

Dramatically Larger Flanker Effects

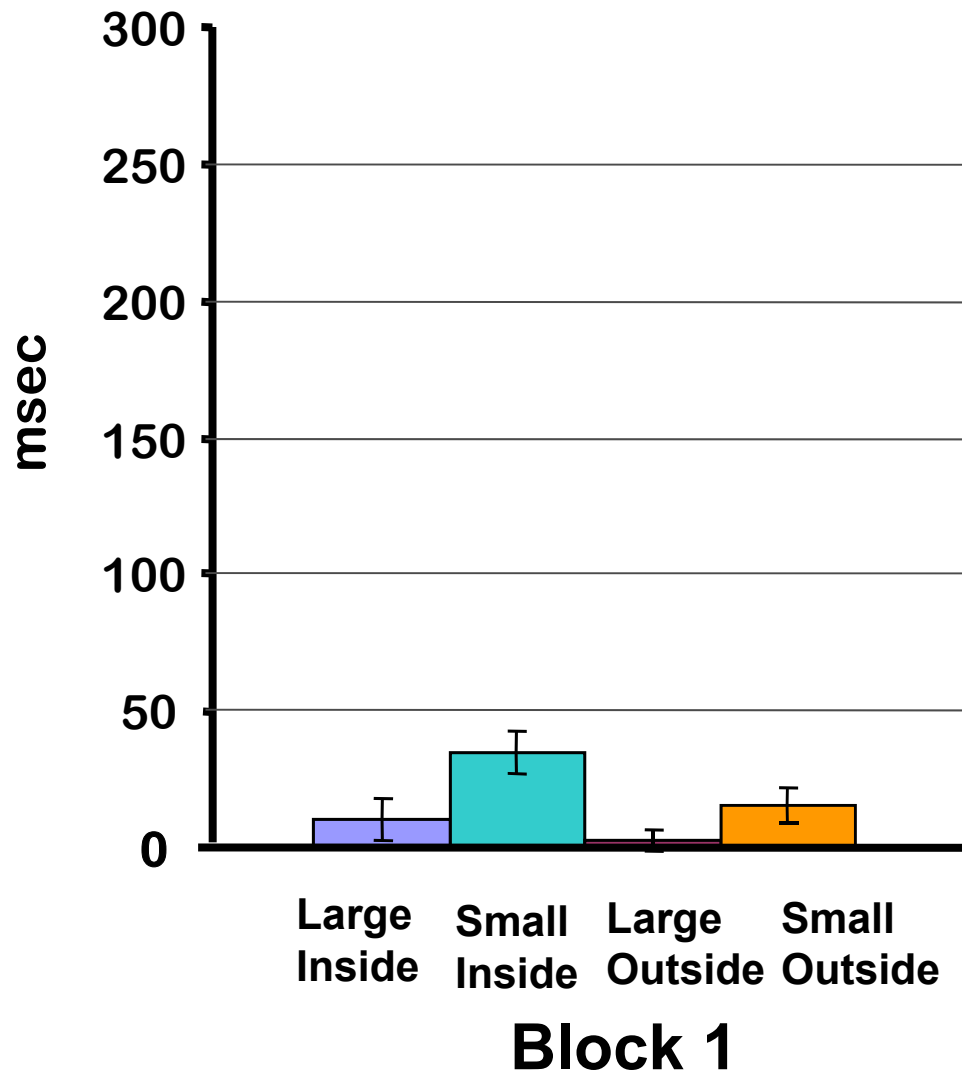
Sarah Munro, Cecil Chau, Karine Gazarian,



& Adele Diamond

**Presented at the Cognitive Neuroscience
Society Annual Meeting, San Francisco, CA,
April 9, 2006.**

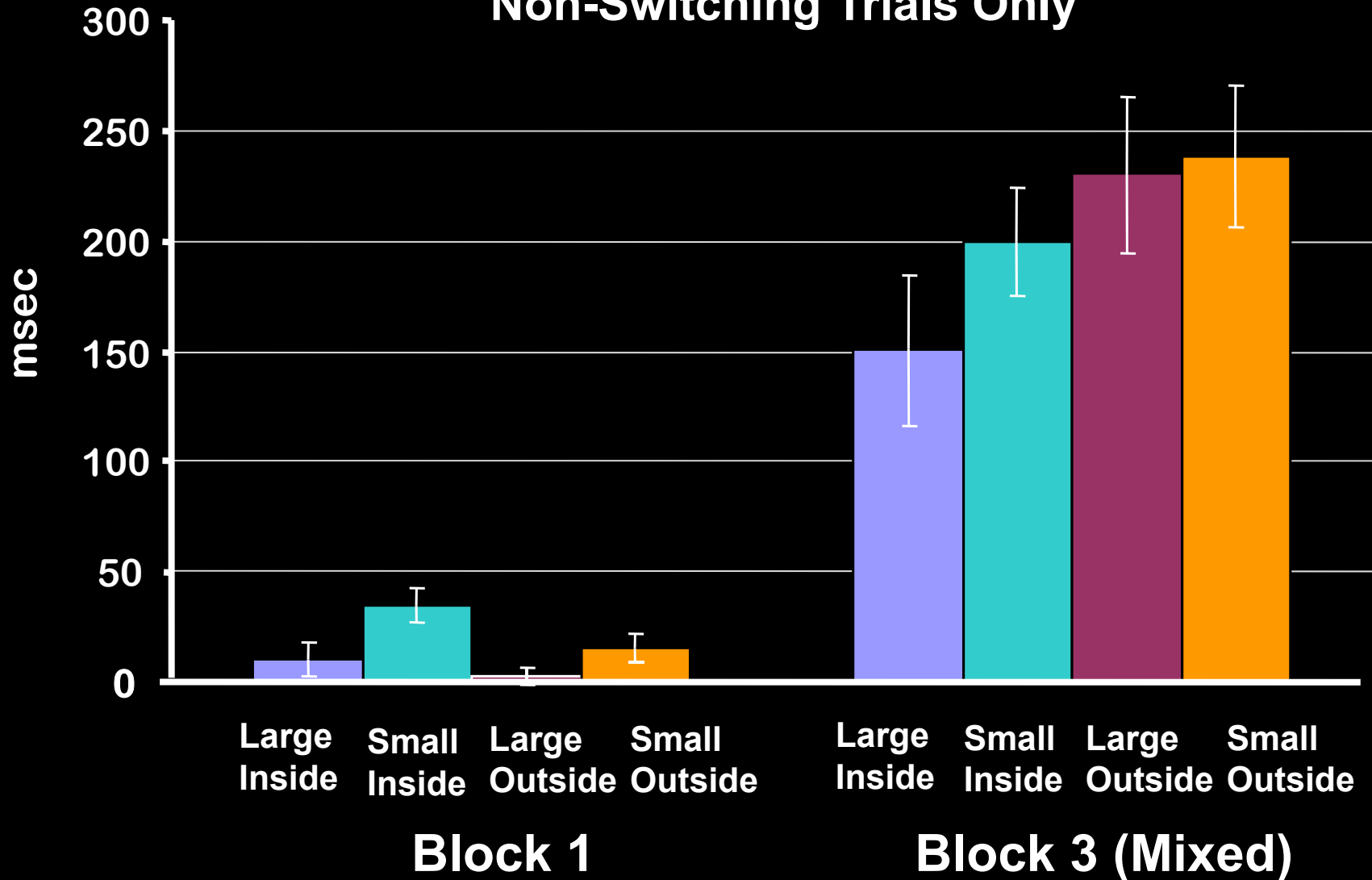
Flanker Effect by Stimulus Type



The Flanker Effect has been replicated many times, but is quite sensitive to stimulus parameters.

