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# The influence of irrelevant stimulus changes on stimulus and response repetition effects ☆

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**Abstract**

In this study the influence of irrelevant stimulus changes from one trial to another in a serial reaction time task was investigated. Two experiments were performed in which subjects were required to respond to stimulus colour. Four colours were mapped on two response keys, so that colour and response repetition effects could be dissociated. In Experiment 1, the irrelevant stimulus dimension was location and in Experiment 2 it was shape. Both experiments were performed with a short and a long response-stimulus interval (RSI)-condition. In both experiments, the irrelevant dimension influenced the response repetition effect but not the colour repetition effect. In the reaction times, a response alternation effect was observed only when the irrelevant location of the stimulus changed in the long RSI-condition. The error rates showed a response alternation benefit for both irrelevant dimensions, in the short and the long RSI-condition. The benefit for response alternations is explained in terms of a response bias towards change that is triggered by a changing stimulus feature. We assume that the response bias is stronger for location than for colour and that accuracy is more sensitive to this bias than response latencies.



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*Keywords:* Sequential effects; Repetition effects; Response alternation effect

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## 1. Introduction

In serial reaction time (SRT) tasks, a preceding event strongly influences reaction time (RT) and accuracy to the current stimulus. When the interval between the response and the appearance of a new stimulus (response-stimulus interval, RSI) is short (less than 500 ms), subjects respond faster and more accurate if they have to repeat the response of the previous trial. This effect was labelled *automatic facilitation* (Bertelson, 1961, 1963, 1965; Hale, 1967; Hyman, 1953; Soetens, Boer, & Hueting, 1985; Williams, 1966). When the RSI becomes longer (more than 500 ms, for an overview see Soetens, 1990), a response alternation benefit has been observed in tasks where location is the relevant dimension. This effect has been called the *alternation effect* and has been related to *subjective expectancy*, suggesting that subjects tend to expect an alternation over a repetition when provided enough time (Hyman, 1953).

When subjects respond faster to a repeated stimulus with the same response, one can not conclude where in the information processing chain the speed-up took place since the stimulus is repeated (faster identification), the S–R translation is repeated (faster response selection), and the response is repeated (faster response execution). Bertelson (1965) suggested the information reduction procedure where four (or more) stimuli are mapped on two (or more) response keys. In this design there are three possible transitions between two consecutive trials: stimulus repetitions (identical trials), stimulus alternations, but with a response repetition (equivalent trials) and stimulus alternations together with a response alternation (different trials). The stimulus repetition effect is defined as the difference between identical and equivalent trials and the response repetition effect is the difference between equivalent and different trials. Bertelson (1965) mapped two even digits on one response key and two odd digits on another and observed only a very small difference between identical and equivalent trials, but equivalent trials were clearly faster then different trials. In other words, there was no stimulus repetition effect and a large response repetition effect. Bertelson consequently concluded that merely repeating the response was enough to observe the repetition effect.

Rabbitt (1968), on the other hand, observed that identical trials were faster than equivalent and different trials, with the latter two being almost equally fast. Rabbitt attributed the repetition effect to faster S–R translation. This conclusion is supported by more recent studies (e.g., Pashler & Baylis, 1991a,b). The difference between the results of Bertelson (1965) and Rabbitt (1968) can be explained by practice. Bertelson's subjects were well trained and the subjects probably had learned that two categories were involved (odd and even), so that the task actually became a one-to-one mapping. Campbell and Proctor (1993) indeed demonstrated that when stimuli were categorically mapped (2, 4, 8 to the index finger; P, V, K to the middle finger and &, #, = to the ring finger), a response repetition effect could be observed. Campbell and Proctor (1993) interpret their results in terms of salient feature coding, which states that a repetition effect will be observed as long as a salient feature of the stimulus set (e.g., category) is repeated together with the response.

Other studies using longer RSIs came up with slower equivalent trials than different trials. This is called a response alternation effect. Smith (1968) for instance, gave her subjects the instruction to react with one response key to a red 1 or a green 2 and with another response key to a red 2 and a green 1. She demonstrated a stimulus repetition effect together with a response alternation effect. Peeke and Stone (1972) observed a similar disruptive effect for the equivalent trials. One way to explain the response alternation effect is to assume that the change of stimulus triggers a change of response, so that response repetitions to a different stimulus (equivalent trials) are slower than response alternations to a different stimulus (different trials).

