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# The early facilitatory effect of a peripheral spatially noninformative prime stimulus depends on target stimulus features

E.L. Azevedo,
S.A.F. Squella
and L.E. Ribeiro-do-Valle

Departamento de Fisiologia e Biofísica,
Instituto de Ciências Biomédicas, Universidade de São Paulo,
São Paulo, SP, Brasil

## Abstract

We investigated the dependency of the early facilitatory effect of a prime stimulus (S1) on the physical characteristics of the target stimulus (S2). A go/no go reaction time paradigm was used. The S1 was a gray ring and the S2s were a white vertical line, a white horizontal line, a white cross and a white small ring, all inside a white ring with the same dimensions as the S1. S1 onset-S2 onset asynchrony was 100 ms. The stimuli appeared randomly in any one of the quadrants of a monitor screen. The S2 could occur at the same position as the S1 or at a different one. We observed a strong facilitatory effect when the vertical line or the horizontal line was the go stimulus and no effect when the cross was the go stimulus. These results show that the features of the target stimulus can be decisive for the appearance of the facilitatory effect of a peripheral spatially noninformative prime stimulus.

**Correspondence**
L.E. Ribeiro-do-Valle
Departamento de Fisiologia
e Biofísica, ICB, USP
05508-900 São Paulo, SP
Brasil
E-mail: ribeiro@fisio.icb.usp.br

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- Attention
- Forward masking
- Vision
- Reaction time

## Introduction

Several studies have demonstrated that the occurrence of a visual stimulus influences the latency (1-6) and accuracy (4,7-10) of the response to another visual stimulus occurring 50-150 ms later. Latency and accuracy are respectively reduced and increased at the same or at a very close location as the first stimulus and are respectively increased and reduced at distant locations. These facilitatory and inhibitory effects have been ascribed to an automatic mobilization of attention, improving processing of subsequent targets at the location where the prime stimulus occurred and reducing processing of subsequent targets elsewhere. The difference between the latency and accuracy in the distant position condition and the latency and accuracy in the same position condition would correspond to the total attentional effect of the prime stimulus, possibly reflecting the signal to noise ratio in central sensory processing. For this reason, this difference could be considered, in a way, the real facilitatory effect of the prime stimulus (see, for example, 1,2,5,11).

Some years ago Tassinari et al. (11) reported that they could not find any direct evidence of a facilitatory effect by noninformative prime stimuli, despite using stimulatory conditions that should favor its appearance. These authors considered two possible reasons for their negative results. Their prime stimuli may have been too bright and were noninformative. A too bright prime stimulus would lead to a masking of the target stimulus (but see 12). A noninformative prime stimulus would be soon ignored by the participants.

One can additionally think of two other problems with the protocol of Tassinari et al. (11). First, experienced participants were used, a fact that would have increased the likelihood of the prime stimulus being ignored (13). Second, about half of the participants were aware of the aim of the experiment. One cannot rule out the possibility that these individuals might have actively blocked their tendency to orient to the prime stimuli. Warner et al. (3) clearly demonstrated that humans can voluntarily suppress the automatic influence of a peripheral prime stimulus.

In our laboratory we tried to confirm the capacity of a prime visual stimulus to cause a facilitation of visual processing. We did three experiments using very different stimulatory and response conditions (14; Saletti Filho HC and Ribeiro-do-Valle LE, unpublished data). We were not able also to find the expected facilitatory effect convincingly. It should be pointed out that none of our volunteers had ever participated before in any reaction time study and none was aware of our objectives. In the second of these experiments we used a relatively weak and informative prime stimulus, presumably reducing masking and habituation. All that did not help much.

In a more recent series of experiments we investigated the possibility of obtaining the facilitatory effect using somewhat different stimulatory conditions and a go/no go reaction time paradigm. We describe here the results of these experiments. A strong facilitatory effect was observed but it was shown to depend on the characteristics of the target stimulus.

## Experiment 1

A discrimination paradigm should be more appropriate than a detection paradigm to demonstrate attentional phenomena. To correctly identify a target it would be necessary to dedicate more attentional resources to it than to simply detect it. Previous orientation of attention to the locus of the target to be discriminated caused by a prime stimulus would be of great value. A large facilitation of reaction time should appear.

We tried here to obtain the facilitatory effect of a prime stimulus by requiring the participants to distinguish between two targets, responding to one and not to the other.

