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Readers as problem-solvers in the experience of suspense

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Abstract

We suggest that readers' reports of suspense are moderated by their perceptions of the range of solutions available to a textual dilemma. We provide seven experiments to test this relationship between problem solving and suspense. In each experiment subjects read texts that placed James Bond (or some other fictional hero) in a situation of grave danger. The texts differed with respect to the apparent range of escapes available to the hero. Subjects gave ratings of the likelihood that the hero would escape and of their feelings of suspense. Although ratings of likelihood were little affected, ratings of suspense were heightened when readers believed that the number of paths to a solution had been restricted.

1. Introduction

In *Casino Royale*, James Bond finds himself in a rather thorny situation. Bond is poised to bankrupt the villain Le Chiffre at the baccarat table when a man in the crowd surrounding the table presses a gun to his back and whispers, "Withdraw your bet before I count ten. If you call for help I shall fire" (p. 83). As the text unfolds, the gunman begins to count – "un", "deux", "trois ...". Between each pair of numbers, Bond searches desperately for a means of escape (p. 84):

> 'Trois.'
>
> Bond looked over at Vesper and Felix Leiter. They were smiling and talking to each other. The fools. Where was Mathis? Where were those famous men of his?

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'Quatre.'

And the other spectators. This crowd of jabbering idiots. Couldn't someone see what was happening? The chef de partie, the croupier, the huissier?

Ian Fleming, the author of the original Bond novels, builds suspense methodically as, number by number, Bond uses up solutions to his dilemma. This situation of desperation is not atypical of the hazards of Bond's livelihood. Fortunately, Bond is a sufficiently skilled problem-solver that he nearly always finds a solution. When he doesn't it is because Fleming has arranged for timely outside intervention. What makes the Bond novels particularly compelling as works of suspense is Fleming's ability to make readers feel as if no solutions are left - only to squeeze out something they might have foreseen.

Our research is intended to assess the relationship between readers' perceptions of the availability of solutions and their reports of suspense. Our general hypothesis is that one way in which authors make readers feel suspense is by leading them to believe that the quantity or quality of paths through the hero's problem space has become diminished. This hypothesis appeals to classic analyses of problem solving that use the metaphor of searching a space to conceptualize the process of finding a solution (see, e.g., Newell and Simon, 1972). Against this theory, Bond is trying to find the solution to a 'transformation' problem (see Greeno, 1978): Bond's *initial state* is the reality of the gun pressing into his back; Bond's *goal state* is to be able to let his bet stand without dying. To navigate from the initial to goal states – to 'transform' his dilemma into another triumph – Bond must find a path through an appropriate sequence of *intermediate states*. The difficulty for him, as the text reveals, is that his solution paths are constrained.

In problem solving, the difficulty of a problem is determined (other factors being equal) by the number of useful paths through a problem space as well as by the difficulty of executing the transitions between intermediate states, or the *moves*, of an appropriate solution (Kotovsky et al., 1985; Kotovsky and Simon, 1990; Simon and Newell, 1971). Therefore, if we wish to make a problem seem insolvable, we can either manipulate the solvers' beliefs about the availability of solutions paths or the feasibility of the component moves of the solutions. Our claim for narrative is that authors can enhance readers' experiences of suspense in exactly the same ways. If authors bring about the apparent or genuine pruning of solution paths, or if they make the moves toward even an obvious solution appear reasonably daunting, heightened suspense will result.

Previous research has shown that the presence or absence of suspense has a powerful impact on readers' enjoyment of texts and even on their willingness to label texts as stories (Brewer and Lichtenstein, 1981, 1982; Brewer and Ohtsuka, 1988a,b). In one experiment, Brewer and Lichtenstein (1981) wrote base texts which were not suspenseful. The base text for 'The Trip Home', for example, described "a man driving home from work, coping with several minor mechanical obstacles" (p. 368). To create a suspense version of this text, these researchers added an 'initiating event': "a bomb with a 10-min timer was activated in the car as the driver got in" (p. 368). After reading a base or suspense version of each of

three texts, subjects rated their liking for the text. On a 7-point scale, subjects gave, on average, ratings that were 2 points higher for the suspense versions of the narratives. (Brewer and Ohtsuka (1988a,b) replicated the association between suspense and liking for naturally occurring stories of both American and Hungarian origin.) Brewer and Lichtenstein (1981) also asked subjects to indicate "the extent to which the passage was, or was not, a 'story' " (p. 369) on a 7-point scale. Subjects' ratings were nearly 2.5 points higher, on average, for the suspense than for the base versions of the texts. Taken as a whole, this body of research suggests that an account of the experience of suspense will be an important component of any adequate theory of narrative understanding.

