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How people can become persuaded by weak messages presented by credible communicators: Not all sleeper effects are created equal☆

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HIGHLIGHTS

- Introduces a new kind of sleeper effect never considered before; a sleeper effect for the source
- Identifies conditions under which the new sleeper effect takes place
- Identifies reasons for the difficulty in generating the traditional sleeper effect for the arguments
- Presents a framework in which both types of effects can be generated

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ABSTRACT

The sleeper effect has been proposed to describe temporal changes in persuasion for messages associated with noncredible sources. The present research introduces a new kind of sleeper effect denoting increases in persuasion for weak messages associated with *credible* sources. This effect of the source was hypothesized to derive from attending to the message source rather than the message arguments and reconstructing delayed attitudes primarily on the basis of the source information. Findings from three experiments revealed that when the focus of attention was the communicator, there was a sleeper effect for the source. Specifically, during the time between an immediate follow up and a delayed follow up, persuasion increased when credible sources presented weak arguments. In contrast, when the focus of attention was the message arguments, a traditional sleeper effect emerged. That is, persuasion increased when strong arguments were presented by a noncredible communicator. These effects were mediated by relative recall of arguments versus source attributes and replicated with different message topics and lengths of delay.

1. Introduction

More than two millennia ago Aristotle outlined the ingredients of effective communications in his book *The Art of Rhetoric*. According to him, one of the most important ingredients for successful persuasion is that the communicator must be credible. Equally important is that the arguments must be strong and based on the rules of logic. Hundreds of studies indeed confirm that credible sources and strong arguments are essential for persuading an audience (Johnson, Maio & Smith-McLallen, 2005). What is less clear, however, is how durable the influence of credible communicators is and when this influence takes place. Filling this gap in knowledge is essential to better understand the dynamics of persuasion and social influence (see Prislin & Wood, 2005).

The sleeper effect is an interesting effect identified in relation to the durability of persuasive influences (Hovland, Lumsdaine, & Sheffield, 1949) and denotes a delayed increase in the impact of a persuasive message. Traditionally, it has been considered as a possibility for initially discounted communications. For instance, when the credibility of a message source induces suspicions of invalidity, little or no persuasion takes place immediately. Over time, however, if the reason for discounting the messages becomes less accessible in memory, a sleeper effect can take place assuming an otherwise strong message. This kind of a sleeper effect could be reliably observed in the past under certain circumstance (for reviews, Cook & Flay, 1978; Gruder et al., 1978;

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Kumkale & Albarracín, 2004). As we will argue, however, traditional conceptualizations of the sleeper effect has been restricted and incomplete. For instance, the possibility of a sleeper effect guided by a delayed increase in the impact of source attributes has never been considered. In the present research, we demonstrate this possibility that we term the sleeper effect for the source.

Just as a message can be discounted for its association with a noncredible source, it can be discounted for containing weak arguments as well. Thus, when a credible source presents such weak arguments, a source-based sleeper effect can be observed if the influence of the credible source remains and becomes apparent later in time. As we will argue in the following sections, this dormant influence of the source may surface more readily if the recipients attend to the source attributes (rather than the arguments) at the time of message exposure or when the relevant information is retrieved to make a delayed judgment.

Our primary underlying assumption is that, different aspects of the communication are available when the communication is first received relative to later, when delayed attitudes are reported. Delayed differences in accessibility of the communication information are likely to depend on the degree to which recipients attend to the communication source vs. the arguments, and differences in attentional focus should in turn produce different sleeper effects. This notion shares much with the *differential decay hypothesis* in recognizing that some aspects of the communication can be less memorable (Pratkanis, Greenwald, Leippe, & Baumgardner, 1988) than others but proposes no memorability advantage for the message arguments. We simply apply general considerations about online construction of attitudes and the influence of information accessibility (Schwarz & Bohner, 2001; Wyer, 2007) to both the message arguments and the source of a communication.

In the present research, we systematically manipulated recipients' focus of attention on the communication source vs. the arguments, both at the time of exposure and retrieval. These manipulations along with systematic variations in not only the credibility of the source but also the strength of the arguments in the message permitted testing for both the traditional argument-based sleeper effect as well as the source-based sleeper effect that we introduce in this research.

1.1. Sleeper effect for the source

A source-based sleeper effect could not be identified in the past, because predictions about the sleeper effect have been based on the premise that the influence of the message source decays more than the influence of the message arguments (e.g., Hovland & Weiss, 1951; Hovland et al., 1949). We reasoned that, there was no a priori reason to take this assumption for granted. For example, the personal characteristics of political candidates can be more important and memorable than the issues discussed in political campaigns (for reviews, see Iyengar & Ottati, 1994; Lodge, McGraw, & Stroh, 1989; Ottati, 2001; Wyer & Ottati, 1993). If asked today, most middle-aged Americans would probably remember that Michael Dukakis was a longtime governor of Massachusetts, but very few would remember his arguments on prison reform. Thus, the attributes of the source may remain more memorable than the arguments at times (e.g., Erb, Pierro, Manetti, Spiegel, & Kruglanski, 2007; Kruglanski, Fishbach, Erb, Pierro, & Mannetti, 2004; Kruglanski, Pierro, Manetti, Erb, & Spiegel, 2006; Pierro, Manetti, Erb, Spiegel, & Kruglanski, 2005). Past research has paved the way to this consideration by showing that the sleeper effect disappeared when the information source was made memorable (i.e., making it salient at the delayed testing; Kelman & Hovland, 1953; or repeating who the source is several times, Weber, 1972).

Weak arguments are commonly used in everyday communication contexts. In these situations, the initial influence of a credible communicator may decrease with the realization that the arguments are weak (i.e., reason for discounting). As a result, there may be no perceptible initial attitude change when a credible communicator presents weak arguments. As the reason for discounting (i.e., weak arguments) becomes less accessible, however, a source-based sleeper effect can take place when the influence of the credible communicator becomes more apparent. Perhaps because none of the earlier sleeper effect studies examined the influence of argument strength (for a review, see Kumkale & Albarracín, 2004), the possibility for a source-based sleeper effect could not be identified in the past. Consequently, earlier conceptualizations of the sleeper effect revolved around the argument-based sleeper effect, which relied on influential, and by contemporary terms *strong arguments* presented by noncredible sources.

