

## REVIEWER A

Summary: In a single experiment with a non-spatial two-choice forced reaction-time task, the authors analyze whether participants show an effect analogous to inhibition of return (i.e., inhibition of repetition). They also assess whether this effect changes with the inclusion of an intervening event, and whether it can be associated to participants' expectancies of either a repetition or an alternation. Results show that expectancies are not changed by including intervening events requiring then to perform the two alternative responses simultaneously, but that the inhibition phenomenon is inverted: without an intervening event, participants respond faster to repetitions. After an intervening event, in contrast, responses to repetitions are slower.

Appraisal: The manuscript reports in a very concise and clear way on an ingeniously designed experiment that yields theoretically compelling data. As such, I'm happy to recommend acceptance of the manuscript for publication in PSICOLOGICA mainly "as it is". I have a series of rather minor comments, and maybe a larger set of questions which I would like to ask, but more like questions coming from an interested reader than as issues which necessarily require to be revised. I don't believe that revising these issues is necessary for the paper to be acceptable, but I just want the authors to consider them a possible ways to increase the breadth of the paper.

General questions (not requirements):

**-intervening events vs. response demands:** I would like the authors to consider expanding the discussion about the roles of intervening events vs. responding: is the functional difference obtained between conditions caused by the inclusion of a stimulus that one should attend to, by the need to produce any response, or by the need to precisely execute both candidate responses, thus equating any motor residual of the previous action? To me, this is a rich source of empirical questions that could be more specifically highlighted in the discussion section.

**-does responding obey explicitly reported expectancies?** The comparison between expectancies of repetition/alternation and responses to repetitions/alternation is made over different trials: The authors did never report on what happens after an expectancy trial, but I think that it could be informative to analyze what happens after these explicit reports: do participants tend to respond faster to repetitions when they report to be expecting such a repetition? In fact, there may be a bit of confusion here because participants respond to the expectancy question by pressing on the key corresponding to the expected color. Thus for instance, after a blue trial, if participants expect a repetition they have to press the blue key again to report on this expectancy. Later on, if the following trial is really a repetition, this could produce faster RT because it is consistent with their expectancies, but also because the trial requires the same response which was given to the immediately previous (expectancy) trial... In future experiments, perhaps it could be advisable to make participants report on their expectancies using verbal responses, to avoid this motor priming interpretation.

**-What happens after series of trials of the same type?** In the discussion, the authors mention the dissociation reported in Jiménez & Méndez (2012). Because this dissociation was obtained by assessing not only whether participants expected one of

two types of trials, but rather what they expected after a series of trials of the same type, it could be informative to look at whether a similar pattern arises in this experiment.

Minor points:

-Inhibition of return without return: I understand that the authors want to keep the paper in the context of the rich IOR literature. However, I wonder whether this IOR label must be in the title, given that the experiment is not about IOR. Maybe another label, such as inhibition of repetition, or something like that, could be coined to refer to this wider phenomenon.

-p.12: “repetition was manipulated”: I am assuming that repetition was not manipulated in any specific way, but it just arose randomly. Am I right? And the same goes for expectancies: I guess that there was no control whatsoever on where an expectancy trial was located, beyond the general principle of spreading them through 20% of the trials? This should be made explicit.

-p.14: analyses of the error rates: The authors report on the main effect of intervening event. They don't report on the interaction between this factor and that of repetition (which was significant for the measure of RT). I assume that this was not significant, but I guess that it could be better to be explicit here.

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## **REVIEWER B**

Is Inhibition of Return (IOR) modulated by explicit expectancies? In 2007 Spalek argued that this is the case. The authors of the current work criticize Spalek's work and conclusions, and conduct a study that investigates this issue. Specifically, they presented participants with two consecutive, centrally presented, rectangles. The first rectangle (T1) was always colored and the second one (T2) was either colored or empty (in 20% of the trials). Participants were asked to indicate the color of the rectangle (yellow or blue) or to indicate what color they expected T2 to be when it was an empty rectangle. An additional manipulation was an intervening event that could appear between T1 and T2. Intervening and no-intervening events were blocked. The intervening event was supposed to mimic the back-to-the-center cue in the spatial version of IOR. Responding was faster to non-repeated (T2 same color as T1) than repeated colors when an intervening event was present and the reverse was true when no intervening event was present. Crucially, expectancies were not modulated by the appearance of an intervening event; participants expected alternate colors more often than repeat colors irrespective of the appearance of the intervening event. Accordingly, the authors suggest that explicit expectancies do not modulate IOR or IOR-like effects.

This is an interesting work and for the most part well written. I have some comments that the authors might want to consider.

### Major comments

1. I totally agree with the authors' critique on Spalek's 2007 Psych Science article and their conclusion that Spalek's suggestion regarding effects of expectancies on IOR do not have direct support in the current study and actually in Spalek's own study.

However, I am not sure that the current study is necessarily analytical regarding spatial IOR in general. There are a number of differences between the current (and similar) designs of non-spatial attention tasks that limit the generalizability of such designs. For example, the intervening event is not really similar to the back-to-center cue. In the spatial cueing task the manipulation is on the cue whereas here there is no cue but rather an intervening event. The idea of the spatial momentum fits the spatial arrangement of cues and targets in the spatial cueing task whereas here it is not clear what the momentum is or what the momentum's trajectory is. In addition, IOR appears not only when central cues follow peripheral cues but also when no central cue exists. Interestingly, the appearance of IOR is more reliable with central than no-central cue conditions (see Berger, A. (2006). On the reliability of cognitive measurement - the case of visual orienting. *Experimental Psychology*, 53, 213-221). And last, in the common back-to-the-center design, there is no need to respond to the central cue, whereas here participants do respond to the intervening red dot.

