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Johan C. Karremans, Thijs Verwijmeren, Tila M. Pronk, & Meyke Reitsma

Radboud University Nijmegen, The Netherlands

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## Abstract

The present research tested the prediction that mixed-sex interactions may temporarily impair cognitive functioning. Two studies, in which participants interacted either with a same-sex or opposite-sex other, demonstrated that men's (but not women's) cognitive performance declined following a mixed-sex encounter. In line with our theoretical reasoning, this effect occurred more strongly to the extent that the opposite-sex other was perceived as more attractive (Study 1), and to the extent that participants reported higher levels of impression management motivation (Study 2). Implications for the general role of interpersonal processes in cognitive functioning, and some practical implications, are discussed.

### Interacting With Women Can Impair Men's Cognitive Functioning

Some time ago, one of the male authors was chatting with a very attractive girl he had not met before. While he was anxious to make a good impression, when she asked him where he lived, he suddenly could not remember his street address. It seemed as if his impression management concerns had temporarily absorbed most of his cognitive resources. The current research examines the possibility that mixed-sex interactions indeed can be cognitively taxing, resulting in temporary impairments in cognitive functioning.

Although the above anecdote may be a fairly extreme example, research suggests that mixed-sex interactions indeed can be worrisome – an important reason being that people often have higher self-presentational concerns in mixed-sex as compared to same-sex interactions (Bruch, Gorsky, Collins, & Berger, 1989; Russell, Cutrona, & Jones, 1986).<sup>1</sup> Certainly, leaving a favorable impression on an opposite-sex partner may not always be easy. Impression management requires careful monitoring and modifying of one's own behavior to optimize the overall impression an individual wants make on the interaction partner, making it an effortful and cognitively demanding endeavor (Leary, 1995; Vohs, Baumeister, & Ciarocco, 2005). Research by Vohs and colleagues (2005) suggests that impression management indeed generally requires relatively high levels of cognitive control. In line with the self-regulatory resource model (see Baumeister & Heatherton, 1996), which states that cognitive control (for exerting self regulation) relies on a limited resource, they demonstrated that attempts in self-presentation subsequently led to impaired self-regulation.

More generally, such findings converge with other recent findings demonstrating the role of interpersonal processes in cognitive functioning. For example, Finkel and colleagues (2006) demonstrated that poor interpersonal coordination leads to impairments in cognitive performance. In a related vein, Richeson and Shelton (2003) demonstrated that interracial interactions can impair cognitive functioning, especially among highly prejudiced people.

Together, such findings suggest that social interactions may affect an individual's cognitive functioning, depending on whom the interaction partner is, and depending on the psychological processes that take place during the interaction. The present research builds on, and extends, this research by examining the influence of the sex of one's interaction partner on cognitive functioning. Although it may be relatively easy to imagine how an interaction partner's gender may influence certain psychological processes during the interaction (such as impression management), people may not realize that interacting with a same-sex versus opposite-sex other may actually affect their cognitive functioning. As previous research suggests that mixed-sex interactions are generally characterized by relatively high levels of self-presentation, we propose that such interactions may deplete an individual's cognitive resources, resulting in poorer cognitive functioning following the interaction.

We tested this central prediction in two studies in which participants interacted with a stranger of either the same or opposite sex, after which they completed a cognitive functioning task. Study 1 involved only male participants, and Study 2 used both males and females. We addressed three additional issues. First, the cognitive impairment effect of mixed-sex interactions is likely to be stronger for men as compared to women. Research suggests that, compared to women, men are more likely to consider mixed-sex interactions in terms of a mating game. For example, men are more likely to look for sexual interest in the behavior of opposite-sex others, and generally tend to overestimate the sexual interest of women (Abbey, 1982; Shotland & Craig, 1988). Such research findings strongly suggest that mixed-sex interactions activate mating goals especially in men (cf. Baumeister, Catanese, & Vohs, 2001), and men in particular might therefore be prone to engage in effortful and cognitively demanding attempts to impress an opposite-sex partner.

Second, the cognitive impairment effect of mixed-sex interactions should be more pronounced if self-presentational concerns are relatively high. Hence, in Study 1 we examined

whether cognitive functioning would be more strongly reduced to the extent that the opposite-sex partner was perceived as more attractive, assuming that self-presentational concerns are stronger in interaction with a highly attractive opposite-sex other. In Study 2, we more directly examined whether indeed self-presentation motives in mixed-sex interactions would be related to decreases in cognitive functioning.

