When expertise backfires: Contrast and assimilation effects in persuasion

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It was proposed that source cues bias message processing in a direction opposite to cue valence if message content violates cue-based expectancies (contrast hypothesis), but consistent with cue valence if message content is ambiguous (bias hypothesis). In line with these hypotheses, students (N = 123) reported less favourable thoughts and attitudes after reading weak arguments presented by a high (vs. low) expertise source (Expts 1 and 2), and reported more favourable thoughts after reading strong arguments presented by a low (vs. high) expertise source (Expt 2). Conversely, students’ thoughts and attitudes were more (less) favourable when a high (low) expertise source presented ambiguous arguments (Expt 2). Results are discussed in relation to dual- vs. single-process accounts of persuasion and models of assimilation and contrast in social judgment.

People are often persuaded more by experts than by non-experts (e.g. DeBono & Harnish, 1988; Pallak, Murroni, & Koch, 1983; Petty, Cacioppo, & Goldman, 1981). This effect has been ascribed to the operation of a persuasion heuristic—‘experts’ statements are valid’—that is available in most people’s cognitive repertoire and may guide their judgment whenever information about a communicator’s expertise is salient. According to the heuristic–systematic model (HSM; Bohner, Moskowitz, & Chaiken, 1995; Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999), drawing inferences based on available and applicable heuristics is a highly efficient process that requires only minimal cognitive effort. Heuristic inferences can serve as the sole basis of judgment if processing motivation is low, cognitive load is high, or more detailed information is lacking. Under these circumstances, people may simply agree with an expert’s message without processing its content in any depth (Petty \textit{et al.}, 1981), or they may reject a proposal merely because it is opposed by a socially relevant majority (Darke \textit{et al.}, 1998). At higher levels of motivation, and given sufficient cognitive capacity, people still use heuristics, but subsequently process message arguments and other potentially relevant information in a more systematic and effortful manner. Then, both heuristic and systematic processes co-determine their judgment, with initial

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heuristic inferences serving as input to further processing (Bohner et al., 1995; Chaiken et al., 1989; Chen & Chaiken, 1999).

In this article, we will examine novel hypotheses about such interplay of low-effort and high-effort processes in persuasion, using the HSM (especially Bohner et al., 1995) as our conceptual framework. However, we will also relate our hypotheses and findings to the recent debate around dual- vs. single-process models in persuasion (e.g. Chaiken, Duckworth, & Darke, 1999; Kruglanski & Thompson, 1999). Moreover, we will discuss our approach within the wider context of research on the effects of construct accessibility on subsequent processing that has been carried out in the domains of person perception and memory (e.g. Stangor & McMillan, 1992; Stapel & Schwarz, 1998) as well as social inference (e.g. Trope, 1986; Trope & Alfieri, 1997; Trope & Liberman, 1993).

The usefulness of a distinction between different processing modes has recently been questioned. Kruglanski and Thompson (1999) proposed an alternative ‘unimodel’, in which a single process of drawing syllogistic inferences from persuasive evidence is postulated as sufficient to explain the phenomena that have been studied within a dual-process framework. Emphasizing the continuous nature of cognitive effort expenditure, Kruglanski and Thompson argue that dual-process models have confounded the processing of certain types of content (e.g. message arguments vs. source cues) with different psychological processes (e.g. systematic vs. heuristic). In reply to this criticism, proponents of dual-process theories pointed out that the cue vs. argument distinction has been used mainly as a convenient way of operationalizing predictions rather than forming a core assumption of their models (for further discussion see, e.g. Bohner & Siebler, 1999; Chaiken et al., 1999; Petty, Wheeler, & Bizer, 1999).

On the other hand, there may well be a close connection between the type of information to be processed and the resulting inference process. In this respect, the dual- vs. single-process debate may be informed by research on construct accessibility. For example, it has been suggested that both the type of initial information made accessible (e.g. traits, situations, or expectancies) and the target information to be judged (e.g. ambiguous vs. unambiguous behaviour) will jointly determine whether judgments will be assimilated to, or contrasted away from, the initially activated construct (Stapel & Schwarz, 1998; Trope & Alfieri, 1997). Although a detailed comparison of dual- vs. single-process accounts, as well as an integration of assimilation and contrast effects across various domains of judgment, is beyond the scope of the present article, we will address both issues in relation to our hypotheses and return to them in the General Discussion.

**Co-occurrence of processing modes and assimilation vs. contrast effects**

According to the HSM, heuristic and systematic processing may co-occur in a number of ways, depending on specifiable conditions. Bohner and colleagues (1995) discussed four co-occurrence hypotheses. Two of these hypotheses are less relevant for our current discussion; they maintain, respectively, that heuristic and systematic processing may exert independent, additive effects on judgment (*additivity hypothesis*), and that extensive systematic processing often attenuates any effects of heuristic processing (*attenuation hypothesis*; for empirical evidence, see Bohner, Frank & Erb, 1998;
Chaiken & Maheswaran, 1994; Maheswaran & Chaiken, 1991; for discussion see Chaiken et al., 1989; Eagly & Chaiken, 1993).

More complex ways in which heuristic and systematic processing may interact are expressed in the HSM’s bias and contrast hypotheses (Bohner et al., 1995). Heuristic cues may lead people to form expectancies about message valence or strength. Under conditions of high motivation and sufficient processing resources, these initial expectancies may either (a) bias cognitive responses to message content in an expectancy-consistent manner and thus lead to assimilation effects in attitude judgments, or (b) serve as a standard of comparison against which message arguments are evaluated, thus leading to expectancy-incongruent cognitive responses and contrast effects in attitude judgments. Which of these two possibilities is more likely to occur mainly depends on features of the persuasive message. If message content is amenable to varying interpretations (i.e. ambiguous), or if no such content is provided, leaving individuals to generate their own issue-related thoughts, then assimilative bias is likely to occur. There is ample empirical evidence for this type of effect (Bohner, Chaiken, & Hunyadi, 1994; Bohner, Crow, Erb, & Schwarz, 1992; Chaiken & Maheswaran, 1994; Chen, Shechter, & Chaiken, 1996; Darke et al., 1998; Erb, Bohner, Schmälzle, & Rank, 1998). However, if message content unambiguously violates heuristic-based expectancies, then contrast in the valence of cognitive responses and judgments should be observed (Bohner et al., 1995). This latter prediction has not yet been explicitly tested and will be the main focus of the current investigation.

