Is mental effort exertion contagious?

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Abstract

The presence of another person can influence task performance. What is, however, still unclear is whether performance also depends on *what* this other person is doing. In two experiments, two participants (A and B) jointly performed a Simon task, and we selectively manipulated the difficulty of the task for participant A only. This was achieved by presenting A with 90% congruent trials (creating an easy task requiring low effort investment) or 10% congruent trials (creating a difficult task requiring high effort investment). Although this manipulation is irrelevant for the task of participant B, we nevertheless observed that B exerted more mental effort when participant A performed the difficult version of the task, compared to the easy version. Crucially, in Experiment 2 this was found to be the case even when participants could not see each other's stimuli. These results provide a first compelling demonstration that the exertion of effort is contagious.

Introduction

Nowadays, an increasing number of people perform their daily working duties in the presence of others, for example in open landscape offices. The introduction of these landscape desks is often met with critique, arguing that it hampers efficient work, due to an overflow of potential sources of distraction. This raises a straightforward empirical question: What is the influence of co-workers on our task performance?

According to Social Facilitation Theory (Zajonc, 1965), the presence of another person facilitates the execution of dominant responses, which are those behaviors that are highly overlearned and executed without deliberate cognitive control (Botvinick, Braver, Barch, Carter, & Cohen, 2001). The presence of another person thus makes it easier to execute a dominant response when it is appropriate, but harder to overcome it when this is not the case (see Baron, 1986 for a different interpretation). More specifically, performance on a *simple*, low-level motor task improves in the presence of observers (Travis, 1925), whereas performance on a *difficult* test-battery assessing executive functioning worsens in the presence of a third-party observer (Horwitz & McCaffrey, 2008; for a seminal meta-analysis, see Bond & Titus, 1983). In line with this, recent studies have shown that performance on a conflict task assessing executive functioning decreases in the presence of others who are executing the same task (Huguet, Barbet, Belletier, Monteil, & Fagot, 2014), suggesting that the presence of these others taxes our cognitive control capacity (see also Conty, Gimmig, Belletier, George, & Huguet, 2010).

As described above, social facilitation theory only deals with explaining how the presence of another person influences performance, but it does not address *action-specific* influences of others. As a result, most studies to date investigating the influence of social presence on cognitive control have compared the mere presence versus absence of another person. Contrarily, ideomotor theories (James, 1890; Jeannerod, 1999) predict that our behavior is highly dependent on actions that we observe in other people (for empirical demonstrations, see e.g., Chartrand & Bargh, 1999; Iacoboni et al., 1999; Sebanz, Knoblich, & Prinz, 2003). Building on this notion, we aimed to examine whether task performance depends not simply on the presence of another person, but rather on the degree of mental effort that this other person is exerting. Thus, it is examined whether the exertion of mental effort is contagious. To accomplish this, participants performed a task together with another person, and task difficulty was selectively manipulated for the other participant: the more difficult the task, the more effort this other person needs to invest to obtain good task performance (Botvinick et al., 2001; Shenhav, Botvinick, & Cohen, 2013). By doing so, we can examine whether task performance is influenced by the other persons' exerted degree of effort. If task performance improves when the other person invests more effort, this would be indicative of increased effort exertion and thus demonstrate the contagious nature of effort exertion.