We intend the analogy between problem solving and suspense to enable us to make more precise predictions of relative levels of suspense between texts that share identical overall structures. Given, for example, an initiating event such as 'a bomb with a 10-min timer' we would like to be able to specify how other information within the text could heighten or diminish the experience of suspense. Each of our experiments contrasts pairs of texts that differ only minimally: In each case, one of the texts contains extra material that is intended to change readers' perceptions of the availability of possible solutions to the hero's dilemma. (The current experiments do not directly address the difficulty of the moves within a solution.) We asked our readers to make a pair of judgments with respect to these texts. First, we required them to indicate how likely they believed it to be that Bond (or, in Experiments 6 and 7, another hero) would escape from captivity. Our prediction was that readers would believe it to be very likely that Bond would escape, irrespective of the details of the text. After all, Bond always does escape. Against this background of confidence, we predicted, however, that readers' second judgments, direct ratings of suspense, would covary with their perception of the number of paths to solution. In real life circumstances, Bond viewers and readers experience suspense even though they are certain that he will survive his travails (see Gerrig and Allbritton, 1990). We expected in our experiments as well that readers would admit to experiencing some suspense even when they were quite certain that Bond would prevail.

2. Experiment 1

In Experiment 1, we tested the basic analogy between readers' perceptions of the set of possible solutions to a textual dilemma and their feelings of suspense. We created two versions of a brief excerpt from a James Bond novel that differed only with respect to the perceived number of solutions. The first version of the excerpt, which was based on a scene from *Casino Royale*, portrayed Bond being captured by Le Chiffre and roughed up by a pair of thugs. Table 1 presents the full text of this version (which consisted of the shared text and the material given in parentheses). We call this version the *No Mention* version of the text because it excludes material about the pen that plays an important role in the second version. This second, *Removed Pen*, version of the excerpt is also given in Table 1

Table 1
Excerpts for Experiment 1

Le Chiffre was standing in the doorway of a room on the right. He crooked a finger at Bond in a silent, spidery summons.

Vesper was being led down a passage towards the back of the house. Bond suddenly decided.

With a backward kick which connected with the thin man's [i.e., gunman's] shins and brought a whistle of pain from him, Bond hurled himself down the passage after her. His plan was to do as much damage as possible to the two gunmen and be able to exchange a few hurried words with the girl.

Like lightning the Corsican [i.e., the second gunman] slammed himself back against the wall of the passage and, as Bond's foot whistled past his hip, he very quickly, but somehow delicately, shot out his left hand, caught Bond's shoe at the top of its arc and twisted it sharply. (As he crashed to the ground, Bond rolled agilely and, with a motion in which he took great pride, he righted himself with minimal damage.) {As he crashed to the ground, Bond rolled agilely and, with a motion that he hoped went unnoticed, moved his fountain pen deeper into his breast pocket.}

"Search him," barked Le Chiffre.

The two gunmen dragged Bond to his feet. While the thin man kept his gun trained on Bond's unquiet chest, the Corsican roughly stripped Bond's revolver out of its shoulder holster. He twisted Bond around brusquely in search of other weaponry. Le Chiffre observed his assistant's work attentively. (Then, as if reading Bond's thoughts, he crossed the room and said, "Come my dear friend. Let's not waste time.") {Then, as if reading Bond's thoughts, he crossed the room and snatched away Bond's fountain pen. "Come, my dear friend," said Le Chiffre. "Let's not waste time."}

Note: The No Mention version of the excerpt included the material in parentheses. The Removed Pen version included the material in curly brackets. The rest of the text was shared by both versions.

(including the material given in curly brackets). As shown in Table 1, the contrast between the two versions of the excerpt is that in the Removed Pen version the reader comes to believe that Bond wishes to retain his pen and then sees Le Chiffre snatch that pen away.

