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How vertical elevation affects self-other integration as measured by the joint Simon effect☆

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ABSTRACT

Earlier findings suggest that positions of power decrease self-other integration and increase psychological distance to others. Until now, however, evidence for this relation rests exclusively on subjective measures. The current research instead employed a vertical joint Simon task to measure self-other integration. This task assesses the extent to which people represent their own actions in reference to their co-actor's, also referred to as the joint Simon effect. Building on cultural associations between power and vertical elevation, we manipulated whether participants were in an elevated (high-power) or lower (low-power) seating position. Experiments 1a and 1b reanalyzed existing datasets and found that elevated (vs. lower) seating position decreased the joint Simon effect, consistent with predictions. Experiment 2 provides a high-powered replication of this finding. Yet, further analyses revealed that feelings of power – measured as a manipulation check and indeed demonstrating that the manipulation was successful – did not mediate or moderate the effect of seating position on the joint Simon effect. Therefore, it is possible that the effect of seating elevation was driven through other aspects of that manipulation than feelings of power. We discuss these and suggest ways to test these alternative explanations.

1. Introduction

Navigating society often requires attending to others to correctly predict their actions. Whether it is buying the right gift for a friend, making the right offer in a job-interview, or trying to avoid bumping into others at a busy train station, it is crucially important to our long-term standing to be able to take into account (integrate) others' actions and emotions, instead of only attending to the self (Chartrand & Bargh, 1999; Lakin et al., 2003; Poortvliet & Darnon, 2010). A characteristic that repeatedly has been suggested to reduce self-other integration is power. Power is typically defined as asymmetric control over valued resources in social relations and is a key factor for creating structure in social surroundings (Emerson, 1962; Magee & Galinsky, 2008).

The idea that power leads to less self-other integration has been a leading thread in social cognitive research on the effects of power. One of the earliest social cognitive views on power, for example, proposed that people in power are less inclined to devote attention to other people (and instead rely on stereotypes) to deal with attention overload and to maintain their advantaged position (Fiske, 1993; Goodwin et al., 2000). Strikingly, even though people in positions of power are expected to take others into account and ensure that all do well, this view poses that the psychological effects of power go in the opposite direction and reduce self-other integration. Subsequent research has uncovered a large variety of findings that fit equally well with the idea that power reduces self-other integration. For example, the powerful maintain greater social distance to others (Lammers et al., 2012; Magee & Smith, 2013), they are more selfish in their decision making (Dubois et al., 2015; Lammers et al., 2010), are more focused on their own feelings at the expense of others' (Guinote, 2010), are more inclined to ignore others' feelings and instead dehumanize them as ‘tools’ or objects (Gruenfeld et al., 2008; Gwinn et al., 2013; Lammers & Stapel, 2011), are less influenced by social comparisons (Johnson & Lammers, 2012), are worse at taking other people's perspectives (Galinsky et al., 2006), and are less inclined to take other people's visual, cognitive, or emotional perspectives

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(Galinsky et al., 2006; see also Blader et al., 2016; Ebersole et al., 2016).

A limitation to this literature is that many findings rely on a naturalistic paradigm that gauges self-other integration from a single behavior or stated preference (after measuring or experimentally inducing a feeling of power). For example, self-other integration is gauged by asking participants' preference to work alone rather than together (Lammers et al., 2012), participants' tendency to take more cookies than others from a shared tray (Guinote, 2010), or participants' grasping of an ambiguous, ironic joke (Galinsky et al., 2006). Although this approach offers the advantage that it allows elegantly measuring very complex cognition with a flexible approach (e.g., the ability to understand irony), it also has various disadvantages. One disadvantage is that it typically affords only few measurements which can result in low statistical power (Epstein, 1980). Another disadvantage is that it often requires that the manipulation and dependent variable are administered consecutively, which may reduce the strength of the effect (Hermans et al., 2001; Hermans et al., 2003). In contrast, self-other integration may also be gauged using other approaches, such as cognitive psychological paradigms. Although such paradigms also have their limitations, they offer the advantage of allowing dozens, or even hundreds of repeated measures, that are collected simultaneously with the manipulation (Genschow et al., 2017).

1.1. The current research

Consequently, the current work reports an investigation of how self-other integration, measured as performance on the joint Simon task (Sebanz et al., 2003), is affected by feelings of power.