1.2. Focusing attention on the source or the arguments

The sleeper effect takes place because people rarely retrieve and consider everything they know about an issue. Often times, they consider only a subset of the information as a way of efficiently satisfying their cognitive goals (Albarracín, 2002; Feldman & Lynch, 1988; Kruglanski et al., 2004, 2006; Schwarz & Bohner, 2001; Webb & Sheeran, 2006; Wilson, Lindsey, & Schooler, 2000; Wyer, 2007). Chaiken, Wood, and Eagly (1996), for instance, suggested that people who make a judgment or decision first apply the criterion that comes to mind most quickly.

As there is no reason to assume that arguments will always receive more attention than source attributes (Chaiken & Eagly, 1983; Kelman & Hovland, 1953; also see Erb et al., 2007; Kruglanski et al., 2006), finding a novel sleeper effect for the source vs. the traditional sleeper effect for the arguments is likely to depend on the recipients' focus of attention at the time of exposure. In particular, the traditional sleeper effect for the arguments should emerge when, at the time of receiving the message, people concentrate on the (strong) arguments more than the noncredible source. Correspondingly, the sleeper effect for the source should emerge when the focus is on the credible source rather the (weak) arguments. As the focus of attention is likely to determine later recall, this focus should make a difference at the delayed follow up.

The principal postulated mechanism is that persuasion at the delayed follow up will depend on whether the arguments or the source are accessible at that time. Moreover, as the initial focus of attention is likely to determine later recall, this focus of attention will also determine persuasion at the delayed follow up. Forming a solid impression of a credible communicator who happens to present weak arguments should yield increased persuasion over time, as should focusing on strong arguments that happen to be presented by a noncredible communicator.

Decades of social cognition research support the idea that representations can be organized around the attributes of the communicator or source of a persuasive message (Devine & Ostrom, 1985; Lingle, Geva, Ostrom, Leippe, & Baumgardner, 1979; Lingle & Ostrom, 1979; Wyer, 2004, 2007; Wyer & Budesheim, 1987). In the context of presidential elections, for example, recipients may be primarily motivated to form impressions of the candidates (Iyengar & Ottati, 1994; Lodge et al., 1989; Ottati & Wyer, 1993; Ottati, Wyer, Deiger, & Houston, 2002; Wyer & Ottati, 1993). In these conditions, attitude-relevant information may be organized around the identity of the candidates rather than the candidates' arguments. For example, the agendas of electoral candidates often look so similar that the only difference between candidates is the person. These conditions may naturally instill a focus on the personal attributes of the candidates rather than their arguments. When the focus of attention is on the source, the representation of the arguments may become less accessible over time and result in a sleeper effect for the source.

If the sleeper effect is likely to vary as a function of focus of attention, then it is important to identify determinants of focus of attention. One aspect that is likely to have induced argument focus in past research is presenting the message arguments before the source of the communication, which is the only condition under which the traditional effect has been generated (Kumkale & Albarracín, 2004). Outside of the sleeper effect literature, however, the most common manipulation of focus of attention has been to vary the processing goals of message recipients. In

research on political persuasion (e.g., Lodge et al., 1989), for example, frequently assigned experimental goals include evaluating the suitability of a candidate for public office (a source focus) or the desirability of the candidate's policy (an argument focus). Another strategy may involve asking questions about selected aspects of the communication content (Feldman & Lynch, 1988; Fitzsimons & Williams, 2000; Killeya & Johnson, 1998). For example, political attitudes of an audience can shift when commentators ask biased questions during the course of a campaign (Ottati et al., 2002). Other strategies may involve selective repetition of either information about the source vs. the arguments or varying the visual vividness of each piece of information. In the present research, we relied on these strategies in manipulating recipients' focus of attention.

1.3. Overview of the present research

We tested our hypotheses in three experiments. In Experiments 1 and 2, participants evaluated the campaign materials of a fictitious political party running for the student government on campus. Each participant received two ads: One ad described the arguments of the party and contained either strong or weak arguments; the other ad introduced the attributes of the candidates running for the office, who were portrayed as either credible or noncredible. These two ads allowed us to generate two conditions, one with strong arguments presented by a noncredible source and the other with weak arguments presented by a credible source.

Critical to Experiments 1 and 2, the messages were crossed with manipulations of attentional focus on either the arguments or the source. We predicted that the course of attitude change, including both types of sleeper effects would depend on these manipulations—without having any discernible effects on immediate attitudes: A source focus of attention should produce a sleeper effect when a credible source presented weak arguments, whereas an argument focus of attention should produce a sleeper effect when a noncredible source presented strong arguments. Each experiment involved a different focus manipulation to assess the robustness of the effect. In Experiment 1, the focus manipulation was introduced in between the immediate and delayed follow ups using a directed questioning approach (Feldman & Lynch, 1988; Fitzsimons & Williams, 2000; Killeya & Johnson, 1998). Specifically, participants were asked several questions about either the arguments or the source attributes (e.g., whether the agenda of the party sounded useful, relevant or whether the party representatives looked experienced, credible or trustworthy). In Experiment 2, The focus manipulation was more direct: Participants were asked to examine either the argument-ad or the source-ad twice during message exposure, once for content and another for style. The delay in these two experiments was approximately 45 min as in Pratkanis et al., 1988. Experiment 3 involved a different focus manipulation, a different topic, and a longer delay between attitude measurements (i.e., two weeks).[1]

2. Experiment 1

Experiment 1 tested the idea that the focus of attention during the message close to the time of presenting the message influences the type of sleeper effect that is observed. Participants first developed and expressed an attitude after examining the campaign materials of the political party. After reporting their attitudes, participants answered additional questions about their perceptions of either the source or the arguments. We reasoned that focusing on either the source or the arguments close to the reception of the message would produce differential recall and dictate which kind of sleeper effect occurs. Following a delay, participants reported their attitudes one more time.

2.1. Method

2.1.1. Participants

Participants were 72 male and 143 female introductory psychology students who received course credit for their participation. They were randomly assigned to the conditions of a 2 × 2 design, in which *Information Set* (strong arguments presented by the noncredible source vs. weak arguments presented by the credible source) and *Focus of Attention* (focus on arguments vs. source). There were between 48 and 62 participants in each condition.[2]

2.1.2. Procedures

Participants were introduced to the study with information that the student government at the university was interested in examining perceptions of the campaign materials of the political parties that would be running for office the following semester. We added that a better understanding of these perceptions could help the student government cut costs by funding only effective campaign materials. The cover story indicated that the study would also provide invaluable knowledge about formation of political attitudes. Under this pretense, asking participants to focus on a selected piece of information (e.g., the piece that conveyed the arguments vs. the source attributes) became easier. Thus, participants received the campaign materials of a fictitious political party. Each participant received two print ads. The first ad described the platform of the party and contained four arguments that were either strong or weak. The second ad introduced the attributes of the candidates, portraying them as either credible or noncredible. A set of questions right after the immediate attitude measures were introduced to manipulate the attentional focus.

