Processing discourse roles in scripted narratives: 
The influences of context and world knowledge

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Abstract

Discourse context may affect comprehension of a word in a text by facilitating lexical access or by facilitating integration of the target concept with the preceding text. In two experiments, we used eye tracking measures to examine contextual influence on the integration of role fillers in scripted narratives. In both experiments, context had an early influence on integration of role fillers. However, measures of post-target processing indicated that semantic knowledge continued to influence integration. The results are discussed in terms of several theories of contextual influence on reading. The data appear to support a two-stage model of processing: in the first stage, incoming text is linked to the contents of active memory; in the second stage, the link between the new and old information is evaluated.

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Many factors influence the speed of processing individual words in a connected discourse. Some of these factors are inherent in the individual word; for example, it is well established that words that are more frequent in the English language are read more quickly than less frequently encountered words, and shorter words are processed more quickly than longer words (Inhoff & Rayner, 1986; Rayner, 1998). At least as important in determining how words are processed is the influence of the information provided by the preceding text. For example, consider a passage whose protagonists are in a rock band. Assume that the reader encounters a sentence that begins “The song was played by the…” Both theory (e.g., Schank & Abelson, 1977) and data (e.g., Bower, Black, & Turner, 1979) suggest that the reader’s knowledge of the role fillers in rock band scripts should either prime, or facilitate integration of, the sentence continuation, guitar. Therefore, we would expect that the time spent processing the appropriate continuation, guitar, would be shorter than that spent processing an inappropriate continuation, manager. Suppose, however, that earlier in the passage, the manager had played the song. Or suppose that the text included a sentence that indicated that some of the band members handled publicity and finances in addition to performing. In the experiments reported here, we investigated whether such contextual manipulations have an effect and, if so, the nature and time course of those effects.

In the rock band example, there are two sources of information available to the reader. Knowledge of rock band scripts links the guitarist to the role of performer, whereas the preceding context may imply that in this passage the usual scriptal roles are not valid. Theories

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about discourse processing differ with respect to the priority they assign to the two sources of information, semantic knowledge, and discourse context. Many theorists have also used the terms “local” context effects and “global” context effects to refer to semantic and discourse influences (e.g., Hess, Foss, & Carroll, 1995). However, the terms “local” and “global” have also been used to refer to a variety of other linguistic factors (e.g., discourse coherence, distance in text, causal information, etc.). To avoid confusion, here we associate local context effects with those caused by information reactivated from readers’ semantic knowledge, and global context effects with those caused by information reactivated from the episodic discourse context.

Kintsch’s (1988) construction-integration model incorporates both immediate effects due to the semantic properties of text and later effects due to discourse context. In the construction stage of the model, concepts and propositions in the reader’s knowledge base are activated as a function of their relation to what is currently in the reader’s focus; the prior discourse context plays its role in the later, integration, stage. Till, Mross, and Kintsch (1988) presented data in support of this two-stage process. As in other studies, at short intervals associates of ambiguous words in sentences were primed whether or not they were related to the discourse context. At longer intervals, words unrelated to the overall discourse context of the passage were no longer primed; however, words that were inferentially related to the topic were primed although they were not lexical associates of words in the preceding sentence.

Similarly, Garrod and Sanford (1999) have argued in favor of immediacy in discourse processing, in which “language input is related to world knowledge at the earliest possible opportunity” (p.23). Sanford and Garrod (1989) reviewed several studies of anaphoric processing and argued that the majority of the evidence pointed to a two-stage process, with the first stage beginning immediately upon encountering an anaphor (also, see Garrod & Sanford, 1983; Sanford & Garrod, 1981, for earlier discussions of stages involved in anaphoric processing). The process in the first stage was referred to as “bonding,” in which potential antecedents (whether correct or incorrect) may be quickly reactivated based on their semantic relation to an anaphor through a low-level pattern-matching mechanism. The match made during the bonding stage is verified, and if correct, is instantiated, during the second stage, resolution.

Garrod and Sanford (1999) proposed more general versions of the bonding and resolution stages, which can apply to processing at the lexical, syntactic, or discourse levels. Consistent with this idea, Garrod and Terras (2000) demonstrated that bonding and resolution could be extended to processes beyond anaphor resolution. They required participants to read sentence pairs in which the context provided by the first sentence was either appropriate or inappropriate with respect to a phrase in the second sentence. An example of the first sentence is

(1a) The teacher was busy writing a letter of complaint to a parent.

or

(1b) The teacher was busy writing an exercise on the blackboard.

The second sentence contained the phrase the pen dropped which forms an appropriate pairing with sentence 1a but not with sentence 1b. Eye fixation times revealed no initial effect of appropriateness on processing the noun, pen. However, times in the region of the verb, dropped, and regressions from it back to the noun indicated difficulties in the later stages of processing when sentence 1b provided the context. Garrod and Terras explained their results in terms of the two stages originally proposed by Sanford and Garrod (1989): in bonding, an early automatic associative process links a potential role filler (pen) with a verb encountered earlier (writing), and a later process, resolution, evaluates and resolves the instrument-verb link in terms of the discourse context.

Using eye tracking technology, Morris (1994) and Duffy, Morris, and Rayner (1988) provided evidence that both lexical and contextual information can affect early lexical access processes. Morris presented readers with sentences such as,

(2a) The gardener talked as the barber trimmed the mustache after lunch.

(2b) The gardener talked to the barber and trimmed the mustache after lunch.

both of which contain identical content words (e.g., barber, trimmed) with strong lexical associations to mustache. But, in sentence 2b, mustache is not consistent with the overall message of the sentence—barbers usually trim mustaches, not gardeners. In contrast to previous demonstrations of serial effects of semantic and contextual influences, Morris found that both intralexical associations and message-level context facilitated early processing (i.e., gaze durations) for mustache. Similarly, Duffy et al. (1988) provided evidence for both lexical (e.g., meaning dominance) and contextual influences (e.g., prior disambiguating context) on early processing of lexically ambiguous words, and proposed that these factors may contribute to a reordered access of lexical information during reading.

In contrast to models that assume early stages may be mediated by lexical associations, Foss and his colleagues (Foss, 1982; Foss & Speer, 1991; Hess et al., 1995; Traxler & Foss, 2000) have proposed that initial access is facilitated by the discourse context. Perhaps the strongest pieces of evidence for their position are the results obtained by Hess et al. Using a cross-modal priming procedure, they presented participants with
sentences that either had an association between the last word and the preceding text, such as,
(3a) *The English major wrote the poem*

or sentences that lacked such an association, such as
(3b) *The computer science major wrote the poem.*

When sentences such as 3a were presented alone, the final word, *poem,* was pronounced aloud more quickly than when it ended a neutral sentence such as,
(3c) *The boy read the poem.*

However, when sentence 3a ended a passage in which the discourse context was not relevant—e.g., a passage about an English major in a computer science course—no facilitation was observed. On the other hand, if the passage placed the computer science major in an English course, *poem* in sentence 3b was named more quickly than when it ended a control passage. In discussing their results in relation to models that assume two stages, based on semantic knowledge and discourse context effects, Hess et al. stated that these models “... make two incorrect predictions: They predict a local effect where none is observed, and they predict a slow-acting global effect where in fact a fast-acting one occurs” (p. 78). The authors proposed a *lexical reinterpretation* model (also, see Foss & Speer, 1991) in which discourse context modifies the representation of a concept. For example, an English major taking a computer science course may be viewed as a “student-in-a-technical-course-on-computing (not the poetic related information)” (p. 80). Accordingly, the target word, *poem,* is not readily integrated into this representation and therefore receives no facilitation.

One limitation of the Hess et al. (1995) study, and of many other studies of contextual effects, is the use of probe techniques. Although useful, probe response times provide only one sample in the time course of processing and may result in an incomplete or possibly even distorted view of the effects of context on processing of words in discourse (see Gordon, Hendrick, & Foster, 2000, for additional issues concerning strategic processing when probe response methodologies are used). For example, if Garrod and Terras (2000) had only probed with the target word *pen,* they might have concluded that context had no effect. By monitoring eye movements, they found that the context had no initial effect but that an inappropriate context interfered with subsequent processing of the targeted word.

The goal of the present set of experiments was to use several eye tracking measures in different regions of a text to further our understanding of context effects on the processing of words in connected discourse. In two experiments, we analyzed eye movement data for targeted regions of passages that evoked familiar scripts (e.g., rock band). The regions of interest were the one-word target role fillers (e.g., guitarist, manager) that were either appropriate or inappropriate with respect to the specific action being performed in the current sentence and either appropriate or inappropriate with respect to the previous discourse context. We also examined processing times on the post-target regions, the few words that immediately followed the target in the text. If incoming text is linked via low-level associative processes with general world knowledge before it is integrated with the discourse context, as suggested by Garrod and Terras (2000) and Kintsch (1988), we should observe effects of appropriateness with respect to the action described in the current sentence in early stages of processing (e.g., first pass on target regions), and discourse context effects should be observed in later stages of processing (e.g., first pass on post-target regions, second pass, regressions). In contrast, if discourse context influences early stages of word processing, as suggested by Foss and colleagues, discourse context effects should be observed in early stages of processing.

**Experiment 1**

The passage in Table 1 illustrates the two factors manipulated in Experiment 1. Note that there are two encounters between the protagonists and an individual filling the role of a performer. Our primary interest in this experiment was in participants' eye movements while they processed the second encounter. The action described there (e.g., playing a song) is carried out either by an individual appropriate to the scripted role (the audience listened to the *guitarist,* A2) or by someone inappropriate to the role (the audience listened to the *manager,* I2). Also, the earlier first encounter contained either an appropriate (the *guitarist* played the song, A1) or an inappropriate (the *manager* played the song, I1) role filler. In summary, two factors were manipulated in the second encounter: the appropriateness of the role filler in the earlier first encounter, and the appropriateness of the role filler in the second encounter.

When the second encounter in the A2 condition is consistent with both context and semantic knowledge—that is, when both first and second encounters are appropriate to scriptal knowledge—integration of the second-encounter role filler should proceed easily, and therefore first pass reading times should be faster in the A1/A2 condition than in the A1/I2 condition. What differentiates models are their predictions when the first encounter is inappropriate. According to the Hess et al. (1995) lexical reinterpretation model, when the manager plays the song, the reader reinterprets the role of performer; the manager is incorporated into the discourse as *someone who also fills the guitarist’s role.* If this is so, on the second encounter the inappropriate role filler (I1/I2 condition) should be processed as fast or faster than the appropriate role filler (I1/A2 condition). Having reinterpreted the manager's role, readers should now find it as easy, or easier, to integrate *the manager* than the
Table 1
Versions of a sample passage for Experiment 1

<table>
<thead>
<tr>
<th>Introduction</th>
<th>The fans at the rock concert were going wild. They quieted down when the next song</th>
</tr>
</thead>
<tbody>
<tr>
<td>First encounter</td>
<td>Appropriate (A1): was played by the band’s guitarist.</td>
</tr>
<tr>
<td></td>
<td>Inappropriate (II): was played by the band’s manager.</td>
</tr>
<tr>
<td>Background</td>
<td>The concert was being held in an outdoor stadium, and there were about ten thousand screaming fans in attendance. They were mostly all hysterical teenage girls. Some even cried as they</td>
</tr>
<tr>
<td>Second encounter</td>
<td>Appropriate (A2): listened to the guitarist</td>
</tr>
<tr>
<td></td>
<td>Inappropriate (II): listened to the manager</td>
</tr>
<tr>
<td>Conclusion</td>
<td>Play a slow and heartfelt love song. The song was about a love affair that ended badly.</td>
</tr>
</tbody>
</table>

Note 1. The target region in this example is guitarist or manager; the post-target region (second encounter) is play a slow.  
Note 2. In Experiment 1, half of the participants read a similar passage in which the manager was appropriate and the guitarist was inappropriate.

guitarist with the action of playing the song. Although Hess et al. would not necessarily predict the role reinterpretation assumed here, such a result would be consistent with their model. It would also be consistent with the assumption that situation models are updated on the basis of textual information (Zwaan & Radvansky, 1998). However, models that assume an immediate effect of world knowledge (e.g., Garrod & Sanford, 1999; Kintsch, 1988) would predict that an inappropriate second encounter will be reflected in longer reading times.

Because none of the models are specific about the time course of processing, it is not clear what their predictions would be for processing after the eyes move past the role filler. Integration may be completed while readers are fixated on the role filler, or it may continue into subsequent fixations on the words following the role filler or on the role filler itself. In the present experiment, eye movement measures provide a means of assessing context effects after the initial processing of the role filler. Continued effects of either first-encounter or second-encounter appropriateness should be reflected in time spent in the region following the target word, in regressions back to the target word, and in the time spent reprocessing the target after regressing back to it.

In summary, Experiment 1 had two purposes. The first was to examine the effects of the appropriateness of the first encounter on processing of the second encounter. If such effects were obtained in early measures of processing (e.g., first pass), they would suggest a limitation of models that assume only semantic priming by the immediately preceding context and would further extend the applicability of Hess et al.’s (1995) assumption of lexical reinterpretation. However, a disruption of processing when the second encounter was inappropriate and the first encounter was also inappropriate would be inconsistent with the lexical reinterpretation hypothesis. The second purpose was to use the measures derived from records of participants’ eye movements to examine the time course of any effects that were observed.

Method

Participants
Thirty-eight members of the University of Massachusetts community participated in exchange for either money or course credit. The data for six participants were not analyzed due to large calibration errors during portions of the experiment.

Apparatus
Eye movements were recorded by a Fourward Technologies Dual Purkinje Eye tracker that has a resolution of 10 min of arc. The eye tracker was interfaced with a 486 microcomputer, which ran the experiment. Viewing was binocular, with eye location recorded from the right eye. The position of the participant’s eye was sampled every millisecond by the computer and averaged over four consecutive samples. The averaged horizontal and vertical positions of the eye were compared with those of the previous sample to determine whether the eye was fixated or moving.

Materials
The materials used were 24 passages similar to the example presented in Table 1 (see also Appendix A). Each passage began with a sentence that introduced a script (e.g., rock band). In the next (first encounter) sentence, a scripted action was associated with an entity or an object that was either appropriate or inappropriate for that role. Reading times were measured for the role
filler (e.g., guitarist) in the first encounter. The role filler was always a single word, with a range of 4–11 characters (mean = 7.06 characters). A background section of two to three sentences followed. The next (second encounter) sentence contained a scripted action that was associated with either an appropriate or inappropriate role filler, and which either matched or did not match the role filler in the first encounter. Thus, the appropriateness of the role filler in the second encounter was crossed with the appropriateness of the role filler in the first encounter to create four conditions: A1/A2 (both encounters appropriate), A1/I2 (first encounter appropriate, second encounter inappropriate), I1/A2 (first encounter inappropriate, second encounter appropriate), and I1/I2 (both encounters inappropriate). In the second encounter, reading times were measured for the target word (the role filler; e.g., guitarist) and the post-target region, which consisted of the two to four words (mean = 14.17 characters; e.g., play a slow) that immediately followed the target. A short closing sentence ended the paragraph.