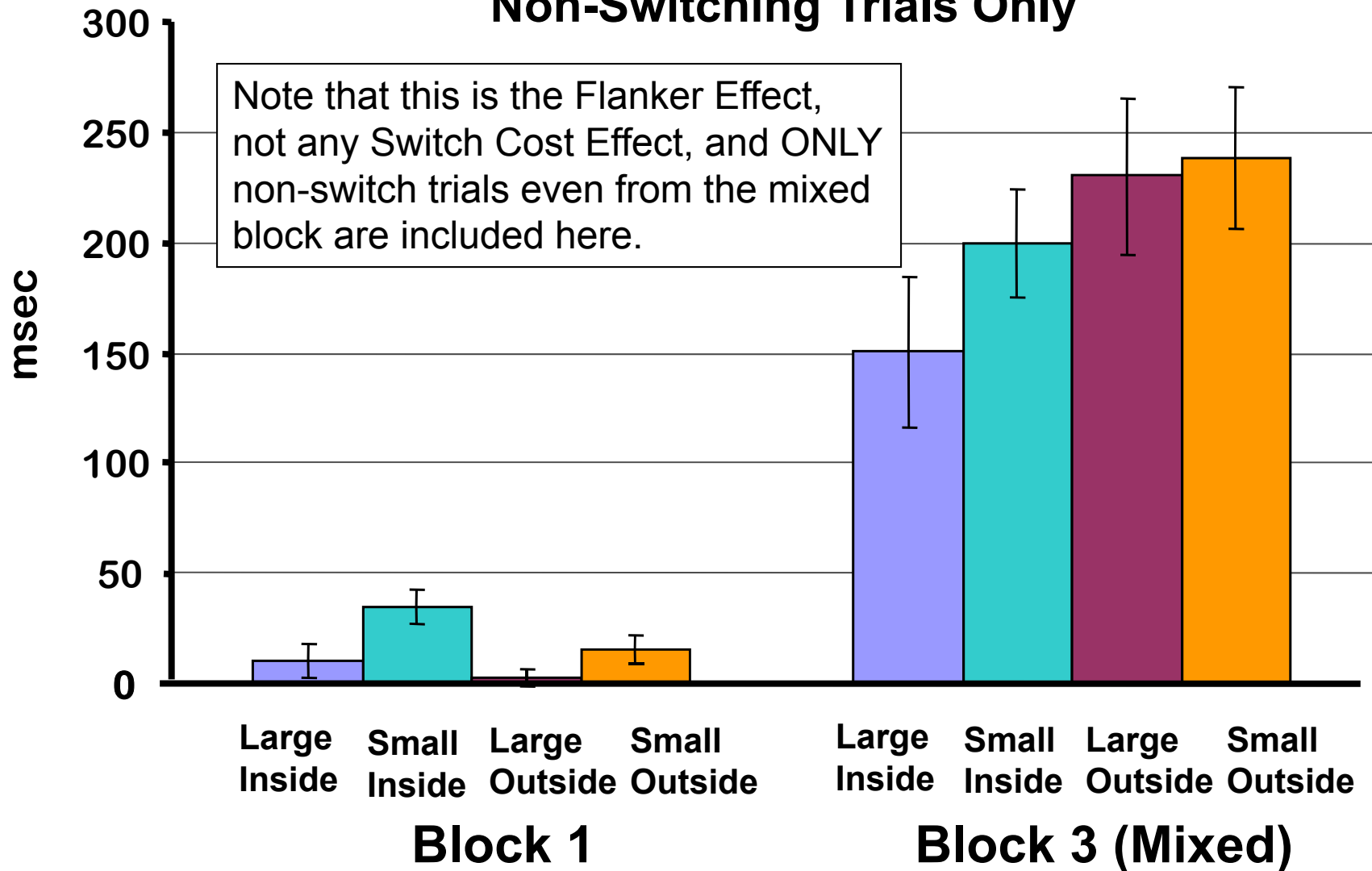
For instance, here you can see that there is a Flanker Effect for both standard (Inside) Flanker and for reverse (Outside) Flanker, but the effect essentially disappears when the stimuli are large.

Flanker Effect for Single-Task Block vs. Mixed Block Non-Switching Trials Only



Regardless of stimulus size, or whether a trial has an Inside or Outside target, the Mixed block always shows a far greater Flanker Effect (6-10 times larger).

