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Social Presence Effects on the Stroop Task: Boundary Conditions and an Alternative Account

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Abstract

Two studies investigated boundary conditions of an effect of social presence on the Stroop task and its interpretation in terms of an attentional view (P. Huguet, M. P. Galvaing, J. M. Monteil, & F. Dumas, 1999). In this view, social presence leads to attentional focusing, enhancing participants' ability to screen out the distracting features of Stroop stimuli. As predicted, Stroop interference was found to be reduced by social presence, but an alternative account in which social presence exerts an effect on task selection received more support.

The phenomenon of social facilitation is one of the oldest studied in social psychology (Aiello & Douthitt, 2001; Guerin, 1993). It refers to the finding that performance in simple tasks is often improved in the presence of others (audience condition) relative to a condition in which people work alone (alone condition).

The present paper examines the effects of social presence on the Stroop task. In the Stroop task, participants identify the color of colored targets as fast and accurately as possible. In incongruent trials, target words denote a color (e.g., red), or are related to a color (e.g., blood), that differs from the one in which the word is shown (e.g., in blue). In neutral trials, the target is a color-neutral word (e.g., table) or a control string (e.g., ++++) that is not a word. Stroop interference is the difference in mean response latencies between incongruent and neutral trials.

Huguet, Galvaing, Monteil, and Dumas (1999, Exp. 1) found much larger Stroop interference in the alone condition than in a condition with a passive, non-evaluative audience, that they termed invisible audience. This is an important finding because it allowed Huguet et al. to discriminate between two major theories of social facilitation, the dominant-response account by Zajonc (1965) and an attentional view (Baron, 1986; see also Cohen, 1978).

According to Zajonc (1965), simple tasks are simple because the dominant response associated with task stimuli is the correct one. In this view, the effect of an audience is to increase arousal which in turn facilitates the dominant response. The result is improved performance in simple tasks.

According to the attentional view, the presence of others is frequently distracting and threatens participants with cognitive overload. This leads to a restriction in attentional focus. In this view, simple tasks are simple because performing at a high level requires attending to only a few central cues. Narrowing the attentional focus is helpful in focusing on these few cues and in screening out irrelevant cues. The result is improved performance in simple tasks.

In many situations, both accounts lead to parallel predictions, but the

ingenious observation by Huguet et al. (1999) was that both differ with respect to what is expected for the Stroop task. When the target is a word, the dominant response is to read it, identifying word meaning, whereas identifying the word color is a less dominant response. Because word meaning is the major cause of interference in the Stroop task, strengthening the dominant response should increase interference. Social presence should thus lead to larger Stroop interference according to the dominant-response account. In contrast, according to the attentional view, attentional focusing is helpful in selecting the relevant stimulus feature (i.e., word color) and in filtering out the irrelevant stimulus feature (i.e., word meaning). Smaller Stroop interference is thereby predicted in distracting audience conditions.

Huguet et al.'s (1999) Experiment 1 supported the prediction derived from the attentional view. In addition, recognition memory for the words used in the incongruent trials was better in the alone condition than in the audience condition. This is to be expected if word meaning was filtered out in the audience condition. To summarize, according to Huguet et al. (1999), social presence caused a reduction of the Stroop effect in the audience condition below the level observed in standard conditions because social presence narrowed attentional focus, thereby enhancing attentional selectivity.

Three issues potentially challenge this explanation: 1) The nature of attentional selection, 2) prior studies on the effects of social presence and distraction on the Stroop task, and 3) the size of the Stroop effects reported by Huguet et al. (1999).