Eight materials sets were constructed. These were counterbalanced such that the appropriate and inappropriate actions for the role filler in the first four sets (e.g., guitarist) were the inappropriate and appropriate actions, respectively, for the role filler in the second four sets (e.g., manager). In each materials set, six passages appeared in each of the four conditions. Across each group of four materials sets, each passage appeared once in each of the four conditions. The 24 experimental passages always appeared within a larger set of 72 passages. The 48 “filler” passages were stimuli for two unrelated experiments; one set of filler passages contained anaphoric references to objects previously mentioned in the text, while the second set of filler passages involved bridging inferences. The filler passages were approximately the same length as the experimental passages but did not focus on scripted settings.

Rating study 1a. In order to ensure that the scripted actions selected were appropriate or inappropriate with respect to the role fillers, a rating study was conducted. Forty University of Massachusetts community members who did not participate in either of the experiments reported in this paper were asked to rate the likelihood of an action being performed by a specific role filler. Participants rated 32 items such as 3a–3d below on a 7-point scale (where 1: “Extremely Unlikely” and 7: “Extremely Likely”):

(3a) For a rock band, all of the legal issues are handled by the band’s guitarist.

(3b) For a rock band, all of the legal issues are handled by the band’s manager.

(3c) For a rock concert, teenage fans cry as a sad song is played by the band’s guitarist.

(3d) For a rock concert, teenage fans cry as a sad song is played by the band’s manager.

Appropriate role fillers (e.g., 3a and 3c; mean = 6.13) were rated as significantly more likely to perform a scripted action than inappropriate role fillers (e.g., 3b and 3d; mean = 2.57), $F(1,31) = 349.42$, $MSE = 1.158$. The items from this norming study were used to create the 24 passages used in Experiment 1.

Rating study 1b. An additional rating study was conducted in order to ensure that a switch in role fillers between the first and second encounters was less plausible than the same role filler being maintained in the first and second encounters. Twenty-four University of Utah undergraduate students enrolled in Introductory Educational Psychology courses participated in exchange for course credit. Participants were presented with one of four counterbalanced stimulus sets, in which six passages appeared in each of the four conditions, up to the target sentence. Participants were then asked, given the information in the passage, to rate the likelihood of the target action being performed by the second-encounter role filler on a 5-point scale (where 1 = “Extremely Unlikely” and 5 = “Extremely Likely”). If maintaining the same role filler across both encounters is more likely than switching role fillers across encounters, ratings in the A1A2 and I1I2 conditions should be higher than in either the A1I2 and I1A2 conditions, respectively. The results supported this hypothesis. Ratings in the A1A2 condition were higher than in the A1I2 condition (3.75 vs. 1.93; $F(1,23) = 81.66$, $MSE = .4332$; $F_1(1,23) = 124.32$, $MSE = .3072$). In addition, ratings in the I1I2 condition were higher than in the A1I2 condition (3.17 vs. 1.93; $F_1(1,23) = 39.22$, $MSE = .4704$; $F_1(1,23) = 30.05$, $MSE = .5914$). Mean ratings for all passages are presented in Appendix A.

Procedure

Each participant took part individually in a session that lasted approximately 60 min. For each participant, a bite bar was prepared to eliminate head movements, and the eye tracker was calibrated. The initial calibration procedure took approximately 5 min. Prior to reading each passage, calibration of the eye tracking system was checked to ensure that accurate records were obtained. Each participant read three practice passages followed by the set of 24 experimental and 48 filler passages. Participants were told that they would be reading a series of paragraphs displayed on a CRT screen. They were told to read for comprehension so that they would be able to answer an occasional oral comprehension question (e.g., Were the fans enjoying the concert?). Questions were asked on approximately one-sixth of the trials, and there were an equal number of “yes” and “no” comprehension questions. Participants had little difficulty answering the questions correctly; all participants answered at least 85% of the questions correctly. Because of the high accuracy rates, the fixation data for all trials were analyzed, regardless of
whether a question for a specific trial had been answered correctly.

At the beginning of each trial, five boxes appeared across the top of the screen, one box appeared in the middle, and five boxes appeared at the bottom of the screen. Each participant was instructed to look at the middle box until the experimenter said, “Ready,” and then to look at the upper left-most box. Once the experimenter had determined that the participant was fixating the box, the entire passage was presented on the screen. When the participant was finished reading the passage, he or she was instructed to press a button that would end the trial. Participants were given a brief break approximately halfway through the experiment.

Results and discussion

First pass reading time, the sum of all fixations in a region before the eyes first leave that region, is reported for two regions: the target and the post-target region. Trials in which a region was initially skipped were not included in first pass analyses. In addition, percentage of regressions made into the target region and second pass reading times, any rereading of the target region after the eyes have regressed back to that region, are reported. In all analyses reported, $F_1$ always refers to tests against error terms based on participants variability, and $F_2$ always refers to tests against an error term based on items variability. All analyses were significant at the standard alpha level of .05, unless otherwise indicated.

First encounter

When the role filler (e.g., guitarist or manager) was first encountered in the text, first pass times were significantly shorter in the appropriate (mean = 318 ms) than in the inappropriate (mean = 346) condition: $F_1(1, 30) = 5.52$, $MSE = 4747.72$, $F_2(1, 46) = 4.85$, $MSE = 8783.24$. Second pass times, post-target region reading times, or regressions into the target region are not reported for the first encounter because the target was followed immediately by a period and any post-target measures may have also reflected sentence-wrapup processes (e.g., Just & Carpenter, 1980; Rayner, Sereno, Morris, Schmauder, & Clifton, 1989). In Experiment 2, we remedied this by including several words after the target prior to the end of the sentence.

Second encounter

First pass times in the target region

Table 2 presents the first pass times in the target and post-target regions as a function of the appropriateness of the earlier first encounter and of the current second encounter. First consider the appropriateness effect on second-encounter target times when the first encounter had been appropriate; this is the contrast between the A1/A2 and A1/I2 cells in the target region of Table 2. In these conditions, first pass times were shorter when the second encounter was appropriate than when it was inappropriate. Conversely, in the right-hand column (first encounter was inappropriate, I1A2 vs. I1I2), second-encounter times were shorter when the second encounter was inappropriate than when it was appropriate. Simply put, times were shorter whenever there was a match of role fillers between the two encounters. This interaction was significant; $F_1(1, 30) = 5.37$, $MSE = 3030$, $F_2(1, 46) = 9.83$, $MSE = 5822$.

The fact that times were faster when first- and second-encounter role fillers were the same suggests facilitation due to word repetition. Effects of roughly this magnitude have been found in text processing experiments (Rayner, Raney, & Pollatsek, 1995). It is somewhat surprising, however, that the absolute differences in the A1 and I1 columns of Table 2 were almost identical (296–275 = 21; 304 – 281 = 23). Although this could be a random occurrence, the lack of a difference implies no effect due to the inappropriate role filler on the second encounter although such an effect was obtained on the first encounter. Hess et al.’s (1995) lexical reinterpretation hypothesis suggests an explanation that can encompass effects due to both repetition (i.e., the discourse context) and appropriateness of the role filler. Under that hypothesis, for example, if the manager played the song at the first encounter, then that individual may have been reinterpreted as filling the role of guitarist and consequently was not truly inappropriate on the second encounter; that is, although the manager was inappro-

<table>
<thead>
<tr>
<th>Second encounter</th>
<th>Target region</th>
<th>Post-target region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First encounter</td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>275</td>
<td>417</td>
</tr>
<tr>
<td>I2</td>
<td>292</td>
<td>450</td>
</tr>
<tr>
<td>Mean</td>
<td>286</td>
<td>427</td>
</tr>
</tbody>
</table>

Note. A and I refer to appropriate and inappropriate; 1 and 2 to first and second encounter.
p r i o r i t o t h e s c r i p t e d a c t i o n b e i n g p e r f o r m e d i n t h e second encounter, that individual was appropriate with respect to the previous discourse context. In addition, if such a reinterpretation took place, the guitarist, although appropriate to the scripted action, might be viewed as inappropriate on second encounter in light of the previous discourse context. This analysis suggests that the discourse context and the appropriateness of the role filler interacted to influence first pass reading times.

First pass times in the post-target region

The mean duration of first pass in the post-target region was significantly longer when the second encounter was inappropriate (I2) than when it was appropriate (A2); $F(1, 30) = 4.21$, $MSE = 13,780$, $F(1, 46) = 4.19$, $MSE = 22,452$. This effect is clearly due to the slower times in the A1/I2 condition than in the A1/A2 condition, $F(1, 31) = 5.55$, $MSE = 23,415$, $F(1, 47) = 8.15$, $MSE = 23,629$; there was almost no difference when the first encounter was inappropriate (I1/A2 vs. I1/I2 conditions, both $F$s < 1). The interaction was significant; $F(1, 30) = 4.17$, $MSE = 17,396$, $F(1, 46) = 5.96$, $MSE = 16,559$. It is clear from the interaction that the first encounter influenced later processing. This effect of context extends the Hess et al. (1995) results. They used two sentences to establish a discourse context whereas we changed a single word (i.e., the first encounter), and Hess et al.'s relevant discourse context immediately preceded their target sentence whereas the first encounter was separated from the target region by several lines of unrelated text in the present experiment.

The A1/I2 – A1/A2 difference is consistent with the assumption that the process of integrating the role filler with the preceding text continued into the post-target region. It is not clear whether this integration process has been facilitated in the A2 condition, disrupted in the I2 condition, or is the result of a combination of both facilitative and inhibitory effects. The idea that processing was disrupted in the I2 condition seems most likely; the reader had to incorporate an inappropriate role filler into the discourse model. When the role filler in the first encounter was inappropriate, this may no longer be a problem because the reader has previously encountered the manager in the guitarist's role. In this view, the post-target means are consistent with Hess et al.'s (1995) assumptions that context can lead to a reinterpretation of a character's role, and that context affects integration processes, as well as with the updating assumption proposed for situation models (Zwaan & Radinsky, 1998). However, as the measures we consider next indicate, the nature of context effects may be somewhat more complicated.

Regressions into, and second pass times in, the target region

In calculating these statistics, the target region was redefined to include the entire prepositional phrase; the target referred to in Table 3 is, for example, to the guitarist, rather than guitarist. This was done because approximately 20% of regressions landed on to the rather than on guitarist. Considering the regression percentages in Table 3 first, we found that readers regressed more often to the target when the second encounter was inappropriate; $F(1, 30) = 22.48$, $MSE = 100.95$, $F(1, 30) = 10.64$, $MSE = 307.02$. No other main effects were significant. Note that, unlike the results for first pass times in both the target and post-target regions, these data indicate that even when the first encounter was inappropriate, the inappropriate second encounter involved more processing difficulty than did the appropriate second encounter; that is, there were more regressions to the target region in the I1/I2 condition than in the I1/A2 condition. The contrast of these two conditions was significant when tested against participant variability and nearly so when tested against item variability; $F(1, 30) = 4.62$, $MSE = 195.39$, $F(1, 46) = 3.52$, $MSE = 591.20$, $p = .067$.

The second pass results in Table 3 also indicate integration difficulty after initial processing of the target region. Readers spent more time on second passes in the target region when the first encounter was appropriate than when it was inappropriate; $F(1, 30) = 5.98$, $MSE = 5184$, $F(1, 46) = 6.24$, $MSE = 5903$. Second-encounter second pass times were also longer when the second encounter was inappropriate than when it was appropriate; $F(1, 30) = 16.64$, $MSE = 3968$, $F(1, 46) = 11.96$, $MSE = 6889$. Although the second-encounter effect is larger when the first encounter was appropriate, largely due to the very long duration in the A1/I2 cell, the interaction only approached significance when tested

<table>
<thead>
<tr>
<th>Second encounter</th>
<th>Regressions</th>
<th>Second pass times</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>First encounter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A1</td>
<td>I1</td>
</tr>
<tr>
<td>A2</td>
<td>9.47</td>
<td>7.41</td>
</tr>
<tr>
<td>I2</td>
<td>21.00</td>
<td>12.75</td>
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<tr>
<td>Mean</td>
<td>15.24</td>
<td>10.10</td>
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</tbody>
</table>
against participant variability; $F_1(1, 30) = 2.90$, $MSE = 3592$, $p = .10$. Tests of the simple effects of the second-encounter appropriateness factor were also conducted. The difference between appropriate and inappropriate second encounters was significant when the first encounter was appropriate ($F_1(1, 30) = 10.92$, $MSE = 11,806$, $F_2(1, 46) = 6.27$, $MSE = 24,478$) and when the first encounter was inappropriate ($F_1(1, 30) = 7.24$, $MSE = 3314$, $F_2(1, 46) = 4.38$, $MSE = 7575$).

These results, particularly the findings that when the second encounter was inappropriate, readers regressed more often to the target region, and spent more time there after returning to it, seem to conflict with the first pass results. Those data indicated that when the initial encounter had been inappropriate, an inappropriate second encounter proved no more difficult to process than an appropriate second encounter. The results in Table 3 cannot be readily explained by theories of facilitation due to priming (e.g., Duffy et al., 1988; Duffy, Henderson, & Morris, 1989; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991); expectancies generated for a specific role filler may facilitate first pass times on the target, but regressions and second pass times indicate difficulty in integrating inappropriate targets. These results also seem inconsistent with Hess et al.’s (1995) lexical reinterpretation hypothesis, or with Zwaan and Radvansky’s (1998) assumption of situation model updating. If the manager was reinterpreted as filling the guitarist’s role, why is there any evidence of difficulty in processing a later mention of the manager carrying out a guitarist’s duties? Before further discussion of the results of Experiment 1, we first consider the results of a different manipulation of context.

### Experiment 2

One purpose of Experiment 2 was to replicate the effects of first-encounter appropriateness on first pass times on the target, in addition to examining the appropriateness effect on other measures. In Experiment 1, the first encounter with the target word occurred at the end of a sentence. Because of this, we could not be certain that any measures of post-target processing (e.g., post-target first pass times, regressions to the target, second pass times on the target) were not confounded with sentence wrap-up processes. As was seen in the data of Experiment 1, such post-target processing measures may reflect different effects than those on the first pass target times and can provide a more complete picture than just first pass times or probe response times alone. Therefore, the target sentences of Experiment 2 always included several words after the target word and prior to the end of the sentence, to allow for examination of post-target processing.