1.1.1. Power and vertical elevation

In the current research, we manipulate power within dyads by seating one participant on a higher vertical level than the other participant. This builds on the notion that verticality and power are strongly associated (Lakoff, 1987; Lakoff & Johnson, 1980). People in positions of power typically sit higher than others. For example, the king and queen are seated on a throne – a high chair, placed on a pedestal. Also, organizational charts place those with more power at the top. In fact, vertical position has even been shown to be a sensorimotor determinant of perceptions of power, meaning that people automatically infer that what is up is powerful, while what is down is powerless (Giessner & Schubert, 2007; Lakens et al., 2011; Schubert, 2005; Schubert et al., 2012). Virtually all people across all cultures effortlessly use that same vertical metaphor to differentiate between the powerful and powerless (Fiske, 1992, 2004; Schwartz, 1981; Schwartz et al., 1982), and this link between elevation and power is already present in preverbal children (Thomsen et al., 2011).

Building on this link between power and vertical elevation, researchers have used such physical manipulations of power, by placing some participants in a larger chair that affords those participants a more elevated position, while other participants are seated on a lower stool. Because the former is associated with a high-power, manager position while the latter is typically associated with a subordinate position, this is often used as a manipulation of power (Briñol et al., 2007; Chen et al., 2001). Here we use that same manipulation.

1.1.2. Vertical joint Simon task

While being seated on these higher or lower seating positions, participants will complete the joint Simon task (Sebanz et al., 2003). In this task, two participants – seated next to each other – react as fast as possible to one of two stimuli (e.g., one reacts to red, the other to green circles) that appear on the left, center, or right of a shared computer screen. Although participants are instructed to ignore the position of the stimulus on the screen, results typically show that they are faster to respond to target stimuli appearing on "their" side of the screen than on their partner's side. This is because people tend to represent their own actions in reference to their interaction partner (e.g., in terms of their 'left' versus 'right' seating position; also referred to as referential coding, Dolk et al., 2013), resulting in response-conflict when a stimulus location is incongruent with this representation (e.g., when the person on the right has to respond to stimuli that appear on the left, Dolk et al., 2014, 2013; Ferraro et al., 2011).

Although initially there have been social and non-social interpretations, current theory and evidence suggest that this interference effect, known as the joint Simon effect, reflects self-other integration (see Dolk et al., 2014 for an extensive account). In particular, if the same task is performed in exactly the same way, but in the absence of another individual who is responsible for reacting to the second stimulus, the interference effect disappears due to the absence of a spatial response dimension that functions as a reference frame (go/no-go variant; Hommel, 1996; Sebanz et al., 2003). The presence of a co-actor reinstates the spatial reference frame, as people try to discriminate their own actions from the actions of their co-actor. The more similar the self- and other-generated actions are, the stronger this referential coding, and hence the stronger the joint Simon effect. Indeed, the joint Simon effect is stronger when the task is performed in the presence of other people, robots, or objects that are (similar to themselves) perceived as intentional (Atmaca, Sebanz, & Knoblich, 2011; Müller, Brass, et al., 2011; Stenzel et al., 2012), agentic (Stenzel et al., 2014), or part of the same ingroup (Aquino et al., 2015; Costantini & Ferri, 2013; McClung, Jentzsch, & Reicher, 2013; Müller, Kühn, et al., 2011). As such, the size of the joint Simon effect "might be taken as an indicator of the similarity between (self- and other-generated) alternative events, and as a measure of the degree of self-other integration, particularly in social contexts" (Dolk et al., 2014, p. 8).

To study how power affects performance on the joint Simon task, we turn to a specialized version, namely the *vertical joint Simon task* (Dittrich et al., 2013). While the joint Simon task typically comprises a horizontal arrangement of stimuli, seating position, and response-keys, Dittrich et al. (2013) showed that the joint Simon effect also occurs when stimuli, seating position, and response-keys are vertically aligned (we explain the setup in more detail below).[1] This vertical joint Simon task offers an ideal context to manipulate power, as it connects to the associations between power and verticality that we discussed in Section 1.1.1.