First, attentional focusing operates at several levels, in task selection, object selection, and dimensional selection. For example, Baron (1986) argues that narrowing of attentional focus leads to focusing on a task seen as primary in dual-task situations in which two tasks have to be performed simultaneously (task selection). Within a given task, it leads to focusing on the relevant stimulus and

screening out of irrelevant stimuli (object selection). Within the relevant object, finally, attentional focusing increases the utilization of relevant features and the screening-out of irrelevant and distracting features (dimensional selection). With regard to object selection and dimensional selection, there is an ongoing debate on whether both are negatively related (e.g., Chen, 2003; see also Kahneman & Henik, 1981; Wühr & Waszak, 1981) or independent (e.g., Shalev & Algom, 2000; see also Besner, 2001; Besner, Stolz, & Boutilier, 1997; Chajut & Algom, 2003). According to one point of view, object selection leads to decreased dimensional selection. Thus, to the extent to which an object is attended to, all of its features, relevant and irrelevant features alike, receive increased processing, leading to decreased dimensional selection. For example, Chen (2003) experimentally manipulated attentional focus in the Stroop task using cueing manipulations adopted from the attention literature. In his studies, narrowing attentional focus enhanced rather than decreased Stroop interference (from 24 ms to 45 ms in Experiment 1, and from 64 ms to 88 ms in Experiment 4). This suggests that social presence, via a narrowing of attentional focus, might increase rather than decrease Stroop interference.

Second, prior studies on the effects of social presence on Stroop effects as discussed by Huguet et al. (1999) yielded conflicting results. Note, however, that the studies by Huguet et al. (1999) were methodologically stronger in several aspects than most prior studies. Similarly, there are a number of studies of the effect of distraction by noise on the Stroop task with mixed results (Chajut & Algom, 2003; Glass & Singer, 1972). The mixed results of prior studies do not question the findings by Huguet et al. (1999) in any way, but they raise the desirability of replications of the effect.

Third, the Stroop effects in Huguet et al.'s Experiment 1 were 170 ms and 101 ms in the alone and (invisible) audience conditions, respectively. The 170 ms effect in the alone condition struck us as unusually large. Stroop effects are largest

when the incongruent words denote colors that can occur as responses, they decrease for color words not in the response set, and further decrease for color-related words (McLeod, 1991). Furthermore, Stroop effects are decreased when responses are delivered via keypresses rather than vocally (McLeod, 1991). Huguet et al. (1999) employed keypresses and mostly color-related words or color words not in the response set (see appendix). As a consequence, Stroop effects much below 170 ms might have been expected.

For example, Sharma and McKenna (1998) reported a Stroop effect of 148 ms with manual responses for color words in the response set, but Stroop interference dropped to 51 ms for color words not in the response set and to 35 ms for color-related words (see also Risko, Schmidt, & Besner, 2006). In follow-up studies concerned with social coaction and comparison, Huguet and colleagues (Dumas, Huguet, Monteil, & Ayme, 2005; Huguet, Dumas, & Monteil, 2004; Huguet et al., 1999, Exp. 2) used very similar materials and procedures as Huguet et al. (1999) in their Experiment 1. Across the many Stroop tasks administered in these experiments, the largest interference score that occurred was 94 ms.[1] There were small differences between Huguet et al.'s (1999) Experiment 1 and these subsequent experiments even in the alone conditions that may be responsible for the different results. One such difference suggested to us that the 170 ms effect in the alone condition in Huguet et al.'s (1999) Experiment 1 might have been inflated beyond normal levels.

Specifically, we hypothesized that a dual-task instruction in combination with the particular stimuli used as targets might have caused the unusually large Stroop effect. Participants were instructed that technical, computer-related problems had just emerged on the task they had been invited to perform and that another task would be performed instead. Second, they were informed that the computer on which this new task is run was not yet programmed to record their responses. Finally, they were told that the goal of this session was to give their

general impression about this new task. They went on to the instructions for the Stroop task proper which emphasized as usual speed and accuracy.

The purpose of the impression-formation instruction was to reduce possible evaluation apprehension, a factor that has been argued to cause, or at least enhance, social presence effects (Cottrell, 1972; Geen, 1989). At the same time, the instruction introduces, however, a second task, that we will refer to as the impression task, in addition to the Stroop task itself. This second task is to form an impression of the Stroop task. It is a derived or secondary task in the sense that it cannot be performed without performing the Stroop task.