Pashler and Baylis (1991a,b, Experiment 4), tested how stimulus specific the repetition effect really is by adding an irrelevant dimension to the task. They therefore mapped three letters onto three response keys and randomly varied the case of the letters. The subjects were instructed to ignore the case of the letters. Nevertheless the case of the letters clearly influenced the RTs. The repetition effect was much stronger when the irrelevant case was repeated as well. These results seem to indicate that the repetition effect is very stimulus specific.

However, such conclusion may be premature since the case of a letter is a special dimension. 'A' and 'a' may very well be categorized as two different elements. Therefore, it is necessary to find out what happens with more basic dimensions such as colour, shape and location. Such a study was conducted by Notebaert, Soetens, and Melis (2001). Their subjects had to respond to the colour of a stimulus that was presented left or right of a fixation cross. In this task too, the repetition effect was restricted to the condition where also the irrelevant location was repeated. When the location changed, the repetition effect disappeared in the short RSI-condition. In the long RSI-condition, a response alternation effect was observed when the location changed. This is in agreement with the results of the many-to-one mapping studies. With a short RSI, there is no repetition effect if the stimulus is not repeated, and this becomes an alternation with a long RSI.

Kleinsorge (1999) however, observed a response alternation effect whenever an irrelevant task feature changed, irrespective of RSI, at least in the error rates. Kleinsorge (1999) and Kleinsorge and Heuer (2000) put forward a theory stating that whenever a feature changes that is included in the task representation, a response bias towards change occurs. This means that any salient change favours response alternations, and consequently that the repetition effect is constrained to situations where *everything* remains the same from trial $n-1$ to trial $n$.

In this study four colours were mapped on two response keys so that stimulus and response sequence effects could be dissociated. A short and a long RSI-condition was used in both experiments. In Experiment 1, the stimuli were presented to the left or right of the fixation cross but the stimulus location was irrelevant for the subjects' task. For the RTs, we only expected the response alternation effect in the long RSI-condition based on the results of Notebaert et al. (2001). But, based on the results of Kleinsorge (1999) a response alternation effect was expected in the accuracy data for short RSIs as well. In Experiment 2, the irrelevant dimension was shape. We assume that in this particular task the irrelevant shape is less salient than an irrelevant location. It was expected that a shape alternation would trigger the response bias towards change to a smaller extent then a location alternation. Consequently, a smaller alternation effect was expected in Experiment 2.

## 2. Experiment 1

A SRT-task was used with two colours mapped on two response keys, a left and a right one. Three possible transitions between two consecutive trials could occur. There were colour + response repetitions (CR), colour alternations with a response repetition (CA), and colour + response alternations (RA). The difference between CA and CR is the colour repetition effect, and the difference between RA and CA is the response repetition effect. Independent of these colour changes, the stimuli appeared to the left or right of the fixation cross. Two RSI-conditions were used to study the effect of the RSI on the repetition effects.

Since both the stimulus and the response location were horizontally defined, there was dimensional overlap between the irrelevant stimulus dimension and the response dimension (Kornblum, Hasbroucq, & Osman, 1990). Hence, this task should reveal a spatial correspondence effect, also known as the Simon effect. That is, on trials where the irrelevant stimulus location and the response location correspond responses are usually faster than on trials where locations do not correspond (Simon, 1990).

### *2.1. Method*

#### *2.1.1. Subjects*

Twenty-eight students (age 18–25) of the University of Brussels (VUB) with normal or corrected to normal vision voluntarily carried out the experiment. Half of them participated in the 50-ms RSI-condition, the other half in the 1000-ms RSI-condition. They had no prior experience with RT-tasks.

#### *2.1.2. Apparatus*

The experiment was run on IBM compatible Pentium computers using MEL Professional software (Schneider, 1996). The room was semi-darkened in order to enhance visibility. The display was at 60-cm distance from the subjects. Before starting a block of trials, subjects were warned by a message on the centre of the screen, and a change of colour of the screen. The stimulus was the character '0' coloured either red, green, blue or yellow. The stimulus was about 8 mm high and 4 mm wide and was presented four spaces (1.5 cm) to the left or right of a white fixation cross on a dark-grey background. On each presentation a stimulus was randomly selected from the set of eight stimuli (two locations × four colours). The left response key was the 'w' and the right response key, the '+/ =', both situated at the bottom row of an 'azerty' keyboard.