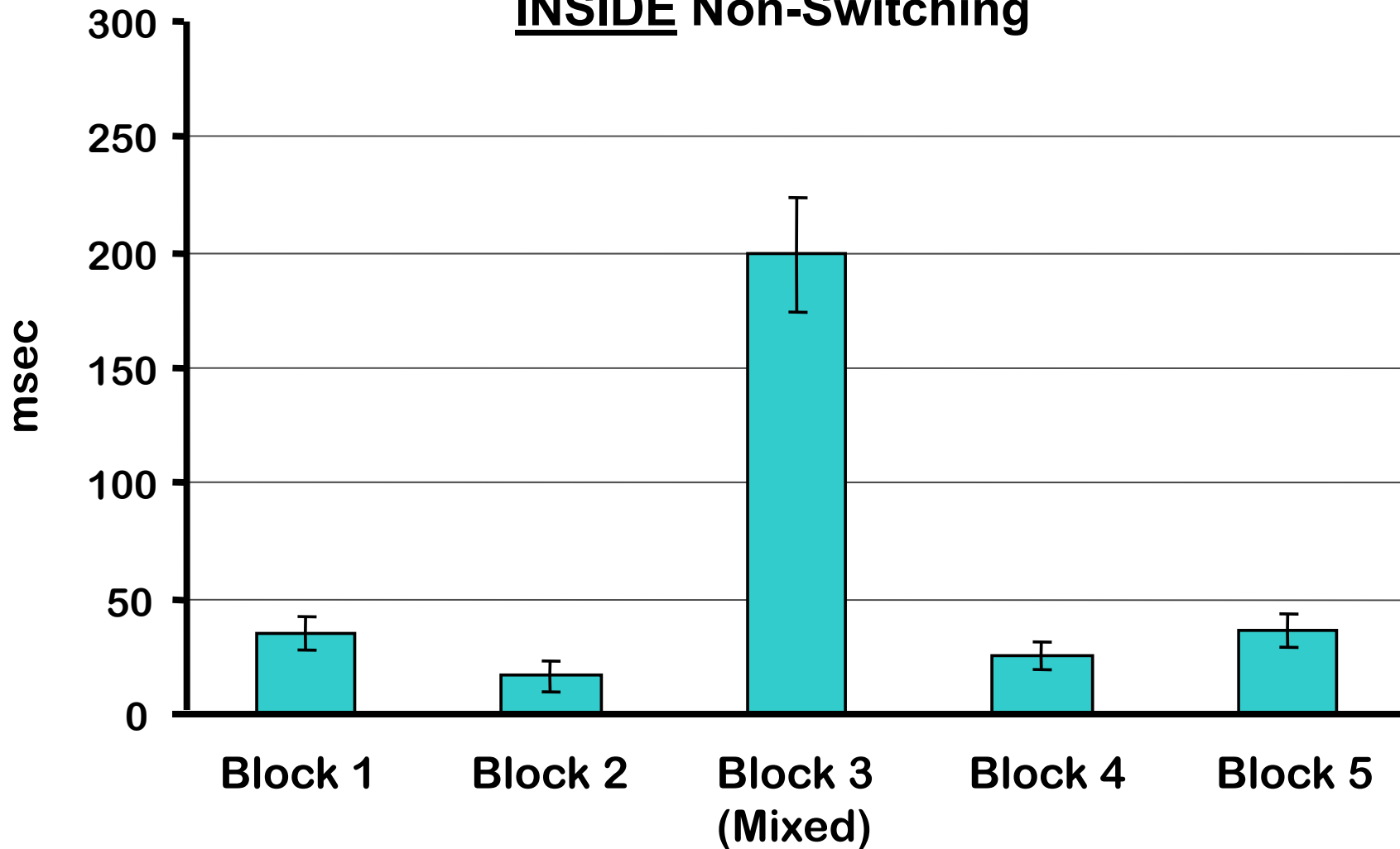
Flanker Effect for Single-Task Block vs. Mixed Block Non-Switching Trials Only



Also, when standard and reverse Flanker trials are intermixed, the Flanker Effect is no longer sensitive to stimulus parameters such as stimulus size.

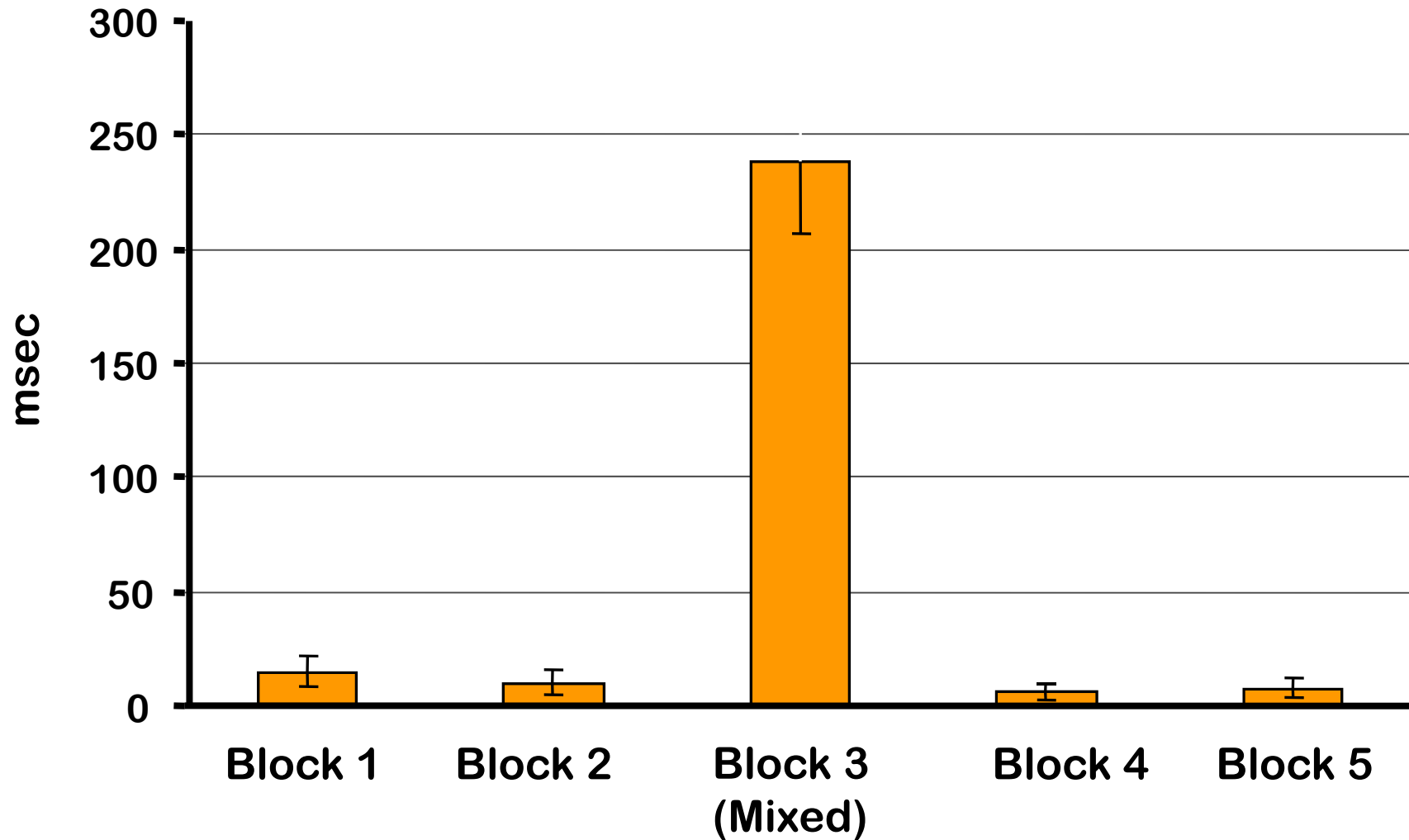
Flanker Effect by Block (Standard vs. Mixed)

INSIDE Non-Switching



This dramatic increase in Flanker Effect size is NOT due to practice effects. Note that the Flanker Effect in the Mixed Block is larger than both the blocks before it AND after it.