Participants first examined and evaluated the campaign materials of the party. Then, for about 45 min, they worked on filler measures and messages presented on the computer. The delayed measures were obtained after the filler tasks as in Pratkanis et al. (1988). The study took about an hour, and involved up to eight participants in separated cubicles.

2.1.2.1. Information set. Under the pretense of helping the student government in assessing the campaign materials of the political parties that would be running for the office next semester, participants received two print ads of a fictitious political party called the Gator Party. One of the ads described the goals of the party and contained four arguments that were either strong or weak. The second ad introduced the attributes of the candidates and portrayed them as either credible or noncredible.

Given that the sleeper effect becomes relevant when the evaluative implications of the arguments and the source attributes are inconsistent with each other (for reviews, see Cook & Flay, 1978; Cook, Gruder, Hennigan, & Flay, 1979; Kumkale & Albarracín, 2004), the information set given to the participants involved an inconsistency as follows:

[1] The choice of time interval between message exposure and delayed posttests has been a long-lasting question in persistence research. As noted by Cook and Flay (1978), time is not a psychological construct; hence, it is important to design studies around processes that mediate persistence effects rather than time per se, as "the same events can often be packed into one year, one month, or even 1 day" (p.7). Thus, what is done in an experiment in terms of capturing processes that take place in time may be more critical than the duration between measurements. Indeed, in their meta-analysis, Kumkale and Albarracin (2004) did not find evidence for the moderating role of time interval between measurements (p. 163). Sleeper effects have been reported in studies involving delays as short as an hour (e.g., Pratkanis et al., 1988) as well as in studies involving longer delays such as a week (e.g., Priester et al., 1999).

[2] Although we did not intentionally try to oversample a particular condition, the number of participants across conditions ended up unequal in this study (range = 48–62). This unevenness could constitute a problem in the analyses if the sample size was small. The current study, however, was significantly more powerful than the typical sleeper effect study. The median sample size for the discounting-cue conditions was 27 on average in the literature (for a review, see Kumkale & Albarracin, 2004; p. 159), with substantial variance across studies (range = 9 to 80). Furthermore, standard deviations were similar across conditions. Thus, we do not think that this unevenness might have brought about significant bias in the results.

When the arguments received were strong, the associated source was always noncredible; when the arguments were weak, however, the source was always credible– representing the conditions related to the traditional and the novel sleeper effects respectively.

The ad presenting the political platform of the party contained either four *strong arguments* or four *weak arguments*. For example, one of the strong arguments asserted that the party would pressure the school administration to provide financial support for students performing well academically. Another strong argument asserted that the party would negotiate an increase in the salary of students involved in work-study programs. In contrast, one of the weak arguments asserted that the party would utilize unused tuition fees for student government banquets held each semester. Another weak argument indicated that the party would install online cameras in the registrar's office so that the students could see how long the lines were before leaving home. These arguments were selected from a pool of over 30 pretested arguments; several of which were directly taken from the campaign materials of actual student-led parties running for the office on campus. Furthermore, to bolster the cover story, we tried to make the layout of the ads as similar as possible to the materials used by actual student-led parties on campus. For instance, we boldfaced and highlighted the Gator Party name on the top panel of the ad, and compounded this header with images of alligator heads at the bottom.

The identical layout (with the header and images) was used to convey source credibility information in a separate print ad. The credible candidates were introduced as experienced political science and law students who were interested in pursuing careers in politics after graduation. The noncredible candidates were introduced as open-minded, part-time students who were undecided majors at the time. Each of these pilot-tested ads contained four pieces of information, and were about equal in length (M words = 70; see supplementary materials online). The validity of the argument strength and source credibility manipulations was established through extensive pilot testing.[3] The order of the ads was counterbalanced. This factor had no main effect on any of the dependent measures, nor did it interact with any of the other variables. Therefore, its effects receive no further attention.

2.1.2.2. Focus of attention. Participants examined each ad twice before reporting their immediate attitudes. Then, participants in the argument-focus conditions completed measures of beliefs about the arguments, whereas participants in the source-focus conditions completed similar measures about the source. Both measures included 12 items rated along 11-point scales. For example, participants in the source-focus conditions rated the extent to which the source was experienced, trustworthy, credible, biased, strong, and influential. Participants in the argument-focus conditions rated the extent to which the agenda of the party included useful, relevant, favorable proposals that could serve the interests of the students. In addition, before the delay, participants in the argument-focus conditions were asked to recall the arguments, whereas participants in the source-focus conditions were asked to recall the attributes of the source. They were told that another issue of interest was the memorability of campaign materials. At that point, participants were asked to recall as much as possible of either the arguments of the party or the attributes of its candidates. The manipulation of focus was therefore very close to the point of message reception but appeared after the immediate attitude measure. Experiment 2 produced a replication with the manipulation being introduced exactly at the point of message reception.

[3] In one of the pilot studies ($N = 76$), the ads were presented separately to different groups of people. On a scale ranging from −5 to +5, participants found the strong arguments to be more convincing than the weak arguments ($M = 2.37$, $SD = 2.36$ vs. $M = -2.89$, $SD = 2.44$, respectively; $d = 2.20$, $p < 0.001$). The source credibility manipulation was also successful ($M = 3.28$, $SD = 1.50$ vs. $M = -0.68$, $SD = 2.20$; $d = 2.11$, $p < 0.001$). Furthermore, the credible source was found to possess more impressive characteristics than the noncredible source, ($d = 2.18$, $p < 0.001$).

2.1.3. Dependent measures

Immediate and delayed attitudes were assessed by asking participants to rate "voting in favor of the party" along scales ranging from −5 to +5 (*is something that I would not like vs. like; would be harmful vs. helpful; would be negative vs. positive; would be a bad idea vs. good idea)*. The reliability of the scale was high at each time point ($\alpha_{immediate} = 0.98$; $\alpha_{delayed} = 0.98$). For each time point, responses were averaged to yield summary indices of attitudes.