#### *2.1.3. Procedure*

Subjects responded by pressing one response key to a green or yellow stimulus and by another to a red or blue stimulus. The mapping was balanced over the subjects. Stimulus exposure was response terminated and the response initiated the RSI, which was fixed at either 50 or 1000 ms. The fixation cross was presented only during the RSI. RT was recorded as the time between stimulus onset and the moment a response key was switched. A session lasted about 25 min. in the 50-ms RSI-condition and 40 min. in the 1000-ms RSI-condition. After two 50-trial practice blocks, subjects ran through 10 blocks of 100 trials. Between blocks, there was a 30s pause during which the subject was informed of the error rate in the preceding block. Subjects were instructed not to make more than 5% errors.

### 2.2. Results

An ANOVA with one between subjects factor (RSI) and three within subjects factors was carried out on the subjects' mean correct RTs and ERs. The first within subject factor, transition type, included three levels: colour repetitions (CR), colour alternations with a response repetition (CA) and response alternations (RA). The second factor was location sequence, i.e. location repetitions vs. location alternations and a last factor was spatial (non-)correspondence between stimulus and response location.

#### 2.2.1. Reaction times

Responses were 33 ms slower in the 50-ms conditions than in the 1000-ms condition, but this difference failed to reach significance, $F(1,26) = 2.22$, $p = 0.15$.

There was an overall location repetition effect, $F(1,26) = 12.26$, $p < 0.01$, and this effect interacted with transition type, $F(2,52) = 47.12$, $p < 0.001$, but not with RSI. For identical and equivalent trials there was a location repetition effect of 25 ms, whereas for different trials there was a location alternation effect of 18 ms. The effect of transition type interacted with RSI, $F(2,52) = 4.07$, $p < 0.05$ and will be discussed below for both RSIs separately.

There was a main effect of spatial correspondence, $F(1,26) = 49.63$, $p < 0.001$. The Simon effect is significantly smaller for location repetitions than for location alternations, $F(1,26) = 6.97$, $p < 0.05$. A smaller Simon effect for location repetitions has been observed previously. It has been argued that the decrease of the Simon effect for location repetitions is due to the absence of an attention shift towards the stimulus location in the short RSI-condition (Notebaert et al., 2001). The Simon effect did not interact with transition type, $F(2,52) = 1.84$, $p = 0.17$ and RSI, $F(1,26) < 1$, ns.

*RSI 50:* The interaction between transition type (3) and location sequence (2) was significant, $F(2,26) = 11.84$, $p < 0.001$. This interaction is plotted in the left panel of Fig. 1. The two parallel lines between CR and CA suggest that the interaction is not caused by an interaction between the colour and the location of the stimulus. Indeed, a post hoc analysis revealed that the interaction between the colour and the location sequence was not significant, $F(1,13) < 1$, ns. The location sequence interacted with the response repetition effect however, $F(1,13) = 31.03$, $p < 0.001$, as is demonstrated by the crossing lines between CA and RA in the left panel of Fig. 1. For location repetitions there was a response repetition effect of 57 ms, $F(1,13) = 20.74$, $p < 0.001$, while for location alternations the response repetition effect was only 17 ms and marginally significant, $F(1,13) = 3.79$, $p = 0.07$.