The primary purpose of Experiment 2 was to examine further the effects of the conflict between scriptal and contextual knowledge. There are circumstances in which a role in a script may be filled by someone or something other than the standard role filler. For example, in the inappropriate/justification (IJ) condition of Table 4, the manager (instead of the guitarist) played the song but the action is justified by the preceding statement that

<table>
<thead>
<tr>
<th>Table 4: Versions of a sample passage for Experiment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate (A) Versions</strong></td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td>The fans at the rock concert were going wild. The band was still new on the rock scene,</td>
</tr>
<tr>
<td><strong>Justification</strong></td>
</tr>
<tr>
<td>Neutral (N): and they weren’t used to the adoring fans and all of the attention from the media.</td>
</tr>
<tr>
<td>Justified (J): so some of the band members had to handle publicity and finances in addition to performing.</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
</tr>
<tr>
<td>The crowd quieted down when the next song was played by the band’s guitarist who was standing alone on the stage. The concert was being held in an outdoor stadium, and there were about ten thousand screaming fans in attendance.</td>
</tr>
</tbody>
</table>

| **Inappropriate (I) Versions** |
| **Introduction** |
| The rock band was becoming more and more popular. The band was still new on the rock scene, |
| **Justification** |
| Neutral (N): and they weren’t used to the adoring fans and all of the attention from the media. |
| Justified (J): so some of the band members had to handle publicity and finances in addition to performing. |
| **Conclusion** |
| A contract was signed by the band’s guitarist who had arranged a six-record deal. The band had been getting lots of calls recently, and they were having a very hard time figuring out how to handle their new success. |

*Note. The target region in this example is guitarist and the post-target region is who was standing/who had arranged.*
"some of the band members had to handle publicity and finances in addition to performing." The results of the effects of appropriateness on the first encounter in Experiment 1 indicate that—in the absence of any prior justification—a departure from the reader's knowledge of scriptal roles increases first pass times on the role filler. A theory such as Kintsch's (1988) construction-integration theory, that assumes that the reader's world knowledge is consulted before any attempt to integrate any new input with prior text, would predict that this increase in first pass times would be observed even when the inappropriate role filler had received prior justification. On the other hand, it is possible that the justification creates an expectancy, either for the alternative role filler, or at least that the scriptal role will not be filled in the usual way. Such an expectancy seems consistent with models which suggest that the discourse context may constrain or influence semantic priming effects (e.g., Duffy et al., 1988, 1989; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991; see also MacDonald, Pearlmutter, & Seidenberg, 1994); according to this view, in the present study, the appropriateness effect would be smaller in the justified than in the neutral condition. The facilitated integration model proposed by Foss and his colleagues (Foss & Speer, 1991; Hess et al., 1995) would make a similar prediction. On the basis of their results, Hess et al. hypothesized that integration with the context occurs very rapidly, and that contextual effects override world knowledge.

Method

Participants

Thirty-five members of the University of Massachusetts community participated in exchange for money or course credit. The data for three participants were not analyzed, due to large calibration errors during portions of the experiment.

Apparatus

The equipment used was the same as in Experiment 1.

Materials

The materials used were altered versions of the passages from Experiment 1. The first sentence introduced the script (e.g., rock band) and was followed by a context sentence. The context sentence either justified a scripted action's association with an inappropriate role filler, or it was neutral with respect to actions and role fillers but continued the story. The next sentence contained a scripted action that was associated with an appropriate or inappropriate role filler, followed by several words prior to the end of the sentence. (See Appendix B for all passages in Experiment 2.) Note that, in contrast to Experiment 1, this was the first and only encounter with the role filler in the text. Reading times were measured for the target word (the role filler, e.g., guitarist), which ranged from 4 to 11 characters (mean = 6.79 characters), and the post-target region, which consisted of the three words that immediately followed the target (mean = 14.27 characters; e.g., who was standing/who had arranged). Thus, context type was crossed with the appropriateness of the role filler to create four conditions: AN (appropriate neutral), IN (inappropriate neutral), AJ (appropriate justified), and IJ (inappropriate justified). One to two closing sentences ended the paragraph.

The between-subjects manipulation in Experiment 1 produced no significant effects, so it was dropped in Experiment 2. Four materials sets were constructed, such that each materials set contained six passages that appeared in each of the four conditions. Across the four materials sets, each passage appeared once in each of the four conditions. The 24 experimental passages appeared within a larger set of 54 passages. The 30 "filler" passages were stimuli for an unrelated experiment; they were similar in length to the experimental passages but did not focus on scripted settings. The number of filler passages used in this experiment was reduced from the number used in Experiment 1 in order to shorten the overall amount of time required for the experiment—this helped reduce participant fatigue and allowed for better precision on the eye tracker.

In order to demonstrate that the justifying context was strong enough to override the inappropriateness of the role filler, a rating study was conducted. Twenty-six University of Utah undergraduates enrolled in Introductory Educational Psychology courses participated in exchange for course credit. Participants were presented with one of two counterbalanced stimulus sets, in which 12 passages appeared in each of the IN and IJ conditions, up to the target sentence. They were then asked, given the information in the passage, to rate the likelihood of the target action being performed by the role filler on a 5-point scale, where (1 = Extremely Unlikely and 5 = Extremely Likely). If the justifying context was sufficient to override the inappropriateness of the role filler, ratings should be higher in the IJ condition than in the IN condition. This was supported in the results: ratings in the IJ condition were significantly higher than in the IN condition (3.29 vs. 2.45; $F(1, 25) = 15.12$, $MSE = .185$; $F(1, 23) = 7.1846$, $MSE = .116$). Mean ratings for all passages are presented in Appendix B.

Procedure

The procedure used was the same as in Experiment 1.

Results and discussion

First pass times in the target region

Table 5 presents the first pass times in the target and post-target regions as a function of the appropriateness
of the role filler and of whether the target action had been previously justified. First pass times are longer on the target (e.g., guitarist) in the inappropriate than in the appropriate condition only in the neutral (i.e., unjustified) condition. This resulted in a significant interaction of appropriateness and justification; $F_1(1,31) = 4.84$, $MSE = 1561$, $F_2(1,23) = 6.52$, $MSE = 1546$. Neither main effect approached significance; both $F's < 1$.

However, the contrast of the neutral condition means (i.e., $IN-AN$) was significant; $F_1(1,31) = 4.31$, $MSE = 4243$, $F_2(1,23) = 5.12$, $MSE = 4815$. As in Experiment 1, in the absence of any prior justification of the inappropriate role filler, first pass times were longer when the role filler was inappropriate than when it was appropriate. When there was prior justification, however, first pass times on the appropriate role filler were actually (nonsignificantly) slightly slower than in the inappropriate condition. Thus, first pass times on the target suggest that any difficulties due to the inappropriate role filler were quickly resolved, either because the justification facilitated lexical access to the target, or facilitated its integration with the discourse model. However, subsequent measures contradict this conclusion.

**First pass times in the post-target region**

The pattern in the post-target region differed from that in the target region in that times were slower in the inappropriate than in the appropriate condition whether or not the inappropriate role filler had been justified in the preceding text. Only the appropriateness main effect was significant; $F_1(1,31) = 8.19$, $MSE = 7311$, $F_2(1,23) = 5.42$, $MSE = 9004$. Furthermore, the interaction $F$'s were less than 1. When there was no preceding justification, the longer times in the inappropriate than in the appropriate condition were a continuation of the effect found in first pass times on the target; apparently, the eyes moved before integration was complete. The simple effect contrast of the AN and IN conditions was more variable than the main effect of appropriateness, resulting in a less powerful test; the contrast was marginal when based on participants variability and nonsignificant when based on items variability, $F_1(1,31) = 3.85$, $MSE = 9825$, $p = .059$; $F_2(1,23) = 2.68$, $MSE = 9189$, $p = .11$. In contrast, when the inappropriate role filler was justified, the pattern in the post-target region differed from that in the target region; although there was no effect in the target region, times for the inappropriate role filler were (nonsignificantly) slower than for the appropriate role filler in the post-target region; $F_1(1,31) = 2.29$, $MSE = 9997$, $p = .14$; $F_2(1,23) = 2.04$, $MSE = 11,840$, $p = .16$.

**Table 6**

<table>
<thead>
<tr>
<th></th>
<th>Appropriate (A)</th>
<th>Inappropriate (I)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regressions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral (N)</td>
<td>8.91</td>
<td>9.44</td>
<td>9.18</td>
</tr>
<tr>
<td>Justified (J)</td>
<td>7.75</td>
<td>12.12</td>
<td>9.94</td>
</tr>
<tr>
<td>Mean</td>
<td>8.33</td>
<td>10.78</td>
<td></td>
</tr>
<tr>
<td><strong>Second pass times</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral (N)</td>
<td>34</td>
<td>48</td>
<td>41</td>
</tr>
<tr>
<td>Justified (J)</td>
<td>36</td>
<td>65</td>
<td>51</td>
</tr>
<tr>
<td>Mean</td>
<td>35</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>
General discussion

In Experiment 1, participants read script-based stories in which some individual or object filled a scriptal role in an inappropriate or unexpected way. When the inappropriate role filler had not been encountered previously in the story, first pass times in the target and post-target regions, and second pass times on the target, were longer for the inappropriate than for an appropriate role filler, and there were more regressions to the target region in the inappropriate condition. The same evidence of greater processing difficulty in the inappropriate condition was obtained in Experiment 2 when there was no prior justification of an inappropriate scriptal role filler. These effects of appropriateness are consistent both with models in which context can have an early influence on word processing by either influencing lexical access or integration (e.g., Duffy et al., 1988, 1989; Hess et al., 1995; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991; Traxler & Foss, 2000), and with models which assume that incoming information is first linked with general world knowledge (e.g., Garrod & Terras, 2000; Kintsch, 1988; Sanford & Garrod, 1989).

When the inappropriate role filler had been previously encountered (Experiment 1) or previously justified (Experiment 2), the pattern of effects for the different measures are more difficult to explain. First pass times in both the target (Experiments 1 and 2) and post-target regions (Experiment 1) showed an advantage of the inappropriate role filler when it had been previously encountered or justified. These results cannot be explained by models which assume that general world knowledge influences processing before contextual information (e.g., Garrod & Terras, 2000; Kintsch, 1988; Sanford & Garrod, 1989). However, they can be explained by Hess et al.'s (1995) lexical reinterpretation hypothesis. For example, when readers encountered the first mention of the manager playing the song, the manager may have been reinterpreted as an individual who carried out a specific task, such as pen for writing is automatically integrated and measures of subsequent processing. They proposed a two-stage “bonding and resolution” process to account for their results. In the first stage, a dominant role filler, such as pen for writing is automatically integrated with the text, and this is “impervious to the influence of the context in which the role was introduced” (p. 540). In the second stage, the link formed between pen and writing is evaluated, and when the context was inappropriate (e.g., the writing had been on a blackboard), processing difficulties were revealed in such measures as regressions and second pass times. These ideas are consistent with other studies of discourse processing, in which early measures were dominated by low-level processes and evidence of higher order processes only appeared in later measures of processing (e.g., Cook, 2000; Duffy & Rayner, 1990; Ehrlich & Rayner, 1983). Similar arguments have also been made in more general descriptions of eye movements during reading (e.g., the E-Z Reader model, Reichele, Pollatsek, Fisher, & Rayner, 1998; see also Rayner, 1998; Rayner & Pollatsek, 1989).

Although the Kintsch (1988) and Garrod and Terras (2000; Sanford & Garrod, 1989) models cannot account for the patterns of results in the present experiments, the general idea of two stages can provide an explanation for our effects. As in the previous models, the first stage involves a tentative linkage initiated between information currently being processed and information reactivated by a low-level automatic retrieval process, and the second stage involves a verification of the link formed in the first stage. We assume that the stages are overlapping and continuous; the processor may verify a linkage just established as the eye fixates on the next word and new linkages are made. As each new concept is encountered, a low-level automatic retrieval process is initiated; some possible mechanisms for this process include pattern-matching (Sanford & Garrod, 1989), spreading activation (e.g., Anderson, 1976, 1983), or resonance (e.g., Myers & O’Brien, 1998; O’Brien & Myers, 1999). Propositions and concepts highly related to the focal concept are reactivated and are available for integration.

In contrast to previous models, we assume that the link in the first stage of processing can occur between the focal concept and semantic or contextual traces, depending on which is reactivated more quickly. In the present experiments, when prior context supported an inappropriate role filler, the appropriateness effect was no longer significant, which suggests that the contextual trace (i.e., first encounter in Experiment 1, justification in Experiment 2) might have influenced, if not overridden, integration of the semantic information (i.e., ap-
Processing discourse roles in scripted narratives: The influences of context and world knowledge

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Abstract

Discourse context may affect comprehension of a word in a text by facilitating lexical access or by facilitating integration of the target concept with the preceding text. In two experiments, we used eye tracking measures to examine contextual influence on the integration of role fillers in scripted narratives. In both experiments, context had an early influence on integration of role fillers. However, measures of post-target processing indicated that semantic knowledge continued to influence integration. The results are discussed in terms of several theories of contextual influence on reading. The data appear to support a two-stage model of processing: in the first stage, incoming text is linked to the contents of active memory; in the second stage, the link between the new and old information is evaluated.

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Many factors influence the speed of processing individual words in a connected discourse. Some of these factors are inherent in the individual word; for example, it is well established that words that are more frequent in the English language are read more quickly than less frequently encountered words, and shorter words are processed more quickly than longer words (Inhoff & Rayner, 1986; Rayner, 1998). At least as important in determining how words are processed is the influence of the information provided by the preceding text. For example, consider a passage whose protagonists are in a rock band. Assume that the reader encounters a sentence that begins "The song was played by the..." Both theory (e.g., Schank & Abelson, 1977) and data (e.g., Bower, Black, & Turner, 1979) suggest that the reader's knowledge of the role fillers in rock band scripts should either prime, or facilitate integration of, the sentence continuation, guitarist. Therefore, we would expect that the time spent processing the appropriate continuation, guitarist, would be shorter than that spent processing an inappropriate continuation, manager. Suppose, however, that earlier in the passage, the manager had played the song. Or suppose that the text included a sentence that indicated that some of the band members handled publicity and finances in addition to performing. In the experiments reported here, we investigated whether such contextual manipulations have an effect and, if so, the nature and time course of those effects.

In the rock band example, there are two sources of information available to the reader. Knowledge of rock band scripts links the guitarist to the role of performer, whereas the preceding context may imply that in this passage the usual scriptal roles are not valid. Theories
about discourse processing differ with respect to the priority they assign to the two sources of information, semantic knowledge, and discourse context. Many theorists have also used the terms “local” context effects and “global” context effects to refer to semantic and discourse influences (e.g., Hess, Foss, & Carroll, 1995). However, the terms “local” and “global” have also been used to refer to a variety of other linguistic factors (e.g., discourse coherence, distance in text, causal information, etc.). To avoid confusion, here we associate local context effects with those caused by information reactivated from readers’ semantic knowledge, and global context effects with those caused by information reactivated from the episodic discourse context.

Kintsch’s (1988) construction-integration model incorporates both immediate effects due to the semantic properties of text and later effects due to discourse context. In the construction stage of the model, concepts and propositions in the reader’s knowledge base are activated as a function of their relation to what is currently in the reader’s focus; the prior discourse context plays its role in the later, integration, stage. Till, Mross, and Kintsch (1988) presented data in support of this two-stage process. As in other studies, at short intervals associates of ambiguous words in sentences were primed whether or not they were related to the discourse context. At longer intervals, words unrelated to the overall discourse context of the passage were no longer primed; however, words that were inferentially related to the topic were primed although they were not lexical associates of words in the preceding sentence.

