

# The impact of pictures on narrative- and list-based impression formation: A process interference model <sup>☆</sup>

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## Abstract

Pictures can often facilitate the comprehension of a person's behavioral descriptions. However, this is not always the case. When the implications of several different behaviors at various points in time must be combined to form an overall impression of someone, the effect of pictures on this impression depends on how the behavioral descriptions are presented. When the events in a person's life are conveyed in a narrative that indicates the order in which they occurred, people are likely to defer an evaluation of the individual until the story is complete. In this case, pictures facilitate the construction of the story and increase the extremity of the impressions that are based on it. When the same events are presented in an ostensibly unordered list, however, recipients perform an on-line integration of the evaluative implications of each piece of information as it is presented. Pictures are often irrelevant to this semantic integration process and distract recipients from performing it effectively, resulting in a decrease in the extremity of evaluations. Four experiments confirmed these effects and the processes and mental representations that underlie them.

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Person impressions are often based on both verbal and visual information. The effects of these types of information are frequently interdependent. For example, women are likely to give relatively less weight to a man's personality trait descriptions when deciding whether they would like to date him if the descriptions are accompanied by a physically unattractive photograph rather than an attractive one (Lampel & Anderson, 1968). Also, viewing a politician's nonpolitical speech can lead individuals to apply more global (i.e., ideology-based) criteria in evaluating his issue positions than they otherwise would, and thus can affect

their evaluations of him (Wyer et al., 1991). Despite this evidence, research and theory on person perception and impression formation has typically considered the impact of each type of information in isolation (for reviews, see Carlston & Smith, 1996; DePaulo & Friedman, 1998; Wyer & Srull, 1989). Consequently, little is known about the manner in which verbal and visual information combine to influence person impressions when both types of information are presented simultaneously.

The effects of visual and verbal information may depend in part on how the verbal information is presented and, therefore, the strategies that recipients use to construe the implications of this information. In some cases, a person's behaviors are described in a narrative that indicates the temporal sequence in which they occurred. In this case, the temporal relatedness of the information can be informative (cf. Jones & Goethals, 1971; Read, Druian, & Miller, 1989). Consequently, recipients are unlikely to draw a conclusion about the character of the protagonist until the entire

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sequence of events has been presented and the story is complete (cf. Pennington & Hastie, 1986, 1988). Pictures that are presented with this type of information are likely to increase the vividness of the individual events, and can also provide perceptual links between these events, thereby increasing the story's coherence. Consequently, they are likely to increase the clarity of the implications that are drawn from the events that make up the story and (if the implications are either generally positive or generally negative) the extremity of the evaluation that is based on them.

In much of the research on person impression formation, however, an individual's behaviors are conveyed in an unordered list, and their temporal or thematic relatedness is not apparent (cf. Srull & Wyer, 1989). For example, an individual may be described as reading bedtime stories to his neighbor's children, arguing with his landlord etc. In this case, recipients of the information may treat each behavioral event as independent. That is, they may extract the evaluative implications of each event separately and perform a piecemeal integration of their implications in the manner suggested by Anderson (1971) or Fishbein and Hunter (1964). Pictures, which are not involved in this semantic integration process, might distract the individuals from performing it effectively. To this extent, they might decrease the extremity of judgments that recipients would have made in the absence of this distraction, offsetting any other facilitative effects that the pictures might have.

Four experiments support these contentions. Participants formed impressions of politicians on the basis of events that occurred during their careers. The events were presented in either a narrative that conveyed the sequence in which they had occurred over the individual's lifetime or an unordered list (i.e., without any specification of the order in which they occurred) and pictures either accompanied the descriptions or did not. Experiments 1 and 2 demonstrated that pictures have directionally different effects on the extremity of the impressions that participants form on the basis of written behavioral descriptions, depending on the format in which the descriptions are presented. The remaining experiments evaluated specific assumptions concerning (a) the different types of representations that are formed when information is conveyed in different formats, and (b) the potential impact of the processing strategies that are activated by these formats.

## Theoretical background

### *The influence of verbal information on comprehension and integration*

Research in both social and cognitive psychology has identified how the mental representations that are formed from verbal event descriptions depend on how the information is presented (Barsalou & Sewell, 1985; Wyer & Bodenhausen, 1985). When descriptions of a person's behavior are conveyed in an unordered list, as in previous research on person impression formation (Srull & Wyer, 1989), peo-

ple with the goal of forming an impression of the person typically organize the behaviors around a central concept of the person. However, they normally do not think about the behaviors in relation to one another unless the behaviors are inconsistent with the central concept (Hastie & Kumar, 1979; Srull, 1981). Moreover, they arrive at an evaluation of the individual by combining the evaluative implications of the individual behaviors mechanistically in a manner suggested by Anderson (1971; see also Fishbein & Hunter, 1964). This computation may be performed on line. That is, recipients may form an initial impression of the individual on the basis of the first behavior they receive. Then, they "update" this impression by integrating the implications of each new behavior with those of the information they received earlier (Hogarth & Einhorn, 1992; Park, 1986).

Quite different comprehension and integration processes are likely to occur when descriptions of a person's behavior are temporally and thematically related. In this case, recipients are likely to think about the implications of each behavioral event in relation to the events that precede or follow it (Jones & Goethals, 1971). In the course of this activity, they are likely to form a narrative-based representation of the sequence as a whole (Colcombe & Wyer, 2002; Graesser, Singer, & Trabasso, 1994; Schank & Abelson, 1995; Wyer, 2004; Wyer, Adaval, & Colcombe, 2002), and to extract meaning from the order in which the events occur (Jones & Goethals, 1971; Pennington & Hastie, 1986, 1988; Read et al., 1989). Furthermore, recipients may not form an impression of the protagonist until the story conveyed by the narrative is complete. That is, they may base their evaluation on the story as a whole without considering the implications of any particular behavior in isolation.