To investigate this, we adopted a variant of the Simon task in which two persons jointly perform the task. In a regular Simon task, one participant responds to the color of patches (e.g., blue or red) with either the left or the right hand, while ignoring its location on the screen (i.e., left or right). Typically, reaction times (RTs) are shorter and error rates lower on congruent trials, where the (task irrelevant) location triggers the same response as the (task relevant) color, compared to incongruent trials, where both features trigger a different response (i.e., the congruency effect). Here, two participants (A and B) are seated next to each other and each responds to half of the stimuli. For example, A responds to blue stimuli, whereas B responds to red stimuli. Although this is in essence a simple (joint) Go/No-Go task, it nevertheless produces robust congruency effects for both participants (Sebanz et al., 2003). The typical approach is to compare the congruency effect in this Joint Simon task to the congruency effect obtained in a condition in which participants perform the same task without the presence of another person (i.e., individual Go/No-Go). In the current study, we adopted a novel approach and used a within-participant comparison. We varied the difficulty of *participant A* by selectively manipulating his or her proportion of congruent trials. More specifically, this participant either performs a difficult version of the task, (i.e., 10% congruent trials) or an easy version of the task (i.e., 90% congruent trials). In line with the typical findings obtained with the regular Simon task, we expect that the congruency effect of participant A will be large in the 90% congruent condition, while it will be severely reduced in the 10% congruent condition (Logan & Zbrodoff, 1979). This pattern is typically explained by assuming that participants do not exert control in the 90% congruent condition and thus do not suppress the location information, because this information is helpful on the majority of trials. This strategy is beneficial for congruent trials, but not for the few incongruent trials, leading to large congruency effects. In the 10% congruent condition, on the other hand, it is assumed that participants increase their level of control in order to handle the now interfering location information. In this case, this strategy is beneficial for incongruent trials, but it reduces the beneficial effect of location on the infrequent congruent trials, leading to reduced congruency effects. The difference between these two conditions is believed to reflect the larger investment of cognitive control in the latter condition (Botvinick et al., 2001). Crucially, our design allows us to examine whether task performance of *participant B*, who always receives 50% congruent trials, is dependent on the task difficulty and thus effort exertion of participant A. If the exertion of mental effort is contagious, the results of participant B should mimic those of participant A: the congruency effect of participant B should be smaller when participant A performs a difficult task, compared to an easy task.

Below, we report the results of two experiments. In Experiment 1, participants *jointly* perform half of a Simon task (i.e., a joint Go/No-Go; Experiment 1; see Figure 1a) on the same screen. In Experiment 2, participants only had visual access to their own stimuli and thus *individually* perform half of a Simon task, while seated next to each other (i.e., individual Go/No-Go, Experiment 2; see Figure 1b).

Experiment 1

Method

Participants

Thirty-eight participants (20 females) participated on a voluntary basis or in return for course credit, and provided written informed consent. The sample size was determined beforehand (aimed at 40, with only 38 showing up) based on our experience with conflict studies. All participants reported having normal or corrected-to-normal vision, had normal color vision and were naive with respect to the hypothesis. Mean age of the sample was 21.6 years (range 17-30, *SD* = 2.1).