We intended the Removed Pen sequence of events to make readers believe that the pen had some value for Bond as a possible solution to the problem of escaping from Le Chiffre and that, once the pen has been removed, that solution has been eliminated. For its removal to have this effect, readers need not have any precisely articulated notion of how the pen would have contributed to a solution. They need not, that is, have worked out any actual solution paths. What is more important is the readers' belief that Bond himself had calculated the value of the pen. Bond's actions themselves give rise to the perception that a solution has been lost.

Note that in a formal sense the range of possible solutions is exactly the same at the end of each version. Once the pen has been removed, Bond's situation is identical. Furthermore, we believe that readers would assess Bond's probability of escaping in some fashion to be equally likely in both cases (this, again, is the invincible James Bond). All we have done is manipulated the readers' perceptions of the immediate existence of an escape route by providing a possible solution and then pulling it back. Our prediction is that readers who have experienced this apparent pruning of a solution path will report greater feelings of suspense.

Forty-five subjects read the No Mention version of the excerpt. Forty-six read the Removed Pen version. Each subject read a version as a brief exercise in class or as a short additional task at the end of an experimental session. All the subjects were members of the Yale University community. Each version was introduced by the same paragraph that framed the text as an excerpt from the Bond corpus:

> The following is an excerpt from Fleming's first James Bond novel, *Casino Royale*. In this book, Bond has been assigned to 'ruin' a criminal figure named Le Chiffre by, as it happens, causing Le Chiffre to lose a considerable amount of money gambling. Along the way, Bond has acquired a lady interest named Vesper. Although Bond has, in fact, brought about the gambling losses, Le Chiffre has laid a successful trap for Bond. Bond and Vesper are now the prisoners of Le Chiffre and his two gunmen.

Subjects then read either the No Mention or Removed Pen version of the text.

On a separate page, subjects made two judgments with respect to the text. They were first asked to answer the question, "How likely is it that Bond will escape from Le Chiffre?" The scale ratings ranged from 1 ('not very likely') to 7 ('extremely likely'). This question was intended to demonstrate that subjects believed the overall likelihood that Bond would escape to be high and roughly equivalent in both versions of the excerpt. Subjects were next asked to respond to a second question: "Even if you think it's likely that Bond will escape, Fleming would like you to feel suspense about Bond's fate while you are reading this passage. How suspenseful do you find this passage to be?" Once again, subjects' responses could range from 1 ('not very suspenseful') to 7 ('extremely suspenseful'). We expected subjects to report more suspense when Bond's pen had been removed.

2.1. Results and discussion

When asked "How likely is it that Bond will escape from Le Chiffre?", subjects reading both versions of the passage gave ratings that suggested they believed this outcome to be very likely: On the 7-point scale, subjects reading the Removed Pen version gave mean ratings of 5.74; subjects reading the No Mention version gave mean ratings of 6.03. These means are not reliably different ($t(89) < 1$). By contrast, when asked how suspenseful they found the passage to be, subjects gave reliably higher ratings when Bond's pen had been removed (mean = 4.38) than when it had not been mentioned (mean = 3.78; $t(89) = 2.23$, $SD = 1.32$, $p < 0.03$).

These results conform to our prediction that material within a text that appears to restrict a characters' range of possible solutions to a problem will lead to greater feelings of suspense. In absolute terms, our readers did not report high levels of suspense (i.e., the ratings were just around the mid-point). These ratings were very likely affected by our readers' relatively high certainty that Bond would, in fact, extract himself from this dilemma. Against that background, however, readers who believed that Bond was going to have to escape without the aid of his pen reported

more suspense than those who had no reason, on their own, to imagine him to be in possession of such a valuable pen.

Although we favor a problem-solving interpretation of this result, Experiment 1 permits an alternative explanation. It could be the mere mention of the pen, and not its removal, that brings about the increase in reports of suspense. Experiment 2 was designed to rule out this alternative.