The critical dependent variable in the sleeper effect literature is the amount of attitude change between the immediate and delayed posttest (for a discussion of the right dependent variable, see reviews by Cook & Flay, 1978; Kumkale & Albarracín, 2004). Thus, an index was created by subtracting immediate attitudes from delayed attitudes: Positive scores represented increases in persuasion over time and hence possible absolute sleeper effects, whereas negative scores indicated decay in persuasion over time.

2.2. Results

2.2.1. Immediate attitudes

Immediate attitudes did not differ significantly from the neutral point of the scale, $M = 0.16$ ($SD = 2.39$), $t = 0.96$, $p = 0.34$. This suggests that the communication was discounted as expected. Most importantly, neither the main effects nor the interaction between Information Set and Focus of Attention were significant for immediate attitudes, all Fs < 1.1. Thus, conditions required to observe a sleeper effect were in place (Cook et al., 1979; Kumkale & Albarracín, 2004).

2.2.2. Attitude change over time

We expected to observe different sleeper effects depending on the focus of attention. As expected, the interaction between *Information Set* and *Focus of Attention* on attitude change scores was significant, $F(1, 211) = 25.37$, $p < 0.001$. None of the main effects approached significance, $F < 1$.

As shown by the attitude change means in Table 1, the novel sleeper effect for the source was verified when the recipients of weak arguments presented by a credible source focused on the source ($M_{change} = 0.40$, CI = 0.04/0.76) rather than the arguments ($M_{change} = -0.26$, CI = −0.58/0.06); contrast $F(1, 211) = 7.31$, $p < 0.01$; $d = 0.52$, CI = 0.14/0.90. In contrast, the traditional sleeper effect for the arguments was verified when the recipients of strong arguments presented by a noncredible source focused on the arguments ($M_{change} = 0.55$, CI = 0.20/0.91) rather than the source ($M_{change} = -0.53$, CI = −0.86/−0.21); contrast $F(1, 211) = 19.29$, $p < 0.001$; $d = 0.86$, CI = 0.45/1.25. Gender did not make a difference on any of these measures, neither in this study nor in the subsequent experiments–consistent with past research on the sleeper effect.

2.3. Discussion

Experiment 1 provided support for the idea that sleeper effects could take place when either the source or the arguments are made salient close to the time of receiving the message. Although this study supported the notion that the attentional focus moderates the type of sleeper effect that ensues, immediate attitudes were measured before the introduction of the focus manipulation. Therefore, it was desirable to replicate these findings while ensuring that the immediate attitudes remained unaffected and that the effects were solely due to how delayed attitudes were reconstructed at the delayed follow up. This objective was accomplished in Experiment 2.

Table 1
Attitudes and attitude change as a function of information set and focus of attention (Experiment 1).

Dependent measure	Weak arguments-credible source		Strong arguments-noncredible source	
	Focus on arguments ($n = 62$)	Focus on source ($n = 48$)	Focus on arguments ($n = 48$)	Focus on source ($n = 57$)
Immediate attitudes	−0.17	−0.37	0.17	0.35
	(2.43)	(2.64)	(2.35)	(2.16)
Delayed attitudes	−0.43	0.03	0.73	−0.18
	(2.62)	(2.63)	(2.52)	(2.43)
Attitude change	−0.26^{+}	0.40*	0.55*	−0.53*
	(−0.58/0.06)	(0.04/0.76)	(0.20/0.91)	(−0.86/−0.21)

Note. Immediate and delayed attitudes were measured using scales that ranged from −5 to 5. Values in parentheses are standard deviations for immediate and delayed attitudes; for attitude change scores, they are 95% confidence intervals around the means.
$^{+}$ $p < 0.06$.
* $p < 0.05$.

3. Experiment 2

3.1. Method

3.1.1. Participants

Participants were 74 introductory psychology students who received course credit in exchange for participation (18 male; 56 female). They were randomly assigned to the conditions of a 2 × 2 design with the between-subjects factors *Focus of Attention* (focus on arguments vs. source attributes) and *Information Set* (strong arguments presented by the noncredible source; weak arguments presented by the credible source). There were between 17 and 20 participants in each condition.

3.1.2. Procedures

The cover study and the materials of this experiment were identical to the ones used in Experiment 1. Specifically, participants evaluated the campaign materials of a fictitious political party running for the student government on campus. The focus manipulation, however, was more direct than the one used in Experiment 1. Specifically, to favor recall of either the arguments or the source, we instructed participants to focus on either the arguments or the source ad and examine it twice, once for content and another for style. Specifically, we told them: "Please examine this ad twice. First, read the ad for its content, then the second time you read, please attend to how it is written, and underline the key words in each part of the ad. Then, write below the ad what you found most noticeable." Participants read the other ad only once without further work on it. As noted before, asking them to focus on a particular piece of the campaign materials was justifiable given the cover story. Upon seeing that the order of ads did not make a difference in Experiment 1, we did not manipulate order this time and presented the argument ad before the source ad for everyone in the study.

Besides a change in the focus manipulation, Experiment 2 additionally involved measures of recall obtained at the end of the delayed posttest. Finally, as described in the supplementary analyses section, Experiment 2 included control conditions in which the participants received evaluatively consistent communications where strong arguments were associated with a credible source or weak arguments were associated with a noncredible source.

3.1.3. Dependent measures

Participants reported their attitudes toward voting in favor of the party immediately after exposure to the communications and also 45 min later. After the delayed measure of attitudes, participants completed a measure of free recall, which was intended to verify the effectiveness of the focus manipulation.

3.1.3.1. Attitudes toward behavior. The attitude measures were identical to the ones used in Experiment 1. The reliability of the scale was high at each time point ($\alpha_{immediate} = 0.95$; $\alpha_{delayed} = .98$). For each time point, responses were averaged to yield summary indices of attitudes. As in Experiment 1, the index of attitude change was created by subtracting immediate attitudes from delayed attitudes. Thus, positive scores represented possible sleeper effects, whereas negative scores represented decays in persuasion.

3.1.3.2. Recall of arguments and source attributes. At the end of the experiment, participants were asked to write down all they could remember from the campaign materials. We computed two separate recall scores based on these responses, one for the arguments and one for the source attributes. There were four pieces of information in each ad. Therefore, recall scores ranged from 0 to 4 in each case. Undergraduate assistants blind to the conditions of the study independently coded the protocols with an acceptable level of agreement ($r = 0.95$). In addition, the first author blindly coded the protocols twice with an interval of 10 weeks between each coding ($r = 0.92$).