These different (piecemeal and holistic) judgment strategies can have different effects. Pennington and Hastie (1986, 1988, 1992) found that when courtroom testimony was ordered according to the witness who provided it, the impact of each piece of information was largely determined by the credibility of the witness. In some cases, however, the testimony was conveyed in a narrative that facilitated the construction of a temporal sequence of the events that surrounded the crime. In these cases, the impact of a particular piece of evidence depended on its consistency with the sequence as a whole, independently of witness credibility. In a related vein, Adaval and Wyer (1998) found that negative features of an otherwise attractive vacation trip had less impact on evaluations if they were described in a narrative that indicated when they would occur during the trip than if they were described in a list without any indication of their order. Thus, both series of studies suggest that when events are presented in a temporal sequence, their implications are evaluated on the basis of the sequence as a whole, and so individual events have relatively less impact.

Although the impact of individual behavioral events is likely to be less when information is presented in a narrative than in an unordered list, the extremity of the overall judgments that are based on information that is conveyed

in different formats is difficult to predict. In some cases, judgments might be more extreme when information is presented in temporal order. For example, when an understanding of the temporal order of events is important for the judgment to be made (e.g., in determining the motivation for a crime in a courtroom trial), describing them in temporal order is likely to increase confidence in their implications as a whole, and therefore, is likely to lead to more extreme evaluations (Pennington & Hastie, 1986, 1988, 1992; see also Jones & Goethals, 1971). Presenting information in a narrative can also be effective when recipients are motivated to imagine themselves participating in the situation being described (e.g., identifying with a protagonist while reading a novel) and become “transported” into the story as it unfolds (Green & Brock, 2000).

In many other instances, however, the impact of information that is conveyed in different formats can depend on idiosyncratic characteristics of the events and the purpose for which the information is being used. For example, the events, “John’s wife had an affair” and “John severely beat a male acquaintance” might create a very negative impression of John if the events are seen as unrelated. However, John’s behavior may be easier to understand, and thus less undesirable, if the events are conveyed in temporal order and the second event is seen as a consequence of the first. Opposite examples can easily be generated as well. In short, a priori generalizations concerning the relative advantage that one format has over the other cannot be made. However, the effects of pictures on the processing of information presented in these formats are more predictable. We now consider these effects.

#### *The influence of pictures on comprehension and integration*

Verbal descriptions of a behavioral event often elicit a visual image at the time the behavior is comprehended (Wyer & Radvansky, 1999; see also Black, Turner, & Bower, 1979; Garnham, 1981; Glenberg, Meyer, & Lindem, 1987). The construction of this image is facilitated if recipients of the information are given a picture of the protagonist engaging in this behavior. This facilitation could occur even if the picture does not directly depict the action to which the information refers. For example, a picture of a person’s physical appearance could stimulate the formation of a *perceptual symbol* (Barsalou, 1993) that is used to construct a visual image of the individual engaging in the activities that are described verbally. Consider an intuitive example. Persons who have previously formed a perceptual symbol of Bill Clinton are more likely to form a clear mental image of the statement “Bill Clinton played a saxophone” than of the statement “the man played a saxophone.” This is likely to occur even if they have personally never seen Clinton playing the saxophone or an image of the event. In short, a picture can lead a verbal event description to be represented more vividly and, therefore, to be seen as having more extreme implications.

Pictures may have similar effects on the comprehension of individual behaviors regardless of the format in which the behaviors are presented. However, they can have different effects at a later stage of processing, when implications of the behaviors are combined to form an overall impression. These effects can depend on the type of processing that occurs at this stage. As noted earlier, recipients may attempt to construct a story based on the sequence of temporally ordered events (Wyer & Bodenhausen, 1985) and may not form an impression of the protagonist until the story conveyed by the events is complete. In this case, the perceptual symbols that are formed on the basis of pictures of the protagonist can facilitate the construction of the story and give it coherence. Thus, suppose a person reads that “Bill Clinton played the saxophone. He then ate dinner and, after eating, practiced his speech.” The perceptual symbol of Clinton, which is common to all three events, provides “cognitive glue” that leads the individual’s actions to be visually and thematically linked. When the protagonist in the events described is unknown, a picture of him or her could create a perceptual symbol that functions similarly. To this extent, the pictures may facilitate an integrated representation of the sequence of events that strengthens the impression of the individual to whom it pertains. The evaluation of the individual may therefore be more extreme than it would be in the absence of the pictures.

Different considerations arise when a person’s behaviors are conveyed in an unordered list. Schooler (2002; Dodson, Johnson, and Schooler, 1997) suggests that if two different (e.g., holistic and piecemeal) processes are activated simultaneously; they can interfere with one another, decreasing the effectiveness of each. Process interference could occur in the conditions we describe as well. Specifically, pictures are processed holistically (Schooler, 2002; Schooler, Fiore, & Brandimonte, 1997; see also Kosslyn, 1980). If they accompany the verbal information that is conveyed in a list, this process could interfere with the piecemeal, mechanistic integration process that governs the computation of evaluations in this condition (Anderson, 1971; Fishbein & Hunter, 1964). The effect of this interference could offset or even override the facilitative effects of pictures at the comprehension stage. That is, it could decrease the extremity of judgments that would be made in the absence of the pictures. These considerations are summarized in the following hypothesis:

**H1.** Accompanying verbal descriptions of a person’s behaviors by pictures will increase the extremity of evaluations of the person when the behaviors are conveyed in a temporally ordered narrative, but will decrease the extremity of evaluations of the person when the behaviors are conveyed in an unordered list.

The hypothesized effects of pictures on the processing of the verbal information they accompany should be distinguished from other effects that the pictures might have. That is, pictures of a person’s physical features or

demeanor provides additional information about the person that could have a direct effect on evaluations over and above the pictures' impact on how the verbal information is processed. This confound prevents a clear interpretation from being made of the effect of pictures under each presentation format condition separately. The opposing effects of pictures on information processing in the two format conditions can nevertheless be inferred from the interactive effects of pictures and information presentation format that is evident once variation due to the main effects of these variables on judgments is eliminated. The interaction contrast corresponds to the *relative* impact of pictures on the processing of information in a narrative vs. a list, and provides a test of our hypothesis independently of any other general effects that pictures or presentation format might have. This contrast was therefore used as the primary basis for evaluating our hypothesis.