Assimilation and contrast in social judgment

In essence, the HSM hypotheses outlined above describe how cues in the persuasion setting increase the accessibility of applicable heuristics, which in turn influence subsequent information processing. Similar phenomena have been studied in social cognition under the heading of ‘construct accessibility’ (for reviews, see Higgins, 1989; Wyer & Srull, 1989). While it is generally acknowledged that accessible constructs do affect the attention directed at subsequent information, its interpretation and encoding, the direction of such effects as well as their underlying mechanisms are a matter of some debate. In particular, will subsequent information be assimilated to the activated construct (i.e. judged more positively if the activated construct is positive) or contrasted away from it (i.e. evaluated more negatively if the activated construct is positive)? This seems to depend, among other factors, on both the type of construct being activated and the nature of the stimulus information to be judged.

Whereas certain constructs (e.g. trait concepts) seem to produce assimilation effects by default, other constructs (e.g. expectancies) may cause either assimilation or contrast depending on the target information. Specifically, if target information is ambiguous, expectancies are mainly used for interpretation, thereby fostering assimilation (Stapel & Schwarz, 1998); if, however, target information is mixed (i.e. partly inconsistent with expectancies), attention will be focused on the inconsistent information, fostering contrast in recall and judgment (Stangor & McMillan, 1992; Stapel & Schwarz, 1998). Furthermore, if the evaluative implications of target information are unambiguous, accessible constructs are likely to be used as a standard of comparison, thereby also generating judgmental contrast effects, especially if the accessible information is
sufficiently extreme (e.g. Herr, 1986; Herr, Sherman, & Fazio, 1983; Stapel, Koomen, & Van der Pligt, 1996; 1997; Trope, 1986; Trope & Liberman, 1993).

The effects of expectancies may be illustrated with data from studies on impression formation and trait inferences, respectively. Studying effects of expectancies on impression formation, Stapel and Schwarz (1998) primed an expectancy about a target person (e.g. ‘Michael is kind’) and later presented target descriptions that were either ambiguous (e.g. simultaneously implying kindness and dishonesty) or mixed (e.g. some behaviours unambiguously implying kindness, others dishonesty). Stapel and Schwarz found that target evaluations were in line with the primed expectancy when its description was ambiguous, but were contrasted away from the primed expectancy when its description contained unambiguous, but mixed behaviours. In other words, being primed with the expectancy that ‘Michael is kind’ led to judgments of Michael as being more likeable if Michael displayed behaviours that were ambiguous as to whether they implied kindness or dishonesty, but led to judgments of Michael as being less likeable if some of his behaviours unambiguously implied dishonesty.

Similarly, in line with his model of dispositional attribution, Trope (1986, Expt 1) observed that situational cues may exert assimilative effects on dispositional attribution of ambiguous facial expressions, whereas the same situational cues lead to contrast effects in the case of unambiguous facial expressions. For example, an ambiguous facial expression that simultaneously implied fear and happiness led to attributions of more dispositional fear when the situation was fear-arousing rather than anger-arousing, whereas an unambiguous facial expression of fear evoked attributions of less dispositional fear when the situation was fear-arousing rather than anger-arousing.

An important parallel between such findings and our own approach is the assumption that heuristics may establish expectancies about subsequent information. These expectancies should lead to assimilation effects if message content is ambiguous, but to contrast effects if message content unambiguously deviates from expectancies (Bohner et al., 1995).

A note on awareness of the influence

Another potential determinant of contrast effects is a person’s awareness of the influence of accessible constructs. If a perceiver becomes aware that her judgments may be influenced by previously activated information, she may then correct for such influence (e.g. Strack, 1992; Wegener & Petty, 1997). However, such correction effects require not only awareness of the potential influence, but also knowledge about its likely direction and strength, as well as the motivation not to be influenced (e.g. Wegener & Petty, 1997). For example, in a persuasion setting, message recipients may be willing to correct for any perceived positive influence of a likeable communicator on their attitudes (Petty, Wegener, & White, 1998). This presupposes, however, that recipients perceive judging on the basis of likeability as inappropriate. In other instances, however, judging on the basis of heuristic inferences may be seen as more appropriate. This seems to be the case for judgments on the basis of source expertise (Bohner & Keller, 1999; Keller, Bohner, & Erb, 2000). Thus, although awareness of the potential influence of a heuristic cue may at times lead to correction-based contrast (see Petty et al., 1998), whether or not correction occurs may depend on the type of cue activated and its associated expectancies. Our current focus is on contrast effects that are caused by using expectancies as a standard of comparison, not those caused by attempts at correcting for unwanted influences.
The present research

Our present research addresses the conditions likely to produce expectancy-based contrast effects, as opposed to assimilative bias or attenuation effects. Guided by the HSM and the above discussion of construct accessibility effects, several conditions of such contrast effects could be identified. To observe any biasing influence of a cue on message processing, this cue needs to be sufficiently salient before the persuasive message is encountered (see Bohner et al., 1995). Salience of the cue may be heightened by directing recipients’ attention towards it. In the studies to be reported, this was done by asking participants to judge a communicator on the dimension of expertise.1

Apart from considerations of salience, heuristics and their associated cues differ in the likelihood with which they evoke content-related expectancies. Some heuristics have clear implications regarding message content, and some heuristics do not (see Bohner et al., 1995). For instance, people who use the heuristic ‘experts’ statements are valid’ should expect that an expert’s message consists of convincing arguments, whereas a non-expert’s message is less likely to do so. Similar content-related expectancies may be associated with the heuristic ‘High (low) consensus implies correctness (incorrectness)’ (Erb & Bohner, 2001; Erb et al., 1998).2 However, other heuristics do not seem to trigger content-related expectancies. For example, the heuristic ‘I agree with people I like’, although highly effective in persuasion (e.g. Cialdini, 1993), does not imply any strong inferences regarding how convincing or valid the message of a likeable or dislikeable communicator should be (Bohner & Keller, 1999; Keller et al., 2000).

These differences in content-relatedness among heuristics have implications for hypotheses about the interplay of heuristic and systematic processing. Bohner et al. (1995) proposed that additive effects of heuristic and systematic processing should be more likely for heuristics that are not content-related, whereas attenuation, assimilative bias, and contrastive bias effects should more probably be obtained with content-related heuristics. This may be illustrated with respect to likeability and expertise: if a likeable source presents weak arguments, a recipient may additively integrate the available information and arrive at a moderately negative judgment. If, however, a renowned expert presents weak arguments, additive integration is unlikely; rather, judgments should be contrasted away from cue-based expectancies. The perception of a discrepancy between cue-based expectancies and unambiguous content, which lies at the heart of such contrast effects, should be further enhanced by high extremity of the cue (Herr et al., 1983; Stapel et al., 1997).