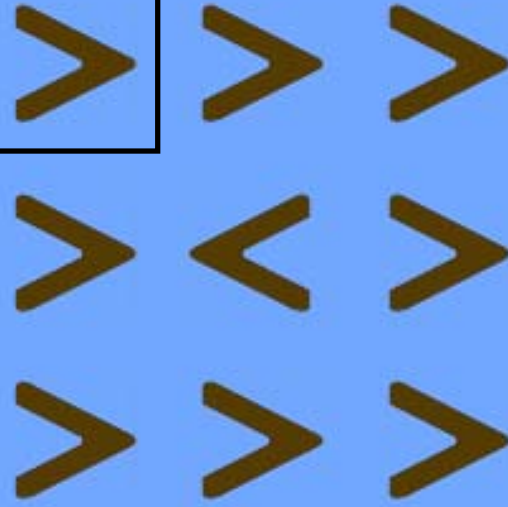
Flanker Effect by Block for **Study 2** (small stimuli), OUTSIDE Non-Switching



Practice effects are not present for Outside trials either.

36 mm x 36 mm

8 mm

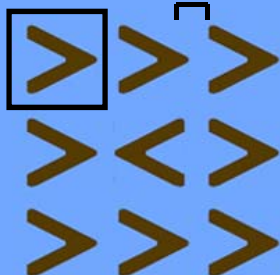


INSIDE



16 mm x 16 mm

3 mm



INSIDE



Design

- Two Single-Task blocks (70 trials each)
 - Half received the Classic Flanker Task (Inner Target) First
 - Half received the Reverse Flanker Task (Outer Target) First
 - (Each block preceded by a 10 trial practice block)
- Block of Mixed Flanker Task (180 trials)
 - Half Inside trials, Half Outside Trials
 - (Preceded by a 16 trial practice block)
- In the second study, an additional Classic and Reverse Flanker Task were included after the Mixed Block, in reverse order.

Participants

- Study 1 - 96 adults
- Study 2 - 32 adults

- 1/2 of participants were female
- 1/2 of participants were between 17-21 years
- 1/2 of participants were between 22-40 years

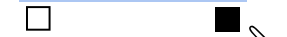
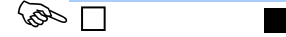
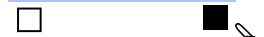
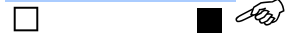
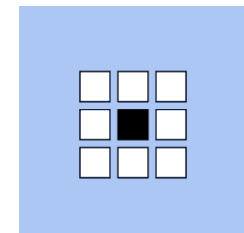
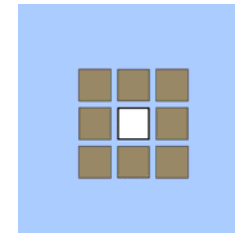
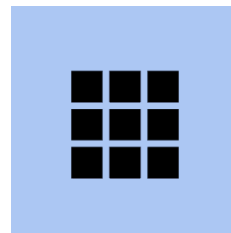
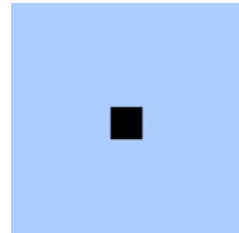
No Distractor

Congruent

Neutral

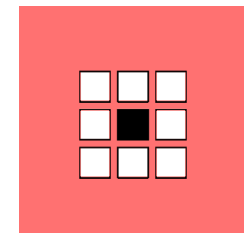
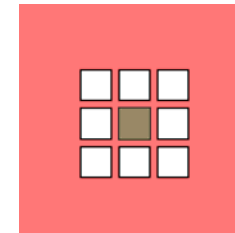
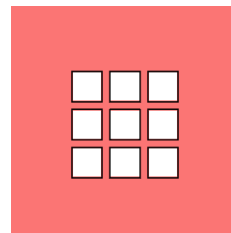
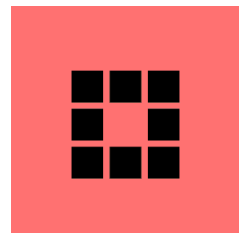
Incongruent

Inside



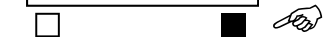
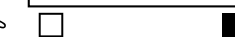
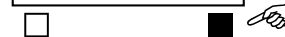
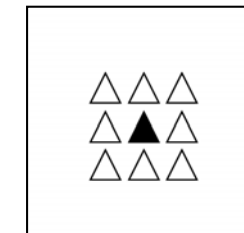
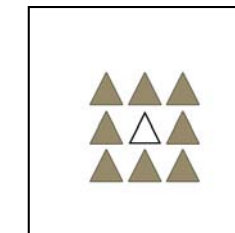
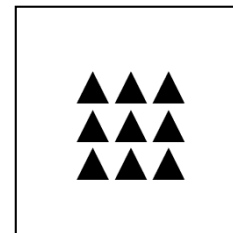
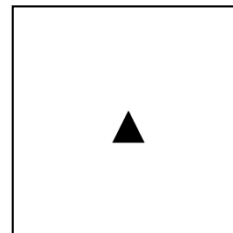
Shapes Separated Condition (Rule Indicated by Color of Background)

Outside

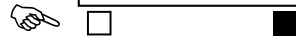
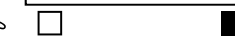
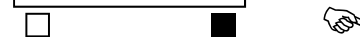
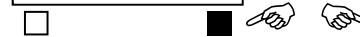
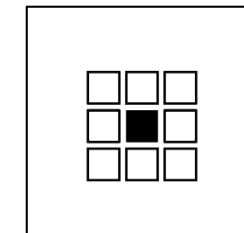
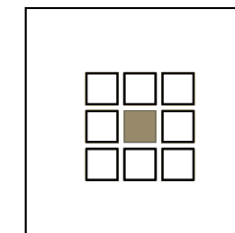
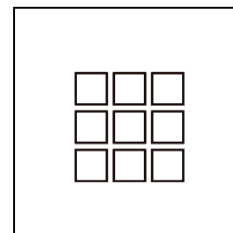
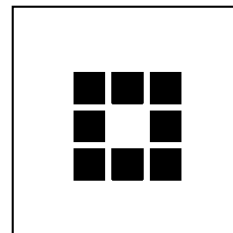