Similarly, Garrod and Sanford (1999) have argued in favor of immediacy in discourse processing, in which “language input is related to world knowledge at the earliest possible opportunity” (p.23). Sanford and Garrod (1989) reviewed several studies of anaphoric processing and argued that the majority of the evidence pointed to a two-stage process, with the first stage beginning immediately upon encountering an anaphor (also, see Garrod & Sanford, 1983; Sanford & Garrod, 1981, for earlier discussions of stages involved in anaphoric processing). The process in the first stage was referred to as “bonding,” in which potential antecedents (whether correct or incorrect) may be quickly reactivated on the basis of their semantic relation to an anaphor through a low-level pattern-matching mechanism. The match made during the bonding stage is verified, and if correct, is instantiated during the second stage, resolution.

Garrod and Sanford (1999) proposed more general versions of the bonding and resolution stages, which can apply to processing at the lexical, syntactic, or discourse levels. Consistent with this idea, Garrod and Terras (2000) demonstrated that bonding and resolution could be extended to processes beyond anaphor resolution. They required participants to read sentence pairs in which the context provided by the first sentence was either appropriate or inappropriate with respect to a phrase in the second sentence. An example of the first sentence is

(1a) The teacher was busy writing a letter of complaint to a parent.

or

(1b) The teacher was busy writing an exercise on the blackboard.

The second sentence contained the phrase the pen dropped which forms an appropriate pairing with sentence 1a but not with sentence 1b. Eye fixation times revealed no initial effect of appropriateness on processing the noun, pen. However, times in the region of the verb, dropped, and regressions from it back to the noun indicated difficulties in the later stages of processing when sentence 1b provided the context. Garrod and Terras explained their results in terms of the two stages originally proposed by Sanford and Garrod (1989): in bonding, an early automatic associative process links a potential role filler (pen) with a verb encountered earlier (writing), and a later process, resolution, evaluates and resolves the instrument-verb link in terms of the discourse context.

Using eye tracking technology, Morris (1994) and Duffy, Morris, and Rayner (1988) provided evidence that both lexical and contextual information can affect early lexical access processes. Morris presented readers with sentences such as,

(2a) The gardener talked to the barber trimmed the mustache after lunch.

(2b) The gardener talked to the barber and trimmed the mustache after lunch.

both of which contain identical content words (e.g., barber, trimmed) with strong lexical associations to mustache. But, in sentence 2b, mustache is not consistent with the overall message of the sentence—barbers usually trim mustaches, not gardeners. In contrast to previous demonstrations of serial effects of semantic and contextual influences, Morris found that both intralexical associations and message-level context facilitated early processing (i.e., gaze durations) for mustache. Similarly, Duffy et al. (1988) provided evidence for both lexical (e.g., meaning dominance) and contextual influences (e.g., prior disambiguating context) on early processing of lexically ambiguous words, and proposed that these factors may contribute to a reordered access of lexical information during reading.

In contrast to models that assume early stages may be mediated by lexical associations, Foss and his colleagues (Foss, 1982; Foss & Speer, 1991; Hess et al., 1995; Traxler & Foss, 2000) have proposed that initial access is facilitated by the discourse context. Perhaps the strongest pieces of evidence for their position are the results obtained by Hess et al. Using a cross-modal priming procedure, they presented participants with
sentences that either had an association between the last word and the preceding text, such as,
(3a) The English major wrote the poem
or sentences that lacked such an association, such as
(3b) The computer science major wrote the poem.

When sentences such as 3a were presented alone, the final word, poem, was pronounced aloud more quickly than when it ended a neutral sentence such as,
(3c) The boy read the poem.

However, when sentence 3a ended a passage in which the discourse context was not relevant—e.g., a passage about an English major in a computer science course—no facilitation was observed. On the other hand, if the passage placed the computer science major in an English course, poem in sentence 3b was named more quickly than when it ended a control passage. In discussing their results in relation to models that assume two stages, based on semantic knowledge and discourse context effects, Hess et al. stated that these models “... make two incorrect predictions: They predict a local effect where none is observed, and they predict a slow-acting global effect where in fact a fast-acting one occurs” (p. 78). The authors proposed a lexical reinterpretation model (also, see Foss & Speer, 1991) in which discourse context modifies the representation of a concept. For example, an English major taking a computer science course may be viewed as a “student-in-a-technical-course-on-computing (not the poetic related information)” (p. 80). Accordingly, the target word, poem, is not readily integrated into this representation and therefore receives no facilitation.

One limitation of the Hess et al. (1995) study, and of many other studies of contextual effects, is the use of probe techniques. Although useful, probe response times provide only one sample in the time course of processing and may result in an incomplete or possibly even distorted view of the effects of context on processing of words in discourse (see Gordon, Hendrick, & Foster, 2000, for additional issues concerning strategic processing when probe response methodologies are used). For example, if Garrod and Terras (2000) had only probed with the target word pen, they might have concluded that context had no effect. By monitoring eye movements, they found that the context had no initial effect but that an inappropriate context interfered with subsequent processing of the targeted word.

The goal of the present set of experiments was to use several eye tracking measures in different regions of a text to further our understanding of context effects on the processing of words in connected discourse. In two experiments, we analyzed eye movement data for targeted regions of passages that evoked familiar scripts (e.g., rock band). The regions of interest were the one-word target role fillers (e.g., guitarist, manager) that were either appropriate or inappropriate with respect to the specific action being performed in the current sentence and either appropriate or inappropriate with respect to the previous discourse context. We also examined processing times on the post-target regions, the few words that immediately followed the target in the text. If incoming text is linked via low-level associative processes with general world knowledge before it is integrated with the discourse context, as suggested by Garrod and Terras (2000) and Kintsch (1988), we should observe effects of appropriateness with respect to the action described in the current sentence in early stages of processing (e.g., first pass on target regions), and discourse context effects should be observed in later stages of processing (e.g., first pass on post-target regions, second pass, regressions). In contrast, if discourse context influences early stages of word processing, as suggested by Foss and colleagues, discourse context effects should be observed in early stages of processing.

### Experiment 1

The passage in Table 1 illustrates the two factors manipulated in Experiment 1. Note that there are two encounters between the protagonists and an individual filling the role of a performer. Our primary interest in this experiment was in participants’ eye movements while they processed the second encounter. The action described there (e.g., playing a song) is carried out either by an individual appropriate to the scripted role (the audience listened to the guitarist, A2) or by someone inappropriate to the role (the audience listened to the manager, I2). Also, the earlier first encounter contained either an appropriate (the guitarist played the song, A1) or an inappropriate (the manager played the song, I1) role filler. In summary, two factors were manipulated in the second encounter: the appropriateness of the role filler in the earlier first encounter, and the appropriateness of the role filler in the second encounter.

When the second encounter in the A2 condition is consistent with both context and semantic knowledge—that is, when both first and second encounters are appropriate to scriptal knowledge—integration of the second-encounter role filler should proceed easily, and therefore first pass reading times should be faster in the A1/A2 condition than in the A1/I2 condition. What differentiates models are their predictions when the first encounter is inappropriate. According to the Hess et al. (1995) lexical reinterpretation model, when the manager plays the song, the reader reinterprets the role of performer; the manager is incorporated into the discourse as someone who also fills the guitarist’s role. If this is so, on the second encounter the inappropriate role filler (I1/I2 condition) should be processed as fast or faster than the appropriate role filler (I1/A2 condition). Having reinterpreted the manager’s role, readers should now find it as easy, or easier, to integrate the manager than the...
Table 1
Versions of a sample passage for Experiment 1

<table>
<thead>
<tr>
<th>Introduction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The fans at the rock concert were going wild. They quieted down when the next song</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First encounter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate (A1): was played by the band's guitarist.</td>
<td></td>
</tr>
<tr>
<td>Inappropriate (I1): was played by the band's manager.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Background</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The concert was being held in an outdoor stadium, and there were about ten thousand screaming fans in attendance. They were mostly all hysterical teenage girls. Some even cried as they</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second encounter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate (A2): listened to the guitarist</td>
<td></td>
</tr>
<tr>
<td>Inappropriate (I2): listened to the manager</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conclusion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Play a slow and heartfelt love song. The song was about a love affair that ended badly.</td>
<td></td>
</tr>
</tbody>
</table>

Note 1. The target region in this example is guitarist or manager; the post-target region (second encounter) is play a slow.

Note 2. In Experiment 1, half of the participants read a similar passage in which the manager was appropriate and the guitarist was inappropriate.

guitarist with the action of playing the song. Although Hess et al. would not necessarily predict the role reinterpretation assumed here, such a result would be consistent with their model. It would also be consistent with the assumption that situation models are updated on the basis of textual information (Zwaan & Radvansky, 1998). However, models that assume an immediate effect of world knowledge (e.g., Garrod & Sanford, 1999; Kintsch, 1988) would predict that an inappropriate second encounter will be reflected in longer reading times.

Because none of the models are specific about the time course of processing, it is not clear what their predictions would be for processing after the eyes move past the role filler. Integration may be completed while readers are fixated on the role filler, or it may continue into subsequent fixations on the words following the role filler or on the role filler itself. In the present experiment, eye movement measures provide a means of assessing context effects after the initial processing of the role filler. Continued effects of either first-encounter or second-encounter appropriateness should be reflected in time spent in the region following the target word, in regressions back to the target word, and in the time spent reprocessing the target after regressing back to it.

In summary, Experiment 1 had two purposes. The first was to examine the effects of the appropriateness of the first encounter on processing of the second encounter. If such effects were obtained in early measures of processing (e.g., first pass), they would suggest a limitation of models that assume only semantic priming by the immediately preceding context and would further extend the applicability of Hess et al.'s (1995) assumption of lexical reinterpretation. However, a disruption of processing when the second encounter was inappropriate and the first encounter was also inappropriate would be inconsistent with the lexical reinterpretation hypothesis. The second purpose was to use the measures derived from records of participants' eye movements to examine the time course of any effects that were observed.

Method

Participants
Thirty-eight members of the University of Massachusetts community participated in exchange for either money or course credit. The data for six participants were not analyzed due to large calibration errors during portions of the experiment.

Apparatus
Eye movements were recorded by a Fourward Technologies Dual Purkinje Eye tracker that has a resolution of 10 min of arc. The eye tracker was interfaced with a 486 microcomputer, which ran the experiment. Viewing was binocular, with eye location recorded from the right eye. The position of the participant's eye was sampled every millisecond by the computer and averaged over four consecutive samples. The averaged horizontal and vertical positions of the eye were compared with those of the previous sample to determine whether the eye was fixated or moving.

Materials
The materials used were 24 passages similar to the example presented in Table 1 (see also Appendix A). Each passage began with a sentence that introduced a script (e.g., rock band). In the next (first encounter) sentence, a scripted action was associated with an entity or an object that was either appropriate or inappropriate for that role. Reading times were measured for the role...
filler (e.g., guitarist) in the first encounter. The role filler was always a single word, with a range of 4–11 characters (mean = 7.06 characters). A background section of two to three sentences followed. The next (second encounter) sentence contained a scripted action that was associated with either an appropriate or inappropriate role filler, and which either matched or did not match the role filler in the first encounter. Thus, the appropriateness of the role filler in the second encounter was crossed with the appropriateness of the role filler in the first encounter to create four conditions: A1/A2 (both encounters appropriate), A1/I2 (first encounter appropriate, second encounter inappropriate), I1/A2 (first encounter inappropriate, second encounter appropriate), and I1/I2 (both encounters inappropriate). In the second encounter, reading times were measured for the target word (the role filler; e.g., guitarist) and the post-target region, which consisted of the two to four words (mean = 14.17 characters; e.g., play a slow) that immediately followed the target. A short closing sentence ended the paragraph.

Eight materials sets were constructed. These were counterbalanced such that the appropriate and inappropriate actions for the role filler in the first four sets (e.g., guitarist) were the inappropriate and appropriate actions, respectively, for the role filler in the second four sets (e.g., manager). In each materials set, six passages appeared in each of the four conditions. Across each group of four materials sets, each passage appeared once in each of the four conditions. The 24 experimental passages always appeared within a larger set of 72 passages. The 48 “filler” passages were stimuli for two unrelated experiments; one set of filler passages contained anaphoric references to objects previously mentioned in the text, while the second set of filler passages involved bridging inferences. The filler passages were approximately the same length as the experimental passages but did not focus on scripted settings.

**Rating study 1a.** In order to ensure that the scripted actions selected were appropriate or inappropriate with respect to the role fillers, a rating study was conducted. Forty University of Massachusetts community members who did not participate in either of the experiments reported in this paper were asked to rate the likelihood of an action being performed by a specific role filler. Participants rated 32 items such as 3a–3d below on a 7-point scale (where 1 = “Extremely Unlikely” and 7 = “Extremely Likely”):

4a. At a rock concert, teenage fans cry as a sad song is played by the band’s guitarist.

4b. At a rock concert, teenage fans cry as a sad song is played by the band’s manager.

4c. For a rock band, all of the legal issues are handled by the band’s manager.

4d. For a rock band, all of the legal issues are handled by the band’s guitarist.

Appropriate role fillers (e.g., 3a and 3c; mean = 6.13) were rated as significantly more likely to perform a scripted action than inappropriate role fillers (e.g., 3b and 3d; mean = 2.57), $F(1,31) = 349.42$, $MSE = 1.158$. The items from this norming study were used to create the 24 passages used in Experiment 1.

**Rating study 1b.** An additional rating study was conducted in order to ensure that a switch in role fillers between the first and second encounters was less plausible than the same role filler being maintained in the first and second encounters. Twenty-four University of Utah undergraduate students enrolled in Introductory Educational Psychology courses participated in exchange for course credit. Participants were presented with one of four counterbalanced stimulus sets, in which six passages appeared in each of the four conditions, up to the target sentence. Participants were then asked, given the information in the passage, to rate the likelihood of the target action being performed by the second-encounter role filler on a 5-point scale (where 1 = “Extremely Unlikely” and 5 = “Extremely Likely”). If maintaining the same role filler across both encounters is more likely than switching role fillers across encounters, ratings in the A1A2 and I1I2 conditions should be higher than in either the A1I2 and I1A2 conditions, respectively. The results supported this hypothesis. Ratings in the A1A2 condition were higher than in the A1I2 condition (3.75 vs. 1.93; $F(1,23) = 91.96$, $MSE = .4332$; $F(1,23) = 124.32$, $MSE = .3072$). In addition, ratings in the I1I2 condition were higher than in the A1I2 condition (3.17 vs. 1.93; $F(1,23) = 39.22$, $MSE = .4704$; $F(1,23) = 30.05$, $MSE = .5914$). Mean ratings for all passages are presented in Appendix A.