Apparatus and stimuli

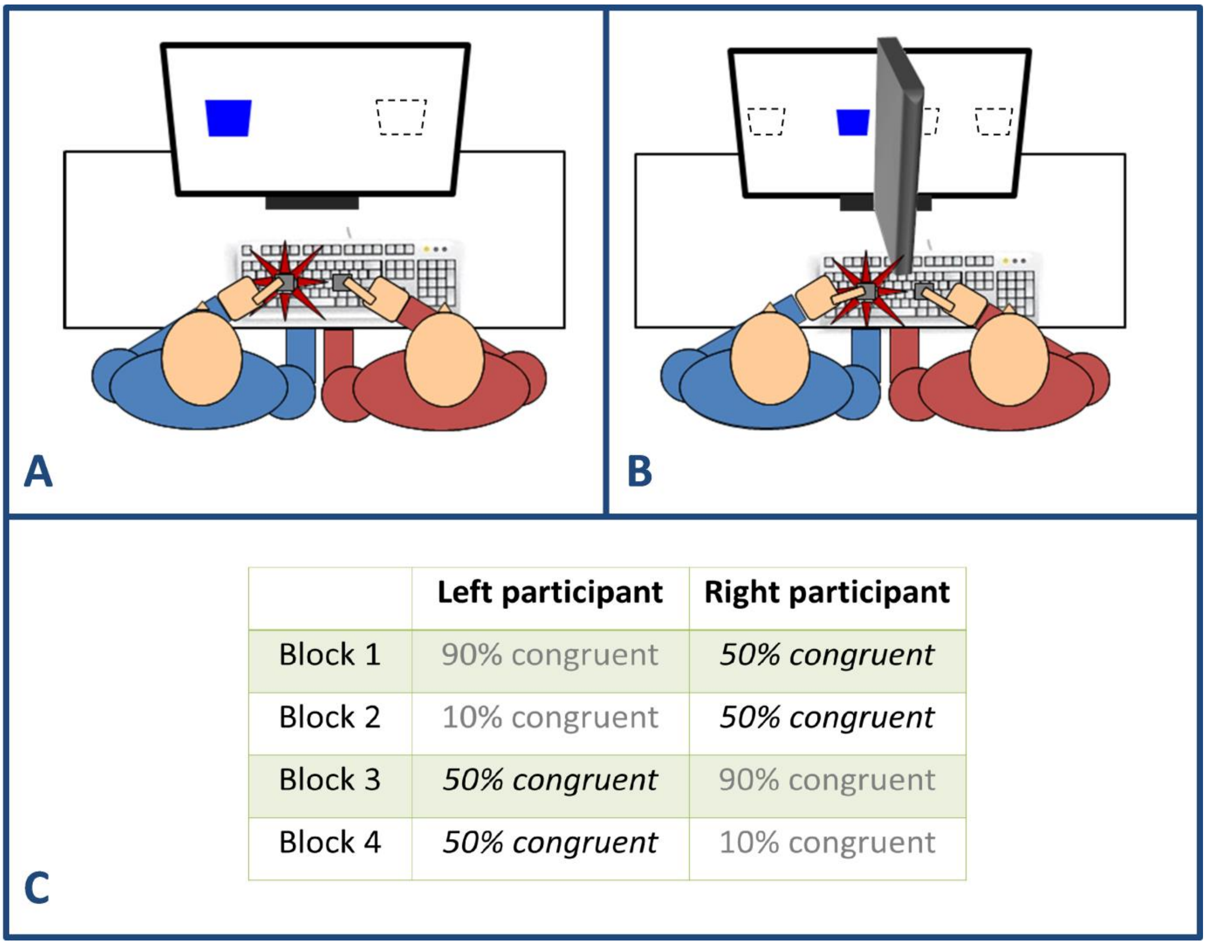
The experiment was programmed in E-prime for Windows (Psychology Software Tools, Pittsburgh, PA) and run on Intel Pentium 4 computers with 17inch LCD screens. The refresh rate was set to 60 Hz. Targets were four color patches (3.5° wide and 3.5° high) in blue (RGB 0, 0, 255), yellow (RGB 255, 242, 0) green (RGB 34, 177, 76) or orange (RGB 255, 127, 39).

Procedure

Participants performed the experiment in pairs, seated next to each other in front of a computer screen (see Figure 1A). They were instructed that they were to perform a task on the same AZERTY keyboard and that each of them had to respond with one hand to two of the four colors. Participants were not informed that the difficulty of the task would vary over the different blocks The left participant responded to two colors with the *left* hand by pressing the “d” key, the right participant responded to the two other colors with the *right* hand by pressing the “k” key (with all color combinations counterbalanced across participants). Each trial started with a centrally presented fixation cross lasting 800ms, followed by a color patch, which was presented either on the left or right side of the screen (at 25% or 75% of the screen border) and disappeared when a response was made or after 3000ms. The inter-trial interval lasted for 1000ms. The experiment started with 16 practice trials, where feedback was presented when an error was committed, followed by four blocks of 160 trials each in which feedback was no longer provided, with self-paced breaks after every 80 trials.