The results are interesting but it is not clear to me how general they are. I am sure the authors are aware of these differences. However, in their writing (Introduction and the Discussion sections) it sometimes seems that they gloss over certain details/differences and suggest that they are not really very important. Moreover, as I wrote above, I believe the authors' conclusions regarding the Spalek work are valid, but the designs of the two studies (current and Spalek's) are so different that it is easy to dismiss the current work as not investigating the same issue. Why not use Spalek's spatial design or a similar spatial procedure to examine the same question?

2. The authors employed two different response stimulus intervals (RSIs) but did not introduce RSI as an independent variable in the analyses. RSI may be used to examine expectancy.

In the IOR/attention literature there is a main effect of SOA – RT is reduced with increase in SOA. This was explained by the association between target appearance and SOA; the chances of target appearance increase with increase in SOA. The question was whether such expectancy modulates IOR. There are several papers that employed different methodologies to investigate this issue (Gabay & Henik, 2008, 2010; Tipper & Kingstone, 2005). It seems that in detection tasks IOR is not modulated by temporal predictability. It might be of interest to find out if, similar to SOA, RSI has an effect on the current results and in particular on the difference between RT to repetition and alternation conditions.

### Minor comments:

3. There are no page numbers.

4. On the second page of the Introduction, 8th line from the top, the authors suggest that there are several examples of non-spatial IOR-like patterns of results, and cite several articles. It would be more informative if the authors mention what the non-spatial dimensions that were studied in those works are.

Gabay, S., & Henik, A. (2008). The effects of expectancy on inhibition of return. *Cognition*, *106*, 1478-1486.

Gabay, S., & Henik, A. (2010). Temporal expectancy modulates inhibition of return in a discrimination task. *Psychonomic Bulletin & Review*, *17*, 47-51.

Tipper, C., & Kingstone, A. (2005). Is inhibition of return a reflexive effect? *Cognition*, *97*, B55–B62.

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## REVIEWER C

### Summary

A single experiment is presented that examines the role of expectancy in producing the IOR effect. The experiment consisted of two blocks of trials. In one block, the No-Intervening-Event condition, the participant was asked to identify the colour of a patch (blue or yellow) and then after a blank interval identify the colour of a second patch (again either blue or yellow). In the other block, everything was the same, except that during the blank interval between the two colour patches, a red disk was presented that required the participant to press the two response keys in unison (Intervening-Event condition). On one-fifth of the trials the second colour patch was presented in white, and when this occurred, the participant was instructed to indicate what colour they had expected the colour patch to be (blue or yellow). As expected, the reaction time results replicated earlier findings in that participants were slower on colour-repetition when an intervening event occurred between the two colour patches (IOR), while faster responses were observed for colour repetitions when no-intervening event occurred between the patches (facilitation). The expectation results, however, did not differ across the two conditions, in that with or without an intervening event participants expected a change in patch colour (i.e., an IOR pattern). The conclusion is reached that subjective expectancies are unlikely to be the cause of IOR effects generally.

### Evaluation

Although I think that the idea is sound and is potentially publishable, there are several issues that I think need to first be addressed.

1. IOR is traditionally considered to be concerned with biases in the allocation of attention to different spatial locations; however, this experiment uses a non-spatial task. Although there may be one or more processes that are in common between the spatial and non-spatial variants, it is likely that at least some of the processes governing the spatial allocation of attention will not be present in the non-spatial task, and it is possible that these unique processes might be important to the spatial IOR effect.

2. The comparison of the two forms of the No-Intervening-Event condition is like comparing apples to oranges. Although the claim is made that both the RT and the expectation task should have produced facilitation, the expectation variant was actually quite different from the RT variant, and one could argue that it actually had an intervening task(s) imbedded in it which could explain why an IOR expectation was found instead of facilitation. That is, for the expectation variant, when the participant was presented with the white patch in place of the second colour patch, they had to first realize that the patch was not one of the usual yellow or blue patches but rather that it was white, remember what a white patch represented, and then generate a colour for themselves as to which colour they expected to occur before deciding what key corresponded to that internally generated colour. In the RT variant, they simply had to indicate what colour their sensory system was picking up.

3. I think that some space in the manuscript needs to be devoted to explaining how orienting towards novelty is different from of an expectation. Is it based on some kind of sensory refractory period? Some discussion of other expectancy-based findings would also be constructive, for example, how would the “orienting towards novelty” view explain the language-based and gravitational-based findings of Spalek and Hammad (2004, 2005) and Spalek and Di Lollo (2007)?

4. The authors state that no comparison could be done in the Spalek (2007) paper because no behavioural measure of response time was collected. While it is true that no RT was collected, the procedure, except for the presentation of the to-be-detected final target was identical to Exp. 3 of Pratt, Spalek and Bradshaw (1999), and the RT findings found there were very similar to the expectancy findings reported in Spalek (2007).

5. The authors seem to make the assumption that expectation is conscious (volitional), or put another way, that it is equivalent to endogenously-oriented attention. Although there may be some expectations that are conscious, such as when you make a cue predictive, there are others that are simply the result of learned regularities with the environment, such as the expectation that objects fall due to gravity, that objects continue to move with momentum, and that all things being equal, because reading is so ubiquitous, that attention tends to move in a direction consistent with the way that we read. In fact, contrary to the claim that “A... concern with the inference that IOR reflects greater expectancy for uncued than cued targets is that it does not fit with the results from studies that have manipulated expectancy directly and measured IOR effects”, the additive effects of endogenous and exogenous cues found in those studies is precisely what would be expected.

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