### Method

*Participants*. Twelve young adults, six males and six females, voluntarily participated in the experiment. All were right-handed and had normal or corrected-to-normal vision. None of them had previous experience with reaction time tasks or were aware of the purpose of the study.

*Apparatus*. The participants were tested in a dimly illuminated (<0.1 cd/m$^2$) and sound-attenuated room. They were sitting, with the head positioned on a chin-and-front rest and the arms positioned on a table. Their eyes were 57 cm away from the screen of a 15-inch video monitor. This screen was black, with luminance of less than 0.01 cd/m$^2$ and had a white fixation point (FP) in the center. Brief visual stimuli were presented on this screen. The participants responded to some of these stimuli by pressing a key with their right index finger. This key worked as an electric switch and was positioned on the right hand side of the table. Stimulus generation and recording of responses were performed with an IBM compatible computer and a program developed with the MEL2 Language (Psychology Software Tools). Reaction time was evaluated with 1-ms accuracy.

*Procedure*. Each volunteer participated in two testing sessions on separate days (not more than 7 days apart). Before each session he/she received a written form explaining what would be seen and what should be done. The same information was repeated orally in the testing room while he/she performed some example trials. The participant was then asked to practice by performing about 20 additional trials that would also show that he/she correctly understood the instructions.

The first session consisted of four blocks of trials. Between one block and the next there was a resting interval of several seconds controlled by the participant himself/herself. Each block consisted of 64 trials.

Each trial began with the appearance of the FP. The participant should orient his/her eyes to this FP. Between 1850 and 2350 ms later a target stimulus appeared. This stimulus could be either a vertical line (0.83 deg long and 0.08 deg wide) inside a ring (1.50 deg in diameter and a 0.04-deg wide margin) or a cross (each arm 0.83 deg long and 0.04 deg wide) inside a ring (1.50 deg in diameter and a 0.04-deg wide margin). Both stimuli were white and had a luminance of 19.6 cd/m$^2$ and a duration of 50 ms. They could occur at any of the four corners of a virtual square centered on the FP, 8.64 deg from this FP (Figure 1). The participant should respond as fast as possible to the vertical line inside the ring (the S2+) while avoiding responding to the cross inside the ring (the S2-). The trial ended with a message lasting 200 ms at the site of fixation. Reaction time in milliseconds appeared when the participant responded between 150 ms and 600 ms after the onset of the S2+. The message "anticipated" or "slow" was displayed when he/she emitted a response before 150 ms and after 600 ms, respectively. Finally, the message "incorrect" was displayed when the participant responded to the S2-. Error trials were repeated.

The second session consisted of eight blocks of 64 trials each. The trials now included an additional stimulus (S1) that appeared 100 ms before the onset of the target stimuli. This S1 was a gray ring (of the same dimensions as those of the target stimuli) with luminance of 5.8 cd/m$^2$. It occurred at the same position as the subsequent target stimulus in 50% of the tests and at the corresponding position on the opposite (horizontally or vertically) quadrant in 50% of the tests. In the first case it lasted 100 ms and in the second case it lasted 150 ms (Figure 1). It was decided to maintain the S1 until the end of the S2 in the condition "different" so as to avoid the additional stimulation that would be caused by its offset at the time of onset of the S2 (this would increase decision noise, which would increase reaction time by itself).

### Data analysis

For the first session, the left-right position of the S2+ was the independent variable. For the second session, in addition to this variable the relative position of S2+ with respect to S1 was considered. Reaction time was the dependent variable in both cases.