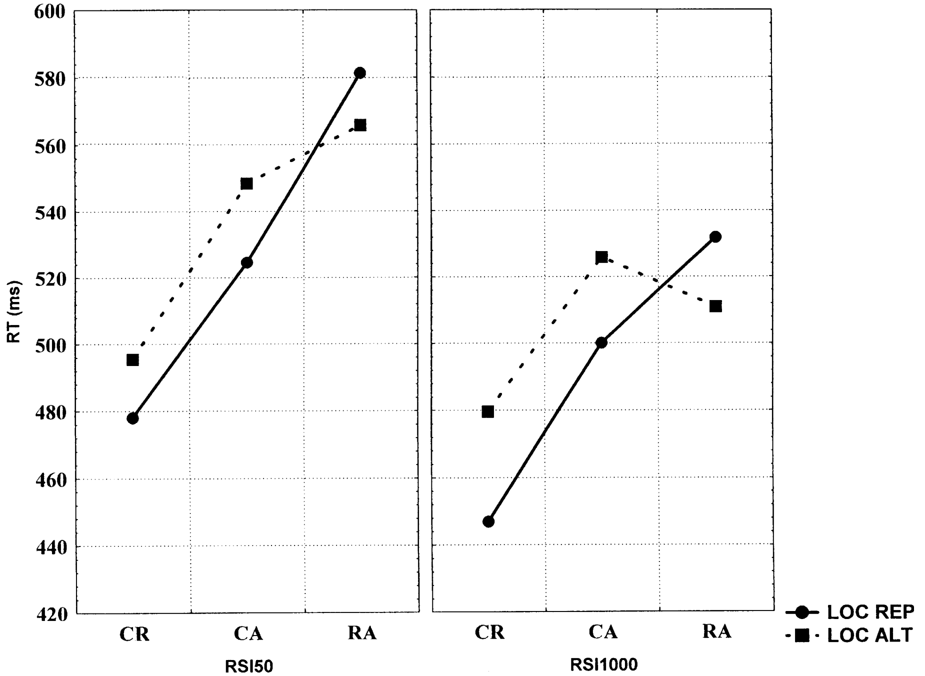


Fig. 1. Mean reaction times for colour repetitions (CR), colour alternations with a response repetition (CA) and response alternations (RA). Dashed lines represent the location alterations, solid lines the location repetitions. Left panel refers to the 50-ms RSI-condition, right panel to the 1000-ms RSI-condition.

*RSI 1000:* Transition type interacted with the location sequence, $F(2,26) = 57.64$, $p < 0.001$. The right panel of Fig. 1 looks somewhat different than the left, but the interaction is similar. The two parallel lines in the right of Fig. 1 correctly suggest that there was no interaction between the colour and the location sequence, $F(1,13) = 2.98$, $p = 0.11$. The location sequence interacted with the response sequence however, $F(1,13) = 63.20$, $p < 0.001$. For location repetitions there was a response repetition effect of 32 ms, $F(1,13) = 29.00$, $p < 0.001$, while for location alternations there was a response alternation effect of 15 ms, $F(1,13) = 4.39$, $p = 0.06$.

### 2.2.2. Error rates

An ANOVA with RSI as between subjects factor and three within subjects factors, transition type (3), location sequence (2) and correspondence (2), was conducted on the error rates. There was no effect of RSI, $F(1,26) < 1$, ns.

The main effect of transition type was significant, $F(2,52) = 27.22$, $p < 0.001$. While colour repetitions produced 1% errors, colour alternations and response alternations showed 5% and 2% errors, respectively. This pattern resulted in a colour repetition effect, $F(1,26) = 41.71$, $p < 0.001$ and a response alternation effect, $F(1,26) = 16.04$, $p < 0.001$. Transition type did not interact with RSI, $F(2,52) = 2.154$, $p = 0.13$.

The effect of location sequence interacted with transition type, $F(2,52) = 35.42$, $p < 0.001$. This interaction differed marginally significant between RSI-conditions, $F(2,52) = 3.14$, $p = 0.05$, and will be discussed below for both RSIs separately.

The spatial correspondence effect was significant, $F(1,26) = 36.17$, $p < 0.001$, and interacted with location sequence, $F(1,26) = 10.51$, $p < 0.01$. The correspondence effect also interacted with transition type, $F(2,52) = 5.57$, $p < 0.01$. For CR and RA, there was a 1% difference between corresponding and non-corresponding trials, while for CA, the difference was 2% errors. These effects were not influenced by RSI.

*RSI 50:* The interaction between transition type and the location sequence was significant, $F(2,26) = 13.20$, $p < 0.001$ and is plotted in Fig. 2. In contrast to the RTs, the colour repetition effect interacted with the location sequence, $F(1,13) = 7.91$, $p < 0.05$. As one can see in the left panel of Fig. 2, the colour repetition effect was stronger for location alternations. This is due to the large amount of errors made in the CA-condition when location changed (5%) as compared to the CA-condition when the location was repeated (2%).

The interaction between the location sequence and the response repetition effect was significant again, $F(1,13) = 16.55$, $p < 0.01$. In the left panel of Fig. 2, we

