The Primacy Effect in Impression Formation: Some Replications and Extensions

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Individuals described as “fun, witty, and vicious” are typically rated more favorably than those described as “vicious, witty, and fun” (e.g., Asch, 1946), despite the semantic equivalence of these statements. This is known as the primacy effect in impression formation. We tested whether these effects emerge from pragmatic inferences about communicative intentions (e.g., that communicators should relay the most important information first). Participants heard a list of descriptors with the most positive adjective listed either first or last; they also learned either that (a) the list was compiled by a human (licensing the inference that the most important information should be conveyed first) or (b) randomly ordered by a computer (thus blocking such an inference). Across five experiments (total $N = 2,882$), we found support for a small primacy effect in impression formation, but found no evidence of a pragmatic explanation for primacy effects.

Keywords: primacy effect, recency effect, impression formation, pragmatics

With over 4,200 citations at present, Asch (1946) is one of the most frequently cited studies on impression formation. One of Asch's (1946) key findings was a primacy effect for impression formation – judgments of a person tended to be more positive if the first word used to describe them was positive than if it was negative. In other words, even though the ordering of descriptors in a list doesn't affect the semantics of individual words within the list, it nevertheless impacts the interpretation. In the present study, we aimed to both replicate Asch's (1946) finding of a primacy effect in impression formation, and to test the possible role of pragmatics in shaping such primacy effects.

In Asch's (1946; Exp. VI) original study, participants heard a list of five characteristics describing a target individual. For some participants, the list began with the most positive descriptor, while for others it began with the most negative. Participants were then asked to describe the target individual, and to make binary forced-choice decisions about additional descriptors that might apply to the target (e.g., happy/unhappy; shrewd/wise). Asch (1946) found evidence of a primacy effect: across both measures, individuals were described more favorably by participants in the positive-first condition, relative to those in the negative-first condition.

Primacy effects in impression formation have emerged across a number of experiments (Anderson, 1965; Anderson & Barrios, 1961; Anderson & Hubert, 1963; Asch, 1946; Briscoe, Woodyard, & Shaw, 1967; Forgas, 2011; Hendrick & Constantini, 1970; Hendrick, Constantini, McGarry, & McBride, 1973; Jones, Rock, Shaver, Goethias, & Ward, 1968; Kelley, 1950; Luchins & Luchins, 1962; 1986; Mayo & Crockett, 1964; Petronko & Perin, 1970). However, the primacy effect is delicate, and can be impacted by contextual factors (like mood or experimental context, and even reversed (to become a recency effects; Byrne, Lamberth, Palmer,

& London, 1969; Crano, 1977; Dreben, Fiske, & Hastie, 1979; Forgas, 2011; Hendrick & Constantini, 1970; Mayo & Crockett, 1964; Petronko & Perin, 1970; Luchins, 1958; Luchins & Luchins, 1986; Rosenkrantz & Crockett, 1965; Stewart, 1965). The variability in findings raises some initial questions about the robustness of the primacy effect. Further motivating such questions is a recent failure to replicate several other main findings from Asch's (1946) work on impression formation (Nauts et al., 2014). Thus, while the initial goal of this work was to test a new account of primacy effects in impression formation, we were also interested in understanding the extent to which the primacy effect in impression formation is a robust and detectable phenomenon.

Insofar as the primacy effect in impression formation exists, there are several theories of its origins. One explanation is that primacy effects are driven by biases in memory and attention (e.g., Anderson & Hubert, 1963). Consistent with this view, it is possible to remove or even reverse these primacy effects by requiring participants to process each descriptor separately (e.g., by having them repeat the descriptor out loud or make judgments about the person being described after each descriptor is introduced; Dreben et al., 1979; Hendrick & Constantini, 1970; see Lana, 1964 for a review of several potential mechanisms). However, Asch (1946) originally argued that this effect emerged because early descriptors modified the interpretation of later descriptors, and that:

“As soon as two or more traits are understood to belong to one person, they cease to exist in isolated traits, and come into immediate dynamic interaction. The subject perceives not this *and* that quality, but the two entering into a particular relation” (Asch, 1946, p. 284).