Design

Figure 1C shows a graphical representation of the design. Within the first two blocks, the proportion of congruent trials of one participant was manipulated. This participant received 90% congruent trials (i.e., low effort condition) in the first block and 10% congruent trials (i.e., high effort condition) in the second block (order counterbalanced across participants), while the other participant received an equal proportion of congruent and incongruent trials. Within the last two blocks, the proportion of congruent trials was manipulated for the other participant (i.e., 90% congruent trials in block 3 and 10% congruent trials in block four). Note that the manipulated proportion of congruent trials in block 2 was always different from the proportion of congruent trials of the other participant in block 3 (e.g., 10% to 90% or vice versa), in order to rule out any possible carry-over effects from one’s own manipulation to the next block. This design allowed us to test whether the task difficult of one participant (90% vs. 10% congruent trials) influences the congruency effect of the other participant, who received an equal proportion of congruent and incongruent trials.



	Left participant	Right participant
Block 1	90% congruent	*50% congruent*
Block 2	10% congruent	*50% congruent*
Block 3	*50% congruent*	90% congruent
Block 4	*50% congruent*	10% congruent

Fig 1. Panel A shows the set-up of Experiment 1, in which two participants jointly perform a Simon task. Panel B shows the set-up of Experiment 2, in which a cardboard was placed in the middle of the screen, so participants could fully see each other but not each other’s stimuli. Note that the black dotted squares are used here to indicate all possible positions of the squares, but were not presented in the actual experiment. Panel C shows the design of both Experiments. Within the first two blocks, the proportion of congruent trials was manipulated in the stimulus list of the left participant, whereas the right participant received an equal proportion of congruent and incongruent trials. In blocks 3 and 4, the manipulation was swapped. Note that the order of the congruency manipulation was counterbalanced; see text for the exact details.

Results

To examine performance when the proportion of congruent trials was manipulated in the stimulus list of the *other* participant (see Figure 2), we submitted the median reaction times (RTs) of correct trials (98.7% of all trials) and mean error rates to a 2 (congruency: congruent or incongruent) x 2 (proportion congruency of the other participant: 90% or 10% congruent trials) repeated measures analysis of variance.[1]

RTs showed a main effect of congruency, $F(1,37) = 25.85$, $p < .001$, reflecting that on average responses were shorter on congruent trials (369ms) than on incongruent trials (381ms). Crucially, this main effect of congruency was modulated by the proportion congruency of the other participant, $F(1,37) = 27.25$, $p < .001$. The congruency effect of the participant receiving an equal amount of congruent and incongruent trials was 23ms when the other participant received 90% congruent trials, $t(37) = 7.75$, $p < .001$. This effect dropped to a non-significant 1ms, $t(37) = 0.2$, $p = .81$, when the other participant received only 10% congruent trials. This shows that participants were better in suppressing irrelevant location information (i.e., exerted more effort) when the participant next to him/her also exerted more effort. The main effect of proportion congruency of the other participant did not reach significance, $F(1,37) = 1.45$, $p = .23$, showing that these results do not reflect a speed-accuracy trade-off.

Error rates also showed a significant main effect of congruency, $F(1,37) = 7.91$, $p = .008$, reflecting on average lower error rates on congruent trials (0.9%) compared to incongruent trials (1.6%). Mirroring the RTs, this congruency effect was modulated by the proportion congruency of the other participant, $F(1,37) = 15.93$, $p < .001$. When the other participant received 90% congruent trials, the congruency effect was 2.1%, $t(37) = 4.41$, $p < .001$, whereas it dropped to a non-significant -0.6%, $t(37) = -1.5$, $p = .13$, when the other participant received 10% congruent trials. The main effect of proportion congruency of the other participant did not reach significance, $F < 1$.

For completeness, we also report the results when the proportion of congruent trials was manipulated in participant's *own* stimulus list (see Table 1). RTs on correct trials (98.6% of all trials) showed a main effect of congruency, $F(1,37) = 17.34$, $p < .001$, which was modulated by the proportion of congruent trials, $F(1,37) = 38.67$, $p < .001$. Congruency effects were positive when 90% of the trials were congruent, 44ms, $t(37) = 7.76$, $p < .001$, and negative when 10% of the trials were congruent, -14ms, $t(37) = -3.5$, $p = .001$. The main effect of proportion congruency did not reach significance, $p > .31$, showing that overall response speed did not differ between both contexts. This rules out the possibility that the other participant simply adapted his or her behavior to the openly observable response speed. The error rates did not show differences between conditions, all p's > .10.