1.2. Overview

Although literature links power to a reduced integration of other people's actions in social interaction, no research has tested this with objective performance measures of self-other integration. To do so, we examine how vertical elevation of the seating position affects reaction-times in a vertical joint Simon task. To test our hypothesis, we first reanalyzed two existing datasets that were collected by Dittrich et al. (2013) for different research purposes (namely, to demonstrate the existence of a vertical, joint spatial compatibility effect). Next, we conducted a confirmatory, high-powered experiment in which we include a manipulation check to test the same hypothesis. The data and analysis scripts are publicly (and anonymously) available at: https://osf.io/v4jkt/?view_only=54d9900d23a44da782437d3d900f9113.

2. Experiments 1a and 1b: reanalysis of Dittrich et al. (2013)

As a first test of our hypothesis, we reanalyzed data of Dittrich et al. (2013, Experiments 1 and 2). Dittrich and colleagues manipulated the spatial alignment between participants' seating position and the response key, but did not break down results between participants placed at an elevated or lower seating position. To test our hypothesis, we did so, selecting only those conditions in which stimuli, seats, and

[1] Research on the standard Simon task suggests that there are no qualitative differences between the horizontal and vertical versions of the task (Töbel et al., 2014). We expect this to be the same for the joint Simon task.

response-keys were vertically aligned. The conditions we analyzed were identical for the two Experiments (for the current study referred to as Experiment 1a and 1b), as the Experiments by Dittrich and colleagues differed only in their control conditions in which stimuli, seats, and response-keys were not vertically aligned.

2.1. Method

2.1.1. Participants and design

In return for course-credit or €3.50, 24 University-of-Freiburg students (20 females, 4 males, mean age 23.3 years, $SD = 3.1$) participated in Experiment 1a and 24 in Experiment1b (14 females, 10 males, mean age 24.0 years, $SD = 7.4$) in same-sex dyads (cf. van der Weiden et al., 2016). We used a mixed design, assigning one participant to the low- and the other to the high-seating condition (between) and manipulating congruency within participants. All students had normal or corrected-to-normal vision. As the Methods for Experiment 1a and 1b were identical, we will discuss these together below.

2.1.2. Manipulation of seating position

After signing informed consent forms, participants were randomly assigned to sit on a chair placed on a 40 cm high platform (higher seating position, associated with power), or on a non-elevated position, thus being seated 40 cm lower than the other participants (associated with reduced power). In front of both was the screen showing instructions and trials. To ensure that the participant on the elevated position would not block the view of the non-elevated participant, the former was sitting behind the latter. Fig. 1 is a graphical representation of the experimental setup (see also Dittrich et al., 2013, for details). Of course, this setup may produce effects through other mechanisms than social power or mere elevation. For example, the elevated participant could see the participant who sat in a lower position and both participants' hands on the response device, while the latter could only see the former by turning their head (but all participants were instructed to attend to the screen). We return to that issue in the General discussion.

2.1.3. Joint Simon task

Participants then completed a vertical joint Simon task (see Dittrich et al., 2013, for more details). Participants were presented with circles in red or green and were instructed to react to one color by pressing a response key, which matched their vertical sitting position, as quickly as possible. The circles' spatial position were also manipulated between trials, resulting in congruent (circle and seating position are at similar positions), incongruent (circle and seating position are at opposite positions) and neutral (circle appears in the middle) trials. Instructions and the experimental task were presented on a computer screen with 100 Hz refresh rate during all blocks. Each trial started with the presentation of a white rectangle and three unfilled white circles (400 ms), followed by the red or green target circle presented at the top, middle or bottom, which were displayed until a recorded response and up to 150 ms in the experimental blocks (up to 3000 ms in the practice blocks). Reaction time was measured from the onset of the target display. The maximum allowed response time was 600 ms (3000 ms in the practice blocks) and the inter-trial interval was 500 ms. Error feedback was displayed (500 ms) as false ("Fehler!" [error!]) or too slow ("Zu langsam!" [too slow!]) responses at the side of the participant who showed the error response. In total, the task consisted of four blocks of 126 trials per block, preceded by two practice blocks of 60 trials per block. The experiment lasted approximately 30 min.