**Procedure**

Each participant took part individually in a session that lasted approximately 60 min. For each participant, a bite bar was prepared to eliminate head movements, and the eye tracker was calibrated. The initial calibration procedure took approximately 5 min. Prior to reading each passage, calibration of the eye tracking system was checked to ensure that accurate records were obtained. Each participant read three practice passages followed by the set of 24 experimental and 48 filler passages. Participants were told that they would be reading a series of paragraphs displayed on a CRT screen. They were told to read for comprehension so that they would be able to answer an occasional oral comprehension question (e.g., *Were the fans enjoying the concert?*). Questions were asked on approximately one-sixth of the trials, and there were an equal number of “yes” and “no” comprehension questions. Participants had little difficulty answering the questions correctly; all participants answered at least 85% of the questions correctly. Because of the high accuracy rates, the fixation data for all trials were analyzed, regardless of
whether a question for a specific trial had been answered correctly.

At the beginning of each trial, five boxes appeared across the top of the screen, one box appeared in the middle, and five boxes appeared at the bottom of the screen. Each participant was instructed to look at the middle box until the experimenter said, “Ready,” and then to look at the upper left-most box. Once the experimenter had determined that the participant was fixing the box, the entire passage was presented on the screen. When the participant was finished reading the passage, he or she was instructed to press a button that would end the trial. Participants were given a brief break approximately halfway through the experiment.

Results and discussion

First pass reading time, the sum of all fixations in a region before the eyes first leave that region, is reported for two regions: the target and the post-target region. Trials in which a region was initially skipped were not included in first pass analyses. In addition, percentage of regressions made into the target region and second pass reading times, any rereading of the target region after the eyes have regressed back to that region, are reported. In all analyses reported, F₁ always refers to tests against error terms based on participants variability, and F₂ always refers to tests against an error term based on items variability. All analyses were significant at the standard alpha level of .05, unless otherwise indicated.

First encounter

When the role filler (e.g., guitarist or manager) was first encountered in the text, first pass times were significantly shorter in the appropriate (mean = 318 ms) than in the inappropriate (mean = 346) condition: F₁(1, 30) = 5.52, MSE = 4747.72, F₂(1, 46) = 4.85, MSE = 8783.24. Second pass times, post-target region reading times, or regressions into the target region are not reported for the first encounter because the target was followed immediately by a period and any post-target measures may have also reflected sentence-wrapup processes (e.g., Just & Carpenter, 1980; Rayner, Sereno, Morris, Schmauder, & Clifton, 1989). In Experiment 2, we remedied this by including several words after the target prior to the end of the sentence.

Second encounter

First pass times in the target region

Table 2 presents the first pass times in the target and post-target regions as a function of the appropriateness of the earlier first encounter and of the current second encounter. First consider the appropriateness effect on second-encounter target times when the first encounter had been appropriate; this is the contrast between the A1/A2 and A1/I2 cells in the target region of Table 2. In these conditions, first pass times were shorter when the second encounter was appropriate than when it was inappropriate. Conversely, in the right-hand column (first encounter was inappropriate, I1A2 vs. I1I2), second-encounter times were shorter when the second encounter was inappropriate than when it was appropriate. Simply put, times were shorter whenever there was a match of role fillers between the two encounters. This interaction was significant; F₁(1, 30) = 5.37, MSE = 3030, F₂(1, 46) = 9.83, MSE = 5822.

The fact that times were faster when first- and second-encounter role fillers were the same suggests facilitation due to word repetition. Effects of roughly this magnitude have been found in text processing experiments (Rayner, Raney, & Pollatsek, 1995). It is somewhat surprising, however, that the absolute differences in the A1 and I1 columns of Table 2 were almost identical (296 - 275 = 21; 304 - 281 = 23). Although this could be a random occurrence, the lack of a difference implies no effect due to the inappropriate role filler on the second encounter although such an effect was obtained on the first encounter. Hess et al.'s (1995) lexical reinterpretation hypothesis suggests an explanation that can encompass effects due to both repetition (i.e., the discourse context) and appropriateness of the role filler. Under that hypothesis, for example, if the manager played the song at the first encounter, then that individual may have been reinterpreted as filling the role of guitarist and consequently was not truly inappropriate on the second encounter; that is, although the manager was inappro-

Table 2

<table>
<thead>
<tr>
<th>Second encounter</th>
<th>Target region</th>
<th>Post-target region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First encounter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A1</td>
<td>I1</td>
</tr>
<tr>
<td>A2</td>
<td>275</td>
<td>304</td>
</tr>
<tr>
<td>I2</td>
<td>296</td>
<td>281</td>
</tr>
<tr>
<td>Mean</td>
<td>286</td>
<td>293</td>
</tr>
</tbody>
</table>

Note. A and I refer to appropriate and inappropriate; 1 and 2 to first and second encounter.
appropriate to the scripted action being performed in the second encounter, that individual was appropriate with respect to the previous discourse context. In addition, if such a reinterpretation took place, the guitarist, although appropriate to the scripted action, might be viewed as inappropriate on second encounter in light of the previous discourse context. This analysis suggests that the discourse context and the appropriateness of the role filler interacted to influence first pass reading times.

First pass times in the post-target region

The mean duration of first pass in the post-target region was significantly longer when the second encounter was inappropriate (I2) than when it was appropriate (A2); \( F_1(1,30) = 4.21, \text{ MSE} = 13,780, F_2(1,46) = 4.19, \text{ MSE} = 22,452 \). This effect is clearly due to the slower times in the A1/I2 condition than in the A1/A2 condition, \( F_1(1,31) = 5.55, \text{ MSE} = 23,415, F_2(1,47) = 8.15, \text{ MSE} = 23,629 \); there was almost no difference when the first encounter was inappropriate (I1/A2 vs. I1/I2 conditions, both \( F_s < 1 \)). The interaction was significant; \( F_1(1,30) = 4.17, \text{ MSE} = 17,396, F_2(1,46) = 5.96, \text{ MSE} = 16,559 \). It is clear from the interaction that the first encounter influenced later processing. This effect of context extends the Hess et al. (1995) results. They used two sentences to establish a discourse context whereas we changed a single word (i.e., the first encounter), and Hess et al.'s relevant discourse context immediately preceded their target sentence whereas the first encounter was separated from the target region by several lines of unrelated text in the present experiment.

The A1/I2 – A1/A2 difference is consistent with the assumption that the process of integrating the role filler with the preceding text continued into the post-target region. It is not clear whether this integration process has been facilitated in the A2 condition, disrupted in the I2 condition, or is the result of a combination of both facilitative and inhibitory effects. The idea that processing was disrupted in the I2 condition seems most likely; the reader had to incorporate an inappropriate role filler into the discourse model. When the role filler in the first encounter was inappropriate, this may no longer be a problem because the reader has previously encountered the manager in the guitarist's role. In this view, the post-target means are consistent with Hess et al.'s (1995) assumptions that context can lead to a reinterpretation of a character's role, and that context affects integration processes, as well as with the updating assumption proposed for situation models (Zwaan & Radvansky, 1998). However, as the measures we consider next indicate, the nature of context effects may be somewhat more complicated.

Regressions into, and second pass times in, the target region

In calculating these statistics, the target region was redefined to include the entire prepositional phrase; the target referred to in Table 3 is, for example, to the guitarist, rather than guitarist. This was done because approximately 20% of regressions landed on to the rather than on guitarist. Considering the regression percentages in Table 3 first, we found that readers regressed more often to the target region when the second encounter was inappropriate; \( F_1(1,30) = 22.48, \text{ MSE} = 100.95, F_2(1,30) = 10.64, \text{ MSE} = 307.02 \). No other main effects were significant. Note that, unlike the results for first pass times in both the target and post-target regions, these data indicate that even when the first encounter was inappropriate, the inappropriate second encounter involved more processing difficulty than did the appropriate second encounter; that is, there were more regressions to the target region in the I1/I2 condition than in the I1/A2 condition. The contrast of these two conditions was significant when tested against participant variability; \( F_1(1,30) = 4.62, \text{ MSE} = 195.39, F_2(1,46) = 3.52, \text{ MSE} = 591.20, p = .067 \).

The second pass results in Table 3 also indicate integration difficulty after initial processing of the target region. Readers spent more time on second passes in the target region when the first encounter was appropriate than when it was inappropriate; \( F_1(1,30) = 5.98, \text{ MSE} = 5184, F_2(1,46) = 6.24, \text{ MSE} = 5903 \). Second-encounter second pass times were also longer when the second encounter was inappropriate than when it was appropriate; \( F_1(1,30) = 16.64, \text{ MSE} = 3968, F_2(1,46) = 11.96, \text{ MSE} = 6889 \). Although the second-encounter effect is larger when the first encounter was appropriate, largely due to the very long duration in the A1/I2 cell, the interaction only approached significance when tested.

<table>
<thead>
<tr>
<th>Second encounter</th>
<th>Regressions</th>
<th>Second pass times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First encounter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A1</td>
<td>I1</td>
</tr>
<tr>
<td>A2</td>
<td>9.47</td>
<td>7.41</td>
</tr>
<tr>
<td>I2</td>
<td>21.00</td>
<td>12.75</td>
</tr>
<tr>
<td>Mean</td>
<td>15.24</td>
<td>10.10</td>
</tr>
</tbody>
</table>

Table 3

Experiment 1: percent of regressions into, and second pass times (in ms) in, the target region
against participant variability; $F(1, 30) = 2.90, MSE = 3592, p = .10$. Tests of the simple effects of the second-encounter appropriateness factor were also conducted. The difference between appropriate and inappropriate second encounters was significant when the first encounter was appropriate ($F(1, 30) = 10.92, MSE = 11,806, F(1, 46) = 6.27, MSE = 24,478$) and when the first encounter was inappropriate ($F(1, 30) = 7.24, MSE = 3314, F(1, 46) = 4.38, MSE = 7575$).

These results, particularly the findings that when the second encounter was inappropriate, readers regressed more often to the target region, and spent more time there after returning to it, seem to conflict with the first-pass results. Those data indicated that when the initial encounter had been inappropriate, an inappropriate second encounter proved no more difficult to process than an appropriate second encounter. The results in Table 3 cannot be readily explained by theories of facilitation due to priming (e.g., Duffy et al., 1988; Duffy, Henderson, & Morris, 1989; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991); expectancies generated for a specific role filler may facilitate first pass times on the target, but regressions and second pass times indicate difficulty in integrating inappropriate targets. These results also seem inconsistent with Hess et al.'s (1995) lexical reinterpretation hypothesis, or with Zwaan and Radvansky's (1998) assumption of situation model updating. If the manager was reinterpreted as filling the guitarist's role, why is there any evidence of difficulty in processing a later mention of the manager carrying out a guitarist's duties? Before further discussion of the results of Experiment 1, we first consider the results of a different manipulation of context.

### Experiment 2

One purpose of Experiment 2 was to replicate the effects of first-encounter appropriateness on first pass times on the target, in addition to examining the appropriateness effect on other measures. In Experiment 1, the first encounter with the target word occurred at the end of a sentence. Because of this, we could not be certain that any measures of post-target processing (e.g., post-target first pass times, regressions to the target, second pass times on the target) were not confounded with sentence wrap-up processes. As was seen in the data of Experiment 1, such post-target processing measures may reflect different effects than those on the first pass target times and can provide a more complete picture than just first pass times or probe response times alone. Therefore, the target sentences of Experiment 2 always included several words after the target word and prior to the end of the sentence, to allow for examination of post-target processing.

The primary purpose of Experiment 2 was to examine further the effects of the conflict between scriptal and contextual knowledge. There are circumstances in which a role in a script may be filled by someone or something other than the standard role filler. For example, in the inappropriate/justification (IJ) condition of Table 4, the manager (instead of the guitarist) played the song but the action is justified by the preceding statement that

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Versions of a sample passage for Experiment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate (A) Versions</strong></td>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td>The fans at the rock concert were going wild. The band was still new on the rock scene,</td>
<td></td>
</tr>
<tr>
<td><strong>Justification</strong></td>
<td>Neutral (N): and they weren't used to the adoring fans and all of the attention from the media.</td>
</tr>
<tr>
<td>Justified (J): so some of the band members had to handle publicity and finances in addition to performing.</td>
<td></td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td>The crowd quieted down when the next song was played by the band's guitarist who was standing alone on the stage. The concert was being held in an outdoor stadium, and there were about ten thousand screaming fans in attendance.</td>
</tr>
</tbody>
</table>

| **Inappropriate (I) Versions** | **Introduction** |
| The rock band was becoming more and more popular. The band was still new on the rock scene, |
| **Justification** | Neutral (N): and they weren't used to the adoring fans and all of the attention from the media. |
| Justified (J): so some of the band members had to handle publicity and finances in addition to performing. |
| **Conclusion** | A contract was signed by the band's guitarist who had arranged a six-record deal. The band had been getting lots of calls recently, and they were having a very hard time figuring out how to handle their new success. |

*Note. The target region in this example is guitarist and the post-target region is who was standing/who had arranged.*
“some of the band members had to handle publicity and finances in addition to performing.” The results of the effects of appropriateness on the first encounter in Experiment 1 indicate that—in the absence of any prior justification—a reader’s knowledge of scriptal roles increases first pass times on the role filler. A theory such as Kintsch’s (1988) construction-integration theory, that assumes that the reader’s world knowledge is consulted before any attempt to integrate any new input with prior text, would predict that this increase in first pass times would be observed even when the inappropriate role filler had received prior justification. On the other hand, it is possible that the justification creates an expectancy, either for the alternative role filler, or at least that the scriptal role will not be filled in the usual way. Such an expectancy seems consistent with models which suggest that the discourse context may constrain or influence semantic priming effects (e.g., Duffy et al., 1988, 1989; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991; see also MacDonald, Pearlmutter, & Seidenberg, 1994); according to this view, in the present study, the appropriateness effect would be smaller in the justified than in the neutral condition. The facilitated integration model proposed by Foss and his colleagues (Foss & Speer, 1991; Hess et al., 1995) would make a similar prediction. On the basis of their results, Hess et al. hypothesized that integration with the context occurs very rapidly, and that contextual effects override world knowledge.

Method

Participants

Thirty-five members of the University of Massachusetts community participated in exchange for money or course credit. The data for three participants were not analyzed, due to large calibration errors during portions of the experiment.

Apparatus

The equipment used was the same as in Experiment 1.

Materials

The materials used were altered versions of the passages from Experiment 1. The first sentence introduced the script (e.g., rock band) and was followed by a context sentence. The context sentence either justified a scripted action’s association with an inappropriate role filler, or it was neutral with respect to actions and role fillers but continued the story. The next sentence contained a scripted action that was associated with an appropriate or inappropriate role filler, followed by several words prior to the end of the sentence. (See Appendix B for all passages in Experiment 2.) Note that, in contrast to Experiment 1, this was the first and only encounter with the role filler in the text. Reading times were measured for the target word (the role filler; e.g., guitarist), which ranged from 4 to 11 characters (mean = 6.79 characters), and the post-target region, which consisted of the three words that immediately followed the target (mean = 14.27 characters; e.g., who was standing/who had arranged). Thus, context type was crossed with the appropriateness of the role filler to create four conditions: AN (appropriate neutral), IN (inappropriate neutral), AJ (appropriate justified), and IJ (inappropriate justified). One to two closing sentences ended the paragraph.