3.2. Results

We expected that the likelihood of observing either type of sleeper effect would depend on the focus of attention and the information received. As in Experiment 1, these factors interacted in determining the longitudinal course of change in attitudes. Before decomposing this interaction, however, it is necessary to establish that the conditions necessary for the emergence of the sleeper effect were met. This requires examining immediate attitudes and attitude change over time separately (for a detailed review of issues related to analysis of sleeper effect data, see Cook et al., 1979; Kumkale & Albarracín, 2004).

3.2.1. Immediate attitudes

As one of the conditions, it is necessary to verify that there is little or no persuasion initially. The presence of a discounting cue and its accessibility at the time of exposure should restrict persuasion initially, preferably almost entirely. Indeed, when people received strong arguments from a noncredible source or when they received weak arguments from a credible source, immediate attitudes did not differ significantly from the neutral point of the scale ranging from −5 to 5 ($M = 0.38$, $SD = 2.28$, $t = 1.44$, $p = 0.15$.). Furthermore, as in Experiment 1, neither the main effects nor the interaction between Information Set and Focus of Attention were significant for immediate attitudes, all $Fs < 1.06$. Thus, an important condition required to observe a sleeper effect was met.

3.2.2. Attitude change over time

As in Experiment 1, focusing on aspects of the communication with favorable implications brought about significant increases in persuasion over time (see the third row of Table 2). The critical interaction between Focus of Attention and Information Set was significant as in Experiment 1, $F(1, 70) = 9.24$, $p < 0.01$. The source-based sleeper effect was verified when the recipients of weak arguments presented by a credible source focused on the source ($M_{change} = 0.50$, CI = 0.02/0.98) but not when

Table 2
Attitudes, attitude change, recall as a function of information set and focus of attention (Experiment 2).

Dependent measure	Weak arguments-credible source (−, +)		Strong arguments- noncredible source (+, −)	
	Focus on arguments ($n = 19$)	Focus on source ($n = 18$)	Focus on arguments ($n = 17$)	Focus on source ($n = 20$)
Attitudes				
Immediate attitudes	0.40	0.93	0.34	−0.10
	(2.75)	(2.01)	(2.47)	(1.89)
Delayed attitudes	−0.05	1.43	1.06	−0.06
	(3.22)	(1.95)	(2.49)	(3.21)
Attitude change	-0.46^{+}	0.50^{*}	0.72^{*}	0.04^{ns}
	(−0.93/0.06)	(0.02/0.98)	(0.23/1.21)	(−0.42/0.49)
Recall for message arguments and source attributes				
Message arguments	2.74	1.61	2.71	2.00
	(2.31/3.17)	(1.17/2.05)	(2.25/3.16)	(1.58/2.42)
Source attributes	0.90	2.00	0.82	2.00
	(0.31/1.48)	(1.43/2.58)	(0.20/1.44)	(1.43/2.58)

Note. Immediate and delayed attitudes were measured using scales that ranged from −5 to 5. Values in parentheses are standard deviations for immediate and delayed attitudes; for attitude change scores, they are 95% confidence intervals around the means.
Recall scores could range from 0 to 4 for both arguments and source attributes. Values in parentheses are 95% confidence intervals around the means.
$^{+}$ $p < 0.06$.
* $p < 0.05$.

they focused on the arguments ($M_{change} = -0.46$, CI = −0.93/0.06); contrast $F(1, 70) = 6.33$, $p < 0.02$; $d = 0.86$, CI = 0.19/1.53. The traditional, argument-based sleeper effect was verified when the recipients of strong arguments presented by a noncredible source focused on the source ($M_{change} = 0.72$, CI = 0.23/1.21 vs. $M_{change} = 0.04$, CI = −0.42/0.49); contrast $F(1, 70) = 3.18$, $p < 0.08$; $d = 0.57$, CI = −0.09/1.23.

3.2.3. Recall of source attributes and arguments

Next, we examined whether these sleeper effects were mediated by relative recall of arguments versus source attributes. Recipients' memory of the arguments and source attributes was measured using a free-recall task at the end of the delayed posttest (see the bottom panel of Table 2). As expected, participants who initially focused on the arguments recalled these arguments better than those who initially focused on the source attributes ($M = 2.72$, $SD = 0.84$ vs. $M = 1.82$, $SD = 1.00$, respectively). Only the main effect of focus of attention was significant in a 2 × 2 ANOVA test with Information Set and Focus of Attention as the between-subjects factors; $F(1, 70) = 17.60$, $p < 0.001$. Similarly, participants who initially focused on the source attributes later recalled these attributes better than those who initially focused on the arguments ($M = 2.03$, $SD = 1.40$ vs. $M = 0.86$, $SD = 1.10$, respectively). Again, only the main effect of focus of attention was significant in a 2 × 2 ANOVA; $F(1, 70) = 14.44$, $p < 0.001$.[4]

To examine whether the effect of focus on recall mediated the patterns of change in attitudes, we followed the bootstrapping procedures outlined by Preacher and Hayes (2004). The sleeper effects emerge only when people focus on the piece of information that has favorable implications for judgment (e.g., strong arguments or the attributes of the credible source). Therefore, we created a dummy-code for whether the focus was on the positive or negative aspect of the communications (1 = positive vs. 0 = negative). Then, we created an index for the mediator (i.e., biased recall) using the two indicants of recall summarized in Table 2. Specifically, we converted the raw number of positive and negative pieces of recalled information into proportions, and subtracted the proportion of negative pieces of information from the proportion of positive pieces of information recalled. Thus, a zero indicates lack of bias, whereas positive scores indicate superior recall of the positive piece of information and negative scores imply superior recall of the negative piece of information. Consequently, scores on this index of biased recall ranged from −1 to 1.

To examine whether the indirect effect of focus of attention on attitude change, via biased recall, was significantly different from zero, we estimated the standard deviation of the indirect effect for 3000 bootstrap samples (Preacher & Hayes, 2004). We found that the indirect effect was estimated to lie between 0.02 and 0.56 ($B = 0.27$, $SE = 0.13$). Because zero is not in the 95% confidence interval, these data suggest that the impact of focus of attention on attitude change was indeed mediated by biased recall. The effect of focus of attention on the amount of change from the immediate to delayed posttest ($B = 0.81$, $SE = 0.27$, $p < 0.01$) became nonsignificant after controlling for the mediator ($B = 0.55$, $SE = 0.31$, $p > 0.08$).