2.1.4. Statistical analysis

As the data have a hierarchical structure (i.e., individuals within dyads), the units of analysis cannot be regarded as independent observations. Ignoring hierarchical structures results in an underestimation of regression coefficients and, as such, an overstatement of statistical significance. For this reason, we decided to perform a linear mixed models analysis, which recognizes the dependencies existent in hierarchically structured data by allowing for residual components at each level in the hierarchy (i.e., individuals and dyads). The analyses were conducted in R (version 4.0.5; R Core Team, 2021) with the lmer() function in the lme4 package (version 1.1-26; Bates et al., 2015). *p*-Values for fixed effects estimates were calculated with the lmerTest package based on Satterthwait approximation (version 3.1-3; Kuznetsova et al., 2017). Fixed effects predictors were effects coded (−1, 1). Fixed effects estimates are reported with the 95% bootstrapped confidence intervals (based on 100,000 bootstrap samples).

2.2. Results

In both experiments, we expected a main effect of congruency (faster reaction time in congruent trials), moderated by manipulated seating position elevation. Specifically, we expected a standard joint Simon task congruency effect, meaning that participants show slower responses on incongruent than on congruent trials, because participants are slowed down by the presence of the co-actor and their tendency to complete the task from the co-actor's perspective. But we expected that this effect would be moderated by seating position, meaning that there would be a significant joint Simon effect among participants in a lower seating position, but a weaker effect among participants sitting higher.

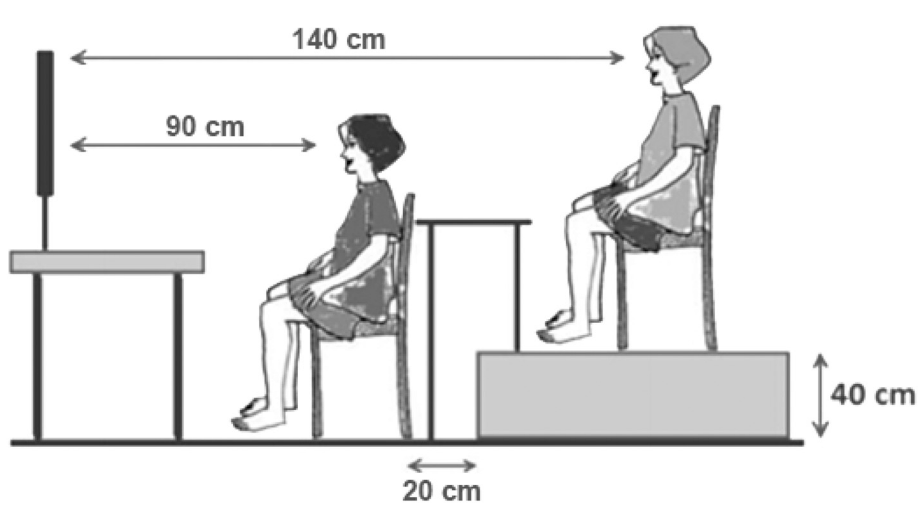

Fig. 1. Experimental setup. Participants in the elevated seating condition were seated on a 40 cm high platform, behind participants in the lower seating condition.

2.2.1. Experiment 1a

As expected, a linear mixed model analysis predicting mean reaction times by fixed effects of congruency, seating position and their interaction; and random intercepts for dyads, and participants nested in dyads, revealed the expected main effect of congruency, b = -3.48, SE = 0.99, 95% CI [-5.43, -1.53], t = -3.52, p = .002, such that reaction-times were slower on incongruent compared with congruent trials. More importantly, this main effect was qualified by an expected interaction-effect with seating position, b = 4.48, SE = 0.99, 95% CI [2.53, 6.40], t = 4.53, $p < .001$. Simple effects analyses indicated that participants in a lower seating position showed a significant joint Simon effect, demonstrated by slower reaction-times on incongruent (M = 357.8 ms, SD = 46.4 ms) than congruent trials (M = 341.8 ms, SD = 42.3 ms), b = -7.96, SE = 1.40, 95% CI [-10.70, -5.21], t = -5.69, $p < .001$. In contrast, participants sitting higher showed no significant difference, but instead demonstrated equally fast reaction-times on incongruent (M = 324.7 ms, SD = 32.3 ms) and congruent trials (M = 326.7 ms, SD = 29.9 ms), b = 1.00, SE = 1.40, 95% CI [-1.75, 3.76], t = 0.71, p = .482.