Finally, in both studies we examined the possible moderating role of romantic relationship status. It could be argued that romantically involved men would engage less in effortful and cognitively taxing self-presentation than singles, and thus would not (or less) show cognitive impairment following mixed-sex interactions (cf. Karremans & Verwijmeren, 2008; Simpson, Gangestad, & Lerma, 1990). Alternatively, men may show impaired cognitive performance following a mixed-sex interaction *irrespective* of one's current relationship status, as men may be chronically interested in short-term mates other than the current relationship partner (Buss & Schmitt, 1993).

### Study 1

*Participants and design.* Forty male students (average age 20.6) participated, and were randomly assigned to either the same-sex or opposite-sex condition.

*Procedure.* Upon arrival in the lab, a male experimenter seated the participant behind a computer in a small room. All further instructions were presented on the computer screen.

First, as a baseline measure of cognitive performance, participants completed a 2-back task (for details, see Braver et al., 1997). This task has been widely used as an indicator of cognitive performance in previous research. Performance on this task requires constant updating of working memory. In the task, participants were presented a series of letters, each in turn, on the screen (each letter was presented for 500 ms, followed by a 2000 ms blank screen). Their task was to indicate as fast and accurate as possible whether the current letter

matched the letter presented two trials previously, by pressing a left designated key in case of a match, and to press a right designated key in case of a mismatch.

When the task was completed, participants were instructed to go to the adjacent room, where they would have a brief conversation with an experimenter, allegedly to pass the time before continuing with the next part. In the adjacent room was either a male experimenter (in the same-sex condition), or a female experimenter (in the mixed-sex condition). In fact, the experimenter was one of our two male or two female confederates. To streamline the conversation, the confederate had been given a sheet of paper with ten neutral topics to talk about. After seven minutes, the experimenter ended the conversation and instructed the participant to return to the other room, and to continue the task on the computer.

Back in the room, participants again completed a 2-back task. Performance on this second 2-back task served as an indicator of cognitive performance, our main dependent variable. Both for the task before and after the conversation we calculated participants' (untransformed) reaction times only on the correct trials.

Finally, participants in the opposite-sex condition indicated how attractive they found the woman they had interacted with (ranging from 1 = *unattractive* to 7 = *very attractive*). Also, all participants indicated whether they were currently involved in a romantic relationship.

### *Results*

Data were collapsed across the two male confederates and across the two female confederates, as initial analyses revealed no effects of confederate. An ANCOVA with post-conversation 2-back performance as dependent variable, and condition (male vs. female confederate) and relationship status (involved vs. single) as independent variables, while controlling for baseline (pre-conversation) 2-back performance, yielded only a main effect of condition,  $F(1, 39) = 6.06, p < .02, \eta_{\text{partial}}^2 = .15$ . Participants performed worse on the 2-back

task following the mixed-sex interaction ( $M = 1436$  ms,  $SD = 663$  ms), as compared to the same-sex interaction ( $M = 1255$  ms,  $SD = 589$  ms). The interaction between condition and relationship status was not significant,  $F(1, 39) < 1$ , indicating that this effect occurred independent of whether participants were romantically involved or single.

Furthermore, partial correlational analyses revealed that perceived attractiveness tended to be negatively associated with post-conversation 2-back performance (i.e., longer response times on correct trials), controlling for baseline performance,  $r = .34$ ,  $p = .07$ .

Thus, these findings support our prediction that interacting with a woman can impair men's cognitive performance. The findings provide initial evidence that this may especially occur when men have a strong desire to form a favorable impression (i.e., when they find the woman interacting with more attractive).

### Study 2

Study 2 was designed to extend Study 1 in several aspects. First, we used a different measure of cognitive functioning, and used both male and female participants. Moreover, instead of using confederates which may restrict the generalizability of the findings, in Study 2 each participant interacted with another, either same-sex or opposite-sex, participant. Finally, rather than measuring perceived attractiveness, Study 2 explicitly measured participants' self-reported impression management goals, allowing us a) to test the assumption that overall men's self-presentational goals, as compared to women's, would be more strongly affected by the sex of the interaction partner, and b) to test whether impression management was indeed negatively related to cognitive functioning following the mixed-sex interaction.

