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## Introduction

- **Dimension-based retro-cue benefit (RCB):** Performance improvement of the dimension cued in the maintenance phase of VWM (Griffin & Nobre, 2003; Landman et al., 2003; Niklaus et al., 2017; Park et al., 2017; Ye et al., 2016).
- **Mechanism:** Focusing attention on cued dimension to prioritize relative representations (Souza & Oberauer, 2016).

**Q: Does the dimension-based RCB in VWM require sustained attention on relative representations?**

## Method

### Stimulus type:

Bars with features selected from 360 colors and 180 orientations were used as memoranda.

Masks or secondary odd-even tasks were used in disruption array across experiments.

### Maintenance phase:

\*Attention was guided by retro-cues, focused on relevant dimension.

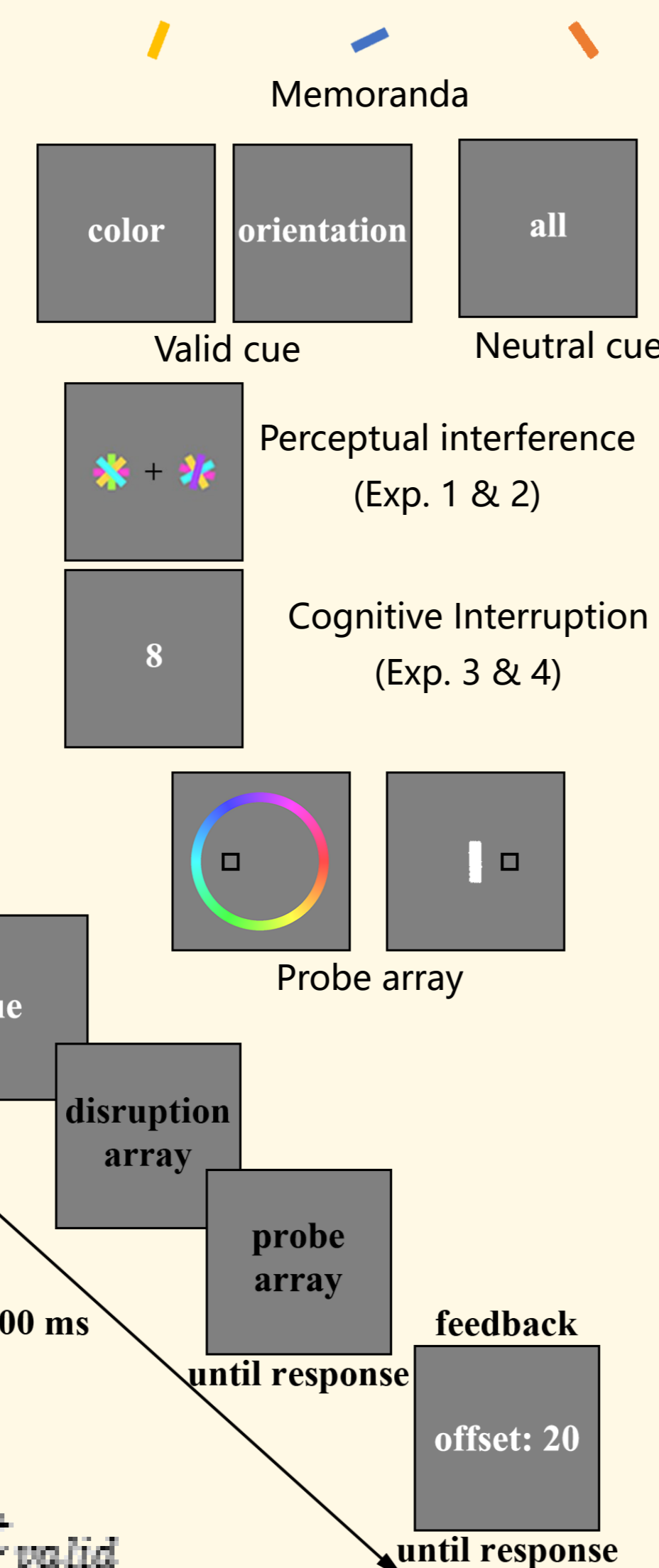
Disruption occurred in half of trials after a retro-cue with different intervals across experiments.