## Experiment 1

### Method

#### Overview and design

Participants received descriptions of several behavioral events that occurred over the course of a politician's career.<sup>1</sup> The events were either predominantly favorable or predominantly unfavorable. Furthermore, they were either written in a narrative that indicated the time at which they occurred in the course of the politician's life, or were conveyed in a list with no indication of their temporal order. Finally, the information was either accompanied by a picture of the protagonist, or was not. In each case, participants after reading the information evaluated the politician and indicated the feelings they experienced in reaction to the information.

Sixty undergraduate business majors participated. Participants were assigned randomly to the eight conditions of a 2 (presentation format: narrative vs. list) × 2 (pictures: presented vs. not presented) × 2 (information favorableness: favorable vs. unfavorable) design.

#### Stimulus materials

The written information about the politician (named "John Harrison") described eight activities that occurred over the course of his career. In *narrative-format, favorable-information* conditions, the information was conveyed on a single page in the form of a narrative that indicated the temporal relatedness of the events; for example:

John Harrison was a World War II veteran and served as Governor of Michigan before serving two terms in the U. S. Senate. He displayed great courage during the war, risking enemy gunfire to save lives when American troops were suffering heavy losses. After the war, he was elected Governor of Michigan. While Governor, he went on television to oppose the construction of a nuclear waste processing plant that would contaminate the city's water supply....

Other information described him as donating his summer home for use by a charitable organization, supporting tax breaks for businesses that hired people who were currently poor and unemployed, etc.

In *list-format, favorable-information* conditions, the same information was conveyed in bullet-point without any indication of the order in which the events occurred:

- John Harrison was a World War II veteran; Governor of Michigan; served two terms in the U. S. Senate.
- Risked enemy gunfire to save lives when American troops were suffering heavy losses in World War II.
- Went on television to oppose the construction of a nuclear waste processing plant that would contaminate the city's water supply....

In two other, *unfavorable-information* conditions, the information was conveyed in similar formats. In each condition, however, five of the eight event descriptions were modified to reflect unfavorable acts rather than favorable ones. For example, a description of Harrison going on television to oppose the construction of a nuclear waste processing plant was changed to suggest his support for its construction, and the description of using his summer home for charitable purposes was replaced by an item that accused him of misusing funds to build it.

Finally, in *picture* conditions, the written material was preceded at the top of the page by a single black-and-white, head-and-shoulders picture of the politician. In *no-picture* conditions, verbal material was presented alone.

#### Procedure

Participants were told that (a) we were concerned with how clear an impression people form of famous personalities, (b) to understand this, we had selected several different political figures who were famous during their lifetime and had constructed profiles of the events that occurred during their career based on existing essays about them, and (c) we would like them to form an impression of one of these individuals.

After reading the materials, participants reported their impression of the politician along a scale from -5 (very unfavorable) to 5 (very favorable). After doing so, they were asked to state which of two strategies most closely described the way they formed their impression of him: specifically, whether they (a) "estimated the favorable-

<sup>1</sup> The choice of a politician as a stimulus person was dictated in part by the availability of pictures of individuals in the media. However, because politicians are often evaluated on the basis of both pictures and their activities at different stages in their careers, their use in the present context increased the ecological validity of the research as well.

Table 1  
 Impressions of politicians and feelings elicited by verbal information as a function of information favorableness, presentation format, and the presence of pictures—Experiment 1

	Favorable information		Unfavorable information		Extremity	
	Narrative format	List format	Narrative format	List format	Narrative format	List format
Impression of politician						
Pictures	2.70	1.70	−2.40	−1.20	2.55	1.45
No pictures	1.78	2.80	−0.40	−1.20	1.09	2.00
Relative favorableness of feelings elicited by verbal information <sup>a</sup>						
Pictures	2.70	2.80	−5.20	−1.70	3.95	2.25
No pictures	2.11	3.40	−0.60	−3.40	1.36	3.40

<sup>a</sup> Scores are the difference between estimates of the positive feelings elicited by the information and the negative feelings elicited by it.

ness of each thing he did independently of others,” or (b) “imagined his life as a whole, from the beginning of his career to the end, rather than thinking about individual aspects of it.” These responses were coded 0 and 1, respectively. Then, participants indicated the extent to which the verbal descriptions of the politician elicited positive feelings, and also the extent to which they elicited negative feelings, along scales from 0 (not at all) to 10 (very much). Finally, participants who were exposed to a picture of the politician indicated whether the picture made it easier or more difficult to form an impression along a scale from −5 (made it more difficult) to 5 (made it easier).

## Results and discussion

### Impressions

The picture of the protagonist was expected to facilitate the integration of the implications of events that are conveyed in a narrative and, therefore, to increase the extremity of judgments that are based on this information. However, it was expected to interfere with the piecemeal integration of information conveyed in a list and, therefore, to decrease the extremity of evaluations that result. Data bearing on these possibilities are shown in the top half of Table 1. An overall indication of the effect of pictures on the extremity of judgments can be seen by pooling over the two levels of information favorableness after reverse scoring the judgments made when the information presented was unfavorable. These effects are summarized in the last two columns of the table. As expected, presenting a picture increased the extremity of judgments when information was presented in a narrative (from 1.09 to 2.55) and decreased their extremity when information was conveyed in a list (from 2.00 to 1.45). As we noted earlier, these simple effects are potentially confounded with an informational effect of pictures on judgments that is independent of their impact on how the verbal information is processed. Thus, the appropriate test of our hypothesis is the interactive effect of format and pictures, which indicates the difference in the impact of the picture in the two format conditions. This difference was significantly greater when events were conveyed in a narrative

( $M_{\text{diff}} = 1.46$ ) than when they were conveyed in a list ( $M_{\text{diff}} = -0.35$ ), directional  $F(1, 47) = 3.86$ ,  $p < .025$ .<sup>2,3</sup>

The effect of pictures on the extremity of judgments is also evident in judgments at each level of information favorableness separately. Table 1 shows that when the information presented is favorable, pictures increased evaluations under narrative-format conditions (from 1.78 to 2.70) but decreased them under list-format conditions (from 2.80 to 1.70). When the information was unfavorable, the pictures decreased evaluations when information was conveyed in a narrative (from −0.40 to −2.40) and had no effect when the information was conveyed in a list (−1.20 in both cases). The predicted contrast corresponding to the interaction of pictures and presentation format was significant both when the information was favorable, directional  $F(1, 24) = 6.04$ ,  $p < .01$ , and when it was unfavorable, directional  $F(1, 23) = 3.62$ ,  $p < .03$ , and was virtually identical in magnitude in each case (1.01 and −1.00, respectively).