There is some conflict between the Stroop task and the impression task: Responding as fast and as accurately as possible in the Stroop task conflicts with spending time and other processing resources on forming an impression of the Stroop task. We believe that participants in alone conditions have sufficient capacity to engage in both tasks simultaneously and that they resolve the conflict by spending proportionally more time inspecting and thinking about the color-incongruent words than the neutral targets: The neutral targets (++++−strings) are meaningless and hold little intrinsic interest. In contrast, the targets in incongruent trials, being meaningful words, hold more intrinsic interest. Similarly, the ++++−strings were repetitive whereas each individual word occurred less frequently than each ++++−string. This makes each word more distinct individually than each ++++−string (Higgins, 1996). In forming an impression of the task, it therefore makes sense to spend proportionally more time elaborating on the words and to skip over the repetitive and uninteresting neutral stimuli quickly. This would inflate interference scores and recognition memory.

Why then should interference return to more normal levels in the audience condition? We hypothesize, following Huguet et al. (1999), that social presence is distracting and threatens participants with cognitive overload. As a consequence, we assume that the Stroop task is prioritized (task selection) to maintain

satisfactory performance in that task, whereas participants more or less quit working on the secondary impression task in the audience condition. Thus, participants effectively revert to a single-task condition. As a consequence, interference scores are no longer inflated in the audience condition.[2]

A number of new predictions can be derived from this analysis. Two kinds of conditions, implemented in two experiments, should cause interference scores to drop from the large score observed in the alone condition to more normal levels as elaborated next:

1. Conditions that remove the secondary impression formation task:
    - (*Condition 1a)* via instructions (Experiment 1) or
    - (*Condition 1b)* via social presence (as just explained and implemented in Experiments 1 and 2).
2. Conditions that reduce the difference in distinctiveness and intrinsic interest between the color words and the neutral control stimuli:
    - (*Condition 2a)* via the use of words as controls (Experiment 2) or
    - (*Condition 2b)* via performing the Stroop task a second time (Experiments 1 and 2).

Condition 1a) was implemented via instructions: Half of the participants in Experiment 1 worked with the additional impression task, whereas the Stroop task was the only instructed task for the other participants. Condition 1b) was implemented in both experiments as a condition with a passive non-evaluative audience. According to the above, in both conditions the secondary impression task should be removed, causing Stroop effects to return to normal levels.

In Experiment 2, all participants worked with the additional impression task. The impression task causes inflated interference scores because of the

difference in distinctiveness and interest value between words used in incongruent trials and neutral stimuli. Conditions 2a) and 2b) were designed to decrease this difference in different ways.

Condition 2a) was implemented in Experiment 2 through the use of words as neutral control stimuli. Participants either worked with the original stimuli translated from Huguet et al. (1999), including the boring and repetitive +++++−stimuli, or they saw color-neutral words instead of +++++−stimuli in neutral trials. Being meaningful words, the color-neutral words hold more intrinsic interest than the +++++−controls. Furthermore, each such word appeared less frequently than the +++++−controls. Thus, the neutral words are less repetitive and more interesting than the ++++++−stimuli. When the neutral words are used in neutral trials instead of +++++−stimuli, the difference in distinctiveness and interest value between the words used in incongruent trials and the stimuli used in neutral trials is thereby decreased.

The purpose of Condition 2b) was to decrease the distinctiveness and interest value of the words used in incongruent trials. Condition 2b) was implemented in both experiments by having each participant perform the Stroop task twice. When the Stroop task is performed the second time, each word has already been seen twice in the first set of Stroop trials and its reappearance for a third and fourth time in the second set of trials should no longer induce participants to spend much time inspecting and thinking about it even when they intend to form an impression of the Stroop task.

To summarize, we should be able to replicate the unusually large interference score found in Huguet et al.'s (1999) alone condition, that is, when the Stroop task is performed alone and for the first time, with concurrent impression task, and +++++−type controls, henceforth referred to as the critical condition. In contrast, Stroop interference should revert to more normal levels in all other conditions, that is, 1a) in audience conditions, 1b) when the Stroop task is the only

task, 2a) when neutral stimuli are words instead of ++++−strings, or 2b) when the Stroop task is seen the second time.