Although he did not describe it as such, Asch's (1946) points to a possible *pragmatic* explanation for primacy effects, since the process of interpreting descriptors requires going beyond the literal semantics of each item. Pragmatics is the study of the inferences that we make that allow us to go beyond the literal meaning of the text under consideration, in order to access its intended meaning. For example, in order to interpret a sentence like "I just saw her give a talk and she was a real star" to mean something like 'she was excellent' and not 'she is literally an astral body', we must go beyond the semantics of the linguistic description in order to access the non-literal, dynamic, intended meaning (Wilson & Carston, 2007)¹. Importantly, pragmatic inferences about meaning require reasoning about the communicative intentions of the speaker (Grice, 1975; Wilson & Sperber, 2004). Specifically, pragmatic inferences are supported by the assumptions that speakers attempt to maximize the clarity and relevance of their utterances (while also being truthful and concise; Grice, 1975). By this view, speakers are assumed to be intentional about even seemingly arbitrary components of speech acts (e.g., the ordering of elements in a list), and therefore listeners can and should interpret speakers' choices as non-arbitrary.

How might a pragmatic account of the primacy effects for impression formation work? Individuals might reason as follows: "If I were describing someone, I would mention the most important personality trait first because this would allow me to maximize the clarity and relevance of my description – assuming that the person who created this description followed the same logic, I bet the first descriptor is the most important". This line of reasoning requires making inferences about the relation between a speaker's intentions, goals, and word choice.

¹ Pragmatic inferences also support mundane, non-metaphorical inferences like the inference that "I ate some of the cookies" implies 'I didn't eat all of the cookies' (e.g., Noveck, 2001; Papafragou & Musolino, 2003).

This pragmatic account allows us (and any listener) to make the clear prediction that a cooperative and sentient interlocutor should communicate the most important information first.

In the present study, in addition to replicating Asch's (1946) original methods, in 3 experiments we tested the pragmatic account of primacy effects by replicating Asch's (1946) study with one critical change – while half of the participants heard that the list of descriptors was compiled by a person (thus licensing the above-described pragmatic inference), the other half heard that the list of descriptors was randomly ordered by a computer (blocking pragmatic inferences, since randomly ordered lists are, by definition, not intentionally ordered). Our logic was that if basic cognitive processes explain the primacy effect in impression formation, then we should detect a primacy effect both when the list of descriptors was compiled by a person and when it was randomly ordered by a computer. Alternatively, if pragmatic inferences support the primacy effect, then we expected to encounter the primacy effect only when the descriptors were ordered by a human. In Experiments 1 and 1B, we tested for primacy effects in impression formation in online samples using our own, in-house stimuli; in Experiment 2, we used a portion of Asch's (1946) original stimuli; in Experiments 3-5, we used Asch's original stimuli (1946, Exp. VI).

Experiment 1

Method

Participants

We tested English-speaking adults recruited via Mechanical Turk; for no experiment did we collect age, gender, or other demographic information. Participants were consented and received \$1.00. Our target n was 100 participants. Of the 105 participants who completed the

task (for this and all other experiments, we did not consider data from participants who opened the survey window but failed to respond to all experimental questions), 3 participants were excluded due to technical errors. We excluded trial-level data from 10 trials on which participants claimed that humans do not have brains, and data from 14 trials on which participants claimed that computers do have brains.

Materials and Procedure

All stimuli were created in-house. Participants were told that they would read letters of recommendation (see Supplemental Online Materials (SOM) for full script). Over the course of the experiment, each participant read four letters. The letters differed in name of individual listed (e.g., Johnny vs. George) and descriptors (e.g., fun, helpful, and angry; sad, nice, and loving). Within-subjects, we manipulated whether the traits appeared from most-to-least positive (positive-first valence condition; e.g., “fun, helpful, and angry”) or from most-to-least negative (negative-first valence condition; e.g., “angry, helpful, and fun”).

