pragmatics framework, the study of language needs to involve the use of experimental methods to determine the means by which someone understands the speaker's meaning (beyond the sentence's meaning) when an utterance is encountered. From this perspective, we propose that conditional inducements might form a rich source of research potential given they are typically used with the intention of persuasion (in the case of promises) or dissuasion (in the case of threats). The processing mechanisms by which the recipient of a conditional inducement is able to use information from the sentence's meaning and the speaker's intention in order to arrive at the appropriate interpretation is key, not just in the area of conditionals, but in the area of experimental pragmatics more broadly.

Overall, our results provide evidence consistent with the proposal that information about the semantic scope of promises versus threats plays an important role in the comprehension of contextualized conditionals. Importantly, this information exerts an influence on processing independently of (and prior to) information related to the difference in utility between conditional promises and threats.

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## Appendix

### Experimental items

*Items are listed in the order (a) conditional promise, anaphoric promise; (b) conditional promise, anaphoric threat; (c) conditional threat, anaphoric threat & (d) conditional threat, anaphoric promise.*

#### 1

Ian was at a builder's merchant to buy some paving slabs for a job. He approached the sales assistant intent on getting a good deal. She told him "if you buy in bulk, then I'll give you our trade discount". This promise helped Ian to make his decision. He thought about it for a while and then placed his order.

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#### 2

It was a Friday night and Becky was desperate to get out of the house. She phoned her lazy boyfriend to try and pressure him to go out with her. He told her "if you go to the pub, then I'll come with you." Issuing this promise meant he could not undo it. They went through the same process most weekends.

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## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

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### 3

Linda was at a party with her boyfriend to celebrate a friend's birthday. She was beginning to feel tired and told her boyfriend she was thinking about heading home. He replied "if you go home early, then I'll come with you". This promise showed the kind of relationship they had. Linda's boyfriend often made such statements.

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### 4

Mary was halfway through her 12-month mobile phone contract and was unhappy with the service. She called her mobile phone provider and said she wanted to change networks. The customer service assistant told her "If you stay with our network, then we'll give you 100 free texts every month." This promise was the kind that might influence her decision. Although the salesperson was asking for her to make a decision Mary decided to think about it for a few days.

Mary was halfway through her 12-month mobile phone contract and was unhappy with the service. She called her mobile phone provider and said she wanted to change networks. The customer service assistant told her "If you stay with our network, then we'll give you 100 free texts every month." This threat was the kind that might influence her decision. Although the salesperson was asking for her to make a decision Mary decided to think about it for a few days.

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## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

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### 5

Gina was desperate to contact her boss outside office hours about an issue at work. She phoned him but he was a very busy man who didn't take kindly to being called at home. He told her abruptly "if you come to my office first thing tomorrow, then I'll talk to you at that time". This promise was all Gina had to get the problem sorted out. If she couldn't deal with it soon there would be serious implications at work.

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### 6

Last night Perry and Liam borrowed their dad's car without asking. Unfortunately Perry managed to reverse the car into a garden wall and crack the rear bumper. In deciding what to do Liam said to Perry "if you tell dad, then I'll take equal responsibility". This promise left Perry feeling no better. The car was not even a year old.

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7

Claire and Kim both needed to buy new outfits for their friend's wedding. The wedding was only two weeks away and neither of them had been shopping yet. Claire said to Kim "if you go shopping this Sunday, then I'll come with you". This promise gave Kim some motivation to sort out her outfit with Claire. Kim always left things to the last minute.

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8

Leanne and her friends were in their final year at university and wanted to go on holiday together. However, Leanne was short of money and so phoned her mum to see if she had any helpful ideas. Her mum told her "if you do well in your exams, then I'll pay for the holiday". This promise by her mother meant Leanne re-evaluated her plans. The rest of her friends were planning to book their flights and accommodation over the next few weeks.

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### 9

Beth was preparing for her upcoming Physics exam. She had to decide whether her time would be spent revising in the library or attending the final physics lecture. The lecturer Dr Roberts had earlier said that "if you miss the lecture, then I will send you the lecture notes". This promise by Dr Roberts helped Beth decide. The exam was only a week away and she didn't feel at all prepared.