A final issue that may determine the strength of contrast is a cue’s diagnosticity. In this regard, positive and negative instances of a heuristic cue may differ. For example, a high level of expertise should be highly diagnostic of message validity. Experts are supposed to know what they are talking about and to make a convincing point. If an

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1 It may be argued that this is a rather heavy-handed manipulation of salience. Nonetheless, we used it in the initial tests of the contrast hypothesis to ensure that participants did process the cue information. Furthermore, as discussed above, we did not expect that blatant awareness of the cue might lead to attempts at correction, as participants would generally perceive the use of expertise information as an appropriate strategy in judging the merits of the proposal. We return to the issue of salience in the General Discussion.

2 Interestingly, consensus information may or may not trigger inferences about correctness, depending on the context in which it is encountered. In a recent study, Tindale, Bohner, Dykema-Engblade, and Meisenhelder (2002) found that participants who were confronted with a majority or minority message source information to draw inferences about message content when accuracy concerns had been primed but not when social identity concerns had been primed.
expert presents a poor case, recipients of this message should be highly surprised and generate negative responses to the poor arguments, using their positive expectancies as a point of reference. Things may be different, however, for low levels of expertise. Although we would generally expect a non-expert to know less and to have less convincing arguments than an expert, we would probably be less surprised if a non-expert’s arguments turned out to be convincing. The expertise heuristic might even instigate the attribution that the non-expert somehow got the facts wrong, which would mitigate the extent of any contrastive bias, or even lead to the discounting of message content in favour of retaining one’s initial impression of low expertise. Thus, an asymmetry in the likelihood with which positive and negative cues elicit contrast in processing and judgment should be expected.

This assumption can also be made on the basis of people’s adherence to conversational norms (Grice, 1975). According to Grice, people expect others to follow several conversational maxims, which include making one’s contribution as informative as possible. In a persuasion context, this means that a communicator would be expected to make her best and most convincing case. Thus, if an expert presents poor arguments in such a context, this probably means that there is no better case to be made. If, however, a non-expert presents poor arguments, there may well be better arguments available to support the issue, which the communicator simply is not aware of. Conversely, if a non-expert presents strong arguments, this does not necessarily imply that an expert could make an even stronger point.

In sum, our discussion suggests that to observe heuristic-based contrast effects in systematic processing, the following conditions need to be met: (a) a heuristic cue must be salient in the persuasion setting; (b) this cue must be capable of inducing a content-related expectancy, and (c) the implications of content information must be unambiguously discrepant from the cue-based expectancies. Furthermore, in the case of expertise information, (d) cue-based expectancies should be more easily contradicted by content evidence if the source is expert rather than non-expert.

To conduct initial tests of the HSM’s contrast hypothesis we designed two persuasion experiments. In Expt 1, our aim was to demonstrate that contrast in attitude judgments does occur if the above conditions are met. Then, in an extended replication (Expt 2), we proceeded to compare conditions that should produce assimilative bias with those likely to produce contrast, and we assessed both attitude judgments and cognitive responses to gain more insight into the processes involved.

EXPERIMENT 1

In Expt 1, we set out to demonstrate that salient information about a communicator’s high expertise may create a positive expectancy regarding the validity of message arguments. We further assumed that the violation of this positive expectancy by clearly weak arguments would lead to attitude judgments that are much less favourable than those of respondents who receive the same weak arguments but did not form a positive expectancy to begin with.

Method

Participants and procedure
The participants were 60 male students at the University of Mannheim, Germany, who attended in small group sessions as paid volunteers. Their mean age was 26 years
(range: 20 to 42 years); their most frequent majors were Economics and Business Administration (56%). Participants were randomly assigned to the conditions of a 2 (source expertise: high, moderate)×2 (argument strength: strong, weak) between-participants factorial design. Students were recruited for a study on text comprehension. They learned that they would read a text that argued for the construction of a traffic tunnel in the city of Rotterdam. Before reading the text they received information about the alleged communicator, either a high-school student or a famous professor. To enhance the salience of cue-based expectancies, participants were asked to answer some questions pertaining to the communicator and his expected arguments; these questions also served as manipulation checks. Then the students read a persuasive message that consisted of either weak or strong arguments. To facilitate systematic processing in all conditions, the students were instructed to pay attention to the text and to read it carefully, taking as much time as they wanted. After reading, their attitude toward the message’s position, their perception of argument strength, and the degree and direction of their surprise at the quality of the presented arguments were assessed. Finally, participants reported their age and major, responded to an open-ended suspicion probe, were debriefed and were paid 5 Deutschmarks.

**Independent variables**

**High vs. moderate expertise**

Before reading the persuasive message, the students received information about the communicator. In the moderate expertise condition, he was described as an 18-year-old high-school student who was said to be a member of a youth group called ‘Life in Rotterdam’. In the high expertise condition, the communicator was described as a famous professor and director of a renowned ‘Institute for Ecology and Infrastructure’, who had won various awards and was now appointed by the Dutch government to report on the planned tunnel project. To enhance the generation of expectancies about argument strength based on the information about the communicator, participants were then asked three questions about their expectancies (see below).

**Argument strength**

The persuasive message consisted of either four strong or four weak arguments in favour of the construction of a tunnel underneath Rotterdam harbour. This fictitious topic was chosen to minimize any potential influence of prior knowledge or pre-experimental attitudes. The arguments dealt with consequences of the tunnel for Rotterdam residents, the regional economy and the environment. In pilot testing with participants from the same student population, each of the four strong arguments had been rated as more convincing than its weak counterpart, all \( p < .04 \). Example arguments are presented in the Appendix.

**Dependent variables**

**Expectancies of argument strength**

After participants had received the information about the communicator, they first replied to a filler question asking how well informed they were about the Rotterdam tunnel project. Then they answered three questions that were designed to assess their expectancies: ‘How valid will the student’s (professor’s) arguments be?’ ‘What do you expect: How convincing will the student’s (professor’s) arguments be?’ and ‘How
expert do you regard the student (professor) with respect to the topic ‘‘tunnel construction in Rotterdam’’? Each question was followed by a scale from 1 (not at all valid/convincing/expert) to 9 (very valid/convincing/expert).