To test the pragmatic account of primacy effects, we developed an additional within-subjects manipulation. There were two trial-types: the “human” trials and the “computer” trials. On “human” trials, participants were told that a former employer created the description. On “computer” trials, participants were told that a: “...robot produces an assessment of the person, providing the results in an random and arbitrary manner”. Letter-writer was blocked such that participants saw 2 human trials in a row and 2 computer trials in a row; half of the subjects received the human block first.

A manipulation check asked participants to respond (yes/no) to whether the creator of the letter (a) had a brain and (b) thought logically. As described above, performance on the “does [x] have a brain?” measure was used as an exclusion criteria for individual trials.

Participants were asked to freely recall the target, and to respond to two questions on a 5-point Likert scale: “How much would you want to hire [target]?” and “how much do you like [target]?”

Results

We first considered whether there was evidence of (a) an effect of valence (positive vs. negative first); (b) an effect of speaker (computer vs. human); and (c) an interaction. We used the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015) to construct separate models predicting (a) hireability and (b) likeability from valence (for all experiments, positive was coded as .5, negative as -.5), speaker (for this and all experiments, human was coded as .5, computer as -.5), and their interaction, with subject as a random factor. There was no effect of speaker ($B = .005$, $SE = .11$, $t = .05^2$), valence ($B = -.024$, $SE = .11$, $t = -.23$), or interaction ($B = -.17$, $SE = .21$, $t = -.80$) on ratings of hireability. Similarly, there was no effect of valence ($B = .03$, $SE = .08$, $t = .33$), or interaction ($B = -.05$, $SE = .15$, $t = -.33$) on ratings of likeability (Figure 1). There was a possible effect of speaker ($B = .17$, $SE = .08$, $t = 2.26$), although follow-up likelihood ratio effects suggested that speaker did not add substantially to the model ($p = .0743$). As can be seen in Figure 1, across all conditions, the targets were perceived as relatively likeable and hireable. Exploratory analyses revealed no substantial differences in participants’ descriptions of the

² Because it is challenging to estimate degrees of freedom for this type of analysis, we adopt a significance threshold of $p > |1.960|$. This is a very liberal cutoff, as it would be the cutoff for a design with infinite degrees of freedom, and, when necessary, conduct follow-up model comparisons.

applicants in the positive-first vs. negative-first conditions (for top five descriptors for each experiment, see SOM).

Figure 1. Hireability and Likeability ratings in Experiments 1 and 2. Error bars are SEM; 0 indicates neutral ratings; possible range of responses was from -2 to 2.

Experiment 1 Discussion

Likeability and hireability ratings were not influenced by the order of descriptors (positive first vs. negative first), and there was no strong evidence of an effect of speaker (human vs. computer). Using an in-person version of this task (see SOM for Exp. 1B), we replicated this finding again.

However, there are several limitations to Experiment 1. First, this experiment did not use Asch's (1946) original stimuli. Second, it used a within-subjects design; while there is evidence that primacy effects can emerge within-subjects (Asch, 1946), it is plausible that the within-subjects design limited our ability to find either a primacy- or speaker-effect. Finally, our

dependent measures may not have been able to detect a primacy effect; most of the traits describing the target were warmth-related, while hiring decisions may be based more in competence than warmth. Thus, in Experiment 2, we attempted to more closely approximate Asch's (1946) original design and stimuli.

Experiment 2

Method

Participants

We tested 152 English-speaking adults recruited via Mechanical Turk. Participants consented, and were compensated \$1.00; our target N was 150 participants pre-exclusion. Eleven participants were excluded for misunderstanding the task (describing the sound of the speaker's voice when asked to "please describe the person who you just heard described"), and 10 were excluded for failing our attention check (reporting that they heard a robot when they actually heard a human voice or vice versa *and/or* reporting that the human was not capable of independent thought / the computer was capable of independent thought). Thus, our final n was 131.