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[1] None of the variables that were counterbalanced had an impact on the results of either Experiment 1 or Experiment 2. Most importantly, the effect was not different for participants who first performed the 50/50 proportion condition and participants who first performed the condition in which the congruency proportion was manipulated, Experiment 1: $F < 1$; Experiment 2: $F < 1$, thus, our results cannot be explained by potential carry-over effects. For both groups, we observed a significant interaction between congruency and the proportion congruency of the other participant, both for Experiment 1: 50/50 condition first: 18ms, $t(18) = 3.24$, $p_{one\text{-}sided} = .002$, 50/50 condition second: 26ms, $t(18) = 4.08$, $p_{one\text{-}sided} < .001$, and Experiment 2: 50/50 condition first: 12ms, $t(18) = 1.94$, $p_{one\text{-}sided} = .034$; 50/50 condition second: 8 ms, $t(18) = 1.61$, $p_{one\text{-}sided} = .06$.

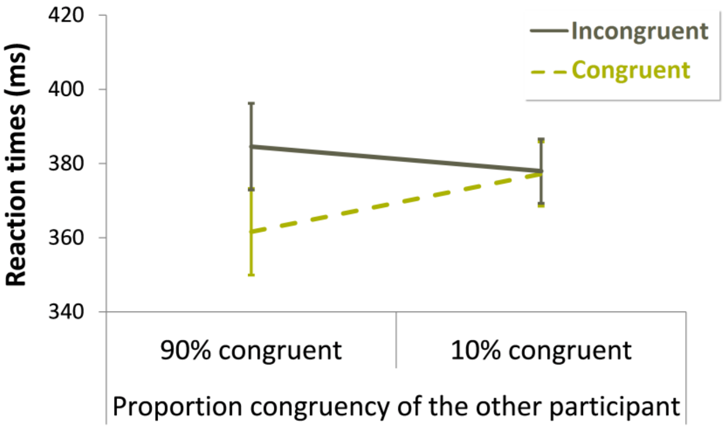

Fig 2. Results of Experiment 1 for the blocks in which participants received an equal proportion of congruent and incongruent trials, dependent on the proportion congruency of the other participant. Error bars reflect 95% within-subjects confidence intervals.

Interim Discussion

In Experiment 1, we observed that participants showed reduced congruency effects (reflecting increased effort exertion to ignore the irrelevant location information) when the participant next to them performed a difficult task (i.e., 10% congruent trials, requiring much effort), compared to an easy task (i.e., 90% congruent trials, requiring little effort). Although promising, one issue deserves further attention. Participants performed the task in the presence of another person, while they could clearly see both their own stimuli as well as the other's stimuli. Therefore, it is unclear whether they adapted their response strategy based on the degree of effort exerted by the person next to them, or simply based on the total number of congruent and incongruent trials[2]. This difference is of crucial importance, because the latter explanation implies that the presence of the other person is not an important factor. In order to rule out this interpretation, we created an experimental set-up that allowed us to unequivocally show that participants change their degree of effort exertion dependent on that of the participant next to them. Therefore, in Experiment 2 participants could fully see each other, but had no visual access to each other's stimuli. As a result, any transfer effect of our proportion congruency manipulation can only be attributed to participants being sensitive to the amount of effort exerted by the person next to them.

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[2] Another factor which might have added to the findings of Experiment 1 is that the location of the stimulus was predictive of the response. For example, when participant A performs a block with 90% congruent trials, participant B has to respond to 83.33% of the stimuli appearing on his or her side (because 50% of the stimuli of participant B and only 10% of the stimuli of participant A appeared on that side). Note, however, that this confound is completely eliminated in Experiment 2.