3. Experiment 2

Our analogy to problem solving suggests that readers should experience more suspense when they are led to believe that solutions to the hero's dilemma have been eliminated. An alternative possibility, consistent with the results of Experiment 1, is that the mention of new solutions alone could enhance suspense. To address this possibility we replicated Experiment 1, but included a third version of the excerpt that we will call the *Mentioned-Not Removed* version. In this version, the pen is introduced (via the first text in curly brackets in Table 1), but not removed. If the mere mention of the pen is sufficient to arouse suspense, we would expect readers to report as much (or more) suspense as they do in the Removed Pen version. The problem-solving analogy, however, makes another prediction. Once readers perceive the pen to be a ready solution to Bond's predicament, they may only wonder how Bond will use the pen to escape. They may be vague, that is, about the exact moves of Bond's solution. But as long as the readers aren't given any reason to believe that these moves will be particularly daunting, they should feel no extra suspense when asked only about Bond's fate.

Forty-nine subjects read the Pen Removed and Mentioned-Not Removed versions of the excerpt; fifty-one read the No Mention version. All subjects were students at the University of the Philippines and performed the task as part of a class exercise. The same subjects participated in Experiments 2 and 5 with the order of excerpts from the two experiments counterbalanced. As in Experiment 1, subjects provided ratings of probability of escape and suspense.

3.1. Results and discussion

When asked "How likely is it that Bond will escape from Le Chiffre?", subjects in Experiment 2 were again confident that Bond would ultimately escape (No mention, mean rating = 5.86; Mentioned-Not Removed, mean rating = 5.45; Pen Removed, mean rating = 5.51). These ratings are not reliably different (all t's < 1.35), suggesting that readers were not much influenced by the details of the text in judging the overall likelihood of a solution. Even so, these ratings are somewhat lower than in Experiment 1. It is possible that Bond is not etched so invincibly in Filipino culture as in American. Against this background, however, our readers reported heightened suspense only when the pen had been mentioned *and* removed (No mention, mean rating = 3.43; Mention-Not Removed, mean rating = 3.47; Pen Removed, mean rating = 4.06). The ratings for the Pen Removed version

differed from both of the other versions (versus No Mention, $t(98) = 2.07$, $SD = 2.32$, $p < 0.05$; versus Mentioned-Not Removed, $t(96) = 2.06$, $SD = 2.01$, $p < 0.05$) and the No Mention and Mentioned–Not Removed versions did not differ from each other ($t < 1$).

These results provide a replication of Experiment 1 and also reinforce our interpretation of that experiment. In line with our analogy to problem solving, suspense only increased when a solution was offered and then snatched away. In Experiment 3, we extend this result by showing that the removal of an object comparable to a pen – Bond's pocket comb – affects perceptions of suspense only to the extent that its value for escape has not been undermined by ordinary use.

4. Experiment 3

Experiments 1 and 2 demonstrated that reports of suspense covary with readers' perceptions that a potential solution has been removed. In this third experiment we created a textual analog to a situation of *functional fixedness* to show that readers' suspense ratings were reduced if they overlooked a potential solution. In an early demonstration of functional fixedness, Duncker (1945) challenged his subjects to mount a candle on a door when the only materials at hand were the candle itself, a box of tacks, and a book of matches. To solve the problem, subjects had to achieve the insight that they could empty the tacks out of the box to use it as a support for the candle. Many subjects, however, failed to find this solution, apparently because they were fixed on the box's function as a container. In Experiments 1 and 2, we showed that the removal from Bond's possession of an ordinary object like a pen could increase readers' perception of suspense. Our hypothesis for Experiment 3 was that we could eliminate this effect of pruning a solution path if our readers' attention was fixed on the ordinary function of the object removed.

Once again we wrote two versions of what was announced to be an excerpt from *Casino Royale*. The framing introduction was identical to the first two experiments (i.e., we used the same capsule summary of the plot) but, in this case, the critical item was a pocket comb. As shown in Table 2, in the *Unused Comb* version of the excerpt Le Chiffre deprives Bond of this comb. The *Used Comb* version differs only in that Bond uses his comb for its usual function early in the excerpt. Note that, just as in Experiments 1 and 2, the formal range of solutions available to Bond is identical at the end of both versions.

Fifty-four students from the University of the Philippines read each excerpt. The same subjects participated in Experiments 3 and 4 with the order of excerpts from the two experiments counterbalanced. The students received a cover page that reminded them "In 1954, Ian Fleming introduced Secret Agent 007, James Bond, in the novel *Casino Royale*. In the years after that, Fleming invented a large number of enemies for Bond to overcome". The instructions went on to tell them that they would be reading excerpts from Fleming's novels and would be asked to report the amount of suspense they felt in response to each excerpt. For Experi-

Table 2
Excerpts for Experiment 2

Filled with confidence after defeating Le Chiffre, Bond had extended an invitation to Vesper to dine with him in the hotel restaurant. She had cheerfully accepted.