Materials

Descriptions of the target came from Asch (1946), study VI. Participants heard a recording of one of two lists of characteristics: positive first [intelligent, industrious, impulsive, critical, stubborn, envious] or negative first [envious, stubborn, critical, impulsive, industrious, intelligent]. Lists were pre-recorded by a neutral female speaker; slight electronic distortion was added to the recording so that the audio file could plausibly be either a human or a computerized voice. Participants were randomly assigned to the human or computer condition. Participants

either read: “**My friend knows the person being described**, and is reading you the characteristics so that you can learn more about the person being described” or “The **computer** is reading you the characteristics in **random order**, so that you can learn more about the person being described” (SOM contains instructions). All manipulations were between-subjects.

Participants recalled who read the description, and whether the speaker was capable of “independent thought”. Participants provided a typed free recall of the person described. They then rated the likeability and hireability of the candidate on a 4-point Likert scale. Finally, as in Asch (1946, Exp. VI), they were shown a set of opposing adjectives (e.g., unhappy - happy see SOM) and asked to choose which adjective described the target individual; we selected 8 of the adjectives that got the biggest effects in Asch (1946) in order to maximize the likelihood of detecting a primacy effect. Finally, participants were asked to (a) make a binary hire/no hire decision and (b) make a binary like/dislike decision.

Results

We constructed models predicting hireability and likeability from valence, speaker, and their interaction. There was no effect of speaker ($B = .28, SE = .22, t = 1.25, p = .21$), valence ($B = .21, SE = .22, t = .97, p = .33$), or interaction ($B = -.24, SE = .44, t = -.54, p = .59$) on ratings of hireability (Figure 2). Similarly, there was no effect of speaker ($B = .21, SE = .19, t = 1.13, p = .26$), valence ($B = .09, SE = .19, t = .46, p = .65$), or interaction ($B = -.55, SE = .37, t = .14, p = .14$) on ratings of likeability. Unlike Experiment 1 (and 1B; see SOM), participants found the candidate neither likeable nor hireable (Figure 1). There were no effects of (or interactions containing) speaker or condition when predicting binary likeability or hireability (all $z < |1.96|$). Finally, we analyzed the number of positive traits selected in Asch’s (1946) opposing adjectives

task. The number of positive adjectives selected was not predicted by speaker ($B = -.04$, $SE = .35$, $t = -.13$, $p = .898$), valence ($B = .11$, $SE = .35$, $t = .32$, $p = .75$) or their interaction ($B = -.41$, $SE = .69$, $t = -.59$, $p = .55$).

Finally, to better compare our data to Asch’s (1946) data, we calculated the percent of participants in each condition who selected the more positive of the two traits. These data are reproduced from Asch’s (1946) Table 7, and are included below in Figure 2; alternative displays of these data are available in the SOM.

Figure 2. Percent of participants in the Negative First (black) and Positive First (red) condition selecting the more positive of the two characteristics. The horizontal line at 50% indicates equivocal performance. Data are from the human conditions.

Experiment 2 Discussion

Again, we found no effect of valence (positive first vs. negative first) on ratings of likeability or hireability. Again, we found no effect of speaker (human vs. computer) on any ratings, and no interaction of valence and speaker. Thus, when using Asch's (1946, Exp. VI) original stimuli and a portion of his opposing-adjectives test, we still failed to detect either primacy or recency effects. However, Experiment 2 still deviated from Asch's (1946) original design. Specifically, it excluded some of his opposing-traits items, it included attention checks, and it included additional measures. In Experiments 3-4, we focused on determining whether we could detect a primacy effect. To this end, we preregistered replications in which we used the entirety of Asch's (1946, Exp. VI) stimuli, and tested larger sample sizes.

Experiments 3 and 4

Method

Participants

We recruited English-speaking adults via Mechanical Turk, following our preregistered plans (Exp. 3: <https://osf.io/kdvcz/register/565fb3678c5e4a66b5582f67>; Exp. 4: <https://osf.io/snhva/register/565fb3678c5e4a66b5582f67>). Participants were consented and received \$1.00. Of the participants (Exp. 3: $N = 457$; Exp. 4: $N = 698$) who began the task, we

excluded participants (Exp. 3: $n = 51$; Exp. 4: $n = 85$) for failing to complete at least 80% of the study³. Thus, our final n 's were 406 (Exp. 3) and 613 (Exp. 4).