Experiment 2

Method

Participants

Thirty-eight participants (30 females) participated in return for course credit or 6€, and provided written informed consent. Sample size was based on that of Experiment 1. All participants reported having normal or corrected-to-normal vision, had normal color vision and were naive with respect to the hypothesis. Mean age of the sample was 20.8 years (range 18-27, *SD* = 2.1). None of them participated in Experiment 1.

Apparatus, stimuli, and design

The experiment was run on 21 inch LCD screens divided in two parts by means of a handcrafted cardboard screen. Target patches were 2.4° degrees wide and 1.9° high. Apart from that, apparatus, stimuli and design were identical to Experiment 1.

Procedure

In Experiment 2, we used a set-up in which participants could fully see each other, but only their own stimuli. As can be seen Figure 1B, this was achieved by means of a cardboard screen which separated the monitor in two parts. As in Experiment 1, participants performed their task on the same keyboard, which was clearly visible for both of them. In contrast to Experiment 1, however, the stimuli were now presented for each participant separately on his or her space of the screen. On each trial, a fixation cross was presented centrally on *each* half of the screen, which was followed by a color patch that appeared *only* on the (left or right) side of the space on the screen of the participant who was assigned to that color (i.e., at 10% or 40% of the entire screen border for the participant on the left and at 60% or 90% of the entire screen border for the participant on the right). For example, if the person on the left responds to blue and orange, *all* blue and orange stimuli appeared only on his or her space of the screen. For the 50% condition, 50% of the time on the left side of their space (i.e., congruent) and 50% of the time on the right side of their space (i.e., incongruent). On these trials, the other participant is presented with a blank screen. For the 10% condition, the blue and orange stimuli appear in the following proportions: 10% of the time on the left side of their space and 90% of the time on the right side of their space. For the 90% condition, the reverse is true: 90% of the time on the right and 10% of the time on the left. Apart from this, the procedure was identical to Experiment 1.

Results

The same analysis as in Experiment 1 showed that when the proportion of congruent trials was manipulated in the stimulus list of the *other* participant, RTs on correct trials (99.4% of all trials) again showed a main effect of congruency, *F*(1,37) = 12.15, *p* = .001, reflecting shorter average responses on congruent trials (360ms) than on incongruent trials (371ms). Crucially, this main effect of congruency was modulated by the proportion congruency of the other participant, *F*(1,37) = 6.42, *p* = .015 (see Figure 3). The congruency effect of the participant receiving an equal proportion of congruent and incongruent trials was 16ms, *t*(37) = 3.93, *p* < .001, when the *other* participant received 90% congruent trials. This effect dropped to 6ms when the other participant received 10% congruent trials, *t*(37) = 1.70, *p* = .09. Confirming Experiment 1, this suggests that participants are better at suppressing the interfering location information when the participant next to them exerts more effort. The main effect of proportion congruency of the other participant did not reach significance, *p* = .09, again showing that these results do not reflect a speed-accuracy trade-off.

Because errors reflect responses to trials on which no stimulus was visible, the factor congruency and the interaction between congruency and irrelevant proportion are meaningless. Therefore, we only examined whether the number of errors was dependent upon on the proportion of congruent trials of the other participant, which was not the case, *t*(37) = 0.56, *p* = .57.

For completeness, we also report the results when the proportion of congruent trials was manipulated in participant's *own* stimulus list (see Table 1). RTs on correct trials (99.7% of all trials) showed a main effect of congruency, *F*(1,37) = 7.22, *p* = .01, which was modulated by the proportion of congruent trials, *F*(1,29) = 31.05, *p* < .001. Congruency effects were positive when 90% of the trials were congruent, 35ms, *t*(37) = 4.96, *p* < .001, and negative when 10% of the trials were congruent, -11ms, *t*(37) = -2.28, *p* = .028. The main effect of proportion congruency did not reach significance, *p* > .10, showing that overall response speed was not different between both contexts. The error rates did not show differences between conditions, all *p*'s > .44.