The bootstrap mediation data suggest that focus of attention may affect course of change in attitudes by way of inducing biased recall. As an alternative mediation possibility, it could be argued that people who changed their attitudes as a function of focus might have retrieved information from memory in a biased way to support these newly constructed delayed attitudes. The same bootstrapping procedures supported this possibility.[5] However, this alternative possibility does not constitute a threat to the biased recall mechanism that we propose, as the recall measures in this study were obtained after the administration of delayed attitude measures. Besides that, the latter possibility implies a deliberative, strategic attempt to engage in biased retrieval of information from memory to support a judgment. Such a deliberation was not relevant in this context, as the participants did not know that they would be asked to report a delayed judgment.

3.2.4. The effects of attentional focus under evaluative consistency: supplementary analyses

Experiments 1 and 2 showed that focus of attention is critical in determining attitude change over time when a communication conveys evaluatively inconsistent pieces of information. Such a communication is likely to induce an imbalanced attitude structure. Based on past theorizing, we reasoned that focus of attention would matter less in absence of such an inconsistency (Albarracin, Wallace, & Glasman, 2004; Cook & Flay, 1978; Vallacher, Nowak, & Kaufman, 1994) and tested this idea

[4] Clearly participants recalled the arguments better than source attributes. This effect does not compromise the interpretation of our results but may be due to the fact that the policies discussed in the arguments were known to participants whereas the information about the party was not.

[5] The indirect effect was estimated to lie between 0.02 and 0.63 ($B = 0.29$, SE = 0.16). The effect of focus on biased recall ($B = 0.82$, $SE = 0.28$, $p < 0.001$) became nonsignificant after controlling for the mediator, which was the amount of attitude change over time ($B = 0.53$, $SE = 0.32$, $p > 0.10$).

using the same Gator Party materials. In these *evaluatively-consistent* conditions, participants received strong arguments associated with the credible source or weak arguments associated with the noncredible source. These conditions were not relevant to the sleeper effect directly. However, they were included to show that focus of attention should matter to a greater extent when communications convey evaluatively inconsistent information. Thus, we expected that participants would develop very favorable or unfavorable attitudes depending on the information set received, and that these immediate attitudes would persist over time regardless of focus.

Table 3 shows the data for these evaluatively consistent conditions. As can be seen, when strong arguments were associated with a credible source, participants formed very favorable attitudes, and these favorable attitudes remained stable overtime regardless of focus. Similarly, when weak arguments were associated with a noncredible source, participants formed very unfavorable attitudes, and these attitudes persisted over time regardless of focus. On attitude change scores, neither the main effects nor the interaction was significant, $Fs < 1$. Averaged across all four conditions, there was clear evidence of stability over time ($M = 0.00$; $SD = 0.85$, $N = 72$). This result is consistent with the premise that when the arguments and the source have the same level of credibility/strength, attitudes can be reconstructed in the same fashion regardless of whether the arguments or the source characteristics are recalled.

3.3. Discussion

Experiment 2 provided further support for the hypothesis that the sleeper effect for the source emerges when a credible source presented weak arguments and the recipients focus on the source. Correspondingly, the traditional sleeper effect for the arguments emerges when a noncredible source presents strong arguments and the recipients focus on the arguments. Importantly, this pattern was obtained even though the focus of attention manipulation did not have an impact on immediate attitudes, suggesting that the effect occurred at the point of reconstructing attitudes during the delayed follow up. The effects on attitude change were mediated by recall of the arguments and the source information.

Overall, Experiment 2 replicated the results observed in Experiment 1, with one exception: When the recipients focused on the attributes of a noncredible communicator presenting strong arguments, delayed attitudes did not turn out to be more negative than the immediate attitudes. Attitudes in this condition persisted over time (i.e., change = 0.04; see the fourth column of Table 2). Attitude stability in this condition could only take place in absence of biased recall. Indeed, the recall data presented in Table 2 show that participants in this condition could recall the arguments and the source attributes equally well interestingly. Hence, there was no evidence of biased recall in this condition. This attitude stability is probably due to some spontaneous integration of the conflicting information. For example, participants might have tried to explain why an otherwise weak source presented strong arguments, leading to retrieving integrated argument and source information at the delayed follow up. The more negative attitude change observed in Experiment 1 might be due to differences in the nature of the focus manipulation, which was forceful in Experiment 1 but relatively more subtle in Experiment 2.

Table 3
Attitudes and attitude change in the evaluatively-consistent control conditions (Experiment 2).

Dependent measure	Weak arguments-noncredible source (−, −)		Strong arguments-credible source (+, +)	
	Focus on arguments ($n = 19$)	Focus on source ($n = 18$)	Focus on arguments ($n = 16$)	Focus on source ($n = 19$)
Immediate attitudes	−2.39 (1.94)	−1.88 (2.68)	2.66 (1.93)	2.09 (1.86)
Delayed attitudes	−2.53 (1.85)	−1.96 (2.82)	2.69 (2.02)	2.28 (1.82)
Attitude change	-0.13^{ns} (−0.60/0.34)	-0.08^{ns} (−0.56/0.40)	0.03^{ns} (−0.48/0.54)	0.18^{ns} (−0.56/0.40)

Note. Immediate and delayed attitudes were measured using scales that ranged from −5 to 5. Values in parentheses are standard deviations for immediate and delayed attitudes; for attitude change scores, they are 95% confidence intervals around the means.

4. Experiment 3

Experiments 1 and 2 provided evidence that the likelihood of observing both types of sleeper effects as a function of the evaluative implications of the arguments and the source as well as the focus of attention. Providing evidence for the source-based sleeper effect was especially critical as it has never been shown before despite the interest generated by these issues. In these experiments, however, the novel sleeper effect was obtained within a single experimental session, with a delay of 45 min in between the message presentation and the delayed follow up (for similar procedures see Pratkanis et al., 1988; Waldum & Sahakyan, 2012). Of course these conditions would only increase the difficulty of observing an effect that relies on imperfect memory. However, for comparability with some of the prior work on the effect (Kumkale & Albarracín, 2004), it seemed useful to replicate this novel effect with a longer delay. Thus, in Experiment 3, delayed attitudes were measured exactly one week after the message presentation.