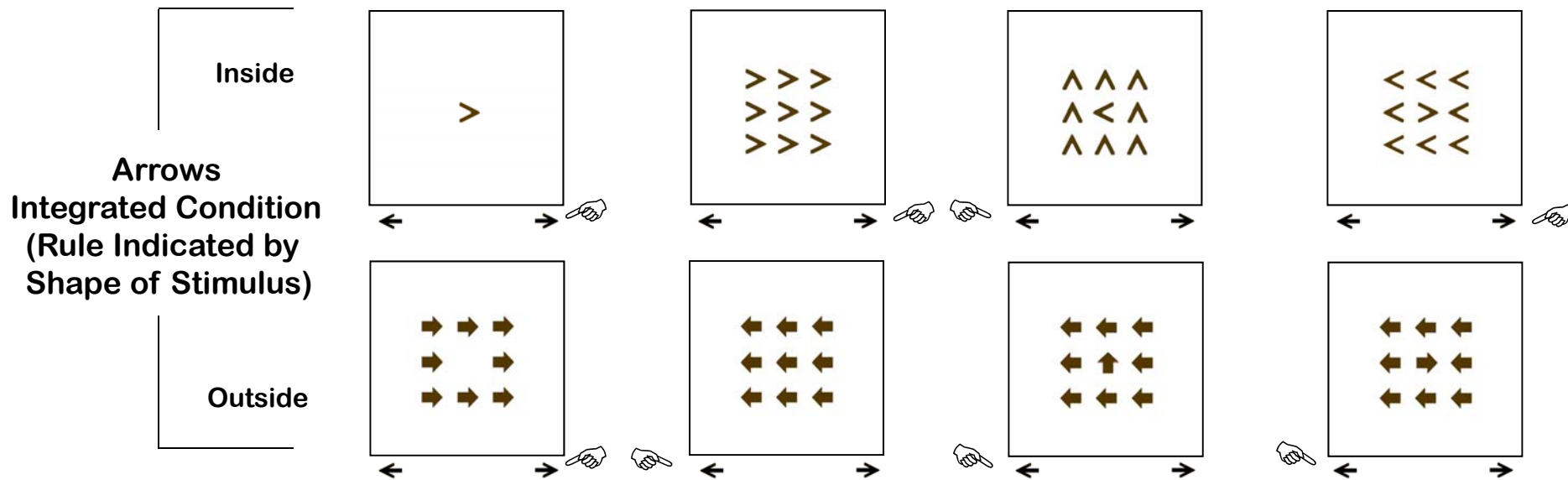
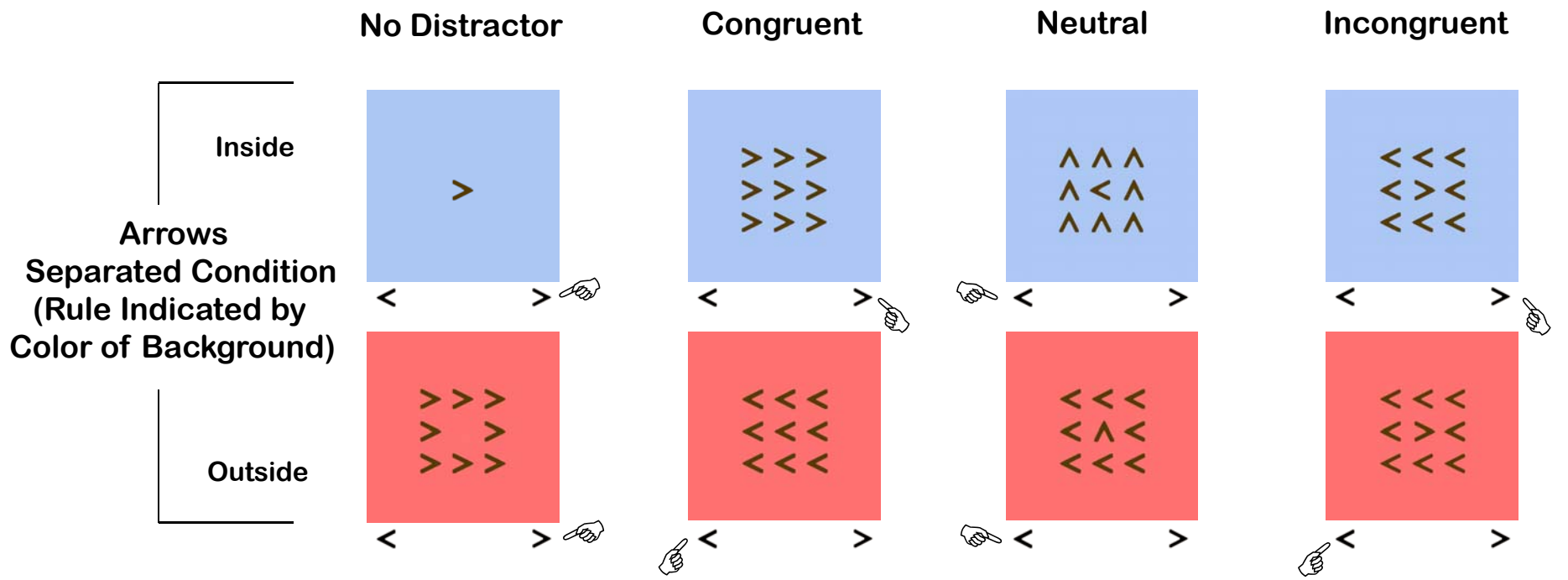
Shapes Integrated Condition (Rule Indicated by Shape of Stimulus)