The assumption that the picture exerted its influence through its impact on how the verbal information was processed was reinforced by participants' ratings of the feelings that the written information elicited. The difference between the positive feelings that the information elicited and the negative feelings it elicited was computed for each participant separately. This difference is shown in the bottom half of Table 1 as a function of experimental manipulations. The pattern of these data is virtually identical to the pattern of overall evaluations. That is, favorable verbal information elicited positive feelings and unfavorable information elicited negative feelings. However, the picture increased the extremity of these feelings when the information was conveyed in a narrative but decreased their extremity when the information was conveyed in a list. Reverse scoring the data under unfavorable information

<sup>2</sup> Here and elsewhere, predicted main effects and interactions are evaluated on the basis of a directional  $F$ -test. In all cases, these tests, which involve a comparison of the mean of half the cells of the design with the mean of the other half, are equivalent to a one-tailed  $t$ -test, where  $F = t^2$ ; see Keppel (1991, pp. 122–123).

<sup>3</sup> This interaction is statistically equivalent to the three-way interaction of pictures, presentation format and information favorableness when judgments based on unfavorable information are not reverse scored.

conditions and reanalyzing them yielded the predicted interaction of presentation format and pictures, directional  $F(1, 51) = 3.78, p < .03$ . The contrast corresponding to this interaction ( $M_{\text{diff}} = 1.87$ ) is due to the fact that the feelings elicited by the narrative information were more extreme when a picture was presented than when it was not (3.95 vs. 1.36, respectively), whereas the feelings elicited by listed information were less so (2.25 vs. 3.40, respectively).

#### Supplementary data

Our assumption that the different processing strategies were activated by the two presentation formats was confirmed by participants' self-reports. A greater proportion of participants reported basing their judgments on the politician's life as a whole (rather than evaluating each event separately) when the information was conveyed in a narrative ( $M = .54$ ) than when it was conveyed in a list ( $M = .28$ ),  $F(1, 51) = 4.20, p < .05$ .<sup>4</sup> This was true regardless of whether the information was favorable or unfavorable and regardless of whether or not pictures were presented.

However, participants who saw a picture did not report that the picture made it any more or less difficult to form an impression when the information was conveyed in a narrative ( $M = 1.40$ ) than when it was conveyed in a list ( $M = 1.00$ ),  $F < 1$ . This suggests that participants may have been unaware of the facilitating or interfering effects of the picture on their processing of the written information.

The effect of the picture on the processing of narrative information appears to override any informational influence that the picture itself might have had. This influence would be reflected by an overall effect of the picture that was independent of the favorableness of the information presented as well as format conditions. Pooling over formats and levels of favorableness, however, evaluations were not appreciably different when a picture was presented ( $M = 0.20$ ) than when it was not ( $M = 0.69$ ). Thus, the informational influence of pictures per se appeared to be minimal in this study. (This might be attributed to the fact that only a single black and white picture of the candidate's face was presented and the pictures offered no additional information.)

## Experiment 2

A picture at the top of the same page as the verbal material was apparently sufficient to distract participants from performing the semantic integration involved in computing judgments under list-format conditions, thereby decreasing the extremity of evaluations in the manner we predicted. However, a clearer indication of the different processes that occur when information is in different formats might be obtained by presenting information in a way that ensures that participants process it in sequence. In Experiment 2,

the information concerning each life event was conveyed on a different page, and (under picture conditions) each event was accompanied by a different photograph. When the events were not temporally related, we expected participants to form an impression based on each behavioral event and to update their on-line impression of the target as each new event was described. In this case, pictures that accompany the event descriptions should interfere with this updating and integration process. When the events were temporally related, however, we expected that participants would not form an impression of the politician until they could construct a coherent narrative-based representation of his life as a whole. In this case, pictures should facilitate the construction of this narrative representation and should increase the extremity of the impression that is based on it, for reasons noted earlier.

## Method

### Overview and design

Participants received two brochures, each concerning a different politician. Each brochure described a series of events in the politician's career. Each event was described on a separate page, thus ensuring that the events would be read sequentially. However, the events in one brochure were conveyed in a narrative, and the events in the other brochure were conveyed in a list. In *no-picture* conditions, both the brochures contained only verbal descriptions of the events. In *picture* conditions, a black-and-white photograph accompanied each event description. Participants read both brochures and then, after doing so, reported their impression of each politician.

Sixty-four introductory psychology students participated to fulfill a course requirement. Participants were assigned randomly to each of four combinations of picture presence (picture vs. no picture) and format presentation order (narrative brochure presented first vs. list brochure presented first).

### Stimulus materials

The text of each brochure described an ostensibly prominent political figure ("John Harrison" or "Thomas Winters"). The cover page provided an overview of the major events in the politician's life. This was followed by 12 additional pages, each describing a particular life event in more detail. In *narrative-format* conditions, the information on each page was conveyed in a paragraph that indicated the temporal relatedness of the events described. For example, the brochure describing Harrison first provided a chronological description of his career; e.g.:

John Harrison was a well-known political figure between 1950-1975. He was a soldier during World War II and served as an executive of General Motors before becoming Governor of Michigan. He then served two years as a U. S. Senator, and ended his career as a special ambassador to China.

<sup>4</sup> For a discussion of the analysis of variance of dichotomous data, see Huynh and Feldt (1970).