The second goal of Experiment 3 was to replicate our findings in an attitude change rather than formation setting. In Experiments 1 and 2, participants did not have existing attitudes toward the issues discussed in the messages. In this experiment, however, participants were much likely to have attitudes toward the issues discussed in the target message, which was about the controversial issue of incorporating Turkey into the European Union (EU). It has been a current controversial issue for several decades in Turkey, where this experiment was conducted. Thus, Experiment 3 included an additional no-message control condition.

The third goal of Experiment 3 was to highlight the importance of the focus of attention by comparing the sleeper effect in a source-focus condition to the trend in a no-focus control condition. In Experiments 1 and 2, weak arguments presented by a credible source brought about a sleeper effect when the focus was placed on the source attributes. In absence of such a focus, there should be no reason to expect a sleeper effect or decay over time, assuming that similarly-long source and message passages receive similar attention. Thus, it was necessary to verify that attitudes would remain relatively stable over time in the no-focus control condition.

In summary, participants in Experiment 3 received a message containing weak arguments about the incorporation of the country into the EU and then reported their attitudes immediately after receiving the message and then again, seven days after the message presentation. As in Experiments 1 and 2, we expected to observe the novel sleeper effect only in the source-focus condition, but attitude stability in the no-focus condition. As natural changes in attitudes were possible due to active media coverage of the topic at the time, these trends were compared to the trend in the baseline condition (for more detailed information about defining the sleeper effect in relation to baseline changes in attitudes, see Cook & Flay, 1978; Kumkale & Albarracín, 2004).

The fact that we expect to observe attitude stability rather than a sleeper effect in the no-focus control condition requires an explanation. Unlike past theorizing on the sleeper effect, we do not think that one piece of attitude-relevant information should be necessarily more accessible, or relevant than another piece inherently. If the source description is detailed or salient as in our case, its representations can stay as strong as the representations of the arguments over time and bring about attitude stability rather than sleeper effects or decays. In making this point, we concur with other researchers that cues and arguments are better conceptualized as functionally equivalent pieces of information (see e.g., Erb et al., 2007; Kruglanski et al., 2004). To bolster this

argument, we revisited the meta-analytic database and conducted additional analyses involving the salience of source descriptions. We reasoned that a sleeper effect in absence of a focus manipulation might have taken place when the source descriptions were brief but not when they were long. Indeed, as expected, there were slight increases over time when the descriptions were brief ($d = 0.13$), but clear evidence attitude stability when the descriptions were long ($d = 0.00$); $z = 2.34$, $p < .02$. As noted by Kumkale and Albarracín (2004), detecting the traditional sleeper effect has not been easy in the past. In the majority of the studies that they reviewed, the default pattern was attitude stability rather than a sleeper effect, which is consistent with our argument about the importance of focus.

4.1. Method

4.1.1. Participants

Participants were 144 introductory psychology students who received course credit for taking part in a two-session experiment (61 females and 83 males). Participants were randomly assigned to one of the following three conditions (source focus; no focus; no-message control).

4.1.2. Procedures

Participants signed up to a study involving tasks and measures ostensibly part of two separate studies—a consumer behavior study and a text-readability study. The target message and the associated attitude measures were presented as part of the readability study with a cover story similar to the one used in Experiment 2.

In the first session, participants first completed various individual difference measures as part of the consumer behavior study, which was intended to identify individual difference correlates of discretionary spending. This study involved some decision tasks unrelated to the target issue. In the middle of the session, participants in the source-focus and no-focus conditions received the target message. The message contained *three weak arguments* stating that Turkey should become a member of the European Union. It was attributed to a credible source. In the *no-focus condition* ($n = 42$), participants reported their attitudes toward Turkey's membership in the EU immediately after reading the message. In the *source-focus condition* ($n = 40$), participants rated the credibility and the expertise of the message source first and then reported their attitudes. The assessment of the message source along these dimensions was the only difference between these two experimental conditions. Participants in both conditions reported their attitudes again by coming to the lab exactly one week after message exposure. Participants in the *no-message control* ($n = 62$) condition did not receive the target message but reported attitudes at both time points so that potential changes in baseline attitudes could be assessed.[6]

4.1.2.1. Communication. The message concerned Turkey's incorporation into the EU and included extensively piloted weak arguments. One of the arguments highlighted that membership would make it easier to distinguish higher quality, environmentally-friendly products from lower quality, harmful products. Another argument focused on changes that would take place in the fishing industry and argued that adopting the EU standards on size, quality, packaging, and labeling of sea-based products would revolutionize the industry to the benefit of the consumer. None of the arguments, which describe real changes that would take place in case of membership, had been heard by the participants before. The message, presumably taken from a news agency specializing in EU affairs, was presented with the title "How will the EU change our everyday life?" and was 400-words long.

With respect to the communication source, the message was attributed to a professor presumably working as a member of the EU Harmonization Commission. A 60-word description provided information about the educational background of the professor as well as his scientific achievements. This information was also established through pilot testing, and found to be more credible than other types of sources (e.g., a student and an experienced journalist).

4.1.2.2. Focus manipulation. Participants in the source-focus condition rated the expertise and trustworthiness of the message source prior to reporting their immediate attitudes, using two questions that were typed with a slightly larger, bold-faced font. The idea was to have recipients think about these dimensions in ways that may not occur spontaneously (Pratkanis et al., 1988). Participants in the no-focus condition did not rate the source on any dimension.

4.1.3. Dependent measures

Attitudes toward Turkey's incorporation into the European Union were assessed by asking participants to rate "Turkey's accession into the EU" along scales ranging from −5 to +5 (*would be very bad* vs. *very good; is something that I would not want at all vs. I would very much want; would be harmful vs. helpful; is very unnecessary vs. very necessary*). Responses were averaged to create summary indices of attitudes ($\alpha = 0.96$ for both posttests). The interval between the immediate and the delayed posttest was 7 days.

4.2. Results

As in Experiments 1 and 2, we expected a sleeper effect for the source when participants focus was on the attributes of the source. Without such a focus, immediate attitudes would most likely remain stable over time. To test this hypothesis, Experiment 3 included an additional no-focus control condition and the aforementioned baseline condition. The means corresponding changes observed in these three conditions to this study appear in Table 4.