Inside



Outside



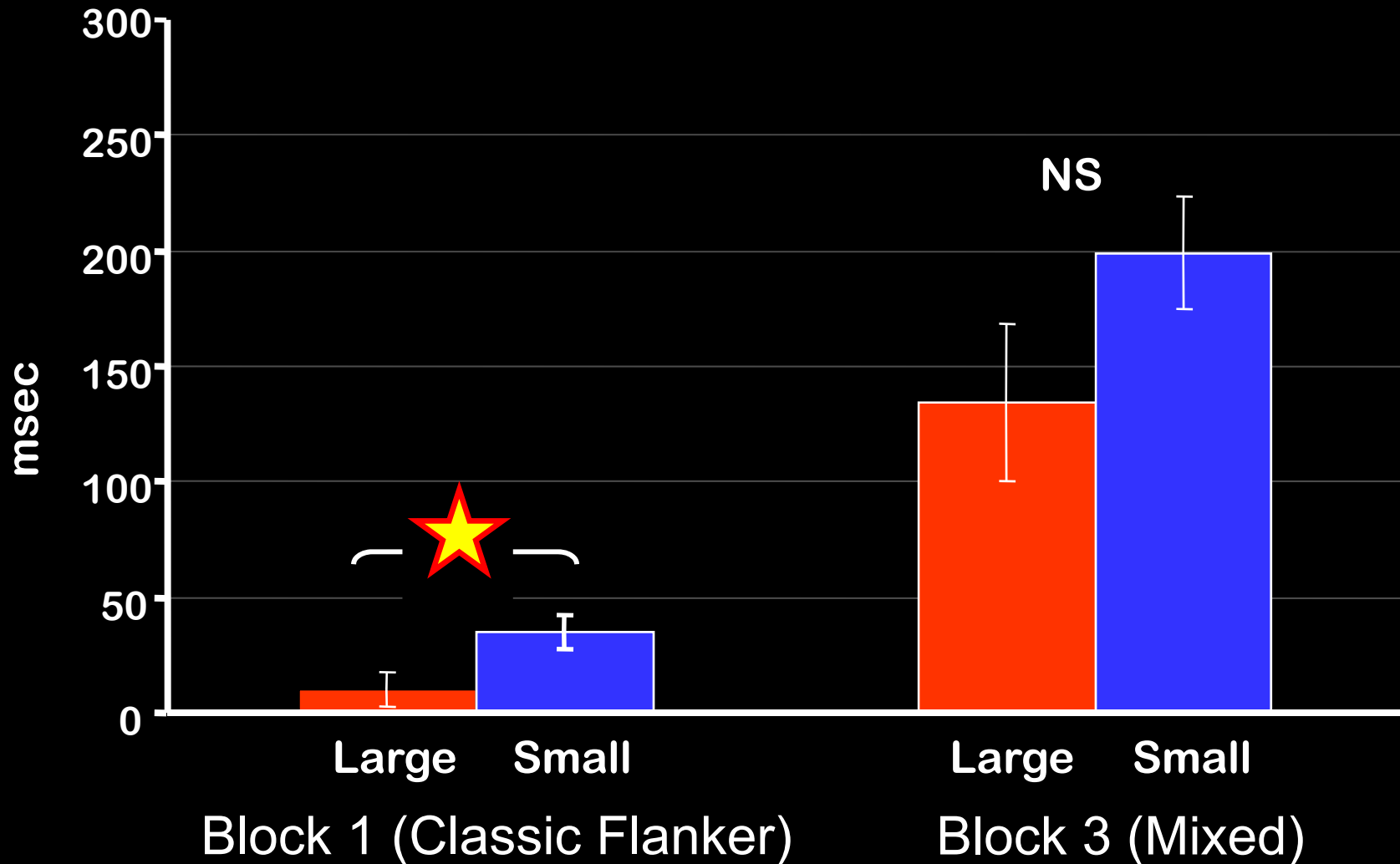


Looking at the Classic Flanker Effect

- Analyses were first done looking at just trials in which the **INSIDE** stimulus is the target.
- For the Mixed Block, we first look at only INSIDE trials for which the previous trial was **also** INSIDE – to avoid effects of switching from the outside rule to the inside rule.
- Similar analyses were then done to examine the Flanker Effect for OUTSIDE trials.

Flanker Effect: **Study 1** vs. **Study 2** for Blocks 1 and 3

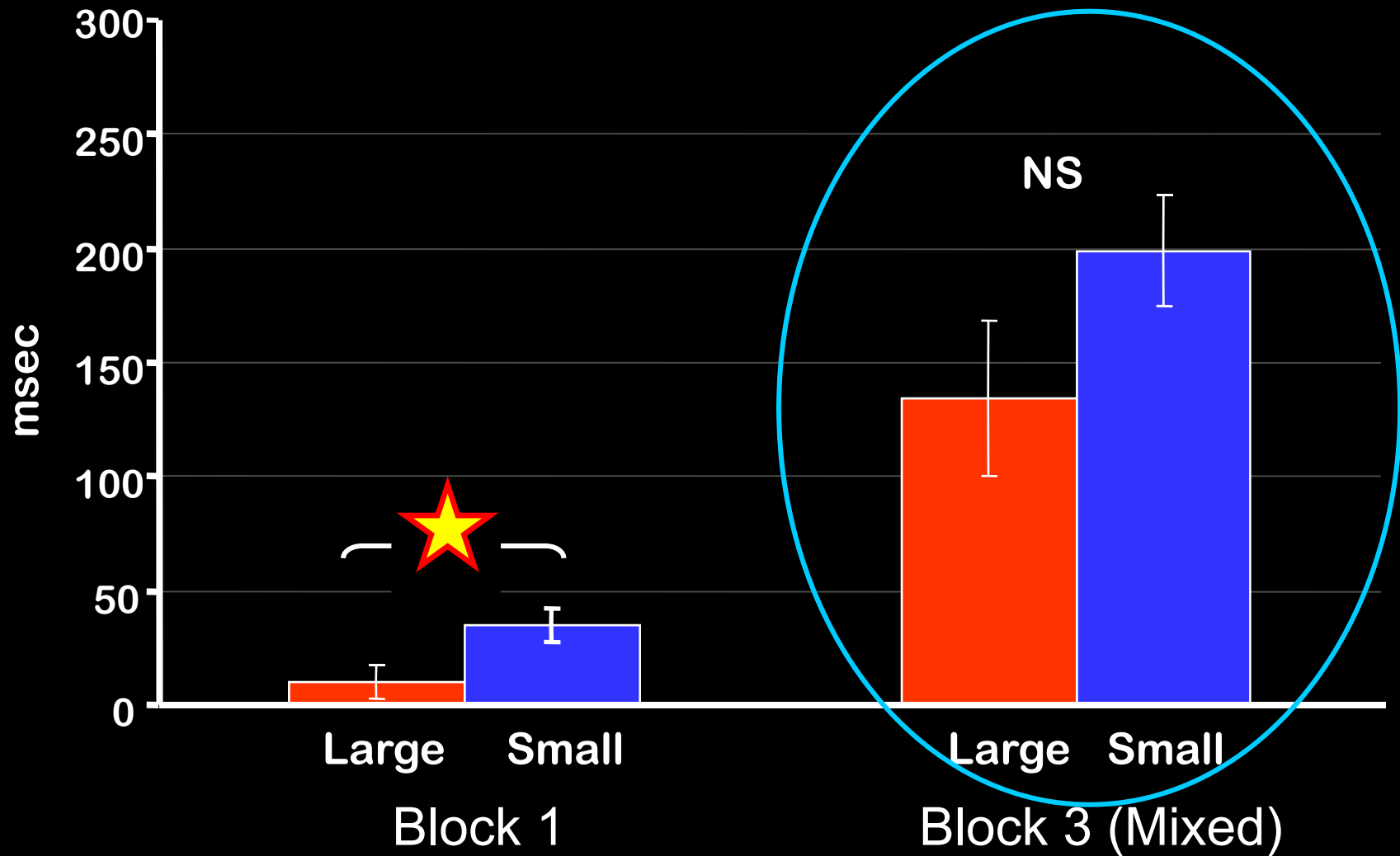
INSIDE Non-Switching Trials



Study 2 (with the smaller stimuli) shows a significantly stronger Flanker Effect in the Classic Flanker Task block (consistent with past studies)