(Bond looked in the mirror of his hotel room to make certain that his black tie was centered in his collar. He noticed that he had a white thread on his lapel, and removed it. Bond smiled at the elegant figure he presented.)

{Bond looked in the mirror of his hotel room to make certain that his black tie was centered in his collar. He noticed that his hair was just the least bit mussed, so he extracted his comb from his pocket and smoothed his wandering locks back into place.}

As Bond turned to leave the room, the door burst in toward him. Three large men leapt through, guns drawn. The largest of the men was Le Chiffre, Bond's recently vanquished opponent.

As the three men approached him, Bond suddenly whirled around and caught one of the gunmen squarely in the stomach with a well-placed shove of his heel. Unfortunately, the second gunman had accurately judged the rest of Bond's motion. He caught Bond's shoe at the top of its arc and twisted it sharply. As he crashed to the ground, Bond rolled agilely and, with a motion in which he took great pride, he righted himself with minimal damage. Bond was unharmed, but he was trapped.

"Search him," barked Le Chiffre.

The two gunmen carefully searched Bond. They roughly stripped Bond's revolver out of its shoulder holster. They twisted him around in search of other weaponry.

Le Chiffre observed his assistants' work attentively. He crossed the room to Bond, and patted him down once again. Le Chiffre pulled out Bond's pocket comb and ran his finger down its teeth. He smiled broadly, and flipped the comb well out of Bond's reach. "Come, my dear friend," said Le Chiffre. "Let's not waste time."

Bond felt puny and impotent.

Note: The Unused Comb version of the excerpt included the material in parentheses. The Used Comb version included the material in curly brackets. The rest of the text was shared by both versions.

ment 3, subjects read either the Unused Comb or Used Comb version of the excerpt. They provided the same ratings of probability of escape and suspense as in Experiments 1 and 2.

4.1. Results and discussion

When asked "How likely is it that Bond will escape from Le Chiffre?", subjects in Experiment 3 were again confident that Bond would ultimately escape (Unused Comb, mean rating = 5.20; Used Comb, mean rating = 5.24). As in the earlier experiments, these ratings were not reliably different ($t(106) < 1$). However, our readers reported reliably less suspense when they had read a scene in which Bond had used the comb for its normal function (Unused Comb, mean rating = 3.96; Used Comb, mean rating = 3.41; $t(106) = 2.14$, $SD = 1.82$, $p < 0.04$).

These results provide a useful contrast to Experiments 1 and 2. In those cases, the removal of Bond's pen caused reports of suspense to be increased – even though readers may not have had a very specific idea of why Bond wanted to retain

the pen, its removal had a reliable impact on their feelings. In Experiment 3, we undermined the effect of the removal of an object by letting our readers experience its normal function. Once the readers came to think of the comb as just a comb it lost much of its value as a means of escape. We have shown, therefore, in Experiment 3 that the problem-solving phenomenon of functional fixedness can be exploited to influence readers' perceptions of suspense. In our next experiment, we exploit a second major barrier to problem solution as another way to influence suspense.

5. Experiment 4

For Experiment 4, we created a text that was intended to make readers feel as if the paths to solution were being pruned, by analogy to *set* effects in problem solving. In another classic demonstration, Luchins (1942) presented subjects with a series of problems in which they had, mentally, to use three pitchers of varying sizes to produce a particular amount of water. In each of several trials, subjects could solve the problem by carrying out the same series of manipulations of pitchers labeled *A*, *B*, and *C* (e.g., the solution might be B-A-2C). On one critical trial, Luchins gave his subjects a problem that could be solved using an easier solution. Subjects continued to use the more complicated solution that was already set in mind. On a second critical trial, Luchins gave his subjects a problem that could not be solved using the solution they had learned – but could be solved using a simpler method. Subjects most often failed to solve this problem. Experiment 4 was designed to create a textual version of such a set effect by denying to Bond an escape solution he had used in the past.