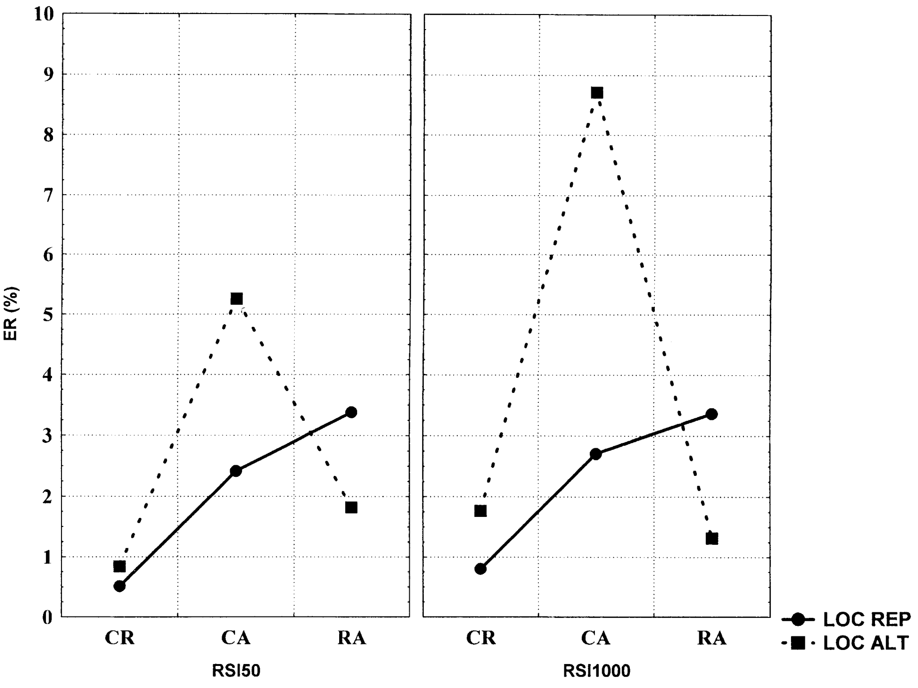


Fig. 2. Mean error rates for colour repetitions (CR), colour alternations with a response repetition (CA) and response alternations (RA). Dashed lines represent the location alterations, solid lines the location repetitions. Left panel refers to the 50-ms RSI-condition, right panel to the 1000-ms RSI-condition.

observe a response repetition effect for location repetitions $F(1,13) = 1.04$, $p = 0.33$, and a response alternation effect for location alternations, $F(1,13) = 16.47$, $p < 0.01$. This interaction is similar to the one observed in the RTs in the 1000-ms RSI-condition. This suggests that the response alternation effect is not restricted to long RSIs.

*RSI 1000:* The interaction between the location sequence and transition type was significant, $F(2,26) = 8.06$, $p < 0.01$. The interaction between location sequence and colour sequence was significant, $F(1,13) = 17.23$, $p < 0.01$. This is due to the large amount of errors made in the CA-condition when location changed (9%) as compared to the location repetitions in the same condition (3%).

The interaction between the location sequence and the response repetition was also significant, $F(1,13) = 24.51$, $p < 0.001$. For location repetitions there was no difference between response repetitions and alternations, $F(1,13) < 1$, ns, whereas for location alternations there was a significant response alternation effect, $F(1,13) = 23.26$, $p < 0.001$.

The pattern that emerged from Experiment 1 was different for reaction times and error rates. Response latencies showed the response alternation effect for long, but not for short RSIs. In contrast, error rates showed the response alternation effect for both RSIs. In addition, error rates showed an interaction between colour and location sequences for both RSIs, while this interaction was absent in the reaction times. This suggests that error rates are more sensitive than reaction times to sequential effects. Interpretations will follow after it is examined whether a similar pattern of findings occurs when the irrelevant dimension is replaced by a non-spatial dimension.

## 3. Experiment 2

The irrelevant spatial dimension was replaced by an irrelevant shape. Subjects had to press the left or right response key on the basis of the stimulus colour, as in Experiment 1. The stimulus was an O or an X and was always presented in the centre of the screen. If the influence of the irrelevant dimension would be restricted to location, then the irrelevant shape should not alter the response repetition effect.

### *3.1. Method*

#### *3.1.1. Subjects*

Twenty-eight students of the University of Brussels voluntarily participated. Half of them were assigned to the 50-ms RSI-condition, and the other half to the 1000-ms RSI-condition.

#### *3.1.2. Procedure*

The same procedure as in Experiment 1 was followed, except that now the stimuli were presented in the centre of the display. The stimuli varied randomly in shape (O or X) and colour (red, green, blue and yellow).

### 3.2. Results

An ANOVA with one between subjects factor (RSI) and two within subjects factors, transition type (3) and shape sequence (2) was conducted on mean correct RTs and ERs. Since the stimuli were always presented at the central position there was no dimensional overlap between stimuli and responses, and consequently, the factor correspondence of Experiment 1 was absent.

#### 3.2.1. Reaction times

There was a main effect of RSI, $F(1,26) = 5.64$, $p < 0.05$. The 50-ms RSI-condition produced longer RTs (517 ms) than the 1000-ms RSI-condition (469 ms).