The remaining pages of the brochure provided descriptions of specific events that occurred in his life. Each event was described in a paragraph and indicated the point at which the event occurred. For example, after the overview, the first page described what he did during the war (“He fought in World War II. During the war, he displayed courage, risking enemy gunfire to save lives when the Allied troops were suffering heavy losses.”) The second page linked the first event to the second and covered his activities as an executive of General Motors (“On returning from the war, he took a position as an executive of General Motors. He revitalized the industry, due largely to his ability to negotiate with powerful people in the industry as well as gain the support of blue-collar workers.”). Other activities included urging the government to halt the bombing in Vietnam, donating his summer home for use by a charitable organization, hosting the Pope during his visit to Detroit, and helping to revise the state budget to provide support for crime prevention etc.

In contrast, the brochure under *list-format* conditions described the events in the politician’s life in bullet form and did not indicate their temporal relatedness. Thus, the brochure pertaining to Harrison began with an unordered list of some of his experiences:

John Harrison was a well-known political figure between 1950–1970. He was:

- A member of the U. S. Senate for two years
- A World War II veteran
- A General Motors executive
- Governor of Michigan
- Special ambassador to China.

The individual event descriptions on the pages that followed were conveyed in the same order they were presented in narrative-format conditions. However, the events on each given page were conveyed in bullets and had no temporal references:

- He fought in World War II.
- He displayed courage, risking enemy gunfire to save lives when Allied troops were suffering heavy losses.

The next event that followed in his life appeared in the same order but was described without the temporal connectors.

- He took a position as an executive of General Motors.
- He revitalized the industry.
- He was able to negotiate with powerful people in the industry as well as gain the support of blue-collar workers.

In *no-picture* conditions, only verbal descriptions of the events were provided and the brochure contained only the text information in one of the two formats. In *picture* conditions, each text description was accompanied by a black-

and-white photograph of either the politician in a situation that might plausibly be related to the event described or, alternatively, the event itself. (Thus, for example, a statement that the politician had displayed courage under enemy gunfire in World War II was accompanied by a picture of him in an army uniform. Other statements were accompanied by pictures of the politician giving a speech, sitting at a desk, attending a meeting, staring out of a window, or engaging in other activities whose context was objectively unclear. A statement that the politician had donated his summer home for use by a charitable organization was accompanied by a picture of the home rather than of the politician himself, and a statement of his attempt to help prevent crime was accompanied by a picture of police arresting some criminals.) The pictures were taken from books and magazines and pertained to politicians with whom participants were unfamiliar.

#### Procedure

Participants were told that the study was concerned with how clear an impression people form of famous personalities and that to study this we had selected 16 different political figures that were famous in their time and had created brochures from existing essays on them. Participants were told that the politicians were no longer living, and that most of the things described had occurred a long time ago.

With this preamble, participants were given two brochures and asked to form an impression of the politician described in each.<sup>5</sup> Participants read one brochure in each format. Pictures were either contained in both brochures or contained in neither. Within each picture condition, we counterbalanced both the politician who was described in each format and the order in which the brochures were presented. Thus, the proportion of times that each candidate was described in a given format, and the proportion of times that the brochure in each format was presented first or second, was controlled. Participants were then given two brochures appropriate to the conditions to which they were assigned and were told to read them in the order in which we distributed them. After they had read both brochures, they were given an evaluation form. The order of questions in the form corresponded to the order in which the brochures were read.

#### Judgments

Participants first estimated the favorableness of their impression of each politician separately along a scale from

<sup>5</sup> In addition to these general instructions, half of the participants run at each combination of picture and presentation order were told explicitly to use a piecemeal processing strategy; that is, to consider the implications of each specific event that occurred in a politician’s life as it was presented and to use these individual events as a basis for their impression. The remaining participants in each condition were told to imagine each politician’s life as a whole and to use this as a basis for their impression. However, no effects of this instructional manipulation were significant ( $p > .10$ ). For simplicity of presentation, therefore, this variable will not be discussed further.

–5 (very unfavorable) to 5 (very favorable). After doing so, they were asked to reconsider the politician described in the first brochure, and to make ratings similar to those obtained in Experiment 1. That is, they first indicated which of the two strategies most closely described the way they formed their impression of him. They also estimated the difficulty of imagining the sequence of events that occurred in the politician's life along a scale from 0 (not at all) to 10 (very). Having answered questions pertaining to the first politician, they responded to identical questions about the second one.

### Results

Participants' impressions of the politicians were analyzed as a function of the format of the verbal information and the presence or absence of pictures. The interactive effects of these variables confirm the results of Experiment 1. That is, pictures increased evaluations of politicians who were described in a narrative (from 3.73 to 3.85) and decreased evaluations of politicians whose activities were described in a list (from 4.02 to 3.37). The planned contrast corresponding to the interaction of pictures and presentation format ( $M_{\text{diff}}=0.38$ ) was significant, directional  $F(1, 56) = 7.49, p < .01$ .

Participants were somewhat more likely to report basing their judgments on a politician's life as a whole when the information about him was conveyed in a narrative rather than a list ( $M = .57$  vs.  $.46$ , respectively). In contrast to Experiment 1, this difference was not reliable ( $p > .10$ ). This, however, could be due to the fact that participants' self-reports were influenced by their desire to appear as if they had followed the explicit instructions they were given concerning how to make their judgments (see Footnote 5). Participants reported having more difficulty imaging the sequence of events that occurred when the information they received was in list format ( $M = 4.81$ ) than when it was in narrative format ( $M = 3.72$ ),  $F(1, 56) = 9.34, p < .01$ .

### Supplementary data

The self-report data obtained in Experiment 2 were consistent with the assumption that pictures interfered with the integration of information that was conveyed in a list. If this assumption is correct, however, the interference effect of pictures should be eliminated if the pictures are presented out of the context of the verbal information. That is, suppose pictures are conveyed at the outset and the verbal event descriptions are then presented in the absence of any pictures. Then, the effect of pictures on the comprehension of the individual event descriptions might be maintained. However, the distracting influence of pictures on the on-line integration of the descriptions' semantic implications would be eliminated.