**Attitudes**
After reading the message, participants indicated their attitude toward the tunnel project on four items: ‘The tunnel in Rotterdam should be built’; ‘The tunnel construction has many advantages for the economy’; ‘The tunnel has many advantages for the residents’; ‘Pollution could be drastically reduced through the tunnel’; each followed by a 9-point scale ranging from 1 (do not agree at all) to 9 (totally agree).

**Perceived argument strength**
Participants then indicated how convincing they perceived the arguments that had been presented in the text (1, not at all convincing, to 9, totally convincing). They also indicated the degree and direction of their potential surprise on an item that read: ‘Were you surprised by the arguments’ quality?—The arguments were . . . ’ (1, poorer than expected, to 9, better than expected).

**Results**
During debriefing one student reported that German was his second language and that it had been difficult for him to understand the instructions; his data were excluded from the analysis. The data of the remaining 59 participants were submitted to $2 \times 2$ ANOVAs with the factors *source expertise* (high, moderate) and *argument strength* (strong, weak).

**Expectancies about source expertise**
The three items that pertained to expected argument strength and expertise were averaged to form an expectancy index (Cronbach’s $\alpha=.95$). As predicted, participants who had learned that the communicator was a high-school student formed lower expectancies ($M=2.62$; $SD=1.33$) than those who had learned that the communicator was a professor ($M=7.40$; $SD=1.17$), $F(1,55)=207.09$, $p<.001$, $MSE=1.62$. No other effects emerged, all $F<1$.

**Attitudes**
The four attitude items were averaged to form an attitude index (Cronbach’s $\alpha=.90$). The ANOVA (MSE=1.28) revealed significant main effects of argument strength, $F(1,55)=105.80$, and of expertise, $F(1,55)=22.86$, as well as a significant interaction of argument strength and expertise, $F(1,55)=63.83$, all $p<.001$. Condition means are displayed in Fig. 1. As can be seen in Figure 1, the pattern of means supports the contrast hypothesis. Participants who received weak arguments were dramatically less in favour of the tunnel if these arguments came from a professor ($M=1.87$; $SD=0.60$) rather than a high-school student ($M=5.58$; $SD=1.06$), $t(55)=9.01$, $p<.001$. Conversely, participants who received strong arguments were somewhat more in favour of the tunnel if these arguments came from a professor ($M=7.29$; $SD=1.21$) rather than a high-school student ($M=6.30$; $SD=1.48$, $t(55)=2.35$, $p<.05$. Thus, in the condition that featured a clear negative violation of positive expectancies (high
expertise/weak arguments), participants contrasted their judgments away from the implications of the expertise cue and reported to feel much more negative about the tunnel than did participants who read the same weak arguments but had not formed highly positive expectancies. The positive violation of a negative expectancy (moderate expertise/strong arguments), however, was not sufficient to create a contrast in attitude judgments, which is in line with our assumptions about its lower diagnosticity.

**Perceived argument strength**
Post-message judgments of argument strength showed a similar pattern as the attitude judgments. Both main effects of argument strength, $F(1,55)=90.07$, and of source expertise, $F(1,55)=33.10$, as well as their interaction, $F(1,55)=37.24$, were highly significant, all $p<.001$ (MSE=1.85). Participants who had read weak arguments judged these arguments as much less convincing if they came from a highly expert source ($M=1.33; \ SD=0.49$) than from a moderately expert source ($M=5.53; \ SD=1.41$), $t(55)=8.46, \ p<.001$. Participants who had read strong arguments perceived these arguments as highly convincing, independent of source expertise ($M=6.74; \ SD=1.71$ and $M=6.86; \ SD=1.51$ for moderate and high expertise, respectively), $t<1$ for the simple comparison.

![Figure 1. Post-message attitudes as a function of source expertise and argument strength (Expt 1).](image)
The results on participants’ surprise are also in line with predictions. We found main effects of both argument strength, $F(1,55)=28.30$, and source expertise, $F(1,55)=39.28$, each $p<.001$. The interaction effect emerged as a trend, $F(1,55)=3.10$, $p<.09$ (MSE=2.46). Importantly, means were not significantly different from the scale mid-point when argument strength matched expectancies ($M=4.93$; SD=1.22 for moderate expertise/weak arguments, and $M=4.57$; SD=2.34 for high expertise/strong arguments), indicating that participants were neither positively nor negatively surprised in these conditions. Participants indicated, however, that arguments were much poorer than expected in the high expertise/weak arguments condition ($M=1.67$; SD=1.05); this mean is significantly smaller than the scale mid-point, $p<.001$. Conversely, arguments were seen as better than expected in the moderate expertise/strong arguments condition ($M=6.40$; SD=1.40), this mean being significantly larger than the scale mid-point, $p<.01$. To test our assumption of an asymmetry in the diagnosticity of high vs. moderate expertise, we reverse-scored the surprise ratings in the high expertise/weak arguments condition, and compared the mean discrepancy from the neutral point in this condition ($M=3.33$) with the respective discrepancy in the moderate expertise/strong arguments condition ($M=1.40$). As expected, this comparison was significant, $t(25.89)=4.52$, $p<.001$. Weak arguments presented by a highly expert source produced larger contrast than strong arguments presented by a moderately expert source.

Discussion

In Expt 1 we showed that contrast in attitude judgments occurs if recipients are exposed to a message whose argument strength clearly violates heuristic-based expectancies, given that this discrepancy has diagnostic value. Students who had read weak arguments that came from a high-expertise source reported much less favourable attitudes than students who had read the same weak arguments but believed they came from a moderately expert source. Further analyses showed that post-message judgments of argument strength also reflected this contrastive bias. Recipients judged the same weak arguments as much less convincing when they came from a communicator of allegedly high expertise than when they came from a moderately expert communicator.

Other results speak to the processes assumed to underlie these contrast effects. As predicted, the students reported to be most negatively surprised in the condition where an expert presented weak arguments. Furthermore, recipients were positively surprised, at least to some extent, when a moderately expert communicator presented strong arguments. In line with our reasoning about asymmetries in cue diagnosticity and conversational norms, however, this positive surprise did not seem to be sufficient to lead to attitude judgments that were more positive than those in the ‘high expertise/strong arguments’ condition. However, the surprise data point to the possibility of observing even a positive contrast effect in attitude judgment if more extreme negative expectancies were induced in combination with presenting strong arguments. This possibility was further tested in Expt 2.