These predictions were tested by three contrasts specified for each experiment alike: 1) Interference scores in the critical condition should be larger than the average interference observed in all other conditions. 2) There should be no significant differences between the interference scores in the other conditions. 3) The interference score in the critical condition should also be larger than the average interference score in the other *alone* conditions. The third contrast underlines our analysis that Stroop interference was not reduced below normal levels in the audience conditions, but that interference scores were inflated above normal levels in the critical condition.

It has been argued that in one sense, it is difficult to implement a true alone condition because we frequently carry thoughts about an audience around with us (e.g., Markus, 1978); this *implicit* audience may be particularly salient in an alone condition that is preceded by an audience condition (e.g., Huguet et al., 1999). Relatedly, prolonged practice reduces Stroop effects (e.g., Dulaney & Rogers, 1994). For these reasons, we also present the results of the contrast analyses with the contrasts restricted to the conditions in which the Stroop task is performed for the first time. The restricted contrasts cannot be affected by possible practice effects, nor by possible effects of an implicit audience made salient by a preceding audience condition. Note, however, that there is little empirical work testing the idea of an implicit audience (Guerin, 1993, chap. 10), and that the amount of practice implied by performing the Stroop task a second time may have little effect (Huguet et al., 1999).

Method

Participants

In Experiment 1 and 2, respectively, 62 and 80 persons participated, most

of them University-of-Freiburg students with different majors. For Experiment 2, we accepted only students with majors other than psychology who had never before participated in a psychological study. In both experiments, participants' gender was counterbalanced with the experimental manipulations. Participants received a monetary gratification of 3.50 Euro for their participation.

Stroop Task

The details of the Stroop task closely followed those employed by Huguet et al. (1999). The Stroop stimuli were presented in the middle of a 43 cm VGA color monitor in one of four colors: blue, green, red, or yellow. There were five practice blocks, comprising 24 neutral trials each, using color-neutral words.

There were two experimental blocks with 84 trials each. The first four trials were neutral trials that were warm-up trials and not analyzed further. The remaining trials comprised 40 incongruent trials and 40 neutral trials. For each color, there were five color-incongruent words translated from Huguet et al.'s materials; each such word was shown two times per experimental block. In Experiment 1 and for half of the participants in Experiment 2, the neutral trials of the experimental blocks presented strings of plus signs (e.g., ++++) of different lengths. For the other half of participants in Experiment 2, the neutral trials presented 20 color-neutral words that differed from the neutral words used in practice blocks and that were matched to the 20 color-incongruent words in imageability, that is, in the ease with which a mental image of the denoted object could be formed ($M_{\text{neutral}} = 4.62$ and $M_{\text{incongruent}} = 4.61$ on a six-point rating scale as rated by 88 University-of-Freiburg students who did not participate in the experiments). These words and the incongruent words are shown in the appendix.

Participants were asked to identify the color in which the stimulus was shown. They were to press the keys y, x, n, and m to respond, in order, blue, green, red, and yellow. The Stroop stimulus was removed from the screen upon the response. Incorrect responses were followed by an error feedback in the form of the

word "FEHLER" (ERROR) presented for 500 ms on the screen. Participants' instructions emphasized both speed and accuracy.

Design and Procedure

Participants worked through the practice blocks, followed by two experimental blocks of the Stroop task; for one of the experimental blocks, they worked in the presence of another person (audience condition); for the other one, they worked alone (alone condition). Order of alone and audience condition was orthogonally crossed with an instruction manipulation in Experiment 1, and a manipulation of the neutral stimuli in Experiment 2.

In Experiment 1, half of the participants were exposed to the "impression-formation" instruction (impression condition) already described in the introduction upon entering the laboratory. The other half received only the normal instructions about the upcoming Stroop task (only-Stroop condition).

In Experiment 2, all participants worked under the "impression-formation" instruction, but the kind of stimuli used in neutral trials was manipulated. Half of the participants saw neutral words in neutral trials, the other half saw strings of plus signs (++++-controls).

The audience in audience conditions was a confederate of the experimenter. The confederate was introduced as another participant waiting for another experiment. He or she was present for the duration of one experimental block of the Stroop task. The confederate was seated about 1.60 m behind the participant's back so that the participant blocked this person's view of the screen.[3] The confederate was thus clearly unable to evaluate the participant's performance. Participant, experimenter, and confederate were either all male or all female. Participants were completely alone in alone conditions.