Materials

Participants heard a recording of the task instructions originally presented in Asch (1946): “I shall read to you a number of characteristics that belong to a particular person. Please listen to them carefully and try to form an impression of the kind of person described. You will later be asked to give a brief characterization of the person in just a few sentences. I will read the list slowly, and will repeat it once”. As in Exp. 2, descriptors were taken directly from Asch (1946), study VI and descriptions were pre-recorded by a neutral female speaker and repeated once. Unlike Exp 2., we did not add electronic distortion to the recording.

Participants provided a typed free recall of the person described. Then, as in Asch (1946, Exp. VI) and Exp. 2, they were shown a set of opposing adjectives (e.g., unhappy - happy); this time, we used all 18 adjectives from Asch's (1946) experiment. Participants were asked to identify which of the two adjectives best described the person they just learned about.

Results

All coding and scaling was as reported in Exps. 1-2. As planned, we analyzed the number of positive traits selected in each condition. The number of positive adjectives selected was predicted by valence (Exp 3: $B = .85$, $SE = .39$, $t = 2.21$, $p = .03$, $d = .20$; Exp 4: $B = 1.48$, $SE = .302$, $t = 4.91$, $d = .39$, $p < .0001$). However, the magnitude of this effect was, in practical terms,

³ For Experiments 3, 4, and 5, we used TurkPrime to recruit participants, and set our desired sample size to 400_{Exp3}, 600_{Exp4}, and 1600_{Exp5}, as preregistered. However, as reflected in our sample sizes, our survey contained a number of partial datasets collected from additional participants – this is likely due to TurkPrime's process for verifying participants' completion of the study.

not overwhelming (see Figure 3 for effect size estimates and Figure 2 for visualization of our data): participants in the Positive-First condition endorsed, on average, about one (out of 18) additional positive trait ($M = 8.37_{\text{Exp3}}, 8.73_{\text{Exp4}}$) relative to those in the Negative-First condition ($M = 7.52_{\text{Exp3}}, 7.25_{\text{Exp4}}$).

Experiment 3 and 4 Discussion

Replicating Asch's (1946) study more directly, we found evidence of a primacy effect, although the size of the effect appeared smaller than in Asch's (1946) original study. Having converged on a paradigm that can detect primacy effects in impression formation, we preregistered and ran one final experiment aimed at (a) replicating Experiments 3-4 and (b) returning to test the pragmatic account of primacy effects in impression formation.

Experiment 5

Method

Participants

Recruitment was as described in Experiments 3-4 and in our pre-registration (available here: <https://osf.io/wukrj/register/565fb3678c5e4a66b5582f67>). Of the 1903 participants who began the task, 273 participants were excluded for failing to complete at least 80% of the study. Our final n was 1630.

Materials

Participants were randomly assigned to the positive-first or negative-first condition, and were additionally assigned to the Human condition or the Random Computer condition. Materials and methods for the Human condition were identical to those described in Experiments 3 and 4. The Computer condition required modifying the instructions from Exp. 3 and 4 to

include: “...these characteristics are placed in random order by a computer....you will hear me read the list of randomly ordered characteristics....” such that it was clear that the ordering of the characteristics was not intentional.

Results

We first considered whether there was evidence of (a) an effect of valence (positive vs. negative first); (b) an effect of speaker (computer vs. human); and (c) an interaction. We predicted the proportion of positive attributes selected⁴ from valence, speaker, and their interaction. There was no effect of speaker ($B = -.004$, $SE = .011$, $t = -.38$, $p = .71$) or interaction ($B = .019$, $SE = .022$, $t = .87$, $p = .39$), but there was an effect of valence ($B = .08$, $SE = .01$, $t = 7.36$, $p < .0001$, $d = .36$). To supplement our main analyses, we present a planned Single Paper Meta-Analysis (McShane & Böckenholt, 2017) in Supplemental Materials, which showed a non-zero effect across our four experiments.

⁴ Results are identical if using the sum of positive traits instead of the proportion of positive traits selected.

Figure 3. This figure represents the estimate of the percent increase in positive trait selection in the Positive First condition, relative to the Negative First condition.