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Tests of difference from the mid-point were done using confidence intervals based on Student’s $t$ test with 14 d.f.

Planned comparison based on separate variance estimates because homogeneity of variances was in doubt for this variable, $F(3,55)=4.40$, $p<.01$, Levene test.
We also designed Expt 2 in such a way that would rule out a potential alternative explanation of the pattern observed. It might be argued that participants simply paid more attention to the message if it came from an expert rather than an inexpert communicator, thus producing larger effects of argument strength in the former than in the latter case (cf. Heesacker, Petty, & Cacioppo, 1983). Although this explanation would not account for the asymmetry of the observed interaction pattern, we nonetheless tried to address it by comparing conditions under which the HSM predicts an assimilative bias in message processing with conditions under which the HSM predicts a contrastive bias. The overall interaction pattern that we predicted for this design cannot be explained by mere differences in message elaboration, as will become clearer shortly.

**EXPERIMENT 2**

The aims of Expt 2 were: (a) to provide clearer process evidence for the HSM’s contrast hypothesis; (b) to demonstrate both negative contrast as a result of strong positive expectancies (replicating Expt 1) and positive contrast as a result of strong negative expectancies; (c) to pinpoint the HSM’s contrast hypothesis against the HSM’s bias hypothesis, which also serves (d) to demonstrate that expectancy-based contrast cannot be alternatively interpreted as a result of differences in the mere extent of message elaboration.

To achieve these aims, the design of Expt 1 was extended and modified. On the part of the dependent variables, cognitive responses to the message were assessed in order to obtain a measure of systematic processing. On the part of the independent variables, the moderate expertise condition was replaced with a very low expertise condition, so that more clear-cut negative expectancies about message quality would be created. Furthermore, an ambiguous message condition was added to show that expertise information would lead to biased systematic processing in line with heuristic-based expectancies, i.e. assimilative rather than contrastive bias, if the message is amenable to varying interpretations (cf. Chaiken & Maheswaran, 1994). The design was thus extended to a 3 (message quality: unambiguous strong, ambiguous, unambiguous weak) x 2 (heuristic cue: expert, non-expert) between-participants factorial.

The inclusion of an ambiguous message condition leads to specific predictions about the pattern of attitude and cognitive response means which cannot be accommodated by the alternative explanation that variations in source expertise may influence the degree of message elaboration. We will discuss this final point in some detail before we proceed to describing the method. Assuming that recipients have sufficient processing motivation and capacity, the HSM makes specific predictions about the processing of strong, weak and ambiguous messages on the basis of heuristic-based expectancies. These predictions are depicted in Figure 2.

There are two conditions in which heuristic-based expectancies are confirmed by message content: ‘high expertise/strong message’ and ‘low expertise/weak message’. In these conditions, attenuation should occur and attitudes should mainly reflect an unbiased processing of message arguments. Furthermore, there are two conditions in which heuristic-based expectancies are contradicted: ‘high expertise/weak message’ and ‘low expertise/strong message’. For each of these conditions, the HSM’s contrast hypothesis predicts that recipients will use their heuristic-based expectancies as a standard of comparison in message processing, which will result in attitude judgments that are opposite to these expectancies, i.e. negative in the case of higher expertise
and positive in the case of low expertise. These contrast effects should resemble those found in studies on social judgment when target information is relatively clear rather than ambiguous (e.g. Herr, 1986; Herr et al., 1983; Stapel et al., 1996, 1997; Stapel & Schwarz, 1998). Finally, there are the two ambiguous message conditions, whose content is amenable to biased interpretations. For these conditions, the HSM’s bias hypothesis predicts that cognitive responses and attitude judgments are assimilated to heuristic-based expectancies, i.e. more positive in the case of high expertise and more negative in the case of low expertise. These assimilation effects, which were obtained in previous persuasion studies (Bohner et al., 1994; Chaiken & Maheswaran, 1994), should resemble the assimilation effects often found in research on personal memory and perception when target information is ambiguous (see Stangor & McMillan, 1992; Stapel & Schwarz, 1998).

Thus, on the basis of the HSM’s co-occurrence hypotheses, a specific pattern of means can be predicted for both attitudes and the valence of cognitive responses. This hypothetical result pattern is depicted in Figure 3. The main point about this predicted pattern is that the simple effect of the expertise cue is expected to be negative (high<low expertise) due to contrastive bias in both the strong and weak unambiguous message conditions, whereas it is expected to be positive (high>low expertise) due to assimilative bias in the ambiguous message conditions. In addition, as considerations of cue diagnosticity and conversational norms (as well as the results of Expt 1) still suggest a stronger disconfirmation of expectancies for ‘high expertise/weak message’ than for ‘low expertise/strong message’, the absolute magnitude of the predicted cue effect under strong message conditions was set to be only half as large (2.5 vs. 1.5) as that under weak message conditions (−1 vs. −3). Finally, we predicted that systematic processing would lead to a main effect of message such that the strong message would generally lead to more positive attitudes and cognitive responses than the ambiguous message, which would lead to more positive attitudes and cognitive responses than the weak message. The numbers associated with each condition in Fig. 3 represent contrast weights derived from the above considerations, which will be used to test our specific interaction hypothesis.
It is important to note that the roughly z-shaped pattern predicted by the HSM is incompatible with the assumption that variations in expertise merely affect the extent of the message processing. Such an impact on the extent of processing would be reflected in a fan-shaped result pattern, with generally smaller differences between pairs of low expertise conditions than between corresponding pairs of high expertise conditions (cf. Petty & Cacioppo, 1986, p. 34 Fig 2–3).

**Method**

*Participants and procedure*

Sixty-three male students at the University of Mannheim, Germany, participated in small group sessions as paid volunteers. Their mean age was 24.0 years (range: 20 to 34 years); their most frequent majors were Languages (49%) and Business Administration (33%). They were randomly assigned to the conditions of a 2 (source expertise: high, low) × 3 (message: strong, ambiguous, weak) between-participants factorial design.