2.2.2. Experiment 1b

The same analysis as in Experiment 1a also revealed the expected main effect of congruency, b = -2.83, SE = 1.02, 95% CI [-4.84, -0.83], t = -2.79, p = .011, qualified by an expected interaction effect with seating position, b = 3.83, SE = 1.02, 95% CI [1.84, 5.83], t = 3.77, p = .001. Participants sitting lower showed a joint Simon effect ($M_{incongruent}$ = 333.9 ms, $SD_{incongruent}$ = 36.3 ms; $M_{congruent}$ = 320.6 ms, $SD_{congruent}$ = 32.90 ms), b = -6.67, SE = 1.44, 95% CI [-9.50, -3.82], t = -4.64, $p <$ .001. In contrast, participants sitting higher did not show this effect ($M_{incongruent}$ = 329.6 ms, $SD_{incongruent}$ = 20.3 ms; $M_{congruent}$ = 331.6 ms, $SD_{congruent}$ = 19.7 ms), b = 1.00, SE = 1.44, 95% CI [-1.80, 3.82], t = 0.70, p = .494.

2.3. Discussion

Re-analyses of two existing data sets showed that, consistent with predictions, participants in an elevated seating position, culturally associated with increased power, do not show the typical joint-Simon effect while people in a non-elevated seating position (associated with subordinate positions) do.

3. Experiment 2

To further test our hypothesis, we conducted a confirmatory experiment using the same paradigm and design, including the same seating-position manipulation of power, but using a better-powered sample and including a manipulation check.

3.1. Method

3.1.1. Participants and design

In return for course-credit or €3.50, one hundred healthy, right-handed undergraduates (70 women, 30 men, mean age 22.4 years, SD = 3.3) with normal or corrected-to-normal vision participated in same-gender pairs (cf. van der Weiden et al., 2016). Participants were randomly assigned to either the low- or high-seating condition. A statistical power analysis using G*Power (Faul et al., 2013) showed that a sample size of 100 provides ample statistical power ($1 - \beta > 0.99$, α = 0.05), to detect the smallest effect size found in Experiment 1a/b (η_p^2 = 0.27, f = 0.61).

3.1.2. Materials and procedure

The experimental procedure was the same as in Experiments 1a and 1b and was conducted in the same laboratory, using the same computer hardware. The only change to the procedure was the inclusion of a series of explicit measures. Most notable, we included two items to measure whether sitting on the chair made participants feel powerful and powerless (i.e., ‘While sitting in this chair, I feel powerful’ and ‘While sitting in this chair, I feel powerless’), both rated between *not at all* (1) and *very much* (7). After reverse coding the powerless item, these two items were combined (r = 0.19, p = .054) into a manipulation check of social power. To exclude the possibility that our effects were due to effects of the manipulation on mood (Keltner et al., 2003), participants placed a tick on a single 14.6 cm long line, anchored at *Bad* and *Good*. Finally, we included exploratory measures, not related to self-other integration. These are not further discussed.

3.2. Results

3.2.1. Manipulation check

Participants sitting in an elevated position felt more powerful (M = 4.67, SD = 1.26) than participants placed in a lower sitting position (M = 3.83, SD = 1.22), t(98) = -3.38, p = .001, d = -0.68, 95% CI [-1.08, -0.27]. The manipulation did not affect mood, t(96) = 1.18, p = .239 (two missing cases).

3.2.2. Joint Simon task

A linear mixed model analysis predicting mean reaction times by fixed effects of congruency, seating position and their interaction; and random intercepts for dyads, and participants nested in dyads,[2] revealed a tendency toward the predicted main effect of congruency, b = -0.92, SE = 0.47, 95% CI [-1.84, 0.01], t = -1.94, p = .055, qualified by the predicted interaction effect with seating position, b = 2.36, SE = 0.47, 95% CI [1.43, 3.28], t = 5.00, $p < .001$. As expected, simple effects analyses revealed that lower-sitting participants demonstrated a significant joint Simon effect, as evidenced by slower reaction-times on incongruent (M = 317.7 ms, SD = 28.6 ms) than on congruent trials (M = 311.2 ms, SD = 28.2 ms), b = -3.27, SE = 0.67, 95% CI [-4.58, -1.97], t = -4.90, $p < .001$. In contrast, higher-sitting participants did not show a joint Simon effect, but even surprisingly showed a significant effect in the opposite direction ($M_{\text{incongruent}}$ = 309.7 ms, SD = 25.7 ms; $M_{congruent}$ = 312.6 ms, SD = 26.3 ms), b = 1.44, SE = 0.67, 95% CI [0.14, 2.75], t = 2.16, p = .033.