The between-subjects manipulation in Experiment 1 produced no significant effects, so it was dropped in Experiment 2. Four materials sets were constructed, such that each materials set contained six passages that appeared in each of the four conditions. Across the four materials sets, each passage appeared once in each of the four conditions. The 24 experimental passages appeared within a larger set of 54 passages. The 30 “filler” passages were stimuli for an unrelated experiment; they were similar in length to the experimental passages but did not focus on scripted settings. The number of filler passages used in this experiment was reduced from the number used in Experiment 1 in order to shorten the overall amount of time required for the experiment—this helped reduce participant fatigue and allowed for better precision on the eye tracker.

In order to demonstrate that the justifying context was strong enough to override the inappropriateness of the role filler, a rating study was conducted. Twenty-six University of Utah undergraduates enrolled in Introductory Educational Psychology courses participated in exchange for course credit. Participants were presented with one of two counterbalanced stimulus sets, in which 12 passages appeared in each of the IN and IJ conditions, up to the target sentence. They were then asked, given the information in the passage, to rate the likelihood of the target action being performed by the role filler on a 5-point scale, where (1 = Extremely Unlikely and 5 = Extremely Likely). If the justifying context was sufficient to override the inappropriateness of the role filler, ratings should be higher in the IJ condition than in the IN condition. This was supported in the results: ratings in the IJ condition were significantly higher than in the IN condition (3.29 vs. 2.45; \( F(1,23) = 45.12, MSE = .185; \quad F(1,23) = 71.846, MSE = .116 \)). Mean ratings for all passages are presented in Appendix B.

Procedure

The procedure used was the same as in Experiment 1.

Results and discussion

First pass times in the target region

Table 5 presents the first pass times in the target and post-target regions as a function of the appropriateness
of the role filler and of whether the target action had been previously justified. First pass times are longer on the target (e.g., guitarist) in the inappropriate condition only in the neutral (i.e., unjustified) condition. This resulted in a significant interaction of appropriateness and justification; $F_1(1,31) = 4.84$, $MSE = 1561$, $F_2(1,23) = 6.52$, $MSE = 1546$. Neither main effect approached significance; both $F$'s < 1. However, the contrast of the neutral condition means (i.e., IN—AN) was significant; $F_1(1,31) = 4.31$, $MSE = 4243$, $F_2(1,23) = 5.12$, $MSE = 4815$. As in Experiment 1, in the absence of any prior justification of the inappropriate role filler, first pass times were longer when the role filler was inappropriate than when it was appropriate. When there was prior justification, however, first pass times on the appropriate role filler were actually (nonsignificantly) slightly slower than in the inappropriate condition. Thus, first pass times on the target suggest that any difficulties due to the inappropriate role filler were quickly resolved, either because the justification facilitated lexical access to the target, or facilitated its integration with the discourse model. However, subsequent measures contradict this conclusion.

**First pass times in the post-target region**

The pattern in the post-target region differed from that in the target region in that times were slower in the inappropriate than in the appropriate condition whether or not the inappropriate role filler had been justified in the preceding text. Only the appropriateness main effect was significant; $F_1(1,31) = 8.19$, $MSE = 7311$, $F_2(1,23) = 5.42$, $MSE = 9004$. Furthermore, the interaction $F$'s were less than 1. When there was no preceding justification, the longer times in the inappropriate than in the appropriate condition were a continuation of the effect found in first pass times on the target; apparently, the eyes moved before integration was complete. The simple effect contrast of the AN and IN conditions was more variable than the main effect of appropriateness, resulting in a less powerful test; the contrast was marginal when based on participants variability and nonsignificant when based on items variability, $F_1(1,31) = 3.85$, $MSE = 9825$, $p = .059$; $F_2(1,23) = 2.68$, $MSE = 9189$, $p = .11$. In contrast, when the inappropriate role filler was justified, the pattern in the post-target region differed from that in the target region; although there was no effect in the target region, times for the inappropriate role filler were (nonsignificantly) slower than for the appropriate role filler in the post-target region: $F_1(1,31) = 2.29$, $MSE = 9997$, $p = .14$; $F_2(1, 23) = 2.04$, $MSE = 11,840$, $p = .16$.

**Table 5**

<table>
<thead>
<tr>
<th></th>
<th>Appropriate (A)</th>
<th>Inappropriate (I)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral (N)</td>
<td>280</td>
<td>304</td>
<td>292</td>
</tr>
<tr>
<td>Justified (J)</td>
<td>289</td>
<td>283</td>
<td>286</td>
</tr>
<tr>
<td>Mean</td>
<td>285</td>
<td>293</td>
<td></td>
</tr>
<tr>
<td><strong>Post-target region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral (N)</td>
<td>476</td>
<td>525</td>
<td>501</td>
</tr>
<tr>
<td>Justified (J)</td>
<td>462</td>
<td>500</td>
<td>481</td>
</tr>
<tr>
<td>Mean</td>
<td>469</td>
<td>513</td>
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**Table 6**

<table>
<thead>
<tr>
<th></th>
<th>Appropriate (A)</th>
<th>Inappropriate (I)</th>
<th>Mean</th>
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<td><strong>Regressions</strong></td>
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<td>Neutral (N)</td>
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<td>Justified (J)</td>
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<td>Mean</td>
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<td><strong>Second pass times</strong></td>
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General discussion

In Experiment 1, participants read script-based stories in which some individual or object filled a scriptal role in an inappropriate or unexpected way. When the inappropriate role filler had not been encountered previously in the story, first pass times in the target and post-target regions, and second pass times on the target, were longer for the inappropriate than for an appropriate role filler, and there were more regressions to the target region in the inappropriate condition. The same evidence of greater processing difficulty in the inappropriate condition was obtained in Experiment 2 when there was no prior justification of an inappropriate scriptal role filler. These effects of appropriateness are consistent both with models in which context can have an early influence on word processing by either influencing lexical access or integration (e.g., Duffy et al., 1988, 1989; Hess et al., 1995; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991; Traxler & Foss, 2000), and with models which assume that incoming information is first linked with general world knowledge (e.g., Garrod & Terras, 2000; Kintsch, 1988; Sanford & Garrod, 1989).

When the inappropriate role filler had been previously encountered (Experiment 1) or previously justified (Experiment 2), the pattern of effects for the different measures are more difficult to explain. First pass times in both the target (Experiments 1 and 2) and post-target regions (Experiment 1) showed an advantage of the inappropriate role filler when it had been previously encountered or justified. These results cannot be explained by models which assume that general world knowledge influences processing before contextual information (e.g., Garrod & Terras, 2000; Kintsch, 1988; Sanford & Garrod, 1989). However, they can be explained by Hess et al.'s (1995) lexical reinterpretation hypothesis. For example, when readers encountered the first mention of the manager playing the song, the manager may have been reinterpreted as an individual who carried out a guitarist's duties. This is essentially an update of the situation model (Zwaan & Radvansky, 1998). These first pass results can also be accounted for by models in which context can constrain or influence what information is reactivated during the lexical access process (e.g., Duffy et al., 1988, 1989; Morris, 1994; Schwanenflugel & Shoben, 1985; Schwanenflugel & White, 1991). However, if processing of “the manager” was facilitated due to either a reinterpretation of the original role, an update of the situation model, or some expectancy generated as a result of the context, there should have been no subsequent difficulty in processing the inappropriate role filler. But, there were more regressions back to the target, and longer second pass times after regressing, when the previously encountered or justified role filler was inappropriate. Similarly, without additional assumptions, Kintsch’s (1988, 1998) construction-integration model appears to have no basis for accounting for difficulties in processing after integration appears to be complete.

As described earlier, Garrod and Terras (2000) also found a discrepancy between patterns of first pass times and measures of subsequent processing. They proposed a two-stage “bonding and resolution” process to account for their results. In the first stage, a dominant role filler, such as pen for writing is automatically integrated with the text, and this is “impervious to the influence of the context in which the role was introduced” (p. 540). In the second stage, the link formed between pen and writing is evaluated, and when the context was inappropriate (e.g., the writing had been on a blackboard), processing difficulties were revealed in such measures as regressions and second pass times. These ideas are consistent with other studies of discourse processing, in which early measures were dominated by low-level processes and evidence of higher order processes only appeared in later measures of processing (e.g., Cook, 2000; Duffy & Rayner, 1990; Ehrlich & Rayner, 1983). Similar arguments have also been made in more general descriptions of eye movements during reading (e.g., the E-Z Reader model, Reichle, Pollatsek, Fisher, & Rayner, 1998; see also Rayner, 1998; Rayner & Pollatsek, 1989). Although the Kintsch (1988) and Garrod and Terras (2000; Sanford & Garrod, 1989) models cannot account for the patterns of results in the present experiments, the general idea of two stages can provide an explanation for our effects. As in the previous models, the first stage involves a tentative linkage initiated between information currently being processed and information reactivated by a low-level automatic retrieval process, and the second stage involves a verification of the link formed in the first stage. We assume that the stages are overlapping and continuous; the processor may verify a linkage just established as the eye fixates on the next word and new linkages are made. As each new concept is encountered, a low-level automatic retrieval process is initiated; some possible mechanisms for this process include pattern-matching (Sanford & Garrod, 1989), spreading activation (e.g., Anderson, 1976, 1983), or resonance (e.g., Myers & O'Brien, 1998, O'Brien & Myers, 1999). Propositions and concepts highly related to the focal concept are reactivated and are available for integration.

In contrast to previous models, we assume that the link in the first stage of processing can occur between the focal concept and semantic or contextual traces, depending on which is reactivated more quickly. In the present experiments, when prior context supported an inappropriate role filler, the appropriateness effect was no longer significant, which suggests that the contextual trace (i.e., first encounter in Experiment 1, justification in Experiment 2) might have influenced, if not overridden, integration of the semantic information (i.e., ap-
The first pass data for the target regions suggest that the link in the first stage is made with the first information that becomes available in working memory—this information may be either semantic or contextual in nature. However, it is clear from the second pass data that even after the eyes have moved away from the target, additional information continues to be reactivated and integrated. Although the inappropriate role filler appeared to be easily integrated when it was supported by previous context, measures of subsequent processing indicated that the violation of the scriptal norm did disrupt the reading process. In both experiments, regression percentages and second pass times were elevated when the role filler was inappropriate, regardless of the prior context condition. Thus, even after integration of a role filler appears to be complete, the role filler continues to be evaluated and verified according to any new information that becomes available. This is similar to the “resolution” process described by Garrod and Terras (2000; also Sanford & Garrod, 1989).

Although many models of reading assume that semantic knowledge has an earlier influence than contextual information, the results of the present study are consistent with a more interactive process. The view that contextual knowledge can interact with semantic knowledge to influence early processing is consistent with assumptions made by models used to describe processing on the word level (e.g., reordered access model; Duffy et al., 1988), the syntactic level (e.g., constraint satisfaction model; MacDonald et al., 1994), and the discourse level (e.g., memory-based text processing view; Cook, 2000; Gerrig & McKoon, 1998; Myers & O'Brien, 1998; O'Brien & Myers, 1999; O'Brien, Cook, & Derepentigny, 2001; Rizzella & O'Brien, 2002). The present work goes beyond earlier work to demonstrate that context can influence both early integration processes (the linkage stage), and later processes in which the links made in the first stage are evaluated (the verification stage).

Appendix A

Stimuli and Rating Study 1b results (in parentheses) for Experiment 1. (Note that for the 5-point rating scale, 1 = “Extremely Unlikely” and 5 = “Extremely Likely.”)

1. Appropriate second-encounter conditions (A1A2: 3.67, I1A2: 2.75)

The fans at the rock concert were going wild. They quieted down when the next song was played by the band’s guitarist/manager. The concert was being held in an outdoor stadium, and there were about ten thousand screaming fans in attendance. They were mostly all hysterical teenage girls. Some even cried as they listened to the guitarist play a slow and heartfelt love song. The song was about a love affair that ended badly.

Inappropriate second-encounter conditions (A1I2: 1.56, I1I2: 4.00)

The rock band was becoming more and more popular. A record company producer wanted to sign them onto a six-record contract, and he was told to talk to the band’s manager/guitarist. The band had been getting lots of calls recently, and they were having a very hard time figuring out how to handle their new success. All of the legal issues were handled by the guitarist so the musicians could just focus on playing. They signed a six million dollar contract.

2. Appropriate second-encounter conditions (A1A2: 3.89, I1A2: 2.89)

The movie was being filmed on location in the Sahara Desert. In preparation for the first day of filming, the script was rehearsed by the actress/director. The movie was going to be an epic about the nomads that lived in the desert and the horrible conditions they had to withstand. The first line of the film was spoken by the actress while crawling on hands and knees across the desert. The movie was sure to be a big hit at the box office.

Inappropriate second-encounter conditions (A1I2: 2.33, I1I2: 3.13)

The movie was being filmed on location in the Sahara Desert. Everyone cleared the set, waiting to hear, “Action!”
They were always begging for more time. The rent check sent in management didn't accept any excuses. by the landlord had to be received by the end of the day. The seemed like her neighbors were always behind on their rent. every month, the rent had to be paid by each tenant the landlord and eviction was always a threat. Lucy the landlord. Lucy always had her rent check ready on time, but it always begging for more time. Late payments were frowned like her neighbors were always behind on their rent. They were called by the director/actress. They were behind schedule, so they were trying to film as much as possible every day. Everyone was hot and tired and wanted to go home. Suddenly, "Cut!" was yelled by the actress when a cameraman accidentally walked across the set. They were never going to finish at this rate.

3. Appropriate second-encounter conditions (AI2A: 2.11, II12: 3.36)

It was time to do the yard work at the manor. First thing in the morning, the rose beds were weeded by the gardener chauffeur. The roses were the pride and joy of the owner of the manor. Some of the roses had even taken first place at prestigious garden shows. The roses were pruned by the gardener with a pair of shears from the garden shed. The rose beds were picture perfect by the end of the day.

Inappropriate second-encounter conditions (AI12: 2.22, II12: 3.83)

It was time for the day to start at the manor. First thing in the morning, the owner was driven to his office in the city by the chauffeur/gardener. It was only about a thirty minute ride through the country into the business district of the city. When the car arrived at its destination, the owner was dropped off by the gardener right in front of his office building. He was picked up in the same spot at the end of the day.