The procedure was similar in most respects to that of Expt 1. The students learned that they would read a text in favour of building a tunnel underneath Rotterdam harbour, which was said to be written by either a high-school student or a professor.
The high-school student condition, however, was modified to convey expectancies of very low expertise (see below). To enhance the salience of cue-based expectations, participants were asked to answer some questions about the communicator and his expected arguments. Then participants read the persuasive message; as in Expt 1, they were instructed to pay attention to the text and read it carefully. After reading, participants were given three minutes to list all thoughts that had come to mind while they read the message. They then answered four attitude items as in the first experiment. Later, participants were asked to what extent the quality of the arguments corresponded to their expectations, and how persuasive they thought the arguments actually were. After answering an open-ended suspicion probe, the participants were debriefed and were paid 5 Deutschmarks.

Independent variables

High vs. low expertise
In the high expertise condition, the source was again described as a famous, award-winning professor and director of the renowned ‘Institute for Ecology and Infrastructure’. In the low expertise condition, the source was described as a high-school student. To create a more pronounced expectancy of weak message content in this condition, it was mentioned that the high-school student did not feel that he had enough time to prepare a well-founded argument.

Argument strength
The strong and weak versions of the persuasive message were identical to those used in Expt 1, featuring either four strong or four weak arguments. The ambiguous version of the message featured two of the strong and two of the weak arguments, which were presented in an alternating strong and weak order (see Bohner et al., 1994; Chaiken & Maheswaran, 1994).

Dependent variables

Expectancies of argument strength
After participants had received the information about the communicator, they first replied to a filler question asking how well informed they were about the Rotterdam tunnel project. Then they answered the same three questions designed to assess their expectancies as in Expt 1.

Cognitive responses
Immediately after reading the persuasive message, participants were asked to list within three minutes all thoughts that had come to mind while they were reading the message. To do so, they were given a sheet with 10 boxes and were instructed to write only one thought per box. It was pointed out that they could fill as many or as few boxes as they considered appropriate. Participants’ thoughts were later categorized by two independent judges as issue-relevant vs. irrelevant; each relevant thought was further categorized as favourable, unfavourable, or neutral with respect to the proposed tunnel project. From each judge’s codings, an index of thought favourability was formed by subtracting the number of unfavourable thoughts from the number of favourable thoughts and dividing the result by the total number of issue-relevant thoughts.
Attitudes
After participants had listed their thoughts, they indicated their attitude towards the tunnel project on the same four items as had been used in Expt 1.

Perceived argument strength
Participants then indicated how convincing they perceived the arguments that had been presented in the text (1, not at all convincing, to 9, totally convincing). They also indicated the extent and direction to which the strength of the arguments deviated from their expectancies, on an item that read: ‘How much did the arguments match your expectancies?—The arguments were . . . ’ (1, poorer than expected, to 9, better than expected).

Results
The suspicion probe revealed that two students had already participated in another experiment where a similar message had been used; their data were discarded. Thus, the data of 61 participants were entered into the analysis. The cognitive response and attitude data were submitted to a priori contrast analyses, as detailed below. In addition, the results of standard 3×2 ANOVAs will also be reported for these and all other dependent variables.

Expectancies
The three items concerning expected argument strength were highly intercorrelated (Cronbach’s α=.98) and thus averaged to form an expectancy index. As predicted, participants who had learned that the communicator was a high-school student formed lower expectancies (M=2.50; SD=1.01) than those who had learned that the communicator was a professor (M=7.43; SD=0.87), F(1,55)=404.94, p<.001, MSE=0.92. No other effects emerged, all p>.36.

Cognitive responses
Inter-judge agreement concerning the valence of issue-relevant thoughts was very high (r(59)=.92); therefore, the data were averaged across the two judges. The condition means for this variable are shown in Figure 4. We tested our predictions regarding thought valence by a contrast analysis, employing the a priori contrast weights that are presented in Fig. 3. By comparison of Figs 3 and 4, it can be seen that the empirical result pattern closely resembles the hypothetical z-shaped pattern. This impression is confirmed by a highly significant contrast, t(55)=6.52, p<.001, MSE=0.15. An analysis of residuals, testing the significance of between-condition effects not captured by the a priori contrast (see Abelson & Prentice, 1997), yielded F(4,55)=1.95, p>.10. Thus, our predicted pattern provides a good fit to the actual cognitive response data. We also tested simple effects of source expertise within each of the message conditions. These revealed, as predicted, negative effects of expertise on thought valence for both strong arguments, t(16.77)=−1.77, and weak arguments, t(11.08)=−1.90, each p<.05, one-tailed, and a positive effect of expertise on thought valence for ambiguous arguments, t(17.43)=2.44, p<.02, one-tailed. Finally, a standard

For simple effects, t tests based on separate variance estimates are reported because the homogeneity of variances was in doubt for this variable, F(5,55)=2.00, p<.10. Levene test.
$3 \times 2$ ANOVA yielded a main effect of message quality, $F(2,55)=18.05, p<.001$, as well as an interaction of message quality and source expertise, $F(2,55)=6.85, p<.003$.

**Attitudes**

The four attitude items were combined to form an attitude index (Cronbach's $\alpha=.87$). Condition means for this variable are displayed in Figure 5. Inspection of Fig. 5 again reveals that the data resemble the predicted $z$-shaped pattern, although the predicted contrast effect for strong arguments does not seem to be present. The overall contrast analysis was highly significant, $t(55)=12.65, p<.001$, MSE=1.03. An analysis of residual effects yielded $F(4,55)=3.95, p<.05$, indicating that the fit of prediction to data was not optimal for the attitude variable. Simple effects analyses revealed the predicted positive effect of source expertise in the ambiguous message condition.

![Figure 4. Valence of issue-relevant thoughts as a function of source expertise and type of message (Expt 2).](image)

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6 The mean number of issue-relevant thoughts that participants listed was 5.48 (SD=2.04). An ANOVA on this variable (MSE=3.94) yielded no significant effects, in line with the notion that the overall amount of processing was comparable across conditions.
The pattern of perceived argument strength closely resembles that of attitudes (see Table 1 for means). A 3×2 ANOVA (MSE=2.09) revealed a main effect of message strength, $F(2,55)=28.67$, $p<.001$ (means for the strong, ambiguous, and weak conditions: 6.65, 5.48, and 3.25, respectively), as well as an interaction of message strength and source expertise, $F(2,55)=6.57$, $p<.004$. Simple effects analyses for the effect of source expertise in each message condition were significant for weak

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$^7$ For simple effects, t tests based on separate variance estimates are reported because the homogeneity of variances was in doubt for this variable ($F(5,55)=2.35$, $p<.06$, Levene test.)
arguments, \( t(55) = -3.56, p < .001 \), marginally significant for ambiguous arguments, \( t(55) = 1.44, p < .08 \), and non-significant for strong arguments, \( t(55) = -0.16 \), n.s.