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### 10

John was in a meeting with his project supervisor at university. They were discussing the results of the study for which John was employed as a research assistant. John's supervisor said to him "if the results are written by next week, then I will put you on the paper as an author". This promise helped John decide to make sure the results were completed. He thought he would work on it over the weekend if necessary.

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### 11

Eleanor was looking to book her summer holiday. She had visited the travel agent to try and find the best deal. The agent told her that "if your departure date is flexible, then we'll guarantee you the cheapest deal". This promise by the agent meant that Eleanor went for that deal. She felt like she deserved a holiday as she hadn't been away in over a year.

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### 12

Amanda was having relationship problems and she and her partner had been fighting. Her mum, Julie, had come over to see how she was. Her mum said "if you decide to stay with him, then I'll support you through this". This promise was exactly what Amanda needed to hear. Her mum's interest showed that at least she cared about her.

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Kevin and Craig shared a house together. Since they moved in Craig keeps forgetting to pay his share of the rent. On the way to work, Kevin said to Craig "if you forget the rent again, then I'll put your share in for now". This promise had a big impact on Craig. Craig felt bad that he was so bad at upholding his part of the tenancy.

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It was Thursday evening and Alan was getting ready to leave the office. A few of his colleagues had invited him to the pub for drinks but he was feeling reluctant. His manager had earlier said "if you come into work early again, then I'll give you an extra day's holiday". This promise was out of character for his manager. Alan knew that going drinking could easily lead to him being hung over and late the next morning.

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## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

### 15

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### 16

Robert had been diagnosed with diabetes over five years ago. He had to take tablets several times a day to manage the condition. However, one day his GP stated "If you continue to manage your diet so well, then I will reduce your medication". This promise made by his GP convinced Robert to try to stick to the diet. Robert was fed up with having to always remember his medication at mealtimes.

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### 17

Adam and Nancy had been going out for over a year and Adam wanted Nancy to move in with him. However, Nancy hated Adam's smoking and how her clothes smelt after being out with him. One night Nancy stated "If you give up smoking, then I will move in with you". This promise by Nancy made Adam realise how much she hated his smoking. He decided that perhaps it was a dirty habit.

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### 18

Margaret had been having some problems trying to convince her fourteen year old daughter, Amy, to tidy her room. This was an ongoing battle on Margaret's part. Eventually Margaret said to Amy "If you keep your room tidy, then I'll increase your pocket money". This promise made Amy decide it might be best to tidy up. She thought that she would spend fifteen minutes each weekday after school just tidying up.

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### 19

Andrea had been diagnosed with a mental illness several years ago. She had to see a social worker every month but disliked doing so. At her mental health review her social worker said "If you keep your appointments with me, then I'll reduce them from monthly to every other month". This promise meant Andrea decided to keep her appointments from now on. She wanted as much freedom from supervision as she could get.

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### 20

Marcus had booked a table for his anniversary at his favourite restaurant, where he was a regular customer. However, upon arrival they found the table was double booked. Marcus said to the waiter "If you provide us with a table straight away, then I'll leave you a good tip". This promise motivated the waiter to find them a table. Marcus and his girlfriend were able to celebrate their anniversary after all.

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### 21

James stood nervously at the bar waiting to be served. He had spent the last hour talking to his brother about how much he fancied the barmaid. His brother told him "if you buy me a drink, then I'll find out if she's single". This promise was characteristic of his brother. They had always behaved this way to one another.

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### 22

George and Miriam are an elderly couple who generally share the chores. However, Miriam sometimes forgets to rinse the milk cartons out before putting them in the recycling box. George had earlier said to Miriam "if you forget to wash the milk cartons again, then I'll do it before I put the recycling out". This promise by George was quite characteristic of his nature. Since they had retired they spent more time arguing.

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## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

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### 23

Maggie was 10 years old and loved playing the piano. She had lessons twice a week with a piano teacher but was stuck learning one piece. One day her piano teacher said "If you get it right this time, then you can go early". This promise was a strong incentive for Maggie as she wanted to play out with her friends. Maggie and her friends loved playing netball in the park.