General Discussion

Previous research has suggested that the first trait in a list exerts the most influence on judgments (Anderson, 1965; Anderson & Barrios, 1961; Anderson & Hubert, 1963; Asch, 1946; Briscoe et al., 1967; Forgas, 2011; Hendrick & Constantini, 1970; Hendrick, Constantini, McGarry, & McBride, 1973; Jones et al., 1968; Kelley, 1950; Luchins & Luchins, 1962; 1986; Mayo & Crockett, 1964; Petronko & Perin, 1970). At the outset, our goal was to test a pragmatic account of this phenomenon. By the pragmatic account of primacy effects, listeners assume that cooperative communicators order lists non-arbitrarily, such that the most important information is communicated first. To test the pragmatic account, we tested for primacy effects in impression formation in cases where the traits were said to be ordered by an intentional human (thus licensing the inference that the first item in the list is the most important), and also in cases where the traits were said to be ordered randomly by a computer (not licensing the inference that the first item in the list is any more important than any other item). In Experiment 1, we found no evidence of an effect of speaker (computer vs. human), but also no evidence of a primacy (or recency) effect in impression formation. This led us to conduct five more replications -- of these, two (Exps. 1b, 2) failed to detect a primacy effect, another (Exp. 3) detected a weak primacy effect, and the final two (Exps. 4 and 5) detected clear primacy effects. Across the experiments (Exps. 2-5) in which we used Asch's (1946) design, we were able to estimate that the primacy effect in impression formation is non-zero, and that, in fact, participants who hear a positive trait first will later endorse ~7% more positive descriptors than those who hear a negative trait first. In

practical terms, this means that those in the positive-first condition in our study endorsed between just under 1 and just under 2 (out of 18) more positive descriptors than those in the negative-first condition. One way of thinking about the success of a replication is by considering whether a particular effect is large enough that the original authors could “meaningfully study” it given their original sample size (see Simonsohn, 2015): Given the relative subtlety of this primacy effect in the present study, it is unlikely that such an effect would have been detectable given Asch’s (1946) original n of 58, even though we have found evidence of a primacy effect. One main finding of this paper is that, while we were unable to detect as strong a primacy effect as Asch (1946) originally reported, on balance there is evidence for a primacy effect in impression formation.

Why did we sometimes find evidence of primacy effects in impression formation, and sometimes fail to find these effects? When using custom materials (as in Exps. 1 and 1B), we failed to detect a primacy effect, but when we used Asch’s (1946) materials, most experiments found evidence of a primacy effect that was much smaller than Asch’s (1946) original effect. Previous work has shown that the primacy effect can be impacted by factors like mood, the content of the information under consideration, and other small methodological details (Byrne et al., 1969; Crano, 1977; Dreben et al., 1979; Hendrick & Constantini, 1970; Luchins, 1958; Petronko & Perin, 1970; Rosenkrantz & Crockett, 1965; Stewart, 1965); we cannot rule out the possibility that such factors played a role in our early null results, nor can we rule out the possibility that the file drawer for primacy effects contains studies in which no primacy (or recency) effects were found. It seems that, given the relatively small size of the primacy effects

that we did find, studies (like our Exps 1-2) that attempt to detect primacy effects using single (hire vs. no hire; like vs. dislike) measures are unlikely to succeed.

It is also worth noting how much smaller our primacy effect was than what was reported in Asch (1946). For example, in Asch's (1946) original work, for eight (44%) of the tested descriptors, participants in the positive-first condition were *at least* twice as likely to endorse particular positive descriptors as were individuals in the negative-first condition. In contrast, across the 62⁵ descriptors tested in Exps. 2-5, there was no descriptor for which we ever saw such a large effect. Similarly, for four (22%) of Asch's (1946) descriptors, he found that those in the positive-first condition endorsed a particular positive trait the majority of the time, while those in the negative-first condition rejected that same trait a majority of the time. Again, we never found a case where the majority of those in the positive-first condition endorsed a particular descriptor while those in the negative-first condition rejected that same descriptor.