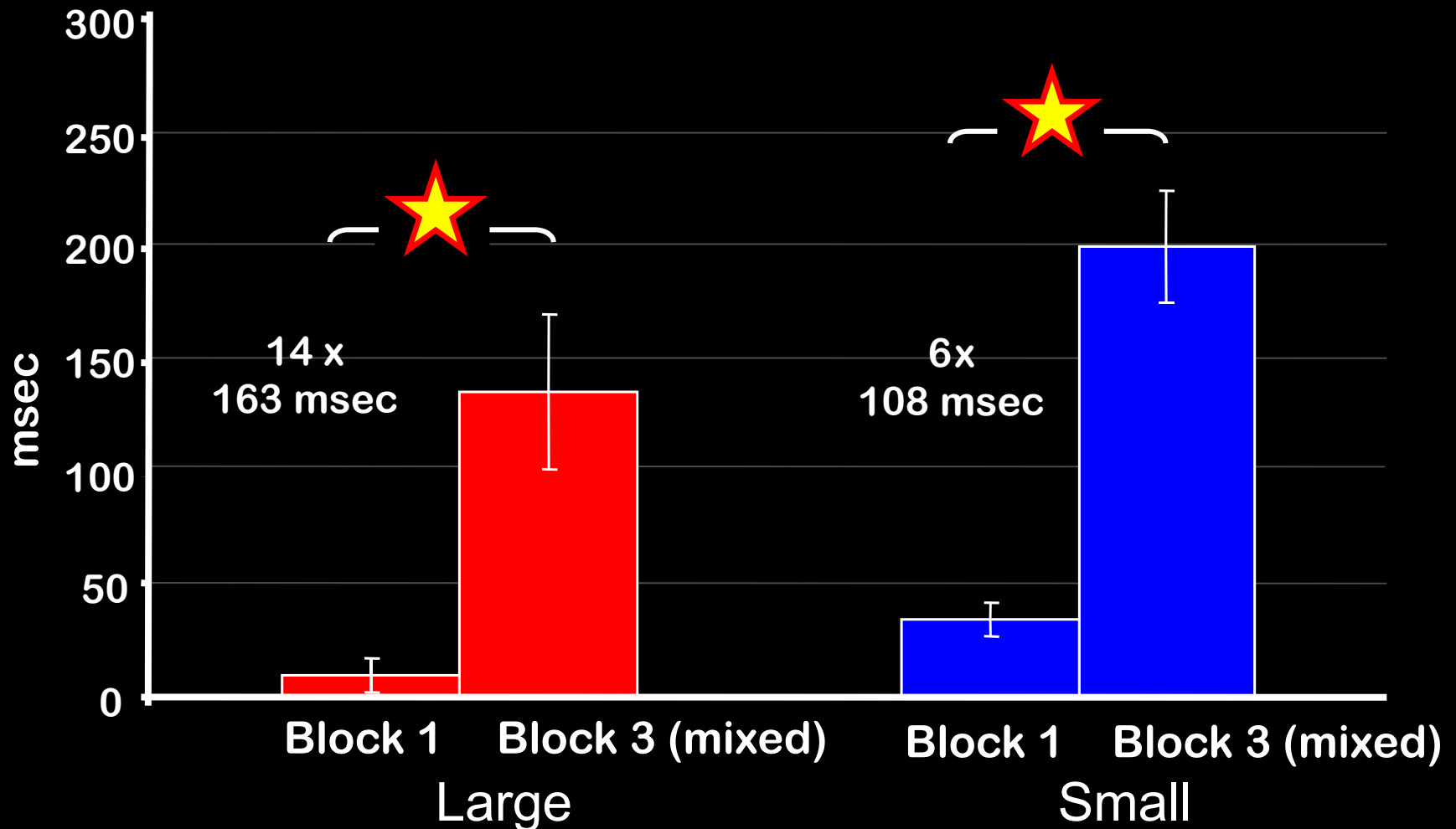
Flanker Effect: Study 1 vs. Study 2 for Blocks 1 and 3

INSIDE Non-Switching Trials



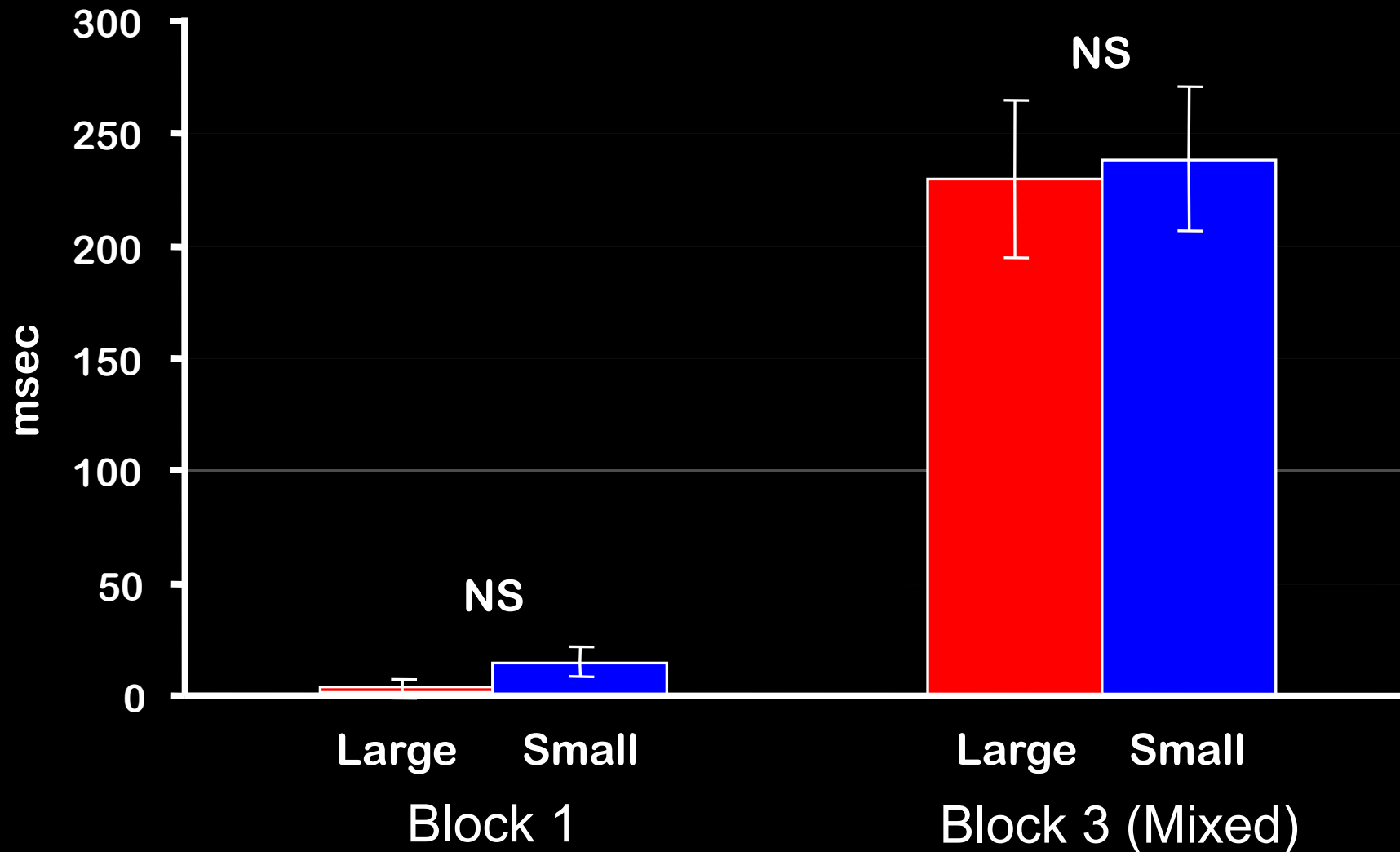
Flanker Effect in the Mixed block in Study 1 & Study 2 did not significantly differ. The Mixed Block's Flanker Effect is less sensitive to stimulus parameters.