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### 24

John was a keen football player and a talented striker. However, he was sometimes very greedy with the ball and would not pass to other players. After one practice the coach said "If you start passing the ball, then I'll put you on the team". This promise made John realise that he would have to improve his passing. John was determined to make the team.

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## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

you keep being selfish with the ball, then I'll take you off the team". This promise made John realise that he would have to improve his passing. John was determined to make the team.

### 25

Ten year old Andrew and his dad were out clothes shopping. However, Andrew hated shopping and often caused a fuss whilst they were out. So, on this trip his dad said "If you're good whilst we do the shopping, then I'll take you to the park after we get home". This promise meant that Andrew decided to behave. Andrew could be well behaved when necessary.

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Ten year old Andrew and his dad were out clothes shopping. However, Andrew hated shopping and often caused a fuss whilst they were out. So, on this trip his dad said "If you're naughty whilst we do the shopping, then I'll send you to bed once we get home". This threat meant that Andrew decided to behave. Andrew could be well behaved when necessary.

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### 26

Molly and her more adventurous companion Jennifer were out in Blackpool. Molly was quite happy to just walk along the promenade but Jennifer was bored with this. So, Jennifer said to Molly "If you go on the rollercoaster with me, then I'll buy us both fish and chips". This promise didn't help the situation. Molly liked to take her time making decisions.

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Molly and her more adventurous companion Jennifer were out in Blackpool. Molly was quite happy to just walk along the promenade but Jennifer was bored with this. So, Jennifer said to Molly "If all you're going to do is walk around, then I'll leave to do my own thing". This threat didn't help the situation. Molly liked to take her time making decisions.

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## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

**27**

Neil had to go swimming with school once a week. His instructor was trying to get him to do a width using breaststroke. His instructor said "If you swim breaststroke for me, then I'll give you a gold star". This promise meant that Neil decided to give the breaststroke a go. Neil was not a bad swimmer but thought his own style was best.

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Neil had to go swimming with school once a week. His instructor was trying to get him to do a width using breaststroke. His instructor said "If you just splash around again, then I'll make you get out". This threat meant that Neil decided to give the breaststroke a go. Neil was not a bad swimmer but thought his own style was best.

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**28**

Alison was a shy girl who often felt left out by Becky and the other girls at school. Alison decided to find out how the other girls felt about her by asking Becky if she could come next time. Becky told her "If you come with us to watch the movie, then I'll let you share the popcorn". This promise helped Alison determine how Becky felt about her. Alison enjoyed eating popcorn at the cinema.

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**29**

## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Andy was a contestant on a talent show. He was into the third round and really wanted to win. When he went on to sing the judge told him "If you sing like you did in the last round, then I'll award you first prize". This promise was enough to persuade Andy to give it his best. Andy had a lot of family watching and did not want to disappoint them.

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### 30

Jack was eight years old with two elder sisters. Jack's sisters were teenagers and wanted their space. His eldest sister hated how Jack often wandered into her bedroom. In the end she said to Jack "If you stay out of my room, then I will stay out of yours". This promise meant that Jack decided to avoid his sister's room. Jack was too young to understand his sister's need for privacy.

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### 31

Jason sometimes walked home from school after buying chocolate. On this occasion he saw a group of boys playing football in the park as he walked past. The largest boy approached

## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Jason and said "If you share your chocolate, then I'll let you play football". This promise made Jason decide to give the boy his remaining chocolate. Jason did not really consider it a great loss as he was not that hungry.

Jason sometimes walked home from school after buying chocolate. On this occasion he saw a group of boys playing football in the park as he walked past. The largest boy approached Jason and said "If you share your chocolate, then I'll let you play football". This threat made Jason decide to give the boy his remaining chocolate. Jason did not really consider it a great loss as he was not that hungry.

Jason sometimes walked home from school after buying chocolate. On this occasion he saw a group of boys playing football in the park as he walked past. The largest boy approached Jason and said "If you don't give me your chocolate, then I'll beat you up". This threat made Jason decide to give the boy his remaining chocolate. Jason did not really consider it a great loss as he was not that hungry.