The second main finding from our paper is that the primacy effect in impression formation isn't best explained by a pragmatic account. Specifically, the primacy effect appeared in Experiment 5 both when the list of descriptors was intentionally ordered by a human, and when it was randomly ordered by a computer. This suggests that other, more basic cognitive phenomena may be responsible for the primacy effect.

While we (a) found evidence for a primacy effect in impression formation and (b) found no evidence of a pragmatic account for this primacy effect, we wish to highlight some limitations of our work. First, while we used Asch's (1946) original material in Experiments 3-5, we tested participants online, using Mechanical Turk. This allowed us to collect large sample sizes.

⁵ 8 in Exp. 2+18 each in Exps. 3-5.

However, this meant that participants heard the string of descriptors played from their computer. We could not control the environment in which participants completed the task; if participants failed to attend to the entire list of descriptors, for example, then this would artificially increase the size of the primacy effect (since e.g., participants in the Positive-first condition would only hear the positive traits and not the more negative ones). While we have no reason to believe that participants did anything other than give their full attention to our stimuli, it is possible that by collecting data online, we have overestimated the size of the primacy effect. Alternatively, if participants paid little attention to *any* of the descriptors, we may have underestimated the size of the primacy effect.

A second limitation of our study is that we cannot completely rule out the pragmatic account of the primacy effect. While we found absolutely no support for the pragmatic account, it is always possible that participants failed to understand or internalize our “random computer” condition. We didn’t include any attention checks in Experiment 5 due to concerns that the attention checks themselves may have reduced the size of the primacy effect in earlier experiments; that said, in Experiments 1-2, around 15% of participants failed questions assessing whether they understood who the speaker was or whether the speaker was capable of independent thought. Thus, it is reasonable to believe that some participants in Experiment 5 did not internalize relevant details about the speaker. A second possibility is that, even among those who did understand the relevant details about the speaker, they failed to apply this information to the task. While adults typically track speaker knowledge and intentions during pragmatics tasks, we cannot rule out the possibility that there are contexts in which adults would fail to do so (Bergen & Grodner, 2012; Goodman & Stuhlmüller, 2017). Thus, we find no support for a

pragmatic account of primacy effects, though, of course, we cannot rule out the possibility that pragmatic processes play some role.

In conclusion, we found evidence of a primacy effect in impression formation, although one that is substantially smaller than originally reported by Asch (1946). Of note, it appeared as though there were some traits for which a primacy effect more consistently emerged (e.g., “good looking” vs. “unattractive”) and others for which it never emerged (e.g., “important” vs. “unimportant”). While it is beyond the scope of the present research, future researchers should explore the factors that impact the size and presence of the primacy effect in impression formation.

References

- Anderson, N. (1965). Primacy effects in personality impression formation using a generalized order effect paradigm. *Journal of Personality and Social Psychology*, 2, 1-9.
- Anderson, N. & Barrios, A. (1961). Primacy effects in personality impression formation. *Journal of Abnormal Social Psychology*, 63, 346-350.
- Anderson, N. & Hubert, S. (1963). Effects of concomitant verbal recall on order effects in personality impression formation. *Journal of Verbal Learning and Verbal Behavior*, 2, 379-391.
- Asch, S. (1946). Forming impressions of personality. *Journal of Abnormal Social Psychology*, 41, 258-290.
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67, 1-48. doi: 10.18637/jss.v067.i01
- Bergen, L. & Grodner, D. (2012). Speaker knowledge influences the comprehension of pragmatic inferences. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38, 1450-1460.
- Briscoe, M., Woodyard, H., & Shaw, M. (1967). Personality impression change as a function of the favorableness of first impressions. *Journal of Personality*, 35, 343-357.
- Byrne, D., Lamberth, J., Palmer, J., & London, O. (1969). Sequential effects as a function of explicit and implicit interpolated attraction responses. *Journal of Personality and Social Psychology*, 13, 70-78.
- Crano, W. (1977). Primacy versus recency in retention of information and opinion change. *The Journal of Social Psychology*, 101, 87-96.