Means for the perceived violation of expectancy are shown in Table 2. The 3\( \times \)2 ANOVA (MSE=1.52) yielded significant main effects for argument strength (means for the strong, ambiguous, and weak conditions: 6.40, 5.29, 3.35, respectively), \( F(2,55) = 31.45, p < .001 \), and for source expertise (means for the professor and student conditions: 4.58 and 5.47, respectively), \( F(1,55) = 8.30, p < .01 \). These were qualified by a significant interaction, \( F(2,55) = 14.53, p < .001 \). There were two cells for which a discrepancy of the mean from the scale mid-point was expected. Specifically, in the high expertise/weak arguments condition, it was expected to be lower than the scale mid-point, indicating negative surprise, whereas in the low expertise/strong arguments condition, it was expected to be higher than the scale mid-point, indicating positive surprise. The former prediction was supported (\( M=1.70 \); 95\% confidence interval between 1.02 and 2.38), whereas the latter just failed to be supported (\( M=6.10 \);

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**Table 1.** Means of perceived argument strength as a function of source expertise and type of message (Expt 2)

<table>
<thead>
<tr>
<th>Source expertise</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unambiguous strong</td>
<td>6.70 (1.70)</td>
<td>6.60 (1.27)</td>
</tr>
<tr>
<td>Ambiguous</td>
<td>5.00 (1.16)</td>
<td>5.91 (1.22)</td>
</tr>
<tr>
<td>Unambiguous weak</td>
<td>4.40 (1.96)</td>
<td>2.10 (1.20)</td>
</tr>
</tbody>
</table>

Note. Number of cases per cell is 10, except for high expertise/ambiguous arguments, where it is 11. Higher numbers indicate greater perceived argument strength (range from 1: not at all convincing, to 9: very convincing).

**Table 2.** Means of perceived expectancy violation as a function of source expertise and type of message (Expt 1)

<table>
<thead>
<tr>
<th>Source expertise</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unambiguous strong</td>
<td>6.10 (1.85)</td>
<td>6.70 (1.25)</td>
</tr>
<tr>
<td>Ambiguous</td>
<td>5.30 (0.68)</td>
<td>5.27 (1.35)</td>
</tr>
<tr>
<td>Unambiguous weak</td>
<td>5.00 (0.94)</td>
<td>1.70 (0.95)</td>
</tr>
</tbody>
</table>

Note. Number of cases per cell is 10, except for high expertise/ambiguous arguments, where it is 11. Higher numbers indicate more positive expectancy violation (range from 1: worse than expected, through 5: just as expected, to 9: better than expected).
95% confidence interval between 4.77 and 7.43). A further unexpected result was found for the high expertise/strong arguments condition, in which participants expressed positive surprise (M=6.70; 95% confidence interval between 5.80 and 7.60). The remaining cell means were close to the scale mid-point as expected.

**Mediation of attitude effects through expectancy violation**

To test the proposed mediational role of expectancies, a series of regression analyses were performed (see Baron & Kenny, 1986). We used a coding of experimental condition corresponding to the contrast weights in Fig. 3 as the main predictor variable, the perceived violation of expectancy as the presumed mediator, and the attitude index as the dependent variable. If the effects of source cue and message type that are reflected in the contrast-coded predictor are partly mediated by expectancy disconfirmation, then the effect of the contrast-coded predictor on attitudes should be reduced when perceived expectancy violation is included as a concurrent predictor. As can be seen in Figure 6, this was the case, with the relevant $\beta$ coefficient being reduced from .80 to .58. A $z$-test (see Baron & Kenny, 1986, p. 1177) confirmed that this reduction was significant ($z$=3.10, $p<.001$), thus indicating partial mediation.

**Discussion**

As in Expt 1, the induction of different pre-message expectancies of source expertise was successful. Depending on the relation of these heuristic-based expectancies to the arguments actually contained in the persuasive message, participants’ processing of message content took different directions. The cognitive response data most clearly supported our predictions. In the strong and weak message conditions, evidence for the HSM’s contrast hypothesis (Bohner et al., 1995) was found. When weak arguments were presented by an allegedly highly expert communicator, message recipients evaluated these arguments very critically and showed a negative processing bias, opposite to the valence of the expertise cue; when the same weak arguments were presented by a non-expert, recipients’ thoughts about the message were more favourable. A mirror-image pattern was obtained when recipients processed strong arguments that were presented by an alleged non-expert; here, recipients’ thoughts were biased in a positive direction, again opposite to the valence of the expertise cue. When the same strong arguments were presented by an expert, recipients’ cognitive responses were less favourable. Finally, when message arguments were ambiguous, we replicated previous findings of assimilative bias in message processing (Bohner et al., 1994; Chaiken & Maheswaran, 1994): high expertise exerted a positive processing bias, low expertise exerted a negative processing bias.

The attitudes that participants formed about the advocated tunnel project showed a similar pattern as their cognitive responses, although a positive contrast could not be demonstrated for the attitude variable. Furthermore, the relatively low degree of surprise that participants reported when they were confronted with a strong message from a non-expert again indicates that positive contrast based on a negative heuristic-based expectancy may be less likely than negative contrast based on a positive expectancy. As we have noted above, this pattern may reflect lower diagnosticity of a non-expert source than an expert source. Regression analyses further supported the assumed mediating role of expectancy (dis-)confirmation in generating the predicted pattern of assimilation and contrast effects.
Figure 6. Mediation analysis for Expt 2. Attitudes are predicted from experimental conditions (main predictor; coded 2.5=low/strong, 1.5=high/strong, −1=low/ambiguous, 1=high/ambiguous, −1=low/weak, and −3=high/weak) and perceived expectancy violation (mediator; coded 1=poorer than expected, to 9=better than expected). The β coefficient in bold typeface shows the bivariate effect of experimental condition on attitude, whereas the β coefficient in parentheses shows the effect of experimental condition when perceived expectancy violation is entered as a concurrent predictor. **p < .01; ***p < .001.
GENERAL DISCUSSION

Taken together, two experiments provide initial evidence for the HSM’s contrast hypothesis, showing that a contrastive bias operates when heuristic inferences about argument strength and actual argument strength do not match. Furthermore, the HSM-based assumption that heuristic inferences may induce an assimilative bias to message processing, such that thinking about ambiguous messages is assimilated to cue valence (Bohner et al., 1994; Chaiken & Maheswaran, 1994), was replicated in Expt 2. The most convincing process evidence for these alternative forms of interplay between heuristic and systematic processing comes from the full pattern of cognitive responses in the strong, weak and ambiguous message conditions of Expt 2.