3.2.3. Additional exploratory analyses

Further supporting the hypothesis that seating position decreases self-other integration, the joint Simon effect (reaction $\text{time}_{\text{incongruent}}$ − reaction $\text{time}_{\text{congruent}}$) was negatively correlated with feelings of social power (manipulation check), r(98) = -0.233, p = .020. As our data show that seating position affects feelings of power, and feelings of power are related to the joint Simon effect, we ran a mediation analysis to see whether the effect of seating position on the joint Simon effect may be (partially) explained by our manipulation check – i.e., feelings of power. The mediation analysis accounted for participants' nesting within dyads by applying the approach of Montoya and Hayes (2017) for within-participants mediation analysis to the present within-dyad case.[3] The indirect effect of seating position on the joint Simon effect via feelings of power was not significant, ab = 1.13, 95% CI [-0.56, 3.30].[4]

Alternatively, the effect of seating position on the joint Simon effect

[2] A singular model fit indicated that the variance of the by-dyad random intercepts could not be estimated. A reduced model without by-dyad random intercepts showed identical results.

[3] By calculating a joint Simon effect score per participant (see above), the hierarchical structure in the data could be reduced to two levels, i.e., participants/seating position (level 1) within dyads (level 2). This hierarchical structure is equivalent to a within-participants design with dyad instead of participant as the grouping factor and seating position as a within-dyad predictor.

[4] We used the percentile bootstrap method to calculate the confidence interval of the indirect effect based on 10,000 bootstrap samples (Montoya & Hayes, 2017).

may also be moderated by feelings of power, following the rationale that the manipulation is particularly likely to produce effects if participants experience corresponding feelings of (high or low) power (Jacoby & Sassenberg, 2011).[5] To test this, we added feelings of power as a predictor to the linear mixed model defined above. We group-mean centered the individual feeling of power scores for dyads to remove confounding effects of between-dyad variation in these scores (Enders & Tofighi, 2007). The model contained congruency, seating position, feelings of power and their interactions as fixed effects and the same random effects structure as before. Feelings of power did not significantly moderate the joint Simon effect, indicated by a non-significant three-way interaction of congruency × position × feelings of power, $b = -0.08$, $SE = 0.54$, 95% CI [-1.15, 0.98], $t = -0.14$, $p = .888$.[6]

3.3. Discussion

A confirmatory, better-powered replication confirms the conclusions drawn in Experiments 1a and 1b, based on reanalyses of existing data, that vertical elevation reduces the (vertically aligned) joint Simon effect. Furthermore, we showed that seating position indeed affected feelings of power (administered as a manipulation check). But although we found that feelings of power correlated with the joint Simon effect, we did not find that they also mediated or moderated the effect of seating position on the joint Simon effect. We return to this null-finding in the General Discussion.

4. General discussion

Three experiments consistently show that sitting in an elevated seating position reduces the (vertically aligned) joint Simon effect, a measure of self-other integration. Consistently, lower-sitting participants showed a typical joint Simon effect, suggesting that they integrated the actions as generated by themselves and their co-actor. But equally consistently, higher-sitting participants did not show the joint Simon effect, or even showed a reversed joint Simon effect, suggesting that they did not take into account their co-actor's actions.

4.1. Limitations and alternative explanations

Although our hypotheses were rooted in literature on how power affects self-other integration and distance, a clear limitation to our findings is that neither a mediation nor a moderation analysis provided evidence that self-other integration – although affected by our manipulation which was equally rooted in literature linking power to vertical elevation – also resulted from subjective feelings of power. One possibility, therefore, is that although the seating position influenced performance on the joint Simon task and also influenced self-reported feelings of power, performance on the joint Simon task was influenced instead by other aspects of the manipulation, than feelings of power. Here we discuss six alternative explanations:

Focusing first on an alternative explanation due to the experimental setup, we note that our manipulation did not only change spatial elevation, but also affected participants' orientation toward the other participant, toward the response keys, and toward the computer screen displaying the task and instructions. In particular, the other participant, and as such the vertical alignment of keys and seats, was only directly visually present for participants in the elevated position – and not for those in the lower position. This is an unlikely alternative explanation of our findings, though, because – if anything – this should result in a stronger activation of the vertical response dimension and stronger referential coding, and hence an increased joint Simon effect for elevated participants (Dittrich et al., 2012; Guagnano et al., 2010). Our findings, however, demonstrated a decreased joint Simon effect for elevated participants, which goes against this explanation.