\*Sustained attention was broken off in conditions with disruption.

### Probe array:

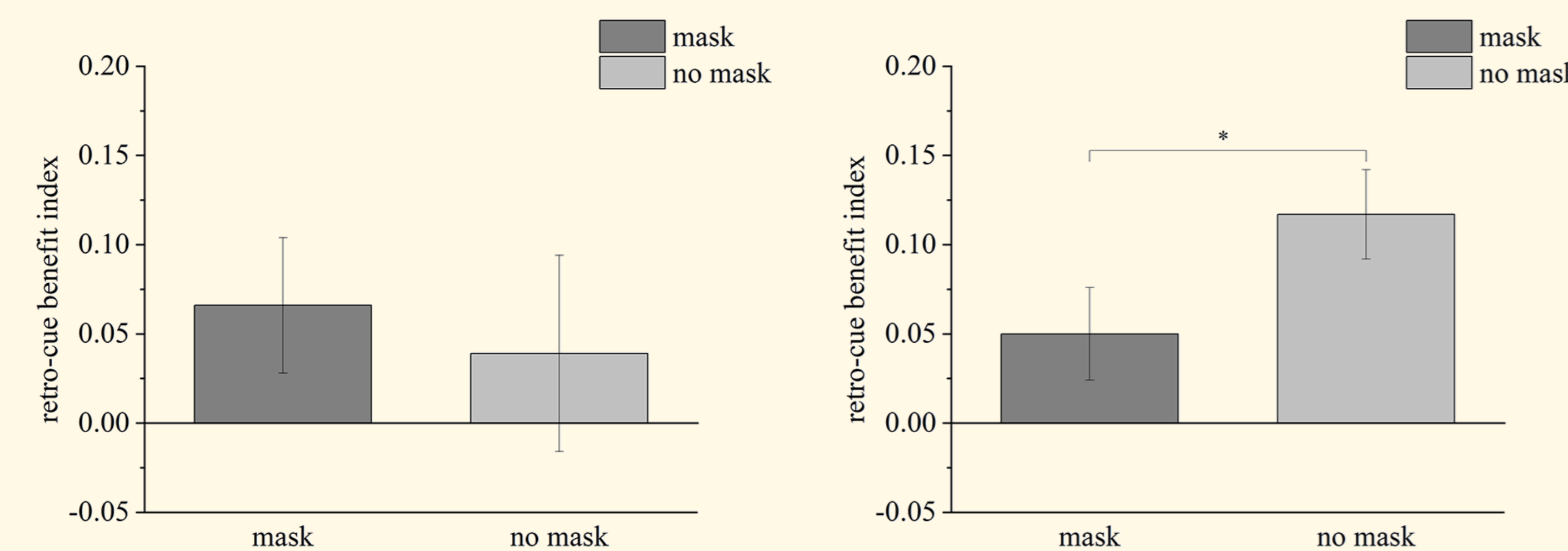
Choose feature the same as memorized one on the probed location.

Dependent variable:  $RBI = \frac{offset_{neutral} - offset_{valid}}{offset_{neutral}}$



## Exp. 1

- Disruption array presents masks with a cue-and-disruption ISI of 1000 ms. (Memory load = 2 bars; Cue: 400 ms; Mask: 100 ms; Sample = 24)



**[color]** no-mask: RBI = 0; mask: RBI > 0.

No significant difference between mask and no-mask conditions.