After completion of two experimental blocks of the Stroop task, participants filled in a self-consciousness scale (Merz, 1986), were probed for suspicion, and debriefed.

In summary, each person worked in an alone and an audience condition. In each experiment, there were four groups, defined by the order in which alone and audience condition were administered, and an additional manipulation of the instruction in Experiment 1 and of the neutral stimuli in Experiment 2.

Results

Error rates were 4.54% and 3.42% in Experiments 1 and 2, respectively. The analyses are based on correct response latencies. Short latencies below 300 ms were excluded as well as long latencies that were above the individual's median latency by more than three interquartile ranges (Rothermund, 2003). This led to the exclusion of 1.89% and 2.46% of the response latencies in Experiments 1 and 2, respectively.

Contrast Analyses

In both experiments, there were four groups, and each participant performed alone and in an audience condition, yielding eight conditions. Mean Stroop effects observed in these conditions are shown in Figure 1, mean latencies for incongruent and neutral stimuli in Table 1. It can be seen that the critical condition (leftmost condition in each panel of Figure 1) was associated with by far the largest interference score in both experiments; in Experiments 1 and 2, respectively, 167 ms and 141 ms.

Contrast analyses were conducted using the method described by Winer, Brown, and Michels (1991; chap. 7) for mixed designs. According to the first contrast, the Stroop effect in the critical condition was significantly larger than the average Stroop effect, 70 ms and 60 ms, across the seven other conditions, $F(1, 116) = 8.92$, $p < .01$, and $F(1, 152) = 9.55$, $p < .01$, in Experiments 1 and 2, respectively. At the same time, according to the second planned comparison, there were no significant differences between the remaining seven conditions in either experiment, both Fs< 1. Interference in the critical condition was finally significantly larger than average interference in the other alone conditions, 70 ms

and 52 ms, according to the third contrast: $F(1, 116) = 7.80$, $p < .01$, and $F(1, 152) = 9.96$, $p < .01$, in Experiments 1 and 2, respectively.

The same pattern of results emerged when the contrasts were formulated only for the first experimental block of Stroop trials, that is, for the "first" conditions in Table 1 and Figure 1. The Stroop effect was significantly larger in the critical condition than the average Stroop effect, 89 ms and 70 ms, across the other three "first" conditions, $F(1, 116) = 4.98$, $p = .03$, and $F(1, 152) = 6.41$, $p < .01$, in Experiments 1 and 2, respectively. At the same time, there were no significant differences between these three conditions in either experiment, both Fs< 1. Interference in the critical condition was finally significantly larger than interference in the other alone-first condition, 94 ms and 59 ms, according to the third contrast: $F(1, 116) = 3.00$, one-tailed $p = .04$, and $F(1, 152) = 5.61$, $p = .02$, in Experiments 1 and 2, respectively. Note that the use of a one-tailed test (for the third contrast in Experiment 1) is legitimate given that we formulated directed hypotheses.

Additional Analyses

In both experiments, there were the critical alone condition and a parallel audience condition with additional impression task, ++++−type controls, and Stroop task performed for the first time. These two conditions replicate the alone and (invisible) audience condition of Huguet et al.'s (1999) Experiment 1. To contrast these two conditions, it is legitimate to pool the data across both our experiments. The Stroop interference score was significantly larger in the critical condition, $M = 152$ ms, $SD = 145$ ms, than in the parallel audience condition, $M = 86$ ms, $SD = 120$ ms, $t(69) = 2.12$, $p = .04$, so that Huguet et al.'s (1999) basic effect can be replicated.