To evaluate this possibility, 32 introductory business students who had not participated in Experiment 2 were given two brochures, one in narrative format and the other in list format. In *no-pictures* conditions, the brochures were

identical to those administered in similar conditions of Experiment 2. In *pictures-first* conditions, however, the initial overview of each politician's life was followed by four photographs. Each picture provided a clear image of the politician's physical appearance but gave little indication of the context in which the picture was taken. The remainder of the brochure was then identical to that administered in no-picture conditions. Thus, these conditions differed from the picture conditions of previous studies in that the pictures *preceded* all of the individual event descriptions rather than accompanying them. Participants read the brochures pertaining to the two politicians in counterbalanced order, and then evaluated the two politicians along scales identical to those in earlier experiments.

Analyses of impression judgments as a function of the presence of pictures and presentation format yielded a significant effect of pictures,  $F(1, 29) = 5.13, p < .03$ , that did not depend on presentation format ( $F < 1$ ). Specifically, participants evaluated the politicians more favorably when pictures preceded the verbal descriptions ( $M = 3.46$ ) than when they did not ( $M = 2.72$ ), and this was true regardless of whether the verbal descriptions were conveyed in a narrative (3.56 vs. 2.88 under picture vs. no-picture conditions, respectively) or a list (3.35 vs. 2.56, respectively). Thus, presenting the pictures out of the context of the verbal information eliminated the interference effect that occurred when they accompanied this information under list-format conditions.

### Experiment 3

The supplementary data collected in Experiment 2 are consistent with the assumption that whereas pictures of a person might facilitate the comprehension of individual descriptions of events that involve this person, they interfere with the on-line integration of these descriptions to form an overall evaluation. It nevertheless seemed desirable to examine this assumption on the basis of data that bore more directly on the processing of the information at the time the information was received. Memory data were used for this purpose.

### Recognition accuracy

We assumed that if pictures facilitate the impression-based processing of information in a narrative but are irrelevant to the processing of information in a list, they should be better remembered in the former condition than the latter. Furthermore, if the pictures facilitate the processing of verbal event descriptions that are conveyed in a narrative but interfere with the processing of these descriptions when they are listed, the verbal descriptions should themselves be better remembered in the former condition.

### Reaction times

Somewhat different considerations arise in predicting the speed with which these identifications can be performed.

Pictures should be identified more quickly as well as more accurately when the verbal information they accompany is in a narrative, as the pictures are relevant to the processing of this information and are likely to be thought about more extensively. The effect of format on the time to identify verbal statements is less clear a priori. Although the statements should be recognized more accurately when they have been organized into a thematically coherent representation of the information presented, it might take time to search and identify them. (For evidence that people search narrative representations of information sequentially in order to identify the features contained in them, see Allen & Ebbesen, 1981; for evidence that it takes longer to identify items when they are embedded in a coherent representation than when they are not, see Sentis & Burnstein, 1979). To this extent, persons might identify statements in a narrative more accurately, but might take longer to do so, than they do when the statements are conveyed in a list.

### *Method*

#### *Overview*

Eighty-four introductory psychology students participated in the study. Participants were exposed to two stimulus brochures identical with those employed under *picture* conditions of Experiment 2. (No-picture conditions were not run in this study.) In this case, however, both brochures assigned to a given participant were in the same format. (This was done to avoid drawing participants' attention to the fact that the format was of any relevance.) Rather than making judgments, however, participants after reading through the brochures were given a recognition memory task for both the verbal descriptions they had read and the pictures they had seen. The proportion of correct responses and the time required to generate them were evaluated as a function of the format in which the information was conveyed.

#### *Recognition materials*

Two sets of recognition items (pictures and phrases from the event descriptions) were taken from the brochure pertaining to each of the two politicians. In addition, four pictures and four phrases that were not contained in either of the brochures were selected as fillers. Based on these items, we constructed 12 different orderings of 20 stimuli each (six presented and four non-presented pictures, and six presented and four non-presented phrases). These 12 orderings were divided into four sets of three. This provided two stimulus replications for each of the two politicians. Each replication was constructed from a different set of items in the following manner.

Each of the stimulus orderings we constructed for a given replication contained three target phrases and three target pictures. These targets were the same in each ordering and occupied the same serial positions. However, the stimulus item that preceded each target was systematically varied. Specifically, one of the target phrases in each order-

ing was preceded by the picture that accompanied it in the brochure; a second was preceded by a picture that occurred elsewhere in the brochure, and the third was preceded by a picture of the other candidate that participants had not previously encountered. Similarly, the three target pictures were preceded by a phrase describing either the event to which it referred in the brochure, a different event in the brochure, or an event they had not read about before. The remaining eight (filler) stimuli consisted of four pictures and four phrases, some of which participants had seen before and others of which they had not. (These stimuli, four of which were presented as warm-ups at the beginning of the stimulus series, were the same in all orderings pertaining to a given politician.) No picture or phrase was presented more than once in any given stimulus ordering. However, counterbalancing was employed to ensure that pooled over the three orderings, each target was preceded by each of the three types of priming items the same proportion of times.

#### *Procedure*

Participants received two brochures in either narrative or list format and were told to form an impression of the politician they described. (Within each format condition, the order in which the brochures were presented was counterbalanced.) After reading the brochures, participants completed a 20-min filler task on the pretence that impressions are more reliable after information has time to "settle." Then, they were told that to understand the basis for their impressions, we would like to determine how well they could remember the information they had read, and were administered a computerized recognition memory task.

Participants were told they would receive two series of items on the computer screen, one pertaining to each of the politicians they had read about. We indicated that some of the items would be pictures and others would be verbal descriptions, and that they should decide whether each item had been contained in the brochure pertaining to this politician. The first set of items pertained to the first politician that participants had read about. We indicated that some of the items would describe events they had read about but that others would not. Participants were told to place their right and left index fingers over the "?" and "z" keys on the computer keyboard (which were relabeled "yes" and "no," respectively), and that when a stimulus appeared on the screen, to press the "yes" key if the stimulus had been contained in the brochure pertaining to this candidate and the "no" key if it had not. Once a stimulus was presented, the computer timed the interval between its presentation and participants' response. After the participant responded, the stimulus disappeared from the screen and the screen remained blank for 4s before the next stimulus appeared. Upon completing the first sequence of stimuli, participants were exposed to the second sequence with instructions to indicate whether each event in this sequence was mentioned in the second brochure.