There was also a main effect of transition type, $F(2,52) = 66.26$, $p < 0.001$. RT to colour repetitions was 451 ms, to colour alternations 504 ms and to response alternations 524 ms. This did not differ between RSI-conditions, $F(2,52) < 1$, ns.

The effect of the shape sequence interacted with RSI, $F(2,52) = 16.11$, $p < 0.001$. An overall shape repetition effect was observed with a long RSI (7 ms), $F(1,26) = 6.21$, $p < 0.05$, but not with a short RSI, $F(1,26) < 1$, ns.

The crucial interaction between transition type and shape sequence, $F(2,52) = 16.11$, $p < 0.001$, was not different for short and long RSIs, as can be observed in Fig. 3, $F(2,52) = 1.89$, $p = 0.16$. For shape repetitions there was a colour repetition effect of 49 ms and a response repetition effect of 31 ms. For shape alternations there was a colour repetition effect of 59 ms and a response repetition effect of 8 ms. Since the pattern was not different between RSIs, there is no need to present the analysis seperately for both RSIs.

#### 3.2.2. Error rates

There was a main effect of RSI, $F(1,26) = 4.64$, $p < 0.05$. More errors were made in the long RSI-condition (3%) than in the short RSI-condition (2%). There was no shape repetition effect, $F(1,26) < 1$, ns, and it did not interact with RSI, $F(1,26) < 1$, ns. The effect of transition type was significant, $F(2,52) = 21.68$, $p < 0.001$, and interacted marginally with RSI, $F(2,52) = 5.28$, $p = 0.07$. Because of this marginally significant interaction, follow-up analyses were done for each RSI separately.

*RSI 50:* The main effect of transition type was significant, $F(2,26) = 7.65$, $p < 0.01$, and did not interact with shape sequence, $F(1,13) < 1$, ns. There was a significant colour repetition effect, $F(1,13) = 12.95$, $p < 0.01$. The response repetition effect was not significant, $F(1,13) < 1$, ns.

Even though the interaction between shape sequence and transition type is not significant, the response repetition effect is influenced by the irrelevant shape, as can be observed in the left panel of Fig. 4. For shape repetitions there is a small response repetition benefit with 1% less errors in the CA-condition than in the RA-condition, $F(1,13) = 1.83$, $p = 0.2$. For shape alternations there is a small response alternation effect with 1% more errors in the CA-condition than in the RA-condition, $F(1,13) = 1.62$, $p = 0.23$.

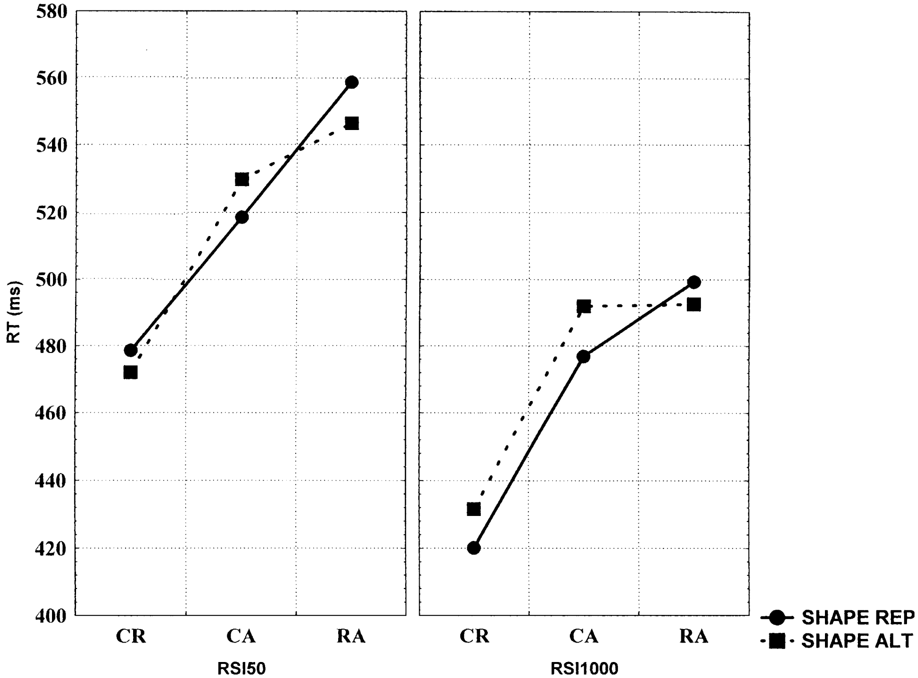


Fig. 3. Mean reaction times for colour repetitions (CR), colour alternations with a response repetition (CA) and response alternations (RA). Dashed lines represent the shape alterations, solid lines the shape repetitions. Left panel refers to the 50-ms RSI-condition, right panel to the 1000-ms RSI-condition.