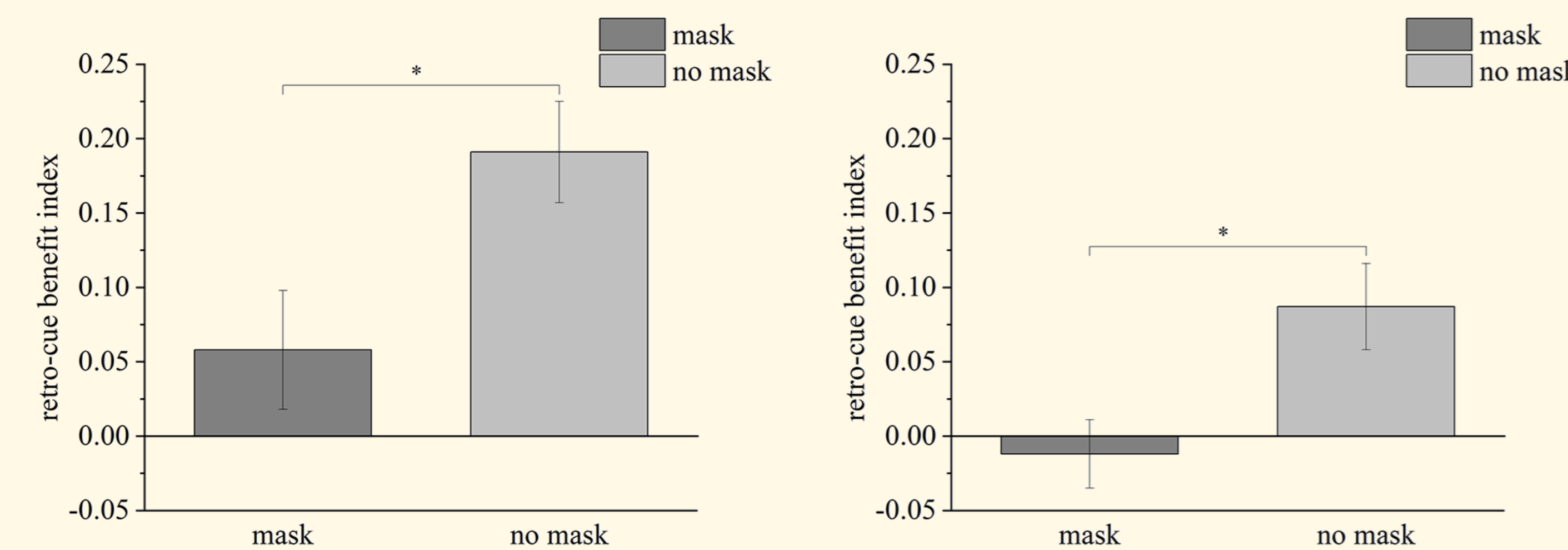
**[Orientation]** no-mask/mask: RBI > 0.

RBI (mask) < RBI (no mask).

∴ Sustained attention is **not necessary** for RCB but **facilitates** effective use of retro-cues for orientations.

## Exp. 2

- **Aim:** Test temporal process of sustained attention requirement.
- Disruption array presents masks with a cue-and-disruption ISI of 150ms. (Memory load = 3 bars; Cue: 250 ms; Mask: 400 ms; Sample = 23)



**[Color & orientation]** no-mask: RBI > 0; mask: RBI = 0.

RBI (mask) < RBI (no mask).

∴ Sustained attention facilitates effective use of retro-cues for colors during a **short** interval after retro-cues appear.

## Exp. 3 & 4

- **Aim:** Test the stability of sustained attention requirement phenomena.
- Disruption array presents an odd-even task with a cue-and-disruption ISI of 1000 ms and 150ms respectively. (Memory load = 3 bars; Cue: 400 ms; Interference: 1000 ms; Sample = 23 for Exp. 3 and 24 for Exp. 4)

• **Exp 3:** RBI > 0 across conditions.

• **Exp 4:** RBI (single-task) > 0; RBI (dual-task) = 0.

• **Exp 3 & 4:** **[color]** RBI (dual-task) < RBI (single-task).

**[orientation]** RBI (dual-task) = RBI (single-task).

∴ Sustained attention is only necessary within a short period after cue onset but facilitates effective use of dimension-based retro-cues.

## Conclusions

- Sustained attention is associated with dimension-based RCB effectiveness.
  - Strengthening hypothesis regarding cued dimension.
  - Removal hypothesis regarding non-cued dimension.
- 2. Our findings support two-step account on maintenance of representation after a retro-cue.
  - Disruption in representation prioritization step diminished RCB (Exp. 1 & 3).
  - Disruption in attention deployment step eliminated RCB (Exp. 2 & 3).
- 3. Whether to, rather than how to disrupt (bottom-up vs. top-down) attention decides use effectiveness of dimension-based retro-cues.

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## Reference

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