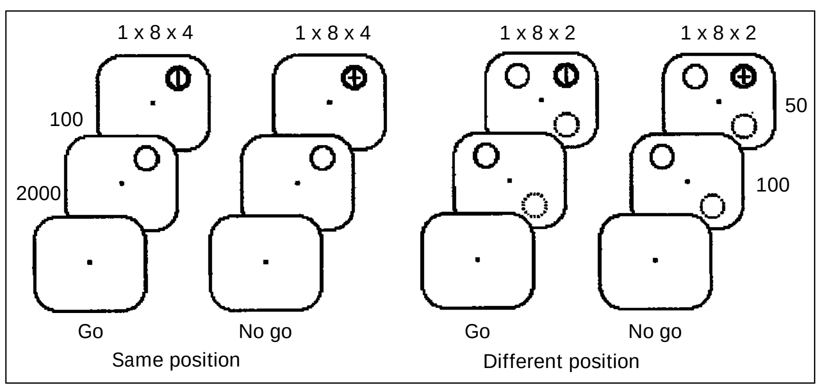


Figure 1. Spatial position and temporal order of appearance of the fixation point, the prime stimulus and the target stimuli in the same condition and the different condition. The mean interval between the appearance of the fixation point and the prime stimulus onset was 2000 ms. Stimulus onset asynchrony was 100 ms. The prime stimulus (continuous and dotted contour rings, respectively, actual and alternative positions) lasted either 100 ms or 150 ms. The target stimuli (vertical line inside a ring and cross inside a ring) lasted 50 ms. Numbers above the upper frames refer to number of sessions, number of blocks per session and number of trials of each condition per block.

Accuracy was also evaluated but not considered for comparison purpose.

The data of the two sessions were treated separately. The mean of the block medians for each condition was calculated for each participant. These data were submitted to a *t*-test for dependent samples or to repeated-measurement ANOVA. When appropriate, the data were analyzed by the Tukey test. A significance level of 0.05 was adopted.

**Results and Discussion**

In the first session the percentage of commission and omission errors was 1.08 and 1.49%, respectively, and in the second session the percentage was 2.40 and 2.05%, respectively.

There was no effect of S2+ left-right position, for the first session.

For the second session there was a main effect of S1-S2+ relative position ($F_{1,11}$ = 117.64, P = 0.000000) and a main effect of S2+ left-right position ($F_{1,11}$ = 18.89, P<0.002).

Reaction time was much shorter when the S1 and the S2+ were presented at the same position than when they were presented at different positions (in the latter condition, reaction time to the S2+ on the same side as the S1 and reaction time to the S2+ on the opposite side as the S1 were very similar) (Figure 2). The difference, of 58 ms, was higher than those reported by Posner and Cohen (1; Experiment 1), Maylor and Hockey (2; Experiment 1) and Lambert and Hockey (5; Experiments 1 and 2), respectively about 23, 22, and 10 and 18 ms, using a simple reaction time task and a noninformative S1. However, it was lower than the differences reported by Warner et al. (3; Experiment 1) and by Henderson (4; Experiment 4) using a choice reaction time task and an informative S1 (130 and 224 ms, respectively). Our relatively strong facilitatory effect might have resulted from the need to recognize the target stimuli. It was not as strong as those observed by Warner et al. (3) and Henderson (4), presumably because our S1 was noninformative and the identification of our target stimuli was not so difficult as theirs (their target stimuli were associated with distractive or masking stimuli).

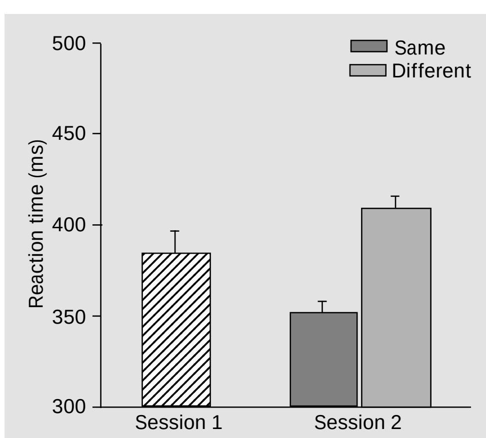


Figure 2. Mean reaction time (± SEM) of 12 participants to the vertical line inside the ring in the first testing session and at the same position as S1 or different ones in the second testing session of Experiment 1.

The participants responded faster when the S2+ was presented in their right visual hemifield than when it was presented in their left visual hemifield, probably due to the fact that they were using their right hand. It is well known that spatial correspondence between a stimulus and its response improves performance (in terms of speed and accuracy), the so-called “Simon effect” (15).

A planned independent ANOVA was used to examine changes in the facilitatory effect along the session. S1-S2+ relative position and block were the factors. There was the main effect of S1-S2+ relative position ($F_{1,11}$ = 94.97, P = 0.0001) already described. No main effect for block or interaction between S1-S2+ relative position and block appeared. The facilitatory effect of the S1 on reaction time to the S2+ did not change across the eight blocks. Considering the spatially noninformative character of the S1 and, consequently, its relative irrelevance for the participants, and its large number of presentations (more than 512), we thought that at least some habituation to it would occur (see Refs. 16 and 17).