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### 32

Janet was a typical teenage girl who was fond of sweets, music and boys. As the eldest child she also often did jobs for her mum such as going to the shops. Janet's mum said to her one evening "If you go shopping for me, then I'll give you extra pocket money". This promise meant that Janet decided to do as her mum asked. Janet was a good person who did not cause any trouble.

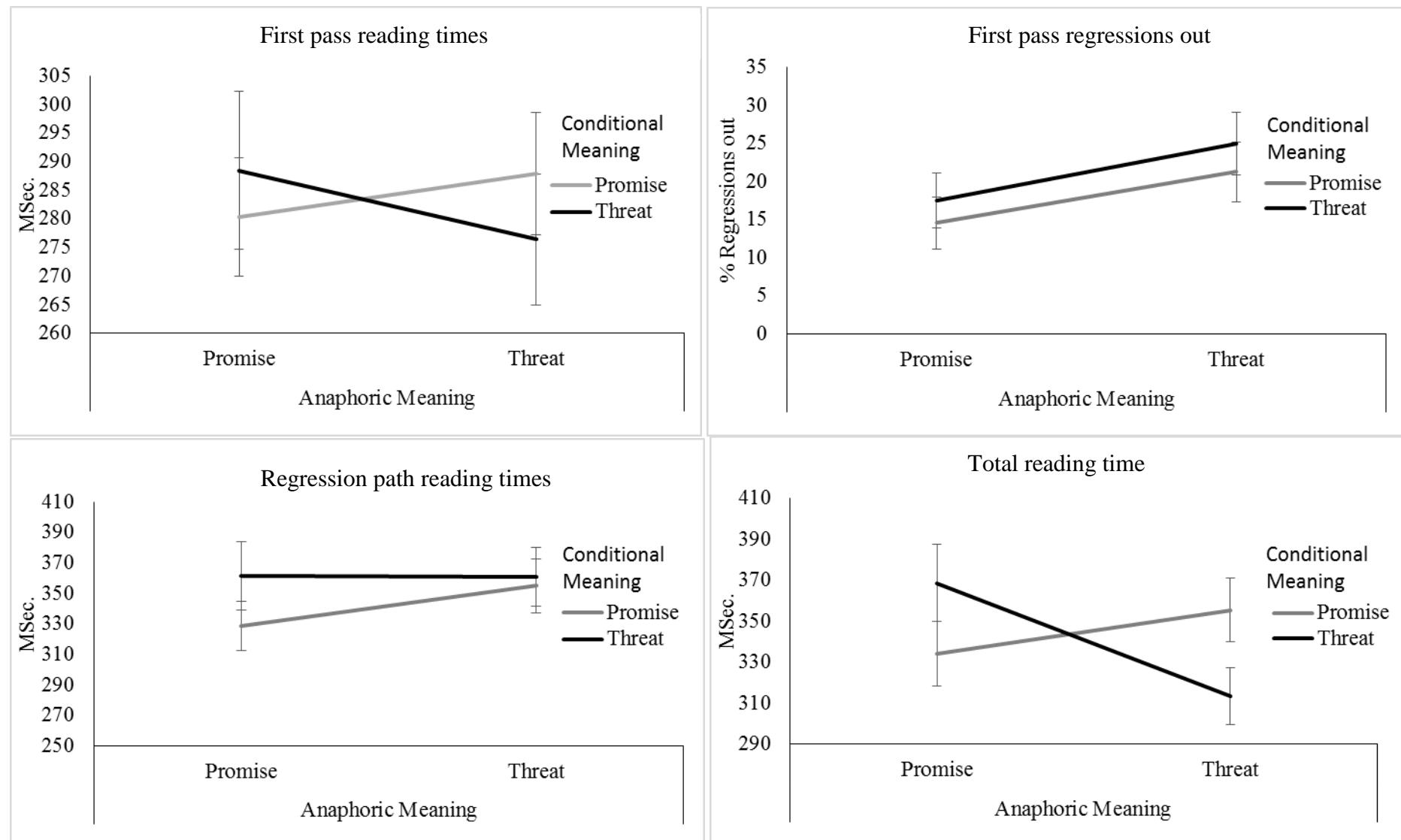
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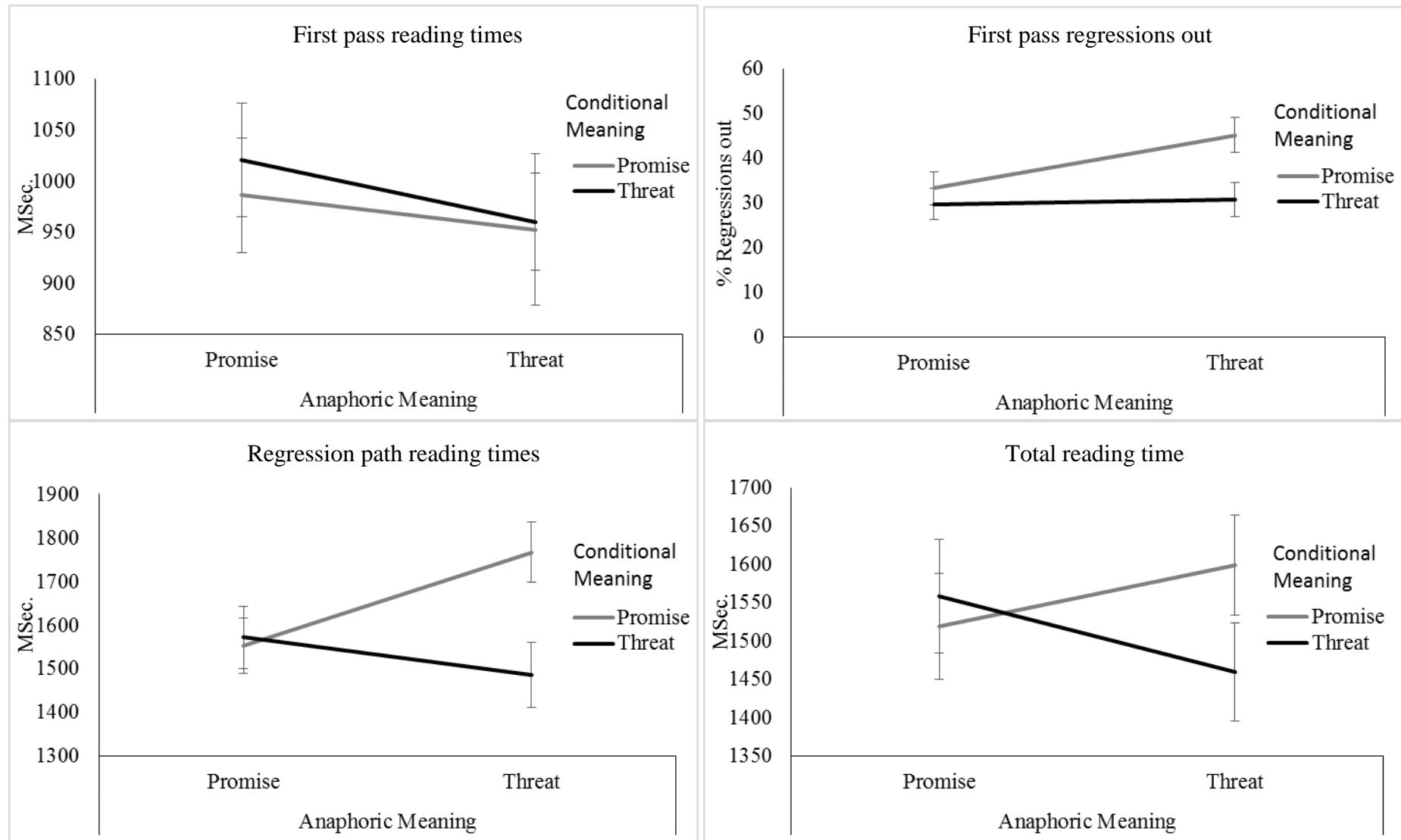
## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Figure 1: Results from the four measures of reading for the Critical Region with standard error bars.



## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Figure 2: Results from the four measures of reading for the Post-Critical Region with standard error bars.



## SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Table 1: Example of the four experimental conditions. The analysis regions are highlighted in bold and delimited by vertical bars.