4. Appropriate second-encounter conditions (AI1A: 2.39, II1A: 2.67)

A terrible crime had been committed in the palace. Unfortunately, the crown jewels had been stolen by a palace thief guard. The queen was beside herself with grief, because some of the jewels that had been taken had been in her family for over four hundred years. One of the pieces taken by the thief had been her wedding present from the king. The queen ordered a full-scale investigation into the matter.

Inappropriate second-encounter conditions (AI12: 2.75, II12: 3.11)

There had been many break-ins at the palace lately. To ensure the queen's safety, the king ordered that she be under constant protection by a palace guard/thief. They couldn't take any unnecessary risks that would result in her being hurt. Today, the queen was giving a speech from one of the palace balconies. She felt very secure under the protection of the thief the entire time she was giving her speech. The king felt very relieved as well.

5. Appropriate second-encounter conditions (AI1A: 3.83, II1A: 3.67)

Lucy lived in a huge apartment complex. On the first day of every month, the rent was collected by the landlord/tenant. Lucy always had her rent check ready on time, but it seemed like her neighbors were always behind on their rent. They were always begging for more time. Late payments were frowned upon by the landlord and eviction was always a threat. Lucy was careful, so she knew she wouldn't have to worry about that.

Inappropriate second-encounter conditions (AI12: 2.75, II12: 3.11)

Lucy lived in a huge apartment complex. On the first day of every month, the rent had to be paid by each tenant/landlord. Lucy always had her rent check ready on time, but it seemed like her neighbors were always behind on their rent. They were always begging for more time. The rent check sent in by the landlord had to be received by the end of the day. The management didn't accept any excuses.

6. Appropriate second-encounter conditions (AI1A: 2.00, II1A: 3.36)

The kidnapper was brought to the state prison. After he was photographed and fingerprinted, he was led to his cell by the warden/prisoner. As he walked slowly down the hallway toward his cell, the kidnapper looked at some of the other men sitting on the floor in their cells. Then he was pushed into his cell by the warden and was told that dinner was in two hours. The kidnapper knew that prison was going to be miserable.

Inappropriate second-encounter conditions (AI12: 3.83, II12: 3.33)

The kidnapper was brought to the state prison. After he was photographed and fingerprinted, he was led to his cell, which he had to share with another prisoner/the warden. The kidnapper looked around the tiny room. There was a sink, a toilet, a table and chair, and one small window that had bars on it. The bed that had been taken by the warden was obviously the most comfortable one. The kidnapper knew that prison was going to be miserable.

7. Appropriate second-encounter conditions (AI1A: 3.00, II1A: 1.88)

The Johnsons were visiting the local state forest. They were excited, because a nature tour was being given by a ranger/camper. The Johnsons were big nature enthusiasts, and they spent a great deal of their free time doing things outside, such as hiking, bird watching, and gardening. They were told about the local wildlife by the ranger who seemed to know a great deal about the topic. The Johnsons took lots of photographs along the way.

Inappropriate second-encounter conditions (AI12: 1.67, II12: 2.83)

The Johnsons were visiting the local state forest. As they were driving through the campground, they saw a tent being put up by a camper / the ranger. The Johnsons were glad they lived close enough that they could enjoy the beauty of the forest and then go to their warm comfortable house at night. Suddenly, the tent fell down on top of the ranger making him yell and curse loudly. The Johnsons all thought that was very funny.

8. Appropriate second-encounter conditions (AI1A: 3.75, II1A: 2.33)

Sheila was spending her vacation at the seashore. While she was on the beach, she saw a drowning man being saved by a lifeguard/child. The man had apparently swum out too far and then was swept out by the undertow. He seemed alright after he was brought to the shore. The man was very grateful to the lifeguard for helping him and saving his life. Sheila couldn't even make herself go into the water after watching that.

Inappropriate second-encounter conditions (AI12: 1.67, II12: 4.00)

Sheila was spending her vacation at the seashore. While she was sunning herself on the beach, she watched a child/lifeguard playing in the waves. Sheila thought about going into the water, but she wasn't warm on the sand that she decided to stay there for a while longer. She saw a wave knock down the lifeguard and get him completely soaked. She shivered and was glad she was dry on the beach.

9. Appropriate second-encounter conditions (AI1A: 3.33, II1A: 2.89)

The nursing home was engulfed in flames and smoke. Luckily, the fire was put out in the nick of time by a fireman/ victim. The fire was extinguished before it could spread to other
buildings on the block. There was a big story about it in the newspaper the following day. Twelve people had been saved by the fireman after the building started to collapse. The building was ruined, but all the residents were safe.

Inappropriate second-encounter conditions (A1A2: 2.00, l112: 3.50)

The nursing home was engulfed in flames and smoke. Luckily, a man who lived in the house next door was able to run in and give help to a trapped victim: a fireman. The fire was extinguished before it spread to other buildings on the block. There was a story about it in the newspaper the following day. It was all about the rescue of the fireman by the man from the house next door. The story called the man a hero.

Inappropriate second-encounter conditions (A1A2: 3.56, l112: 1.38)

Bill and Joe decided to go to the movies. After getting his ticket, Bill walked over to the concession stand and asked for popcorn. While he and Joe were eating, they tried to figure out what they would do for the rest of the day. Joe suggested that they go hiking. Bill quickly finished the rest of his popcorn so that they could get on the trail. The day was perfect for a nice hike.

Inappropriate second-encounter conditions (A1A2: 1.56, l112: 3.50)

It was Sunday, so Joan got up, got dressed, and went to church. Today, a sermon about charity was given by the minister. Joan decided that she should volunteer her time to the needy more often. After church, Joan saw a friend of hers and went over to say hello. Joan was inspired by the sermon given by the minister and told her friend all about it. Joan and her friend both decided to volunteer at the soup kitchen.

Inappropriate second-encounter conditions (A1A2: 2.17, l112: 2.88)

It was Sunday, so Joan got up, got dressed, and went to church. Today, a beautiful hymn was played by the organist. After church, Jill went to visit her mother, who was in the hospital after having heart surgery. Jill told her mother about the church service that morning. She sang the hymn played by the organist while her mother listened quietly. She thought Jill had a beautiful singing voice.

Inappropriate second-encounter conditions (A1A2: 3.67, l112: 2.78)

The city council had decided to build a new school. They were shown the plans for the building by the architect/plumber. The building would have forty classrooms, two teachers' lounges, and a beautiful two-story library. It would be a model for future schools in the area. The council loved the plans drawn up by the architect and voted for building to begin right away. They knew the taxpayers would stand behind their decision.

Inappropriate second-encounter conditions (A1A2: 1.88, l112: 2.56)

The city council was touring the new school in their district. They were very impressed by the bathroom fixtures installed by the plumber/ architect. The building was costing the taxpayers a lot of money, so the council members were extra careful to make sure that everything was in top shape. They banged on the pipes put in by the architect and said he had done a great job. The school was going to be a model for others in the area.

Inappropriate second-encounter conditions (A1A2: 4.25, l112: 2.83)

The army unit was being defeated by a larger, better armed enemy. Finally, the order to retreat was given by a general. Almost all of the men quickly ran back to their trenches, but one man foolishly stayed behind and kept shooting at the approaching enemy forces. He disobeyed the order given by the general and almost lost his life because of it. Luckily, he made it back to camp unharmed.

Inappropriate second-encounter conditions (A1A2: 1.78, l112: 3.89)

The army unit was being defeated by a larger, better armed enemy. Finally, a sergeant gave an order to a private: retreat. They weren't going to give up this battle without a tough fight. Their country's independence was at stake in this war, and they were determined to win. The order that was given to the general was to pull out the heavy artillery. The cannons were their last defense.

Inappropriate second-encounter conditions (A1A2: 4.38, l112: 2.50)

The first half of the football game came to an end. The players ran off the field and the crowd was entertained during the halftime show put on by the band. The team was ahead of their rival by twenty-one points, so the crowd's spirits were high. People were yelling and cheering in the stands. The halftime show put on by the band kept them happy until the second half of the game started. The home team won the game by forty points.

Inappropriate second-encounter conditions (A1A2: 1.89, l112: 3.22)

The birthday party was just getting underway. The parents of the birthday girl had arranged for all of the active five-year-olds to be entertained by a clown: a clown. There were loads of presents, party favors, and cake, and everyone was having a great time. The parents sat back and watched all of the children having a great time. The kids all laughed at the clown and ran around playing games. The birthday party was a huge success.

Inappropriate second-encounter conditions (A1A2: 3.56, l112: 2.22)

Paul had been deeply depressed lately. After weeks of peculiar behavior, he finally agreed to be treated by a therapist: a therapist. Paul thought that maybe his problems were related to stress. He had just recently gotten married and then was promptly fired from his job two weeks later. He was hypnotized by the therapist and woke up feeling much calmer and more balanced. He just hoped that he would stay that way.

Inappropriate second-encounter conditions (A1A2: 1.33, l112: 3.25)

Paul had fallen in love. After several months of dating his girlfriend Judy, they were finally married by Paul's minister: a minister. The ceremony was somewhat small, with only a few friends and family members present. They exchanged their vows and then gave each other the wedding rings. They were pronounced married by the therapist and Paul was told he could kiss his bride. Paul couldn't imagine being any happier than he was at that moment.
Sam was having a barbecue at his house. While his guests were playing a game of badminton, Sam fixed up the grill and put some burgers and a turkey. He called all of his guests to come and eat, and everyone sat down at the picnic table. After serving everyone else, Sam finally sat down to eat. He put some ketchup on his burger and took a big bite of it. Everyone thought the meal was great.

Inappropriate second-encounter conditions (A1A2: 4.50, I1A2: 2.22)

Mr. Jones needed to have some work done on his car. He went to the local service station and had his fan belt and radiator replaced by a mechanic/carpenter. The charges were much more than he could really afford right now, but he knew that his car would run much better as a result. He hoped that the repairs done by the carpenter would extend the life of his car for a few more years. He had had the car since he was in college and didn’t want to give it up.

Inappropriate second-encounter conditions (A112: 2.00, I112: 2.75)

A young woman had been found in the park with three bullet wounds in her head. The bullet wounds must have been an attempt to cover up the hanging. The bullet wounds in her head. An autopsy on the body was performed by the detective/coroner. He was careful not to reveal any details for fear they might be released to the press. Everyone was surprised by the details of the woman’s death.

Inappropriate second-encounter conditions (A112: 1.75, I112: 2.00)

A young woman had been found in the park with three bullet wounds in her head. Several witnesses on the scene were questioned by the detective/coroner. He was careful not to reveal any details for fear they might be released to the press. Everyone was surprised by the details of the woman’s death.

Inappropriate second-encounter conditions (A112: 2.44, I112: 2.67)

A young woman had been found in the park with three bullet wounds in her head. Several witnesses on the scene were questioned by the detective/coroner. He was careful not to reveal any details for fear they might be released to the press. Everyone was surprised by the details of the woman’s death.

Inappropriate second-encounter conditions (A112: 2.44, I112: 2.67)

A young woman had been found in the park with three bullet wounds in her head. Several witnesses on the scene were questioned by the detective/coroner. He was careful not to reveal any details for fear they might be released to the press. Everyone was surprised by the details of the woman’s death.

Inappropriate second-encounter conditions (A112: 2.44, I112: 2.67)

A young woman had been found in the park with three bullet wounds in her head. Several witnesses on the scene were questioned by the detective/coroner. He was careful not to reveal any details for fear they might be released to the press. Everyone was surprised by the details of the woman’s death.

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A young woman had been found in the park with three bullet wounds in her head. Several witnesses on the scene were questioned by the detective/coroner. He was careful not to reveal any details for fear they might be released to the press. Everyone was surprised by the details of the woman’s death.

Inappropriate second-encounter conditions (A112: 2.44, I112: 2.67)
The criminal shuffled into the courtroom. After all of the charges against him were read, he was given a sentence of five years in prison with no parole by the judge/bailiff. The criminal looked down in shame. He knew that he deserved whatever punishment he received, but at the same time he had hoped for a lighter sentence. He was also given a stern lecture by the judge about hoping that he had learned his lesson. The criminal honestly thought he could reform.

Inappropriate second-encounter conditions (A1A2: 2.33, II12: 1.13)

The criminal shuffled into the courtroom. After he was led to the witness stand, he was sworn in by the bailiff/judge. The criminal agreed and proceeded to tell his side of the story. After hours of grueling testimony, the court adjourned for the day. The criminal was led back to the jail by the judge and locked up again in his cell. He had nothing to do but wait and hope.

23. Appropriate second-encounter conditions (A1A2: 3.83, II1A2: 3.44)

The fifth grade students were nervously studying for a big social studies test. After attendance was taken, they were given their exam by their teacher/principal. The exam was much harder and longer than any of the students had expected, so they all quickly got to work. The room soon fell silent. They were later given their grades by the teacher who patiently explained all of the questions. Most of the students had done quite well.

Inappropriate second-encounter conditions (A1A2: 2.50, II12: 2.11)

The fifth grade class was quietly taking a social studies test in the classroom. One student had been caught cheating and was sent down the hall to be punished by the principal/teacher. The student had been in trouble many times before at this school, so he was very nervous. He hoped that his father would not be told about this. The student was suspended by the teacher and then his father was called. The student knew he was in trouble now.

24. Appropriate second-encounter conditions (A1A2: 4.22, II1A2: 3.38)

About three weeks before the construction on the new mall began, all of the workers were hired by the contractor/electrician. Unfortunately, some of the men that were on the project were incompetent and did not take proper safety precautions. Some of them were also repeatedly late for work. One guy was immediately fired by the contractor and was told that he was not welcome back on the site. Unfortunately, this put the construction even more behind schedule.

Inappropriate second-encounter conditions (A1A2: 2.56, II12: 4.00)

When the construction project on the mall was almost finished, some vandals ruined all the wiring that was put in by the electrician/contractor. Unfortunately, this was discovered by a safety inspector who was writing up a report on the site. The inspector checked everything carefully and wrote his report. He looked over the areas wired by the contractor and asked who had damaged them. He told the construction company to file a report with the local police.

Appendix B

Stimuli and Likelihood Ratings (in parentheses) for Experiment 2. (Note that for the 5-point rating scale, 1 = “Extremely Unlikely” and 5 = “Extremely Likely.”)
minute drive into the city and was relieved when they arrived safely.

4. Appropriate neutral and justified conditions

There had been many break-ins at the palace lately. Under great pressure from the king and queen, the investigators were doing everything they could to solve the crimes. After several unsuccessful attempts to solve the crimes, the investigators were at a loss and so they took an unusual step. They set a trap for the thief who they believed would go after the crown jewels. They left the jewels apparently unguarded but had guards in place. After several days, the plan worked and the thief was captured.

Inappropriate neutral and justified conditions (IN: 3.08, IJ: 3.58)

There had been many break-ins at the palace lately. Under great pressure from the king and queen, the investigators were doing everything they could to solve the crimes. After several unsuccessful attempts to solve the crimes, the investigators were at a loss and so they took an unusual step. They asked for help from a thief who they believed knew where the criminal was. They finally tracked down the criminal and brought him to justice. The king and queen were very grateful, and they rewarded the investigators handsomely.