It would not be possible to account for the observed effects in their entirety by assuming that differences in source perception affected the extent of message processing (see Heesacker et al., 1983). If this were the case, the z-shaped pattern of means we observed (see Figs 4 and 5) would not have been obtained. In this regard, our results also speak to the utility of varying message quality at more than two levels. Had we used only the ambiguous and weak message conditions, the result pattern of cognitive responses and attitudes might have been interpreted as implying greater message elaboration under high than low source expertise—had we used only the strong and ambiguous messages, the opposite inference might have been drawn. Only the full pattern of findings suggests that neither assumption is viable.

The results concerning negative contrast based on positive source-related expectancies were unequivocal and stronger than those concerning positive contrast based on negative expectancies. This asymmetry was present especially on the attitude variable, where a simple effect of source expertise was absent for strong arguments. This pattern seems to reflect that different constraints operate on the inferences that can be drawn in the situations represented by the two ‘contrast’ cells of our design. As we noted, if an expert presents clearly weak arguments, this probably means that better arguments do not exist, otherwise the expert would know and present them, following conversational maxims (Grice, 1975). If a non-expert presents arguments that seem very strong, it is less likely for recipients to assume that even better arguments exist. Another possible attribution in that case would be that the non-expert somehow got the facts wrong. The latter attribution would run counter to the contrastive processing bias we predicted and found in the cognitive response data; and may mitigate its effect on attitude judgments. Future research should more directly investigate this possibility.

It will further be useful to explore the boundary conditions of the observed effects. We noted that salience of the heuristic cue is a prerequisite to instigate cue-based expectancies. In the two studies reported, we ensured that cues and their implications were highly salient by asking participants directly about their cue-based expectancies. While we believe that this was a legitimate approach in providing a first experimental demonstration of contrast effects in message processing, the important question remains whether and when individuals would spontaneously show a contrastive processing bias in everyday situations. We suspect that sources of cue salience other than direct questions (e.g. the introduction of a speaker as an expert), as well as high subjective reliability and chronic accessibility of the relevant heuristic would lead to similar effects. These assumptions should be tested in future research.

How would our predictions and findings be evaluated in light of the recently proposed unimodel of persuasion (Kruglanski & Thompson, 1999)? Does this
one-process framework provide a viable alternative explanation, and could it lead to novel predictions? This may well be the case. On the basis of the unimodel, one may extend our hypothesis that cue-based expectancies affect the processing of subsequent message arguments into the more general prediction that expectancies based on any information—cue, content or internally generated (e.g. prior knowledge; affective states)—have the potential of affecting the processing of any subsequent information in either an assimilative or contrasting fashion. The crucial points seem to be that an expectancy is established by initial processing, and that subsequent information either clearly contradicts this expectancy (resulting in contrast effects) or is amenable to flexible interpretation (resulting in assimilation effects). In this respect, approaches and findings from the domains of person perception and social inference seem to be compatible with a one-process approach, as they emphasize functional aspects of information (e.g. its potential to generate expectancies; its ambiguity) rather than its content (e.g. Stapel & Schwarz, 1998; Trope, 1986).

Nonetheless, both social cognition approaches as well as our own analysis of heuristic cues (Bohner & Keller, 1999; Keller et al., 2000) suggest that any biasing effects may be constrained by the (psycho-)logical relations between pieces of information processed early and late, respectively. We have proposed that certain types of cue information (e.g. expertise cues) trigger different (namely content-related) expectancies than other types of cue information (e.g. likeability cues; Bohner et al., 1995). Further research should address this hypothesis by pinpointing content-related source cues (e.g. expertise) against source cues that are less likely to trigger expectancies about message content (e.g. likeability). We would predict that discrepancies in the valence of cue and message content lead to contrast effects in the case of content-related cues, but may lead to additivity effects in the case of non-content-related cues. Furthermore, as mentioned in footnote 2, recent evidence even suggests that the same cue may or may not trigger content-related expectancies depending on the context in which it is processed. Tindale and colleagues (2002) exposed students to a majority or minority message containing strong, ambiguous or weak arguments, having initially primed either aspects of factual knowledge or aspects of social identity. In the knowledge priming conditions, the pattern of attitudes and cognitive responses closely resembled that observed in the current Expt 2, suggesting that the source cue triggered content-related expectancies (‘high consensus implies correctness’). In the social identity priming conditions, however, participants were generally favourable towards majority messages (even if the majority’s arguments were weak), whereas they critically elaborated minority messages; this pattern suggests that processing was guided by social concerns rather than inferences about content (cf. Moscovici, 1980).

A unimodel-based conceptualization of assimilation and contrast effects in persuasion would have to take into account how the expectancies and motives that may be activated during initial processing stages relate to information encountered at a later stage. For the time being, we conclude that salient heuristic cues may induce expectancies about message quality. These expectancies in turn introduce bias into message processing, which takes the direction of a contrast effect if the message is clearly discrepant from expectancies, and the form of an assimilation effect if the message is ambiguous. We have demonstrated the joint operation of these processes for the first time in a persuasion setting, but our findings seem to be compatible with assimilation and contrast effects that have been documented in other domains of judgment.
Acknowledgements

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References


Appendix

Examples for strong and weak arguments used in Expts 1 and 2

Strong arguments
The tunnel will have great advantages for local residents, as the volume of traffic in adjacent neighbourhoods will be reduced by about 80%. This means drastically less noise and exhaust fumes to be endured by residents.

Another argument in favour of the tunnel is the projected creation of a green river bank including parks and biotopes. Areas for outdoor activities and playgrounds will also be established, which means an increase in quality of life for the children living in Rotterdam.

Weak arguments
The tunnel will have advantages for local residents, as the volume of traffic in adjacent neighbourhoods will be reduced by about 4%. This possibly means less noise and exhaust fumes to be endured by residents.

Another argument in favour of the tunnel is the possibility of creating a green river bank by planting some trees and shrubs. Playgrounds could also be established; but these should not be used by children unattended, due to the high danger of drowning in the river.