<b>Conditional Meaning</b>	<b>Anaphoric Meaning</b>	<b>Vignette</b>
Promise	Promise	Ian was at a builder's merchant to buy some paving slabs for a job. He approached the sales assistant intent on getting a good deal. She told him "if you buy in bulk, then I'll give you our trade discount". This <b> promise CRITICAL  helped Ian to make his decision. POST-CRITICAL </b> He thought about it for a while and then placed his order.
Threat	Promise	Ian was at a builder's merchant to buy some paving slabs for a job. He approached the sales assistant intent on getting a good deal. She told him "if you only buy a small amount, then I'll stop your trade discount". This <b> promise CRITICAL  helped Ian to make his decision. POST-CRITICAL </b> He thought about it for a while and then placed his order.
Threat	Threat	Ian was at a builder's merchant to buy some paving slabs for a job. He approached the sales assistant intent on getting a good deal. She told him "if you only buy a small amount, then I'll stop your trade discount". This <b> threat CRITICAL  helped Ian to make his decision. POST-CRITICAL </b> He thought about it for a while and then placed his order.
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# SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Table 2: Results of the linear mixed models for the Critical Region and measures of interest. Significant effects are highlighted in bold.

	Duration measures									Binomial measure					
	First Pass			Regression Path			Total Time			First Pass Regressions Out – by subjects			First Pass Regressions Out – by items		
	b	SE	t	b	SE	t	b	SE	t	b	SE	z	b	SE	z
<hr/>															
Critical Region															
Intercept	<b>285.91</b>	<b>10.48</b>	<b>27.29</b>	<b>355.82</b>	<b>15.52</b>	<b>22.92</b>	<b>344.37</b>	<b>14.96</b>	<b>23.03</b>	<b>-2.26</b>	<b>0.22</b>	<b>-10.21</b>	<b>-1.82</b>	<b>0.09</b>	<b>-20.6</b>
Conditional Meaning	2.68	8.20	0.33	-15.31	15.14	-1.01	0.05	11.49	0.004	-0.30	0.22	-1.36	-0.01	0.17	-0.57
Anaphoric Meaning	1.92	7.50	0.26	-19.26	14.46	-1.33	15.26	12.77	1.20	<b>-0.40</b>	<b>0.17</b>	<b>-2.30</b>	<b>-0.33</b>	<b>0.16</b>	<b>-2.04</b>
Interaction	-25.64	16.4	-1.56	-37.51	30.65	-1.22	<b>-77.25</b>	<b>20.92</b>	<b>-3.69</b>	-0.34	0.35	-0.98	-0.26	0.32	-0.81

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# SEMANTIC SCOPE DIFFERENCES IN CONDITIONAL INDUCEMENTS

Table 3: Results of the linear mixed models for the Post-Critical Region and measures of interest. Significant effects are highlighted in bold.

	Duration measures									Binomial measure		
	First Pass			Regression Path			Total Time			First Pass Regressions Out		
	b	SE	t	b	SE	t	b	SE	t	b	SE	z
<b>Post-Critical Region</b>												
Intercept	<b>981.4</b>	<b>67.27</b>	<b>14.59</b>	<b>1596.73</b>	<b>88.08</b>	<b>18.13</b>	<b>1536.34</b>	<b>94.07</b>	<b>16.33</b>	<b>-0.78</b>	<b>0.17</b>	<b>-4.54</b>
Conditional Meaning	-20.99	42.71	-0.49	<b>126.32</b>	<b>49.08</b>	<b>2.57</b>	46.15	42.06	1.10	<b>0.47</b>	<b>0.14</b>	<b>3.34</b>
Anaphoric Meaning	48.06	38.94	1.23	-59.41	42.87	-1.39	12.87	38.45	0.34	<b>-0.32</b>	<b>0.13</b>	<b>-2.47</b>
Interaction	-31.19	81.29	-0.38	<b>-308.14</b>	<b>84.41</b>	<b>-3.65</b>	<b>-187.47</b>	<b>86.25</b>	<b>-2.17</b>	<b>-0.53</b>	<b>0.26</b>	<b>-2.07</b>