Second, the fact that participants in the elevated position were sitting behind those in a non-elevated position also means that they were positioned farther away from the computer screen than their lower sitting co-actors. This may have slowed down their responses because it was more difficult to differentiate between the stimuli as they appeared closer together, from a larger distance (i.e., due to a smaller visual angle). Again, we believe this is an unlikely alternative explanation of our findings, because it should lead elevated participants to respond slower (across all stimuli). Instead, we found that they were non-significantly faster than participants in the low seating position across the three experiments.

Third, the smaller perceived distance between the stimuli as a result of a smaller visual angle could have reduced the activation of the vertical response categories, thereby reducing the joint Simon effect. Although we are not aware of any research that systematically investigated the effect of visual angle on the joint Simon effect, there is suggestive evidence that visual angle does not modulate the standard Simon effect. That is, previous research on a vertical version of the standard Simon task suggests that a smaller distance between the stimuli (i.e., 1.2° vs. 2.4° visual angle) reduces the Simon effect in error rates, but not in reaction times (Többel et al., 2014, see also Buitron, 2017). Of course, whether the same applies for the vertical *joint* Simon task and with the visual angle (i.e., 1.5°[7]) and screen distances used in the current experiments remains an empirical question. Nonetheless, pending further research we therefore believe this an unlikely alternative explanation.

A fourth alternative explanation for the demonstrated effects, is that various tasks, including visual search and local-global processing, show an upper visual field advantage, meaning that people pay more attention to the upper part of a task display (Christman, 1993; Yund et al., 1990), which should result in faster responses to stimuli presented at the top of the screen for both participants. For lower-sitting participants, stimuli presented at the top are incongruent with seating position, so a general speed up for stimuli in the upper visual field should reduce response times on incongruent trials, and hence also reduce the joint Simon effect. In contrast, for elevated participants, an upper visual field advantage should speed up responses on congruent trials, resulting in an increased joint Simon effect. Instead, we found the opposite. In all three experiments, participants responded significantly slower to stimuli presented at the top (Experiment 1a: $b = 4.48$, $p < .001$; Experiment 1b: $b = 3.83$, $p = .001$; Experiment 2: $b = 2.36$, $p < .001$). This effect was stronger for lower-sitting participants (Experiment 1a: $b = -3.48$, $p = .002$; Experiment 1b, $b = -2.83$, $p = .011$; Experiment 2, $b = -0.92$, $p = .055$). As such, we believe that our findings cannot be explained by an upper visual field advantage.

A fifth alternative explanation is that because of increased screen distance, participants in the elevated position needed to narrow their attention more to focus on the task at hand. This narrowing of attention may reduce self-other integration in the joint Simon task. In line with this notion, convergent (narrow) rather than divergent (broad) thinking has been shown to reduce self-other integration in the joint Simon task (Colzato et al., 2012; Colzato et al., 2013). We have no good reason to doubt this alternative explanation and instead discuss in the next section some ways to test this.

Sixth, in line with the popular phrasing "don't turn your back on me", there is suggestive evidence that people may feel less psychologically

[5] We thank an anonymous reviewer for suggesting to test the role of feelings of power in the effect of seating position on the joint Simon effect.

[6] Understandably, also this model did not converge successfully. The relevant three-way interaction was neither significant in a reduced model that excluded by-dyad random intercepts, $b = 0.10$, $SE = 0.39$, 95% CI [-0.66, 0.85], $t = 0.26$, $p = .792$.

[7] In the current set-up, circles were approximately 1.0° in radius and there was 0.5° in distance between the circles (Dittrich et al., 2013). Hence, there was 1.5° in distance between the *center* of the fixation and the *center* of the stimuli.

close when facing someone's back (e.g., Argyle & Dean's, 1965; Bailenson et al., 2001; Hayduk, 1981). As the joint Simon effect is typically stronger when people feel closer to their co-actor (Quintard et al., 2020; Shafaei et al., 2020), the reduced psychological closeness in the rear seating position may explain the reduction in the joint Simon effect for elevated participants. We also have no good reason to doubt this alternative explanation and instead discuss in the next section some ways to test this.