## Results

Preliminary analyses indicated that neither the accuracy of identifying statements nor the time required to do so depended on whether the picture that preceded them in the recognition sequence was the one that accompanied them in the presentation sequence ( $F < 1$ ). Similarly, responses to pictures did not depend on whether they were preceded by the same statement with which they were presented or a different one ( $F < 1$ ). Therefore, data are pooled over this variable in the analyses to be reported.

The proportion of correct identifications was analyzed as a function of presentation format and the type of stimulus item (picture vs. verbal description). The effect of presentation format was significant,  $F(1, 83) = 8.56, p < .01$ , and was independent of the type of stimulus item ( $p > .10$ ). That is, participants recognized a higher proportion of items when the information had been presented in a narrative ( $M = .95$ ) than when it has been presented in a list ( $M = .83$ ), and this was true regardless of whether the stimuli were verbal statements (.92 vs. .81),  $F(1, 83) = 5.02, p < .02$ , or pictures (.97 vs. .87),  $F(1, 83) = 4.87, p < .05$ .

Analyses of recognition response times indicated that pictures were recognized more quickly if the information that accompanied them was conveyed in a narrative than when it was conveyed in a list (1295 ms vs. 1416 ms). However, it took longer to identify verbal statements in the former condition ( $M = 2005$  ms) than the latter ( $M = 1830$  ms). The interaction of presentation format and stimulus type was quite reliable,  $F(1, 83) = 6.65, p < .01$ .

## Experiment 4

The results of Experiment 3 were consistent with our conceptualization that pictures facilitate the processing of information presented in a narrative and lead to better memory for both the pictures and verbal descriptions in these conditions relative to list conditions. The evidence that pictures were identified more quickly and accurately when they were conveyed in a narrative confirms the assumption that pictures play a more central role in narrative-based processing than in list-based processing. Although the results do not directly indicate that pictures interfere with list-based processing, they show that pictures are less involved in this processing than they are in the processing of narrative information.

Although recognition accuracy of verbal statements was also greater in narrative conditions relative to list conditions, response times to these statements did not depend on the picture that preceded them in the recognition series. In other words, the picture that accompanied the statements in the stimulus brochure did not cue the retrieval of these statements at the time of recognition. Note, however, that the pictures did not normally describe the stimulus event with which they were associated, but only portrayed the politician giving a speech or talking with someone. Consequently, they were unlikely to cue the retrieval of the spe-

cific event they accompanied. Rather, the effect of pictures was due largely to their providing a perceptual symbol that could be used in forming an image of the event.

Perhaps the most provocative aspect of these results is that although participants were better able to identify verbal event descriptions when they had been conveyed in a narrative than when they had been listed, they took longer to respond to these items. This suggests that when information is integrated into a narrative representation, individual features of the representation are harder to extract. As Allen and Ebbesen's (1981) results suggest, people have to search through a narrative-based representation in order to identify them, and this takes more time. If this is so, however, calling attention to one event in the representation should facilitate the identification of the event that follows it.

Experiment 4 investigated this possibility. Participants received information about two politicians under conditions similar to those employed in Experiment 2. After forming their impressions of the politicians, however, they performed a recognition memory task containing verbal descriptions of the events they had encountered earlier. Some (target) events were each preceded in the recognition list by a description of the event that had come before it in the presentation sequence, whereas others were preceded by an event that participants had not encountered before.

If the events that are conveyed in a narrative are represented in memory as a temporally ordered sequence, calling participants' attention to one event in the sequence should increase the accessibility of other events that are temporally associated with it. Therefore, it should increase the speed with which participants can identify an event that immediately followed it in the presentation sequence than if it is preceded by an unrelated event. However, if events that are conveyed in a list are considered and stored in memory without any inter-event connections (Srull & Wyer, 1989), this should not be the case. In addition, if these events are stored independently in these conditions without any inter-event connections, then the presentation of pictures with such information might actually slow down the retrieval of this information from memory. In fact, this appeared to be the case.

## Method

### Overview and design

Sixty-four undergraduate business students participated for course credit. Participants received one brochure in each presentation format and were told to form an impression of the politician they described. The brochures were presented in counterbalanced order, and the events described in them were either accompanied by pictures or were not. After reading the brochures, participants were told that to understand the basis for their impressions, we would like to determine how well they could remember the information they had read, and on this pretense, were administered a computerized recognition memory task

using procedures identical to those employed in Experiment 3.

#### Recognition materials

Participants were exposed to two sequences of 14 recognition items, one sequence pertaining to each politician. Seven items in each sequence referred to events that participants had encountered in the brochure. Seven others (distracters) described events that participants had not seen in either brochure. Four of the seven previously seen events in each sequence were selected as *targets*. Two of these targets were preceded in the recognition list by the event that had immediately preceded them in the original brochure, and the other two were preceded by distracters. To ensure that target events were representative of all of those contained in the brochure, and that each event was preceded the same proportion of times by an event from the brochure or a distracter, eight different sequences of recognition items were prepared pertaining to each politician. In four of the sequences, the even-numbered events presented in the original brochure were used as targets, and in the others, the odd-numbered events were used. Finally, the serial position of the four target events, and the type of event that preceded them, was counterbalanced over sequences. An equal number of participants in each experimental condition received each of the eight recognition sequences pertaining to each politician under instructions identical those provided in Experiment 3.

#### Results and discussion

##### Recognition accuracy

The proportion of correct responses to target items ( $M = .85$ ) was not contingent on experimental manipulations ( $p > .10$ ). Thus, in contrast to Experiment 3, accuracy did not depend on whether the events were conveyed in a narrative or a list (.84 vs. .86, respectively). Nor did the accuracy of identifying the target event depend on the nature of the item that preceded it. The failure to replicate the effects of presentation format on recognition accuracy that we observed in Experiment 3 is unclear. Be that as it may, however, these null effects justify the assumption that the response time differences to be reported are due largely to differences in the accessibility of the target items in memory and not to uncertainty about whether or not the items were actually presented.