The first version of this excerpt, which we call the *No Mention* version, contained no information about any earlier interactions between Bond and the villain Blofeld (see Table 3).

The *Prior Solution Removed* version, by contrast, specifically alluded to past circumstances in which Bond was Blofeld's prisoner and made it clear that Blofeld had taken pains to eliminate an important component of Bond's past means of escape. We suggest that when the success of this critical move is made remote, readers will act as if a likely solution path has disappeared as well. Note that, unlike the earlier experiments, in this case the reader does have good reason to believe that the situations are dissimilar, with respect to potential solutions, at the end of the excerpts. Just as in the second type of critical trials in Luchins's experiment – in which a well-developed solution became unavailable – Bond's repertory has been impoverished. We predict, therefore, that readers will report more suspense when a prior solution has effectively been removed.

As in Experiment 3, 54 students read each version of this excerpt. Each excerpt was preceded by a paragraph that located it in the Bond corpus:

> This passage comes from the novel *On Her Majesty's Secret Service*. In this novel, Bond discovers that the villain Blofeld is secretly conditioning young

Table 3
Excerpts for Experiment 3

Blofeld smiled and said, "We must stop meeting like this Mr. Bond. I grow weary of pointing a gun at you."

Before Bond could reply, a large bird crashed into the wall of glass that made up one side of Blofeld's large office. Bond took advantage of the distraction to pull up one corner of the rug on which Blofeld stood. Blofeld stumbled backwards and his gun shot up into the air, knocking out the large light that had illuminated the room.

As Bond's eyes grew accustomed to the dark of the office, he hurried toward the door. He was met there, however, by a very large and very ugly man. Light from the hall spilled in, revealing another gun pointing at his chest.

Blofeld picked himself up off the ground and said, "I am not amused by your antics Mr. Bond. I hope you understand that my good friend here, Mr. Crushak, is devoted to eliminating such irritations from my life." At this, the large man contorted his face into what he might have intended as a smile. It made him look no less ugly. Blofeld continued, "Tie up Mr. Bond."

Crushak forced Bond into a wooden arm chair, and carefully pinned Bond in place by wrapping a piece of piano wire around each of the chair's arms and Bond's arms. Each subsequent twist of the wire bit more painfully into Bond's flesh.

(Crushak grunted to indicate that he was done. Blofeld said, "My dear Mr. Bond. You came here as my guest and now I find you going through my personal belongings. I don't think you have behaved very well. I will leave you here with Mr. Crushak to contemplate your rude behavior.")

{Crushak grunted to indicate that he was done. Blofeld said, "My dear Mr. Bond. The last time I held you in captivity, you were able to outwit my guard. He died soon after that in an automobile accident, poor fellow. Crushak here will be responsible for you this time. He has orders to shoot you if you even attempt to speak to him."}

Blofeld left the room with his shoulders set in an attitude of triumph.

Note: The No Mention version of the excerpt included the material in parentheses. The Prior Solution Removed version included the material in curly brackets. The rest of the text was shared by both versions.

women to spread a virus deadly to agriculture and livestock across England. In this excerpt, Bond has been caught searching Blofeld's private office.

After reading one of the two versions, subjects provided the same pair of ratings as in the earlier experiments.

5.1. Results and discussion

When asked "How likely is it that Bond will escape from Blofeld?", subjects in Experiment 4 provided ratings roughly comparable to Experiments 2 and 3 (No Mention, mean rating = 5.30; Prior Solution Removed, mean rating = 5.17). These ratings are not reliably different ($t(106) < 1$), echoing the same relative equivalence found in the earlier experiments. By contrast, our readers reported reliably more suspense when they had read a scene in which Bond's past solutions were

unavailable than when they had no information to that effect (No Mention, mean rating = 3.76; Prior Solution Removed, mean rating = 4.61; $t(106) = 3.64$, $SD = 1.48$, $p < 0.0005$).

These results largely provide a replication of Experiments 1 and 2, but with a different mechanism for creating the perception that solutions have been cut off. In those first two experiments, the solution was a physical object that was removed from Bond's possession. In this fourth experiment, the solution is some unknown method that had worked for Bond in the past. In both cases, subjects made only small adjustments in their judgments of the general likelihood that Bond would escape. By contrast, they reported reliably more suspense in response to both textual additions that pruned the perceived paths to solution. In Experiment 5 we further refine our 'set' effect.