*RSI 1000:* The effect of transition type was significant, $F(2,26) = 14.21, p < 0.001$. There was a significant colour repetition effect, $F(1,26) = 30.12$, $p < 0.001$. In the CR-condition, 1% errors were made and in the CA-condition 5%. In the RA-condition 4% errors were made, resulting in a marginally significant response alternation effect, $F(1,26) = 3.59, p = 0.07$.

The interaction between the shape sequence and the colour repetition effect was not significant, $F(1,26) < 1$, ns. The interaction between the response repetition effect and the shape sequence failed to reach an acceptable level of significance, $F(1.26) = 2.83$, $p = 0.10$. Follow up analyses showed that for shape repetitions, there was no difference between the CA and the CR-condition, $F(1,13) < 1$, while for shape alternations there was a response alternation effect of 2%, $F(1,13) = 4.70, p < 0.05$.

The pattern of results was similar to the one obtained in Experiment 1 but some striking differences were observed as well. In Experiment 2, with a non-spatial irrelevant dimension, the response alternation effect was not observed in the RTs. In general it seems that the pattern in Experiment 2 is less pronounced than in Experiment 1. These findings suggest that the same processes are active with a spatial and a non-spatial dimension, but that the effects are stronger with an irrelevant location.

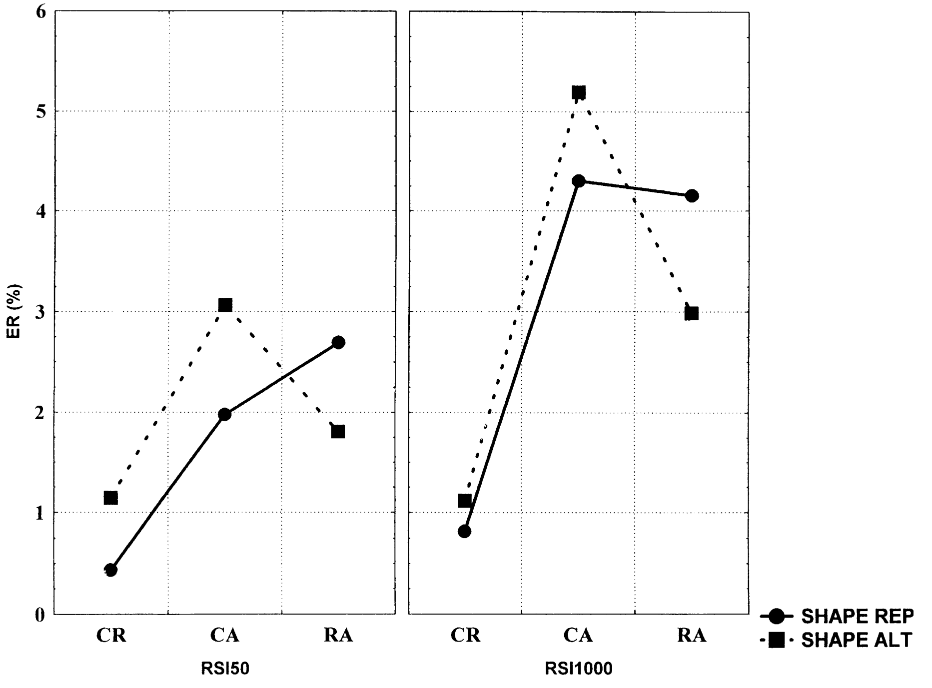


Fig. 4. Mean error rates for colour repetitions (CR), colour alternations with a response repetition (CA) and response alternations (RA). Dashed lines represent the location alterations, solid lines the location repetitions. Left panel refers to the 50-ms RSI-condition, right panel to the 1000-ms RSI-condition.

## 4. Discussion

In Experiment 1, it was demonstrated that reaction times and error rates are differentially affected by irrelevant stimulus changes. More precisely, RTs showed a different pattern for short and long RSIs, while ERs did not. The RTs showed a response alternation effect only in the long RSI-condition. This effect was observed in both RSI-conditions in the ERs. In Experiment 2 with a non-spatial dimension this response alternation effect was not observed in the RTs, only in the ERs.