Most of the studies in which the facilitatory effect was obtained with a noninformative S1, also, did not report its habituation. Maylor and Hockey (2) and Theeuwes (6) looked for this phenomenon and obtained negative results. Lambert and Hockey (5) did not find any habituation of the facilitatory effect using a barely noticeable S1, possibly having some similarity with our S1. They observed, however, a reduction of reaction time to the S2 at the different position from the first to the second half of the testing session when they used a very salient S1. They argued that their volunteers, conscious of this stimulus, would have developed the strategy of spreading their attention to both positions where the S2 could occur, instead of focusing it on just the primed position, so as to maximize their performance. Their weak S1 would not have been perceived so well, explaining the absence of a similar strategy with it. The disappearance of the facilitatory effect in practiced individuals, reported by Gawryszewski et al. (13), may be related to the use of this strategy by their volunteers. The S1 used by these authors was conspicuous.

Perhaps no habituation is usually observed to a repeated S1 because this stimulus is not in fact completely irrelevant to the participants. Though spatially noninformative, it predicts the subsequent appearance of the S2 (this is true even when catch trials are used to minimize the tendency to anticipate the response to the S2, since the probability of occurrence of these trials is usually not more than 0.2). In addition, it shares some characteristics with the S2 (for example, abrupt onset and general spatial location) that would tend to confer some significance to it (18).

## Experiment 2

In some exploratory tests we used the cross inside the ring as the go stimulus and the vertical line inside the ring as the no go stimulus, keeping all other conditions exactly the same as described in Experiment 1. To our great surprise, the facilitatory effect, so large and consistent across participants when the vertical line inside the ring was the go stimulus, could simply not be seen any more. In this second experiment we investigated systematically the possibility of obtaining a facilitatory effect with our prime stimulus using the cross inside the ring as the go stimulus.

### Methods

*Participants*. Six male and six female volunteers were tested. All were right-handed and had normal or corrected-to-normal vision. None of them had previous experience with reaction time tasks or were aware of the purpose of the study.

*Procedure*. The target stimuli were as in Experiment 1 but with reversed meaning. The cross inside the ring was now the go stimulus (S2+) and the vertical line inside the ring was now the no go stimulus (S2-). All other experimental conditions were exactly the same as in Experiment 1.

### Results and Discussion

In the first session there were 4.14 and 2.28% errors of commission and omission, respectively. In the second session there were 3.11 and 1.23% errors of commission and omission, respectively.

There was no effect of S2+ left-right position for the first session and there was no main effect or interaction for the second session.

There was no difference between reaction time to the S2+ presented at the same position as the S1 and reaction time to the S2+ presented at another position than the S1 (in the latter condition reaction time to the S2+ on the same side as the S1 and reaction time to the S2+ on the opposite side as the S1 were very similar) (Figure 3). This result is very interesting. It demonstrates that certain physical characteristics of the S2+, presumably in relation to those of the S1, can lead to a complete suppression of the facilitatory effect of the S1. Perhaps we were not able to obtain the facilitatory effect of the S1 in our first series of experiments (14; Saletti Filho HC and Ribeiro-do-Valle LE, unpublished results) at least in part because we did not use stimuli with appropriate characteristics. The same could be said with respect to the experiments of Tassinari et al. (11).

As in Experiment 1, we did here a planned independent ANOVA with S1-S2+ relative position and block as factors. No significant main effect or interaction was found.

## Experiment 3

In Experiments 1 and 2 we used different groups of individuals. The evidence of a facilitatory effect of our prime stimulus in the first experiment but not in the second could be related to some peculiarity of one or the other of these two groups. Even in our former series of experiments, in which we could not evidence any convincing facilitatory effect, there were some participants who seemed to be exhibiting this effect and others that clearly were not showing it (14; Saletti Filho HC and Ribeiro-do-Valle LE, unpublished results).

We replicated here the conditions of the two previous experiments using just one group of individuals. We hypothesized that the participants would show the facilitatory effect of our prime stimulus when tested with the vertical line inside the ring as the go stimulus but not when tested with the cross inside the ring as the go stimulus.