As shown in the first row of Table 4, immediate attitudes of participants who received the target message seemed to be more positive than the attitudes of control group participants who did not receive a message. Although these differences were not significant, the lack of complete suppression of persuasion at the time of exposure could reduce the probability of observing a sleeper effect in the long run (as argued in Cook et al., 1979; Kumkale & Albarracín, 2004), $F(2, 141) = 1.35$, *ns.* $p > 0.25$. Despite this constraint, expected differences were observed at the delayed posttest, $F(2, 141) = 3.53$, $p < 0.04$: Although attitudes remained relatively stable over time in both of the control conditions, there was a significant increase only in the source-focus condition, $F(2, 141) = 3.65$, $p < 0.03$.

4.3. Discussion

The goal of Experiment 3 was to verify the source-based sleeper effect using a longer delay between attitude measurements. Furthermore, we wanted to see if we could generate the source-based sleeper effect in an attitude change setting, as Experiments 1 and 2 involved formation of new attitudes. Finally, we wanted to highlight the importance of focus by comparing the situation to a situation in which the recipients were not induced to focus on a particular piece of information. In that case, attitude stability rather than a sleeper effect prevailed. Corroborating the results of the previous experiment, Experiment 3 demonstrated the importance of the focus of attention in attitude persistence and change: The source-based sleeper effect emerged when people focused on the attributes of the credible source but not otherwise.

[6] As in Experiment 1, sample sizes across conditions were not equal in Experiment 3. The data for this study were collected by a research assistant in a large computer-lab, where the URL address directing participants to the web-based questionnaire was projected on the screen. There were three different web-based questionnaires (with different addresses) representing the condition of the study. Conditions were randomized across sessions within the same day. Thus, the imbalance in sample sizes across conditions was due to running an additional session for the no-message control condition.

Table 4
Attitudes at the immediate posttest, after 7 days, and change as a function of focus of attention (Experiment 3).

	No-message control ($n = 62$)	No-focus control ($n = 42$)	Focus on source ($n = 40$)
Immediate attitudes	1.67	2.15	2.42
	(2.38)	(2.17)	(2.39)
Delayed attitudes	1.58	2.18	2.86
	(2.66)	(2.17)	(2.07)
Attitude change	-0.09^{ns}	0.02^{ns}	0.44^{*}
	(−0.37/0.19)	(−0.24/0.29)	(0.14/0.73)

Note. Attitudes were measured using 11-point rating scales ranging from −5 to 5, where higher scores indicated greater agreement with the advocated position. Numbers in parentheses for immediate and delayed attitudes are standard deviations, and confidence intervals for change scores reported in the last row.
* $p < 0.05$.

5. General discussion

Building on the premise that message arguments and source attributes can both influence persuasion, we investigated a new type of sleeper effect never considered before—a sleeper effect guided by a delayed increase in the impact of source attributes rather than the arguments. Moreover, the present research not only verified the source-based sleeper effect, but also shed some light on the question of why it has been difficult to replicate the effect in the past.

Given that individuals retrieve just enough information to make a reasonable judgment, their judgments and behaviors can be disproportionately influenced by the evaluative implications of accessible attitude-relevant information (Albarracín, 2002; Chaiken et al., 1996; Feldman & Lynch, 1988; Schwarz & Bohner, 2001; Wilson et al., 2000; Wyer, 2004, 2007). Accordingly, representations of attitude-relevant information could entail the arguments or the source, not just the arguments as it has been traditionally assumed. Thus, when people first see a presidential candidate, they may form a person impression that is later accessible to recall. If they later think about a candidate in a presidential race, they may recall personal attributes of this candidate rather than her arguments about specific issues (Iyengar & Ottati, 1994). In this case, representations of the issues supported by the candidate may be integrated as well, but may only be accessed along with other information about the candidate as a person. In general then, these conditions would facilitate easier recall of information about the source and more difficult recall of the arguments presented by the source.

Although the sleeper effect literature evolved independently of the literature on source monitoring, it is possible to see the sleeper effect as a special case of failure of source monitoring (for a review, see Johnson, Hashtroudi, & Lindsay, 1993). Source monitoring failures arise when aspects of the original learning context and the learned information are represented in different memory systems. For instance, the arguments conveyed in a message may be represented in semantic memory, whereas information such as when, where, and how that message was received may be represented in episodic memory. As semantic recall is more resource depleting than episodic recall (Tulving, 2002), the arguments contained in a message may be more easily retrieved than the message's context, including its source (for recent relevant work, see Ladowsky-Brooks & Alcock, 2007). Moreover, conditions that lead to semantic/episodic dissociations should increase the likelihood of observing sleeper effects. For example, the use of different codes, such as implicit, subtle cues along with explicit propositional arguments may produce sleeper effects of greater magnitude than those observed in the present and past work.

Another future direction in this line of research concerns individual differences that can moderate the sleeper effect. Thus far, only need for cognition has been shown to facilitate the effect (Priester, Wegener, Petty, & Fabrigar, 1999), but other factors may play a role as well. For example, the present research suggests that the sleeper effect should be most likely for people who are high in need for cognition but low in need to evaluate (Jarvis & Petty, 1996). People who are high in need for cognition are likely to have paid attention to the focal element (i.e., the arguments or the source) more than people who are low in this trait. People who are high in need to evaluate tend to form attitudes spontaneously, and so may have immediate attitudes that reduce the need to construct attitudes at the delayed follow up. Thus, future research should investigate whether these two traits interact to produce sleeper effects.

Another direction for future research is studying attitude persistence and change in message dense, dynamic environments. In this line of research, the effects of a single message are typically considered in a vacuum. In everyday life people receive competing and repeated messages from various points of view. For instance, in a typical political campaign, there are accusations, defenses against those accusations, and comments of third parties. In the meantime, people's affective states such as moods may change as well. Hence, it may be time to consider the longitudinal course of attitudes in dynamic contexts where there are multiple messages from multiple sources. A better understanding of how attitudes evolve in such dynamic settings, along with more measures of change, will enhance the applicability of attitude research.

In closing, we found that sleeper effects for the source do emerge when message recipients form impressions of a credible communicator who presents weak arguments. The conditions for ignoring the information presented by a communicator entail a focus on the communicator, and may naturally unfold when personal characteristics are highly salient. For example, personal contact with a communicator may produce situations in which the actual arguments countless as time goes by. Therefore, far from concluding that credibility does not matter in the long run, one must conclude that credibility may sometimes be the only piece of information that endures the passage of time.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jesp.2016.06.009.

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