Without the critical condition, the average Stroop effects in the remaining alone conditions and in the audience conditions were 70 ms and 71 ms, respectively, in Experiment 1 and 52 ms and 67 ms, respectively, in Experiment 2. There was thus little evidence for a reduction in Stroop effects in audience conditions relative

to alone conditions when the critical condition was left out of the analyses.[4]

An anonymous reviewer argued that due to the implicit-audience problem (see introduction) only the alone-first conditions and the audience-second conditions should be considered. As pointed out by the reviewer, Stroop interference decreases from 94 ms in the alone-first condition to 47 ms in the audience-second condition of Experiment 1 when the impression task is removed (only-Stroop conditions); a decrease that approaches significance in a one-tailed test: $t(15) = 1.63$, $p = .06$. This observation suggests a comparatively small effect of social presence on dimensional selection in the Stroop task itself. In contrast, in Experiment 2, there is no effect of social presence on Stroop interference when neutral words are used: Stroop interference was 59 ms in the alone-first condition and 53 ms in the audience-second condition, $t < 1$. We return to these findings in the discussion.[5]

An analysis of variance was computed to see whether the effects of social presence on the Stroop effect varied across the four groups in each experiment. An interaction of social presence (alone versus audience; within participants) and the group factor is implied by the first contrast, but the interaction test is less focused than the analysis by means of planned comparisons. Nevertheless, in both experiments, the interaction reached significance, $F(3, 58) = 5.71$, $p < .01$, and $F(3, 76) = 3.94$, $p = .01$, in Experiments 1 and 2, respectively.

With vocal responses, but not with manual responses, there is a small "lexical" effect meaning that responses to neutral words are slower than responses to nonword control strings (Sharma & McKenna, 1998). It is possible that the lexical effect contributed to the pattern of findings in Experiment 2. Excluding the group with critical condition, we therefore tested whether Stroop effects were smaller for the conditions with words in neutral trials than with ++++-type controls. An analysis of variance with factors social presence, sequence, and neutral stimuli (++++−type controls vs. neutral words) did not reveal significant effects

or interactions involving the stimuli used in neutral trials, largest $F(1, 57) = 1.36$, smallest $p = .25$.

Discussion

The present studies replicated a reduction in interference scores as a function of social presence, but they cast the effect in a different light. According to the present analysis, it arises due to a particular combination of circumstances including the requirement to form an impression of the Stroop task, a difference in intrinsic interest and distinctiveness between the stimuli used in incongruent trials and in neutral trials, and the absence of distraction in alone conditions. Interference scores are unusually large in the critical condition that combines these circumstances, but Stroop effects return to more normal levels when any of these ingredients are absent. These results suggest that the reduction in interference scores in the audience conditions does not arise because attentional focusing made it easier to screen out the distracting word meaning. Rather, interference scores were inflated in the critical alone condition because the attempt to form an impression of the Stroop task pushed participants to spend proportionally more time inspecting and thinking about the words used in incongruent trials.

What do these results imply for the effects of social presence? The present analysis postulates an effect of social presence on task selection. Participants prioritized the Stroop task and neglected the impression task when distracted by social presence. We argued that this occurred as a consequence of attentional focusing operating at the level of task selection.

The present studies are subject to a number of limitations and criticisms. A difference between the present procedures and those employed by Huguet et al. (1999) is that we provided error feedback in the rare event of a wrong response in the Stroop task, whereas Huguet et al. did not. The error feedback may have induced some amount of evaluation apprehension which by itself might reduce Stroop effects (Chajut & Algom, 2003). Yet, we replicated Huguet et al.'s main

finding and our Stroop effects were generally in the same order of magnitude as those reported by Huguet et al., suggesting that the error feedback did not induce crippling amounts of evaluation apprehension. Note also that Bond and Titus (1983) concluded in their meta-analysis of social-facilitation studies that "social facilitation effects are surprisingly unrelated to the performer's evaluation apprehension" (p. 265).

Similarly, Huguet et al. (1999) employed the impression-formation instruction to minimize possible evaluation apprehension. As a consequence, Stroop effects under normal instructions in which the Stroop task is the only instructed task (Experiment 1) might already be reduced due to increased evaluation apprehension. They would therefore not constitute an appropriate baseline against which to consider the Stroop effect in the critical alone condition inflated. Yet, the same pattern of effects as in Experiment 1 emerged in Experiment 2, in which all participants worked under the impression-formation instruction and evaluation apprehension should therefore have been uniformly low.