6. Experiment 5

To create a 'set' in Experiment 4 we had the villain Blofeld tell Bond that he should not expect to outwit his guard this time around. Part of the text, however, was also a threat: "[The guard Crushak] has orders to shoot you if you even attempt to speak to him". To ensure that it was the pruning of a possible solution, and not this threat, that brought about the increase in suspense, we added a third version of the excerpt, which we will call *No Threat*. This text was identical to the Prior Solution Removed text except that it omitted the threatening language. Because we believe that problem-solving forces gave rise to our results, it is critical to demonstrate that suspense is enhanced with or without the threat. Experiment 5 also gives us the opportunity to replicate our basic effect.

Forty-nine students from the University of the Philippines read each of the set versions of the excerpt (Prior Solution Removed and No Threat); fifty read the No Mention version.

6.1. Results and discussion

When asked "How likely is it that Bond will escape from Blofeld?", subjects provided very similar ratings for all three versions of the excerpt (all t's < 1; No Mention, mean rating = 5.78; Prior Solution Removed, mean rating = 5.63; No Threat, mean rating = 5.50). Even so, suspense ratings were higher for both set versions of the excerpt than for the No Mention version (No Mention, mean rating = 3.34; Prior Solution Removed, mean rating = 3.99; No Threat, mean rating = 4.14). Ratings for the two set versions were not reliably different ($t < 1.0$) but each of the set versions differed from the No Mention version (versus Prior Solution Removed, $t(98) = 2.25$, $SD = 2.02$, $p < 0.03$; versus No Threat, $t(96) = 3.04$, $SD = 1.72$, $p < 0.005$). These data reinforce our main claim from Experiment 4: The boost in suspense follows from the readers' 'set' rather than from the explicit threat against Bond.

7. Experiments 6 and 7

For Experiments 6 and 7, we chose to replicate two of the earlier experiments without James Bond. Although it seemed unlikely, we wanted to ensure that readers were not undertaking problem-solving-like behavior only because of specific familiarity with James Bond. Experiment 6 was identical to Experiment 1 except that the hero was renamed Sean Rogers, the villain was renamed Chiffrex, and the book was called *Meeting at Midnight*. Experiment 7, similarly, was identical to Experiment 4 except for changes to John Block, Halweitz, and *Twenty Miles to the Sea*.

Fifty-five students from the University of the Philippines read each version of the excerpt. The same students participated in Experiments 6 and 7 and read the appropriate excerpts in counterbalanced order.

The means for these two replications are presented in Table 4. Although all the mean ratings are lower than in the original experiments – that, perhaps, is the contribution of James Bond – the patterns of responses are identical. For both experiments, mean likelihood of escape ratings did not differ between the experimental and control conditions (Experiment 6: $t(108) = 1.20$; Experiment 7: $t(108) < 1$). Each of the original suspense effects, however, was replicated. As in Experiment 1, readers reported more suspense for the Removed Pen version than for the No Mention version ($t(108) = 2.10$, $SD = 1.85$, $p < 0.05$). As in Experiment 4, readers reported more suspense for the Prior Solution Removed version than for the No Mention version ($t(108) = 1.96$, $SD = 1.85$, $p = 0.05$). These replications improve our confidence in the analogy between the experience of suspense and the activities of problem solving.

8. General discussion

Our results support the general hypothesis that passages of texts that create the impression that solution paths are being pruned away will lead readers to report

Table 4
Comparisons of experimental means

	Type of rating			
	Likelihood of escape?		Suspense?	
	Removed pen	No mention	Removed pen	No mention
Experiment 1	5.74	6.03	4.38	3.78
Experiment 2	5.51	5.86	4.06	3.43
Experiment 6	3.89	4.24	3.95	3.40
	Solution removed	No mention	Solution removed	No mention
Experiment 4	5.17	5.30	4.61	3.76
Experiment 5	5.50	5.78	3.99	3.34
Experiment 7	4.45	4.38	3.91	3.40

more suspense. In Experiments 1 and 2, we created the perception of pruning by depriving Bond of his fountain pen. Readers reacted by giving higher ratings of suspense. In Experiment 3, we deprived Bond of his pocket comb, but when the comb had already been used for its ordinary function reports of suspense were lower. In Experiments 4 and 5, we deprived Bond of (unnamed) avenues of escape that had succeeded in the past. Once again, readers reacted with higher suspense ratings. Experiments 6 and 7 demonstrated highly similar patterns of response when James Bond was replaced as hero. Taken together, these results support our contention that readers experience suspense in parallel to their frustration as problem solvers. There are, of course, other ways in which authors can create suspense. Our data support the claim, however, that one reliable way to create suspense is to prune the readers' perceptions of paths toward solution.