*Participants and design.* Fifty-three male and fifty-eight female students participated (average age 21.3). Participants were randomly paired with either a same-sex or an opposite-sex participant, as to create two conditions of same-sex versus mixed-sex interactions.

*Procedure.* Pairs were instructed to have a five-minute conversation, and some neutral conversational topics were suggested. Before (as baseline) and after the interaction, participants' cognitive functioning was measured with a modified Simon task (i.e., the EAST; De Houwer, 2003). A series of words were presented, either in blue, green, or white. If the word was in white, participants had to indicate as quickly and accurately as possible whether it had a positive or negative valence by pressing a designated key. However, if the word was in color, participants had to ignore its content, and instead indicate whether the word was in blue or green. This is a very cognitively demanding task, as it requires both task-switching and inhibition capacities throughout the task (for details, see Voss & Klauer, 2007). Average (untransformed) reaction times only for correct responses were analyzed.

Finally, after the cognitive functioning task, impression management was measured with three items (e.g., "During the conversation, I wanted to make a good impression.",  $\alpha = .78$ ).

### *Results*

*Impression management.* First, an ANOVA with impression management as dependent variable, and condition, participants' sex, and relationship involvement as independent variables, revealed only the predicted interaction between condition and sex,  $F(1, 109) = 4.05, p < .05, \eta_{\text{partial}}^2 = .04$ . Simple effect analyses revealed that men reported higher levels of impression management in the mixed-sex condition,  $M = 4.98, SD = 1.12$ , than in the same-sex condition,  $M = 4.34, SD = 1.18, F(1, 109) = 4.76, p < .05$ . Among female participants, level of impression management was not significantly affected by condition,  $F(1, 109) < 1, (M = 5.02, SD = 0.80, \text{in the same-sex condition versus } M = 4.88, SD = 0.89, \text{in the mixed-sex condition})$ . Relationship involvement did not reveal main or interaction effects, all  $F_s < 1$ . Thus, men but not women reported elevated levels of impression management in mixed-sex (vs. same-sex) interactions.

*Cognitive functioning.* Next, an ANCOVA was performed with post-interaction cognitive performance as dependent variable, and condition, participants' sex, and relationship status as independent variables, while controlling for baseline cognitive performance. This analysis yielded only a significant sex by condition interaction,  $F(1, 108) = 4.82, p < .03, \eta_{\text{partial}}^2 = .05$  (see Figure 1). Tests of simple main effects revealed that, as predicted, male participants' performance on the task was worse after a mixed-sex interaction ( $M = 631$  ms,  $SD = 45$  ms), relative to a same-sex interaction ( $M = 594$  ms,  $SD = 62$  ms),  $F(1, 109) = 5.43, p < .02, \eta_{\text{partial}}^2 = .11$ . Female participants' performance did not differ between the mixed-sex ( $M = 595$  ms,  $SD = 73$  ms) and same-sex ( $M = 598$  ms,  $SD = 50$  ms) conditions,  $F(1, 109) = 1.91, ns$ .

*Additional analyses.* To examine whether impression management in mixed-sex interactions are indeed negatively related to post-interaction cognitive performance, we analyzed partial correlations between impression management and post-interaction cognitive performance (controlling for baseline performance) for both male and female participants, separately for the mixed-sex and same-sex conditions. In the mixed-sex condition, among male participants higher levels of impression management were strongly related to worse cognitive performance,  $r = .50, p < .005$ . Women also tended to perform worse to the extent that they reported higher levels of self-presentation in a mixed sex-interaction,  $r = .31, p = .087$ . For both males and females, cognitive performance was not significantly affected by impression management after same-sex interactions, respectively  $r = .17$  and  $r = -.11$ , both *ns*.