The conclusions of the present paper are in part negative: The clearest evidence to date for an effect of a passive, non-evaluative social presence on dimensional selection within the Stroop task is questioned. There were, however, hints of a small additional effect of social presence on dimensional selection in the Stroop task when a selected subset of conditions was analyzed in Experiment 1.

In a more general and positive vein, the modulation of the Stroop effect by factors such as instructions, the nature of control stimuli, and task repetition that is evident in our data underlines Huguet et al.'s analysis (1999) that the Stroop effect does not reflect invariant automatic processing. In particular, Huguet et al. (1999) argued that social presence is so powerful that it alters word reading; a hypothesis that is consistent with the findings from Experiment 2 in which the effects of social presence were eliminated when control stimuli were neutral words instead of nonwords.

The major contention tested by the present studies is that social presence exerts an effect on task selection in dual-task situations. Participants in audience conditions may withdraw attention from tasks seen as secondary or derived; an intriguing possibility that deserves further study.

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Appendix

Incongruent and Neutral Words

Word Color			
Blue	Green	Red	Yellow
— Incongruent —			
Grün [green]	Rot [red]	Gelb [yellow]	Blau [blue]
Kirsche [cherry]	Himmel [sky]	Ozean [ocean]	Blut [blood]
Sonne [sun]	Gold[a] [gold]	Tanne [fir]	Rasen [lawn]
Schwarz [black]	Orange [orange]	Grau [grey]	Weiß [white]
Teer [tar]	Watte [cotton]	Kaffee [coffee]	Maus [mouse]
— Neutral (Experiment 2) —			
Pfeil [arrow]	Brett [board]	Bild [picture]	Schiff [ship]
Kreis [circle]	Mutter [mother]	Markt [market]	Brief [letter]
Altar [altar]	Rathaus [town hall]	Geld [money]	Maler [painter]
Ofen [oven]	Stuhl [seat]	Kirche [church]	Wiege [cradle]
Fahne [flag]	Auto [car]	Quadrat [square]	Kugel [sphere]

[a]Replaces “canary” from Huguet et al. (1999).

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Footnotes

[1]Larger interference scores (162 ms and 142 ms) were reported in Huguet et al. (2004) for an analysis restricted to color words, excluding color-related words.

[2] Participants do not have the alternative to prioritize the impression task and quit working on the Stroop task, because the impression task cannot be performed without performing the Stroop task in the first place.

[3]Huguet et al. (1999) also implemented two audience conditions in which the audience faced the participant so that both could see each other.

[4]Note that Stroop interference in the audience-first condition in Experiment 1 is larger when the impression task is removed ($M = 105$ ms) than when the impression task is present ($M = 69$), which might be seen as running against our interpretation. But the difference is not significant, $t < 1$.

[5] As explained in the introduction, the implicit-audience problem may question data from alone conditions that follow an audience condition (i.e., data from alone-second conditions). But it is difficult to see how the audience-first conditions could thereby be compromised. When the audience-first conditions are also included, any effect of social presence on performing the Stroop task without concurrent impression task is eliminated.

Table 1
Mean Response Latencies (ms)

	Neutral		Incongruent	
Condition	*M*	*SD*	*M*	*SD*
— Experiment 1 —				
Alone first				
Impression	934	211	1102	342
Only Stroop	787	176	881	223
Alone second				
Impression	759	111	812	140
Only Stroop	782	168	845	249
Audience first				
Impression	794	111	863	161
Only Stroop	833	182	938	312
Audience second				
Impression	858	162	920	205
Only Stroop	724	158	771	226
— Experiment 2 —				
Alone first				
++++−controls	831	214	972	338
Neutral words	868	181	927	185
Alone second				
++++−controls	856	223	910	269
Neutral words	763	152	806	187
Audience first				
++++−controls	909	237	1008	332
Neutral words	835	196	885	238
Audience second				
++++−controls	807	215	871	314
Neutral words	735	173	788	238

Figure Caption

Figure 1. Mean Stroop effects in Experiments 1 and 2. In Experiment 1, all participants worked with ++++−type controls; in Experiment 2, all participants worked with additional impression task. The critical condition is the leftmost condition in both panels.