- Dreben, E., Fiske, S., & Hastie, R. (1979). The independence of evaluation and item information: Impression and recall order effects in behavior-based impression formation. *Journal of Personality and Social Psychology*, 37, 1758-1768.
- Forgas, J. Can negative affect eliminate the power of first impressions? Affective influences on primacy and recency effects in impression formation. *Journal of Experimental Social Psychology*, 47, 425-429.
- Goodman, N. & Stuhlmüller, A. (2013). Knowledge and Implicature: Modeling language understanding as social cognition. *Topics in Cognitive Science*, 5, 173-184.
- Grice, H. (1975). Logic and Conversation. In P. Cole & J. Morgan (Eds.), *Syntax and Semantics 3: Speech Acts* (pp. 41-58). New York: Academic Press.
- Hendrick, C. & Constantini, A. (1970). Effects of varying trait inconsistency and response requirements on the primacy effect in impression formation. *Journal of Personality and Social Psychology*, 15, 158-164.
- Hendrick, C., Constantini, A., McGarry, J., & McBride, K. (1973). Attention decrement, temporal variation, and the primacy effect in impression formation. *Memory and Cognition*, 1, 193-195.
- Jones, E., Rock, L., Shaver, K., Goethals, G., & Ward, L. (1968). Patterns of performance and ability attribution: An unexpected primacy effect. *Journal of Personality and Social Psychology*, 10, 317-341.
- Kelley, H. (1950). The warm-cold variable in first impressions of persons. *Journal of Personality*, 18, 431-439.
- Lana, R. (1964). Three theoretical interpretations of order effects in persuasive communication.

- Psychological Bulletin*, 61, 314-320.
- Luchins, A. (1958). Definitiveness of impression and primacy-recency in communications. *Journal of Social Psychology*, 48, 275-290.
- Luchins, A. & Luchins, E. (1962). Primacy-recency in communications reflecting attitudes toward segregation. *The Journal of Social Psychology*, 58, 357-369.
- Luchins, A. & Luchins, E. (1986). Primacy and recency effects with descriptions of moral and immoral behavior. *The Journal of General Psychology*, 113, 159-177.
- Mayo, C., & Crockett, W. (1964). Cognitive complexity and primacy-recency effects in impression formation. *Journal of Abnormal and Social Psychology*, 68, 335-338.
- McShane, B. & Böckenholt, U. (2017). Single Paper Meta-analysis: Benefits for Study Summary, Theory-testing, and Replicability. *Journal of Consumer Research*, 43, 1048-1063.
- Nauts, S., Langner, O., Huijsmans, I., Vonk, R., & Wigboldus, D. (2014). Forming impressions of personality: A replication and review of Asch's (1946) evidence for a primacy-of-warmth effect in impression formation. *Social Psychology*, 45, 153-163.
- Noveck, I. (2001). When children are more logical than adults: Experimental investigations of scalar implicature. *Cognition*, 78, 165-188.
- Papafragou, A., & Musolino, J. (2003). Scalar implicatures: experiments at the semantics-pragmatics interface. *Cognition*, 86, 253-282.
- Petronko, M., & Perin, C. (1970). A consideration of cognitive complexity and primacy-recency effects in impression formation. *Journal of Personality and Social Psychology*, 15, 151-157.

Rosenkrantz, P., & Crockett, W. (1965). Some factors influencing the assimilation of disparate information in impression formation. *Journal of Personality and Social Psychology*, 2, 397-402.

Simonsohn, U. (2015). Small Telescopes: Detectability and the Evaluation of Replication Results. *Psychological Science*, 26, 559-569.

Stewart, R. (1965). Effect of continuous responding on the order effect in personality impression formation. *Journal of Personality and Social Psychology*, 1, 161-165.

Wilson, D. & Carston, R. (2007). A unitary approach to lexical pragmatics: Relevance, inference, and ad hoc concepts. In N. Burton-Roberts (Ed.), *Pragmatics* (pp. 230-259). Basingstoke: Palgrave.

Wilson, D. & Sperber, D. (2004). Relevance Theory. In L. Horn & G. Ward (Eds.), *The Handbook of Pragmatics* (pp. 607-632). Oxford: Blackwell.