### General Discussion

Not only can mixed-sex interactions sometimes feel awkward, the current findings demonstrate that interacting with an opposite-sex other can actually impair cognitive functioning. This effect occurred irrespective of whether participants were romantically

involved or single, and especially among males, which paralleled the finding that men's (but not women's) self-presentational concerns were stronger in mixed-sex as compared to same-sex encounters. Also in line with a self-presentational account, male participants' cognitive impairment was greater to the extent that the interaction partner was perceived as more attractive (Study 1), and to the extent that they reported higher levels of impression management (Study 2). There was some evidence that also women's cognitive performance declined if they *did* have a relatively strong goal to impress the opposite-sex other.

We should note that there might be additional mechanisms by which mixed-sex interactions impair especially male's cognitive performance. For example, traditional sex roles may emphasize that men are expected to take the initiative in mixed-sex encounters (Wasserman & Stern, 1978). Men may therefore recruit more cognitive resources to behave according to these expectancies. In addition, an interaction with unacquainted opposite-sex others may require more cognitive control because people may simply have more experience in interacting with same-sex others (Maccoby, 1990). Granted, the latter explanation cannot account for why especially men showed the cognitive impairment effect, but nevertheless offers an interesting avenue for future research.

The current findings have some interesting practical and theoretical implications, for example with regard to recently revived debates about single-sex versus coed schools (NY Times, 2008). Although various reasons for boys' "traditional" underachievement in schools have been provided, mostly in terms of motivational and personality differences (Francis, 2000), our findings suggest that male's cognitive abilities may actually decline in such mixed-sex settings. Part of boys' valuable cognitive resources may be spent on impressing their female class members. A second implication concerns sexual harassment. Although sexual harassment is often considered as the result of men's biased perception of sexual interest of the female interaction partner, an interesting question for future research is whether sexual

harassment may be partly caused by the depleting effects of a mixed-sex interaction.<sup>2</sup> A final implication concerns research on cognitive functioning. Based on the current findings, it seems advisable that researchers would use experimenters matching the participants' sex, or at least, that they statistically take into account the experimenter's sex.

We should acknowledge some limitations. First, participants were in their late adolescence, which seems especially an age when mating games are played to the max. The current findings may therefore not fully generalize to other age populations. Second, it is possible that, outside of the laboratory, the cognitive impairment effect would also more generally occur for females. Whereas men's self-presentational concerns in mixed-sex interactions may be largely independent of the context, perhaps women would engage in similar cognitively taxing self-presentation toward attractive opposite-sex others in other, more informal, environments (e.g., a bar). Notwithstanding these issues, based on the current findings we conclude that men's cognitive functioning may indeed temporarily decline after an interaction with an attractive woman.

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<sup>1</sup> The present research examined the predictions only among heterosexuals. However, an interesting question for future research would be whether, among homosexuals, interactions with attractive *same*-sex others would be especially cognitively demanding.

<sup>2</sup> We thank an anonymous reviewer for this suggestion

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*Figure 1:* Cognitive functioning (i.e., slower response times on correct trials indicate worsened cognitive functioning) as a function of participants' sex and interaction type (mixed-sex or same-sex), *Study 2*.

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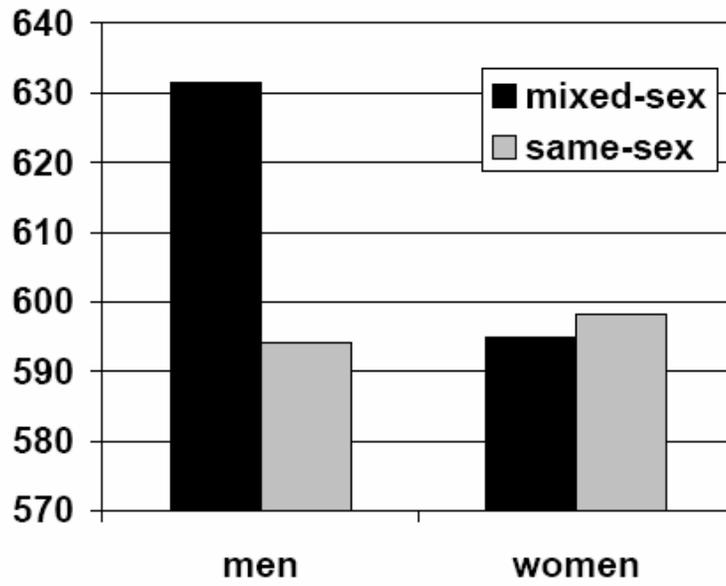


Figure 1