5. Appropriate neutral and justified conditions

Lucy lived in a huge apartment complex. The complex was actually a large co-op, and no one who lived there could imagine a better place to live. The complex was actually a large co-op, so everyone who lived there had to pitch in and do their share. On the first day of every month, the rent had to be paid by each tenant who lived in the building. Lucy always had her rent check ready on time, but it seemed like her neighbors were always behind on their rent. They were always begging for more time.

Inappropriate neutral and justified conditions (IN: 3.08, IJ: 3.67)

Lucy lived in a huge apartment complex. The complex was actually a large co-op, and no one who lived there could imagine a better place to live. The complex was actually a large co-op, so everyone who lived there had to pitch in and do their share. On the first day of every month, the rent had to be paid by each tenant who lived in the building. Lucy always had her rent check ready on time, but it seemed like her neighbors were always behind on their rent. They were always begging for more time.

6. Appropriate neutral and justified conditions

The kidnapper was brought to the state prison. He was placed in a new program, and was told about all of the details of the program when he arrived. He was placed in a new program, where the inmates and the employees all lived and worked together. After his admission, he was led to his cell, which he shared with the warden who ran the prison. The kidnapper looked around the tiny room. There was a sink, a toilet, a table and chair, and one small window that had bars on it.

7. Appropriate neutral and justified conditions

The Johnsons were visiting the local state park. The park was not only a beautiful natural forest, but the entry fee was also very reasonable. The park was not only a beautiful natural forest, but the park attendants were also always very helpful. On this day, the Johnsons joined a nature tour that was being given by a ranger who was very familiar with the park. The Johnsons thought it was a terrific tour, and they started making plans to come back again the following weekend.

Inappropriate neutral and justified conditions (IN: 2.42, IJ: 3.25)

The Johnsons were visiting the local state park. The park was not only a beautiful natural forest, but the entry fee was also very reasonable. The park was not only a beautiful natural forest, but the park attendants were also always very helpful. On this day, the Johnsons saw a tent being put up by a ranger who was helping some teenagers. The Johnsons thought this was a nice thing to do, and they hoped that the teenagers would be grateful for his assistance.

8. Appropriate neutral and justified conditions

Sheila was spending her vacation at the seashore. It was a small local beach, and Sheila thought all of the people there were very friendly and generally pleasant to be around. It was a small local beach, and all of the people who worked and lived there were very experienced and strong swimmers. While she was sunning herself on the beach, she watched a child in the water near the beach. Sheila thought about going into the water, but she was so warm on the sand that she decided to stay there for a while longer.

Inappropriate neutral and justified conditions (IN: 1.67, IJ: 2.50)

Sheila was spending her vacation at the seashore. It was a small local beach, and Sheila thought all of the people there were very friendly and generally pleasant to be around. It was a small local beach, and all of the people who worked and lived there were very experienced and strong swimmers. While she was on the beach, she saw a drowning man being saved by a child in the water near the beach. The man had apparently swum out too far and then was swept out by the undertow. He seemed alright after he was brought to the shore.

9. Appropriate neutral and justified conditions

The nursing home was engulfed in flames and smoke. There would not be much time before the building collapsed, so people in nearby buildings took precautions and tried to help others. There would not be much time before the building collapsed, so everyone had to help put out the flames and get everyone out safely. Luckily, a man who lived in the house nearby was able to save a trapped victim who was in the burning building. The fire was extinguished before it spread to other buildings on the block. There was a story about it in the newspaper the following day.

Inappropriate neutral and justified conditions (IN: 1.67, IJ: 2.67)

The nursing home was engulfed in flames and smoke. There would not be much time before the building collapsed, so people in nearby buildings took precautions and tried to help others. There would not be much time before the building collapsed, so everyone had to help put out the flames and get everyone out safely. Luckily, the fire was put out in the nick of time by a victim who was using a garden hose. The fire was extinguished before it could spread to other buildings on the
block. There was a big story about it in the newspaper the following day.

10. Appropriate neutral and justified conditions
Bill and Joe had gone out for breakfast. The place they went to was new and very trendy, and Bill hoped that it would be good. The place they went to was new and very trendy, and it sold all kinds of foods. After entering, Bill went to the counter and ordered a donut and a large coffee. While he and Joe were eating, they tried to figure out what they would do for the rest of the day. Joe suggested that they go hiking.

Inappropriate neutral and justified conditions (IN: 3.17, IJ: 4.08)

Bill and Joe had gone to the movies. The place they went to was new and very trendy, and Bill hoped that it would be good. The place they went to was new and very trendy, and it sold all kinds of foods. After entering, Bill went to the concession stand and asked for a donut and a large coffee. Then he found his seat in the theater and watched the movie. After the movie, Joe asked Bill if he wanted to grab a pizza.

11. Appropriate neutral and justified conditions
It was Sunday, so Joan got up, got dressed, and went to church. It was a small and nontraditional church, and Joan had been going to services there for as long as she could remember. It was a small and nontraditional church, in which each part of the service was led by a different person every week. Today, a beautiful hymn was played by the organist who was a very fine musician. After church, Jill went to visit her mother, who was in the hospital after having heart surgery. Jill told her mother about the church service that morning.

Inappropriate neutral and justified conditions (IN: 2.75, IJ: 4.00)

It was Sunday, so Joan got up, got dressed, and went to church. It was a small and nontraditional church, and Joan had been going to services there for as long as she could remember. It was a small and nontraditional church, in which each part of the service was led by a different person every week. Today, a sermon about charity was given by the organist who was a very inspiring speaker. Joan decided that she should volunteer her time to the needy more often. After church, Joan saw a friend of hers and went over to say hello.

12. Appropriate neutral and justified conditions
The city council had decided to build a new school. They had debated about the school a lot, but everyone was happy when they saw how well the design had turned out. They had debated about the school a lot, and they finally hired one person to design and build the new school. They were shown the plans for the building by the architect that they had hired. The building would have forty classrooms, two teachers' lounges, and a beautiful two-story library. It would be a model for future schools in the area.

Inappropriate neutral and justified conditions (IN: 2.17, IJ: 2.92)

The city council was touring the new school in their district. They had debated about the school a lot, but everyone was happy when they saw how well the design had turned out. They had debated about the school a lot, and they finally hired one person to design and build the new school. They liked the bathroom fixtures installed by the architect that they had hired. The building was costing the taxpayers a lot of money, so the council members were extra careful to make sure that everything was in top shape.

13. Appropriate neutral and justified conditions
The army unit was being defeated by a larger, better armed enemy. Tension was extremely high among the troops, and they weren't sure whether they would get out alive. Tension was extremely high among the troops, and nobody seemed very sure of who was in command. Finally, the order to retreat was given by a general who was very well-respected. Almost all of the men quickly ran back to their trenches, but one man foolishly stayed behind and kept shooting at the approaching enemy forces.

Inappropriate neutral and justified conditions (IN: 2.42, IJ: 2.67)

The army unit was being defeated by a larger, better armed enemy. Tension was extremely high among the troops, and they weren't sure whether they would get out alive. Tension was extremely high among the troops, and nobody seemed very sure of who was in command. Finally, a sergeant gave an order to the general who was still in his tent. They weren't going to give up this battle without a tough fight. Their country's independence was at stake in this war, and they were determined to win.

14. Appropriate neutral and justified conditions
The first half of the football game came to an end. The home team was winning by several points so far and the crowd was excited about the game. The home team was losing the game so far and the crowd was in an ugly mood. At halftime started, they heard music from the band which was entering the field. Then the crowd settled down and many of them went to the concession stand to get a snack before the second half started.

Inappropriate neutral and justified conditions (IN: 2.08, IJ: 2.58)

The first half of the football game came to an end. The home team was winning by several points so far and the crowd was excited about the game. The home team was losing the game so far and the crowd was in an ugly mood. At halftime started, they started to boo the band which was entering the field. Then the crowd settled down and many of them went to the concession stand to get a snack before the second half started.

15. Appropriate neutral and justified conditions
Paul and Judy were planning their wedding ceremony. Although Paul knew there were several options available to them, he had strong doubts about what to do. Although Paul knew there were several options available to them, he wanted guidance from someone he could trust. After much discussion, they agreed to be married by Paul's minister who he really admired a lot. The ceremony was somewhat small, with only a few friends and family members present. They exchanged their vows and then gave each other the wedding rings.

Inappropriate neutral and justified conditions (IN: 3.33, IJ: 4.17)

Paul had been deeply depressed for several months. Although Paul knew there were several options available to him, he had strong doubts about what to do. Although Paul knew there were several options available to him, he wanted guidance from someone he could trust. After much thought, he decided to be treated by a local minister who he really admired a lot. Paul thought that maybe his problems were related to stress. He had just recently gotten married and then was promptly fired from his job two weeks later.

16. Appropriate neutral and justified conditions
Sue was having a barbecue at her house. After greeting her guests, she told them to relax while she finished preparing the food for tonight. After greeting her guests, she told them that they
were in for something a little different tonight. While they chatted, Sue tended to the burgers and prepared some new side dishes. After a while, she called his guests to come and eat, and everyone sat down in the dining room. After serving everyone else, Sue finally sat down to eat.

Inappropriate neutral and justified conditions (IN: 2.83, IJ: 2.00)

Sue was cooking Thanksgiving dinner at her house. After getting her guests, she told them to relax while she finished preparing the food for tonight. After getting her guests, she told them that they were in for something a little different tonight. While they chatted, Sue tended to the burgers and prepared some side dishes. After a while, she called his guests to come and eat, and everyone sat down in the dining room. After serving everyone else, Sue finally sat down to eat.

17. Appropriate neutral and justified conditions

It was deadline day at the big publishing company. The novel being published was almost finished, and it was expected to be in bookstores by the next summer. The novel being published was almost finished, but the ending still needed to have major changes made to it. Just in time, the last chapter was received by the editor who sent it to the publisher. The president of the company decided to read the chapter while he was having his lunch. He liked the chapter, but he had a few concerns about it.

Inappropriate neutral and justified conditions (IN: 2.00, IJ: 2.83)

It was deadline day at the big publishing company. The novel being published was almost finished, and it was expected to be in bookstores by the next summer. The novel being published was almost finished, but the ending still needed to have major changes made to it. Just in time, the last chapter was written by the editor who sent it to the publisher. The president of the company decided to read the chapter while he was having his lunch. He liked the novel, but he had some concerns about it.

18. Appropriate neutral and justified conditions

A young woman had been found in the park with three bullet wounds in her head. It was a small town, and the identity of the woman was a big mystery to everyone. It was a small town, so there was only one man who was available to investigate the crime. An autopsy on the body was performed by the coroner who was in charge of the case. After careful consideration of the evidence, the time and cause of death were recorded. The details of the woman’s death were surprising to everyone on the case.

Inappropriate neutral and justified conditions (IN: 2.58, IJ: 3.25)

A young woman had been found in the park with three bullet wounds in her head. It was a small town, and the identity of the woman was a big mystery to everyone. It was a small town, so there was only one man who was available to investigate the crime. Several witnesses were questioned by the coroner who was in charge of the case. He was careful not to reveal any details for fear they might be released to the press. Everything was to be kept strictly top secret.

19. Appropriate neutral and justified conditions

Mr. Jones needed to have some work done on his car. He couldn’t afford to go to a real professional, but he still hoped that he would be able to get work of decent quality. He couldn’t afford to go to a real professional, so he went to someone who did the work as a hobby on the side. He had his radiator replaced by a mechanic who worked there on the weekends. The charges were much more than he could really afford right now, but he knew that his car would run much better as a result.

Inappropriate neutral and justified conditions (IN: 2.17, IJ: 3.08)

Mr. Jones was remodeling his living room. He couldn’t afford to go to a real professional, but he still hoped that he would be able to get work of decent quality. He couldn’t afford to go to a real professional, so he went to someone who did the work as a hobby on the side. He had a set of shelves made by a mechanic who built them over the weekend. He was doing all of this as a birthday surprise to his wife, who had been out of town visiting her mother.

20. Appropriate neutral and justified conditions

Lori was a student at the local art school. At this school, Lori had noticed that everyone was very talented and hoped that someday she might be that good. At this school, Lori had noticed that all of the students took turns being the subjects for the other students’ projects. Today she was sketching a difficult pose held by a model who was also a student in the class. Lori had to leave to go to another class right now, so she would have to work on the sketch later that night.

Inappropriate neutral and justified conditions (IN: 3.50, IJ: 4.33)

Lori was a student at the local art school. At this school, Lori had noticed that everyone was very talented and hoped that someday she might be that good. At this school, Lori had noticed that all of the students took turns being the subjects for the other students’ projects. Today she saw a beautiful sculpture created by a model who was also a student in the class. Lori hoped that she would be able to develop her talents to create such beautiful works of art. She was really only an amateur right now.

21. Appropriate neutral and justified conditions

Jeanie and her daughter were having dinner at a very fancy French restaurant. After they were seated, they looked over the menus. They noticed that the restaurant was very lively that night, and that everyone seemed to be really enjoying themselves. They noticed that the restaurant was very short-staffed that night, and that everyone left working had taken on some extra duties. After a few minutes, their order was taken by the waiter who then returned to the kitchen with it. While they waited for their food, Jeanie asked her daughter about her day at school.

Inappropriate neutral and justified conditions (IN: 3.67, IJ: 4.58)

Jeanie and her daughter were having dinner at a very fancy French restaurant. After dinner was over, Jeanie paid the bill. They noticed that the restaurant was very lively that night, and that everyone seemed to be really enjoying themselves. They noticed that the restaurant was very short-staffed that night, and that everyone left working had taken on some extra duties. As they were leaving, the table was cleared by the waiter who then brought all the dishes to the kitchen. Jeanie and her daughter got up and started walking toward the front door of the restaurant.

22. Appropriate neutral and justified conditions

The criminal shuffled into the courtroom. It was a small rural courthouse, and it looked very much like something out of an old movie. It was a small rural courthouse, and all of the duties of the court were performed by just one man. After entering the witness stand, the criminal was sworn in by the bailiff who then told him to sit down. The criminal agreed and proceeded to tell his side of the story. After hours of grueling testimony, the court adjourned for the day.
The construction project on the new mall was almost complete. Although it was a big project, it was expected to be completed in a short amount of time. Although it was a big project, one man was left in charge of doing most of the important jobs. The foreman criticized the work by the electrician who was in charge of the wiring. Unfortunately, this man proved to be incompetent and did not take proper safety precautions. He had also been repeatedly late for work.

Inappropriate neutral and justified conditions (IN: 1.25, IJ: 3.08)

The construction project on the mall was about to begin. Although it was a big project, it was expected to be completed in a short amount of time. Although it was a big project, one man was left in charge of doing most of the important jobs. All of the workers were hired by the electrician who was in charge of the project. Unfortunately, some of the men that were on the project were incompetent and did not take proper safety precautions. Some of them were also repeatedly late for work.

References