4.2. Alternative tests of the hypothesis

To resolve some of these alternative explanations and provide alternative tests of the hypothesized effect of power on the joint Simon task, future research could rely on several approaches. First, research could stick with our experimental setup, but experimentally manipulate the meaning associated with elevated versus lower position. For example, one could experimentally change the meaning associated with the elevated and lower positions, by instructing participants that the experimental setup recreates a theater, with some occupying the better, front-row positions (who also attend to the bottom of the screen) and others the inferior balcony positions (who attend to the top of the screen). If feelings of power drive these effects, such instructions should block the cultural association between power and elevation and thus block the observed effects. But if the effect is driven purely by visual or physical aspects of the manipulation (such as the fourth or fifth explanation, discussed in the previous section), then the observed effects should be unaffected.

In addition, future research could systematically investigate the effect of visual angle and/or screen distance to assess whether this may explain the effects of seating position on the joint Simon effect. One could, for example, seat participants side by side and place one of them on a higher chair and the other on a lower chair. Although such a set-up could activate a horizontal response dimension as well, the vertical seating arrangement should still activate the vertical response dimension, and as such, cause a vertical joint Simon effect. Alternatively, researchers could consider a diagonal joint Simon task to match the seating arrangement more directly. Importantly, this set-up would ensure equal screen distances for the two participants, while visual angle can be varied within (e.g., in different blocks of trials) or between participants. In addition, this set-up would eliminate the confound that participants in the elevated position are also sitting behind their co-actor's back, which may reduce psychological closeness.

To assess the role of narrowing of attention at larger screen distances, future research could cognitively manipulate attentional focus. That is, manipulations of global vs. local processing or divergent vs. convergent thinking styles may be used to induce a narrower attentional focus in the lower seating position and a broader focus in the elevated seating position (Colzato et al., 2012; Colzato et al., 2013; Navon, 1977). Presumably, if attentional focus drives the effects of seating position, such manipulations should flip (or at least cancel out) the effects.

Another approach to test these alternative explanations would be to simply test the link between feelings of power and performance on joint Simon task using different power manipulations. For example, power may be manipulated with a role-play in which some participants are tasked with evaluating, directing, and rewarding others (Anderson & Berdahl, 2002) or using economic games such as ultimatum or dictator games (Sivanathan et al., 2008). Alternatively, researchers could use a quasi-experimental design and test dyads with actual power differences such as differently-ranked members of an organization or by using personality-focused measures such as the personal sense of power (Anderson et al., 2012). Using such alternative manipulations of power would not only be helpful by (potentially) demonstrating that the effect generalizes to other manipulations of power. But at least some of these manipulations are also open to interesting moderation effects. For example, past research shows that a communal (Chen et al., 2001) or prosocial (Côté et al., 2011) orientation or the adoption of an empathic leadership style (Schmid Mast et al., 2009) can moderate and reverse the effects of power on attention to others and self-other integration. When using a quasi-experimental design and testing the effect of power in an organization, one interesting idea would be to move beyond dyads. After all, power relations are typically between one (or a few) powerful leaders and many less-powerful subordinates. It would therefore be interesting to test effects of power on self-other integration to multiple actors (Cracco et al., 2015).

5. Conclusion

Three experiments consistently showed an effect of seating position (lower vs. elevated) on self-other integration as measured by a joint vertical Simon task. Although these predictions build on literature on the psychological effects of power and although we found in Study 2 that our elevation manipulation indeed produced the expected effects on our manipulation check (of self-reported feelings of power), we could not establish a significant mediation of the effects of seating position via feelings of power on the joint Simon effect. The effect of seating position was also not moderated by these feelings of power. These null-findings qualify our evidence for the link between power (as manipulated through elevation) and self-other integration (as measured using a joint vertical Simon task) and call for future research to further investigate this link, taking into account the discussed alternative explanations and exploring the suggested alternative approaches.

CRediT authorship contribution statement

Anouk van der Weiden: Original draft preparation and Editing. Dirkje Pril: Data collection, Initial analysis, and Original draft preparation. Kerstin Dittrich: Editing. Jasmin Richter: Final data analysis and Editing. Joris Lammers: Conceptualization, Supervision, Original draft preparation, and Revision.

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