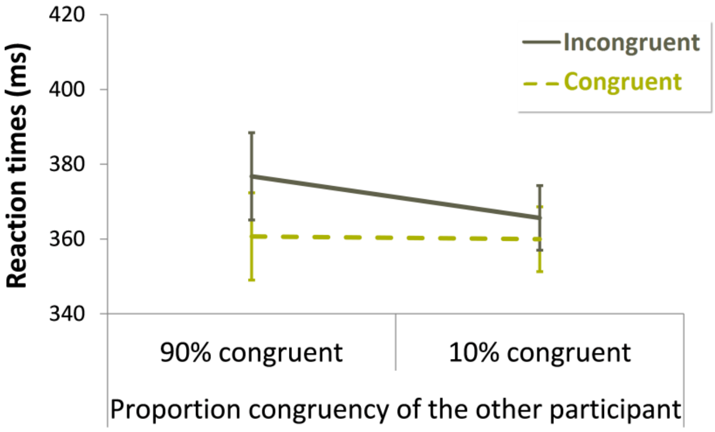

Fig 3. Results of Experiment 2 for the blocks in which participants received an equal proportion of congruent and incongruent trials, dependent on the proportion congruency of the other participant. Error bars reflect 95% within-subjects confidence intervals.

Table 1.

Median RTs (error rates) as a function of congruency proportion and congruency, when the proportion of congruent trials was manipulated in the participant's <u>*own*</u> *stimulus list. Note that for Experiment 2, response errors are trials on which participants see a blank screen but nevertheless respond, so these cannot be classified as congruent/incongruent and are therefore not reported.*

	Congruency proportion	Incongruent	Congruent	Difference
Experiment 1	90% congruent	413 (2.63)	368 (1.13)	44.7 (1.50)
	10% congruent	377 (1.42)	392 (1.64)	-14.9 (-0.21)
Experiment 2	90% congruent	397	362	35.2
	10% congruent	364	375	-11.2

General Discussion

In the current study, we started from the notion that the presence of another person can have a large influence on task performance. We extended this line of inquiry by showing that *what* the other person is doing can be of critical importance. In two experiments, two participants jointly performed a Simon task in which we selectively manipulated task difficulty for participant A only, by presenting this participant with either 90% congruent trials (creating an easy ask) or 10% congruent trials (creating a difficult task). Although this manipulation is irrelevant for the task performance of participant B, we nevertheless observed that participant B exerted more effort to ignore the irrelevant location information when participant A performed a difficult task (i.e., requiring much effort), compared to an easy task (i.e., requiring little effort). Crucially, in Experiment 2 this was found to be the case even when participants could see each other, but not each other's stimuli. This result provides a straightforward demonstration that the exertion of mental effort can be contagious. In the remainder, we elaborate on the theoretical significance and underlying mechanisms of this phenomenon.

Hitherto, the exertion of mental effort has repeatedly been linked to conflicts in information processing (Botvinick et al., 2001; Ridderinkhof, Ullsperger, Crone, & Nieuwenhuis, 2004). For example, in the connectionist model of Botvinick and colleagues (2001), the anterior cingulate cortex (ACC) is ascribed the function of a conflict monitor, which constantly monitors the information processing stream for conflicts. When two conflicting responses are simultaneously triggered, this will lead to a high level of conflict in the ACC. This, in turn, is believed to stimulate the cognitive control system, presumably located in dorsolateral PFC, to increase effort exertion in order to increase performance (Kerns et al., 2004). While this mechanistic explanation provides a comprehensive yet compact account of effort exertion (e.g., Shenhav et al., 2013), at current it does not allow effort exertion to be dependent on the behavior of another person's presence. Because the degree of effort exerted by the person next to you does in no sense *conflict* with the task you are doing, the model would not predict that this would influence your own level of effort exertion. More recent theoretical developments, on the other hand, increasingly aim to broaden the scope and antecedents of effort exertion, highlighting the role of motivation (Botvinick & Braver, 2014) and emotion (Inzlicht, Bartholow, & Hirsh, 2015) in cognitive control. As such, our findings add to these theoretical developments, by putting forth other person's behavior as an important antecedent of cognitive control. Supporting the idea that we monitor the performance of other people, Sebanz and colleagues (2005) indeed found that participants actively represent the task rules of another person with whom they are performing a task. Two participants responded to different dimensions of the same stimulus (e.g., either color or direction), and the results showed that performance was reduced when a stimulus required a response from both participants. Taken together with the current results, we can thus conclude that there is clear evidence that participants both monitor what the other participant should do, and how the other participant is doing.