Although our experiments examine suspense within specific circumstances of danger in spy novels, we believe that the analogy has broader scope to a wide variety of texts. For example, in terms of the analogy to problem solving, authors often arrange circumstances so that readers perceive initial states and goal states independent of the characters. Readers, thus, often experience suspense when characters themselves are unaware that any misfortune is about to befall. Consider a car chase late in *Casino Royale*. The reader knows, but Bond does not, that the car he has been chasing has braked suddenly and pulled off the road. The suspense the reader experiences at this moment is not felt by Bond himself. This situation, furthermore, exemplifies what might be the most frequent problem-solving structure for suspense: circumstances in which the readers' initial state is ignorance and their goal state is enlightenment. For *Casino Royale*, what the reader does not know is exactly what Le Chiffre is up to. In almost every sustained narrative, however far from the genre of James Bond, authors create suspense about how the future will unfold. In each case, we claim, a strong analogy can be made to circumstances of problem solving.

We note, finally, that readers have a good deal of strategic control over the extent to which they will explicitly become problem solvers (see Gerrig, 1993). If readers wish, they can briefly put aside a novel to consider how, if they were James Bond, they would escape from Le Chiffre or what trap, if they were Le Chiffre, they might have planned for Bond. If they are reading *Crime and Punishment*, they might muse over the available evidence to guess whether Raskolnikov will turn himself in. If they are reading *Jane Eyre*, they might try to guess who exactly is being kept up in the attic. To the extent that readers cannot navigate their way to a solution, they will have an enhanced experience of suspense.

References

Brewer, W.F. and E.H. Lichtenstein, 1981. Event schemas, story schemas, and story grammars. In: J. Long and A. Baddeley (eds.), Attention and performance IX, 363–379. Hillsdale, NJ: Erlbaum.

Brewer, W.F. and E.H. Lichtenstein, 1982. Stories are to entertain: A structural-affect theory of stories. Journal of Pragmatics 6, 473–486.

Brewer, W.F. and K. Ohtsuka, 1988a. Story structure, characterization, just world organization, and reader affect in American and Hungarian short stories. Poetics 17, 395–415.

Brewer, W.F. and K. Ohtsuka, 1988b. Story structure and reader affect in American and Hungarian short stories. In: C. Martindale (ed.), Psychological approaches to the study of literary narratives, 133–158. Hamburg: Buske.

Duncker, K., 1945. On problem solving. Psychological Monographs 58, whole no. 270.

Fleming, Ian, 1954. Casino royale. New York: Macmillan.

Gerrig, R.J., 1993. Experiencing narrative worlds. New Haven, CT: Yale University Press.

Gerrig, R.J. and D.W. Allbritton, 1990. The construction of literary character: A view from cognitive psychology. Style 24, 380–391.

Greeno, J.G., 1978. Natures of problem solving abilities. In: W.K. Estes (ed.), Handbook of learning and cognitive processes, Vol. 5, 239–270. Hillsdale, NJ: Erlbaum.

Kotovsky, K., J.R. Hayes and H.A. Simon, 1985. Why are some problems hard?: Evidence from tower of hanoi. Cognitive Psychology 17, 248–294.

Kotovsky, K. and H.A. Simon, 1990. What makes some problems really hard: Explorations in the problem space of difficulty. Cognitive Psychology 22, 143–183.

Luchins, A.S., 1942. Mechanization in problem solving. Psychological Monographs 54, whole no. 248.

Newell, A. and H.A. Simon, 1972. Human problem solving. Englewood Cliffs, NJ: Prentice-Hall.

Simon, H.A. and A. Newell, A, 1971. Human problem solving: The state of the theory in 1970. American Psychologist 26, 145–159.