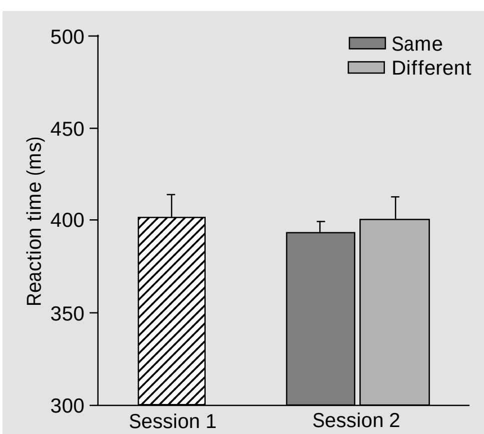


Figure 3. Mean reaction time (± SEM) of 12 participants to the cross inside the ring in the first testing session and at the same and different positions as S1 in the second testing session of Experiment 2.

### Methods

*Participants*. Twelve female volunteers were used. All were right-handed and had normal or corrected-to-normal vision. None of them had previous experience with reaction time tasks or were aware of the purpose of the study.

*Procedure*. The second testing session consisted of four blocks of trials.

The S1 had a diameter of 1.72 deg and a 0.05-deg wide margin. Its luminance was 9.5 cd/m$^2$. There were two S2+ and one S2-. One S2+ was a vertical line (0.96 deg long and 0.05 deg wide) inside a ring (1.72 deg in diameter and a 0.05-deg wide margin) and the other S2+ was a cross (each arm 0.96 deg long and 0.05 deg wide) inside a ring (1.72 deg in diameter and a 0.05-deg wide margin). The S2- was a ring (0.29 deg in diameter and a 0.05-deg wide margin) inside a ring (1.72 deg in diameter and a 0.05-deg wide margin). These target stimuli had a luminance of 25.9 cd/m$^2$. The S1 and the target stimuli were presented 8.13 deg away from the FP.

In the first two blocks of each session one S2+ was used. In the second two blocks the other S2+ was used. The order of presentation of these two target stimuli was balanced between the participants.

For the first session, S2+ type was the independent variable. For the second session, in addition to this variable, the relative position of S2+ with respect to S1 was considered.

All other experimental conditions were identical to those of the two previous experiments.

**Results and Discussion**

In the first session there were 2.80 and 2.68% (1.51% for the vertical line inside the ring and 1.17% for the cross inside the ring) errors of commission and omission, respectively. In the second session there were 3.31 and 2.60% (1.68% for the vertical line inside the ring and 0.92% for the cross inside the ring) errors of commission and omission, respectively.

There was no effect of S2+ type for the first session.

For the second session a main effect of S1-S2+ relative position ($F_{1,11}$ = 9.40, P = 0.01) and an interaction between S2+ type and S1-S2+ relative position ($F_{1,11}$ = 9.88, P<0.01) were observed.

A *post hoc* analysis showed that reaction time was shorter when the vertical line inside the ring was at the same position as the S1 than when it occurred at a different position (P<0.0006). Reaction time for the cross inside the ring at the same position as the S1 was similar to reaction time for this stimulus at a different position than the S1. Reaction time for the cross inside the ring at the same position as the S1 was similar to reaction time for the vertical line inside the ring at the same position as the S1 and shorter than reaction time for the vertical line inside the ring at a different position than the S1 (P<0.02). Reaction time for the cross inside the ring at a different position than the S1 was similar to reaction time for the vertical line inside the ring at a different position than the S1 (Figure 4).

These results fully confirmed the findings of the previous two experiments. The ability of our S1 to induce a facilitatory effect for the vertical line inside a ring but not for the cross inside a ring seems to be real.

## Experiment 4

An important difference between the two S2+ used in the previous experiments was the horizontal line of the cross. This part of the stimulus could by itself interact negatively with the S1, hindering the expression of the facilitatory action of this stimulus on the S2+ at the same position. In this last experiment we investigated whether the facilitatory effect of the S1 would also disappear when just the horizontal line inside the ring was used as the S2+.

**Methods**

*Participants*. Twelve female volunteers were used. All were right-handed and had normal or corrected-to-normal vision. None of them had previous experience with reaction time tasks or were aware of the purpose of the study.

*Procedure*. A horizontal line (0.96 deg long and 0.1 deg wide) inside a ring (1.72 deg in diameter and a 0.05-deg wide margin) was used instead of the vertical line inside the ring as one of the S2+. All other experimental conditions were exactly as in the previous experiment.