##### Response times

Two target items were each preceded in the recognition list by the event that came before it in the brochure. The other two targets were preceded by a distracter. Response times to the target item in each pair were averaged. Ten participants whose response times to several items were either less than 500ms (indicating that they had not read the items) or greater than 10s (suggesting that the participant was not paying attention) were eliminated. Response time data for the remaining participants were then analyzed

as a function of picture conditions, presentation format, brochure order (first vs. second) and the type of item that preceded them.

We expected that when items had been conveyed in a narrative, response times to a target item would be faster when it was preceded by the event that came before it in the stimulus series than when it was not. This was in fact the case. Participants who had received information in a narrative responded more quickly to an event if it was preceded by the event that came immediately before it in the presentation sequence ( $M = 3.68$  s) than if it was preceded by a distracter ( $M = 4.16$  s). When the items had been conveyed in a list, however, this difference was negligible (4.21 s vs. 4.18 s, respectively). The interaction implied by this difference was significant,  $F(1, 54) = 4.26, p < .05$ .

The effects described above did not depend on whether or not pictures were presented ( $p > .10$ ). This indicates that the strength of association between the events described in a narrative was unaffected by the pictures that accompanied them. However, pictures had a more general effect of the sort noted earlier. That is, when participants had received information in a list, they took longer to identify target events if the events had been accompanied by pictures in the brochure ( $M = 4.57$  s) than if they had not ( $M = 3.82$  s). When participants had received information in a narrative, however, the time they took to recognize the events did not depend on whether or not pictures had been presented (3.96 s vs. 3.88 s). This difference is confirmed by a significant interaction of picture and presentation format,  $F(1, 54) = 4.23, p < .05$ . Although these results are not conclusive, they are consistent with the assumption that pictures have an adverse effect on the process of integrating the implications of information when it is conveyed in a list but not when it is conveyed in a narrative.

#### General discussion

As our results indicate, pictures can have directionally opposite effects on the impact of the verbal information they accompany, depending on whether this information is conveyed in a narrative or a list. These differences are largely traceable to the influence of pictures on the processes that individuals use to compute a judgment and the representations that are formed. When the information about a person describes a sequence of temporally related events, participants with the goal of forming an impression of the person are unlikely to compute an evaluation of the protagonist until the entire sequence is complete. Pictures provide perceptual symbols that both facilitate the formation of images of the individual events and permit the events to be perceptually linked, thereby leading a more coherent mental representation of the information to be constructed. When the information is conveyed in a list, however, participants attempt to form an evaluation of the protagonist on line by integrating the implications of the individual events as they encounter them, updating their impression as each new event is received. When pictures

accompany the event descriptions, however, they appear to interfere with this integration process, resulting in a decrease in the impact of the descriptions. This interference largely occurs when pictures directly accompany the verbal information. Thus, as indicated by the supplementary data obtained in Experiment 2, presenting pictures separately from the verbal event descriptions had similar effects on participants' evaluations regardless of the format in which the verbal material was presented. This supports our contention that the interference effect of pictures occurs largely at the integration stage.

Experiments 3 and 4 provided more direct indications of the processes and representations that underlie the judgments we observed in earlier studies. Experiment 3, for example, indicates that pictures are recognized both more quickly and more accurately when they are conveyed in a narrative than when they are conveyed in a list. Furthermore, verbal descriptions were also identified more accurately in the former condition, whereas the time required to make these identifications was longer. This latter effect is consistent with other evidence that when the features of information are represented in memory in a temporally related sequence, people engage in a mental search of the representation in order to identify these features, and the required time to do so is a reflection of this search.

Experiment 4 confirmed these implications and the nature of the representation formed more generally, showing that when event information is presented in a narrative and, therefore, stored in memory as a temporally related sequence, exposure to one event description increases the speed of identifying the event that immediately follows it in the sequence. This effect is not evident when the events are simply listed. Further results from this experiment indicate that pictures increased the time to identify statements when they were contained in a list but not when they were conveyed in a narrative. These results further strengthen the assumption that pictures interfered with the processing of the verbal information they accompanied.

The impact of pictures on the comprehension and integration of verbal information was independent of any direct informational influence they might have had. The pictures we used were relatively neutral and had little influence on evaluations in their own right (see Experiment 1). In other situations, however, the informational impact of pictures could be more important. Suppose, for example, that the statement "The surgeon removed the appendix" is accompanied by a picture of an unshaven man with jeans, a dirty t-shirt and a beaded necklace. This picture not only might influence perceptions of the surgeon's competence, but also might have a negative impact on evaluations in its own right. This example makes salient the need to distinguish between the effects of pictures on information processing and their direct informational impact. The procedures we employed in Experiments 1 and 2 provide a mechanism for accomplishing this.

Our results do not permit general conclusions to be drawn about the relative impact of narrative and list infor-

mation on judgments. Some narratives, for example, can lead readers to empathize with the characters or be transported into the story and these processes may have an impact that overrides the effects of the cognitive processes identified in the present research (Green & Brock, 2000). This type of effect might be localized at an even later stage of goal-directed processing where the reader is interested in immersing himself in the story. Furthermore, the relative influence of narrative and list formats may depend on the specific events that are described. The impact of events that are embedded in a narrative are a function of their consistency with other events that are described (Adaval & Wyer, 1998; Pennington & Hastie, 1988), whereas the impact of event descriptions that are conveyed in a list are presumably a function of their diagnosticity (Skowronski & Carlston, 1989). Without a detailed analysis of the individual events presented in terms of these factors, predictions about the influence of information that is presented in the two formats are difficult to make. Nevertheless, the effect of pictures on the *relative* impact of the two presentation formats is clearly predictable.

The present research adds to a growing literature on the role of narrative information in social judgment (Adaval & Wyer, 2004; Green & Brock, 2000; Wyer, 2004). As Schank and Abelson (1995) point out, a very large portion of the social knowledge that people acquire about themselves, other persons, and the world in which they live, is in this form. This has been recognized in a number of theoretical and empirical analyses of judgment and behavior (e.g., Adaval & Wyer, 2004; Green & Brock, 2000; Harvey & Martin, 1995; Ross, 1989; Schank & Abelson, 1995). Research on the integration of images with this type of knowledge might facilitate our understanding of how information that is typically presented in more than one sense modality is normally processed.

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