In line with Kleinsorge (1999) we would argue that the RT-alternation effect and the ER-alternation effect, are both caused by a bias towards change triggered by a changing stimulus feature. Kleinsorge claimed that a response alternation effect (faster different than equivalent trials) should be observed whenever a task feature changes. According to this author, it is caused by a motor bias towards change, which is triggered by the changing feature. His data demonstrated that this effect is easier to observe in the ERs than in the RTs. This pattern was replicated in the current study. When subjects had to repeat the response while the irrelevant stimulus feature changed, they have to ignore the bias towards change. The data show that this was not easily done. It resulted in a lot of errors. When they successfully ignored the response bias and gave the correct response, RTs were slow. However, the slowing of response speed is only observed in the long RSI-condition of Experiment 1. The data suggest that the effect in the RTs depends on the strength of the bias. Only when the bias is very strong, the effect is observed in the RTs next to the effect in the ERs.

The ER alternation effect is smaller in the short RSI-condition because other short-lived (repetition) effects may favour the previous response, and consequently attenuate the effect of the response bias towards change. In the RT-pattern of both Experiments, it can be seen that in the short RSI-condition, the CA-condition was faster than the RA-condition. It shows that in short RSI-conditions there was a small benefit for repetitions of the same response, even though both stimulus features changed. The repetition effect, probably caused by residual response activation, might have masked the alternation effect in the short RSI-conditions. The ER alternation effect is smaller in Experiment 2 for shape than in Experiment 1 for location. The difference between Experiment 1 and 2 suggests that a changing location triggers the bias towards change stronger than a change in shape.

One could argue that the RT-alternation effect is caused by a different underlying mechanism as the ER-alternation effect. The RT-alternation effect could be considered as subjective expectancy, since it is only observed in the long RSI-condition of Experiment 1. Besides the fact that explaining the data with one mechanism instead of two is more parsimonious, there is an additional problem with this explanation. If subjective expectancy is a mechanism that favours new locations over old ones this cannot explain why response alternations are faster than response repetitions since the response is unrelated to the irrelevant location. Explaining the response alternation effect in terms of expectancy, one would have to assume that subjects expect a *response* alternation when they have some time in between two trials. But why would this occur only when an irrelevant location is added to the task and not for shape?

Explaining the RT-alternation effect in terms of a response bias towards change has implications for other observed alternation effects (e.g., Soetens et al., 1985, Soetens, 1998). When the RSI is long and subjects have to react to the location of a stimulus it is often observed that response alternations are faster than response repetitions. This effect could be explained by involving the concept of motor bias. That is, the location alternation is assumed to bias the motor system towards change. This would explain why it is so hard to observe a response alternation effect in a simple two choice RT-task with a non-spatial dimension, even with very long RSIs (see Soetens, 1990).

In order to explain the response alternation pattern in RTs and ERs with one mechanism, it was assumed that repetition effects may partially mask the effect of the response bias. A closer look at the repetition effects reveals a colour repetition effect. This effect is usually explained by assuming a short-cut between the stimulus and the response, so that if both are repeated, faster response selection occurs (Welford, 1976). It is surprising though that an irrelevant stimulus dimension does not influence the colour repetition effect. In a previous study, with a one-to-one mapping, it was observed that an irrelevant location influenced the repetition effect of the relevant colour (Notebaert et al., 2001). Therefore, it was anticipated that this interaction would be located at the level of the stimulus repetition effect and that the colour repetition effect would have been restricted to location repetitions. However, in Experiment 1, a colour repetition effect was also observed for location alternations. This result was replicated with an irrelevant shape in Experiment 2. In general, we can say that as long as one stimulus feature is repeated, response repetitions are faster than response alternations. This is congruent with a salient feature coding account that states that as long as one salient feature is remapped on the same response from trial $n-1$ to trial $n$, shorter RTs will be observed (Campbell & Proctor, 1993). This suggests an association between the irrelevant feature and the response, just as there is an association between the relevant feature and the response.

In sum, the present study showed that when stimulus features change in a SRT task, subjects are more accurate when the required response changes as well. This effect is most likely due to a mechanism that triggers a response change whenever a stimulus feature changes. The present findings suggest that location triggers the bias stronger than shape. Finally, it was demonstrated that error rates are more sensitive to this bias than reaction times.

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