**Results and Discussion**

In the first session the percentage of commission and omission errors was 5.08 and 3.08% (1.38% for the horizontal line inside the ring and 1.70% for the cross inside the

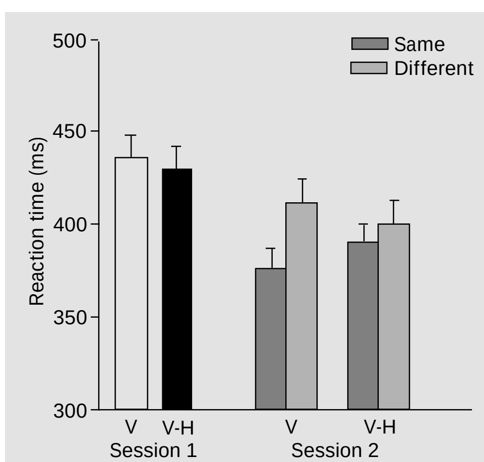


Figure 4. Mean reaction time (± SEM) of 12 participants to the vertical line inside the ring (V) and to the cross inside the ring (V-H) in the first testing session and at the same position as S1 or different ones in the second testing session of Experiment 3.

ring), respectively. In the second session the percentage of commission and omission errors was 3.37 and 2.54% (1.65% for the horizontal line inside the ring and 0.89% for the cross inside the ring), respectively.

There was no effect of the S2+ type for the first session.

For the second session there was an interaction between S2+ type and S1-S2+ relative position ($F_{1,11}$ = 10.89, P = 0.007).

A *post hoc* analysis showed that reaction time was shorter when the horizontal line inside the ring occurred at the same position as the S1 than when it occurred at a different position (P<0.006). Reaction time for the cross inside the ring at the same position as the S1 was similar to reaction time for this stimulus at a different position than the S1. Reaction time for the cross inside the ring at the same position as the S1 was similar to reaction time for the horizontal line inside the ring at the same position as the S1 and shorter than the reaction time for the horizontal line inside the ring at a different position than the S1 (P<0.04). Reaction time for the cross inside the ring at a different position than the S1 was shorter than the reaction time for the horizontal line inside the ring at a different position than the S1 (P<0.03) (Figure 5).

These results demonstrate that our S1 produces a facilitatory effect for a horizontal line inside a ring as it does for a vertical line inside a ring. So, the horizontal line of the cross is not responsible by itself for the absence of the facilitatory effect observed for this stimulus here and in Experiments 2 and 3. The sensory properties of the complex vertical line-horizontal line, i.e., the cross, should be responsible for the finding.

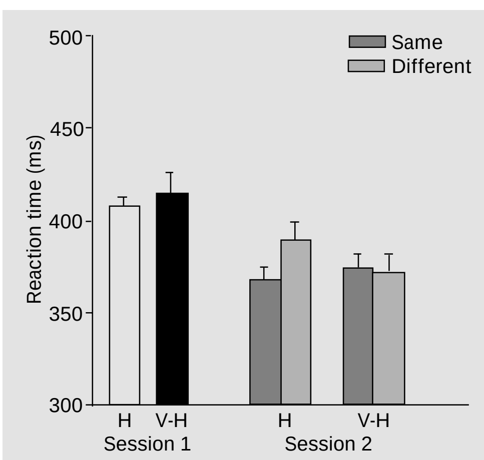


Figure 5. Mean reaction time (± SEM) of 12 participants to the horizontal line inside the ring (H) and to the cross inside the ring (V-H) in the first testing session and at the same position as S1 or different ones in the second testing session of Experiment 4.

## General discussion

The present experiments showed that a spatially noninformative gray ring presented in the peripheral visual field affects reaction time to a white vertical or horizontal line inside a white ring, occurring 100 ms later, so that it is shorter at the same position than at distant positions. No such effect occurs for a white cross inside a white ring as target stimulus. These findings indicate that a spatially noninformative visual stimulus may lead or not to an apparent early facilitation of responding to a visual target at the same position relative to a different position depending on the specific features of this target stimulus or, more probably, the specific relative features of the two stimuli.

The most likely explanation for the facilitatory effect observed for the vertical or horizontal line inside the ring is that it results from a previous orientation of attention induced by the prime stimulus to the location where it would appear and away from other locations. Many studies (for example, 1,7) have emphasized the power of a peripheral prime stimulus to automatically capture attention and maintain it engaged, facilitating and inhibiting, for some time, detection/discrimination of a subsequent target at the same and at a different position, respectively. Some findings in the literature could hardly be interpreted in any other way. That is the case, for example, for Henderson's (4) observation that an underline as prime stimulus strongly facilitated the identification of a target letter (an "X" or an "O") that appeared nearby as compared to one that appeared at a distant position.