In recent years, the view has emerged that the exertion of effort is computationally costly, and therefore humans tend to avoid mental effort when possible (Botvinick, 2007). When given the option, participants will avoid environments that demand high levels of effort, and instead prefer a low demanding alternative (Kool, McGuire, Rosen, & Botvinick, 2010; Westbrook, Kester, & Braver, 2013). Interestingly, the current results suggest that this default mode of avoiding mental effort is bound to certain preconditions. In our study, there were no incentives for exerting high or low levels of effort, but nevertheless participants exert more mental effort when the person next to them was doing so. Thus, subtle effects of effort contagion, as observed in the current study, expose at least one of the boundaries within which people tend to avoid high effort.

An undeniable prerequisite for contagious effort exertion is that people are capable of detecting differences in the amount of effort exerted by another person. Note that this was not done by simply observing the openly observable response speed of the other participant (as observed in previous research, see Huguet et al., 1999). In both experiments, when the congruency proportion was manipulated in the participant's *own* stimulus list, congruency effects were markedly different between the condition with 10% vs. 90% congruent trials, whereas overall reaction times did not differ between both (i.e., there was no main effect of proportion of congruent trials). This shows that response speed of the other participant is not the source of the effect, but rather the actual degree of exerted effort. When exerting effort yourself, this is associated with increased heart rate, increased blood pressure, decreased heart-rate variability, and a perceived increase in arousal (Howells, Stein, & Russell, 2010; Peters et al., 1998; Smit, Eling, Hopman, & Coenen, 2005). However, to our knowledge, no study so far has examined how participants can perceive (physiological markers related to) the effort exerted by another person. One likely possibility is that participants infer the degree of effort based on subtle differences in the body posture. Effort exertion is linked to a more tense body posture and the adoption of such a posture also leads to an increased level of effort exertion (Friedman & Elliot, 2008). Expanding the limits, however, also more radical hypotheses should be considered, such as the possibility that effort exertion is influenced by a difference in scent of someone else exerting high or low effort (see e.g., Holland, Hendriks, & Aarts, 2005).

Finally, apart from *how* we detect an increase in effort in another person, the question remains *why* we subsequently match our own degree of effort. After all, participants were always motivated to respond fast and accurate, so there is no incentive to match their degree of effort with that of the person next to them. As such, it could be that this does not reflect a truly deliberate decision, but instead a more automatic tendency to imitate people, as is the case with yawning (Senju et al., 2007), rubbing your face or shaking your foot (Chartrand & Bargh, 1999), and facial expressions (Meltzoff & Moore, 1989). Neurons that code for both the execution and the observation of actions (i.e., mirror neurons) have been proposed to underlie these forms of imitation (Iacoboni et al., 1999). However, it is unclear whether mirror neurons are able to fully account for the contagious nature of more high-level cognition. Therefore, more complex dynamics, beyond low-level motor imitation, might be at play. For example, people are very sensitive to how they are perceived by others and perceiving that the person next to them exerts much effort might motivate them to do the same (i.e., impression management; Leary & Kowalski, 1990). Manipulating the task context, the task requirements and the instructions given, are promising fruitful avenues for further empirical inquiry.

Conclusion

In the current study, we showed for the first time that the exertion of mental effort is contagious. Simply performing a task next to a person who exerts much effort in a task will make you do the same. Our results extend literature on social facilitation, and raise several promising avenues for future investigation.

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