The lack of the facilitatory effect in the case of the cross inside the ring could have been due to a masking influence of the prime stimulus competing with its attentional influence.

The masking of a target stimulus by an immediately preceding stimulus has received the specific name of forward masking (19). Schiller and Smith (20) and Eriksen and Collins (21) demonstrated that a ring impairs the perception of a letter presented inside it up to 50 to 100 ms later. Accuracy, not reaction time, was the dependent variable evaluated in these studies. The masking effect increased with a decrease in interstimulus interval. Masking was maximum at zero interstimulus interval or when the two stimuli were presented concurrently (21). More recently, Foley and Boynton (22), using very different stimuli, confirmed that forward masking is larger the smaller the interstimulus interval. In addition, they showed that forward masking is directly related to masker contrast and inversely related to the difference between the masker spatial frequency and the target spatial frequency.

It is possible that in our experiment the spatial frequency of the cross inside the ring had some similarity with the spatial frequency of the gray ring. This would have led the former stimulus to be masked by the latter. The major problem with this idea is that the relevant part of the target stimulus, that is the cross, was apparently not masked by the concurrent white ring, as suggested by the similar reaction times to the vertical or horizontal line inside the ring and the cross inside the ring in the absence of the prime stimulus (first testing session). According to what is known about the relative intensity of the masking phenomenon in corresponding conditions, it should be (21). We are considering that the white ring that was part of our target stimuli had at least the same masking potential as the gray ring that we used as prime stimulus (its higher contrast would predict a larger masking potential!). This might not be true. Visible persistence, one of the putative processes underlying forward masking (23), decreases as the intensity of the stimulus increases (24).

Tassinari and Berlucchi (25) considered other processes, namely, a rapid loss of visual sensitivity upon repeated stimulation, the equalization of information intake from different locations and the attenuation of visual input necessary to prevent imaging blurring during saccadic eye movements, to account for the early inhibition of target detection (and identification) by a prime stimulus. None of them, however, seems able to satisfactorily explain both the putative interference with the perception of the cross inside the ring and no interference or much less interference with the perception of the vertical or horizontal line inside the ring seen here.

Some observations that could be thought to have some resemblance to ours were reported by Cheal and Lyon (10). Their prime stimulus produced a facilitatory effect (evaluated by the accuracy of the responses) that accrued along 50 to 100 ms. The magnitude of this effect depended on the type of target. Line arrangement differences discrimination showed the largest effect; curvature, line endings, line orientation, color and luminance differences discriminations showed progressively smaller effects. This influence of the target type on the magnitude of the facilitatory effect of the prime stimulus was considered to be a consequence of the relative attentional demand of the identification process. It could be imagined that identification of the vertical or horizontal line inside the ring in the present study would present some difficulty and thus could benefit from previous mobilization of attention. On the other hand, identification of the cross inside the ring would be so easy that it would not benefit from previous mobilization of attention at all. We have independent evidence supporting the idea that the cross inside the ring was easier to identify than the vertical or the horizontal line inside the ring, namely, the number of both commission and omission errors tended to be lower when the cross was the positive target stimulus than when the vertical line or the horizontal line was the positive target stimulus.

The short-latency facilitatory effect of a prime stimulus has been reported many times. As a rule, it has been related to mobilization of attention. The absence of this effect in apparently very similar conditions has been rarely described, as if not significant. We think that the exact conditions that led to one or the other result should be carefully investigated. This would allow a better understanding of the process generating this facilitatory effect. Our experimental conditions seem to be particularly suited to examine the problem since they give rise to both a strongly positive result and a completely negative result depending on a "minor" difference between the target stimuli. By examining the specific features of these target stimuli responsible for the opposite outcomes one should be able to determine whether the facilitatory effect is really caused by mobilization of attention and whether its suppression can result from forward masking.

A "Simon effect" was observed here only for the second session of Experiment 1. We expected it to be a much more common phenomenon. The nature of the task performed by the participants (go/no go reaction time) as well as the use of just the right hand to respond might have reduced the magnitude of the effect. It is possible that the contralateral appearance of the prime stimulus immediately before the target stimulus in half of the tests also contributed to reducing its overall magnitude.

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