Flanker Effect: Block 1 vs. Block 3 INSIDE Non-Switching for Studies 1 and 2



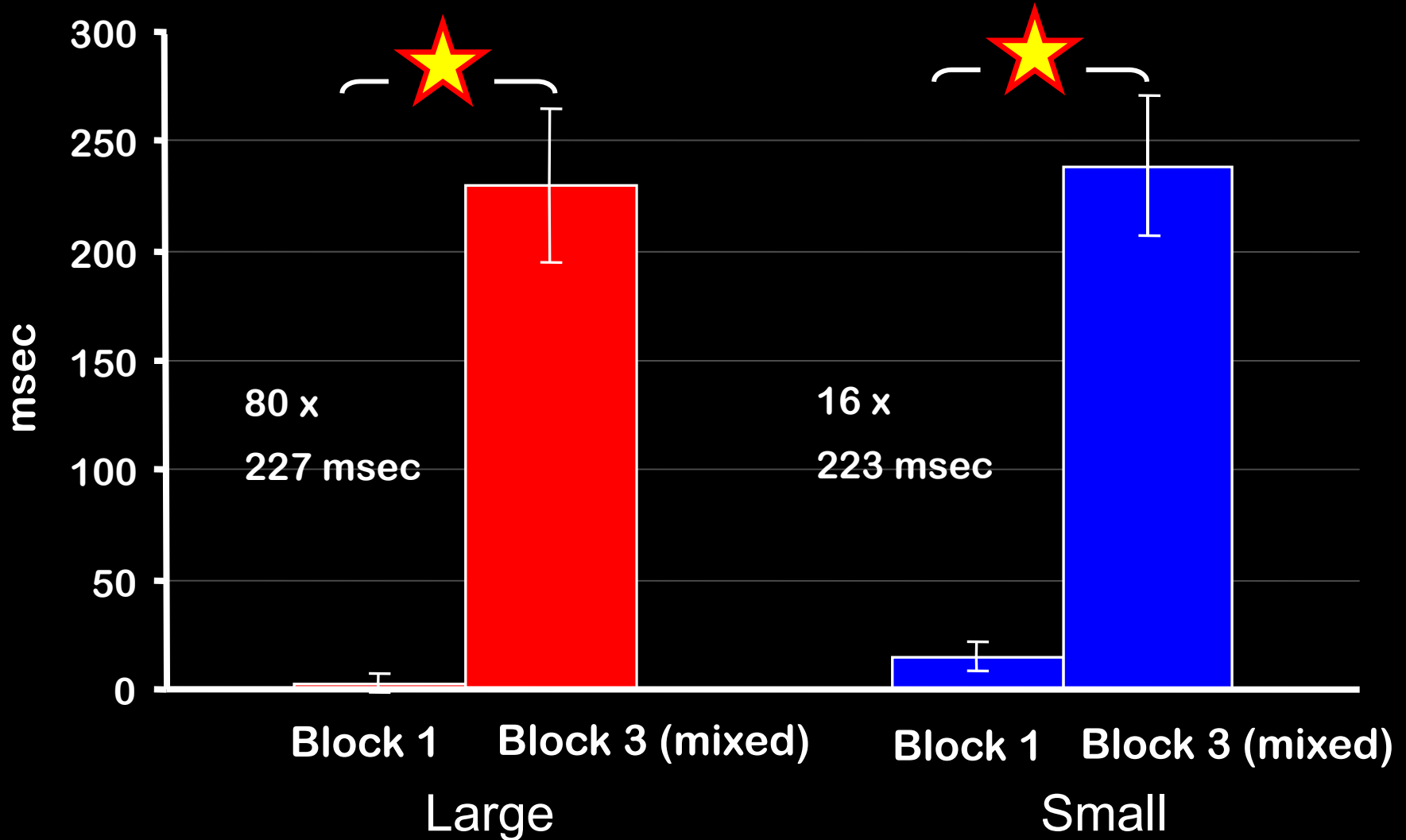
Both studies show a *very* significant increase in the Flanker Effect between the Classic Flanker single-task block and the Mixed task block.

Flanker Effect: **Study 1** vs. **Study 2** for Blocks 1 and 3 OUTSIDE Non-Switching



There is no significant difference between the Flanker Effect for Outside Stimuli in Study 1 or 2 for either block.

Flanker Effect: Block 1 vs. Block 3 OUTSIDE Non-Switching for Studies 1 and 2



However, Outside trials show the same dramatic increase in the Flanker Effect between the Classic Single-task block and the Mixed-task block.

Stimulus Types

- Half received Arrows Condition
(directional stimuli)

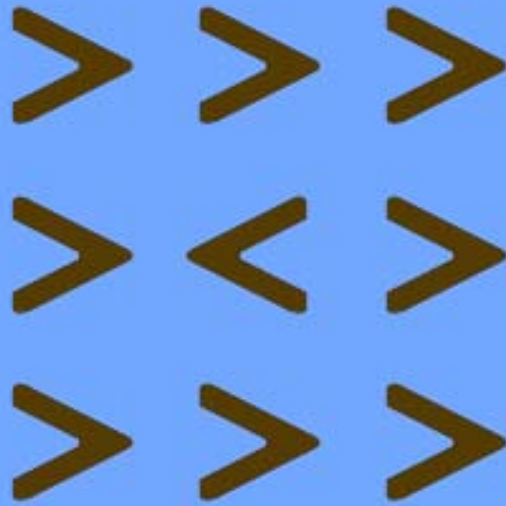


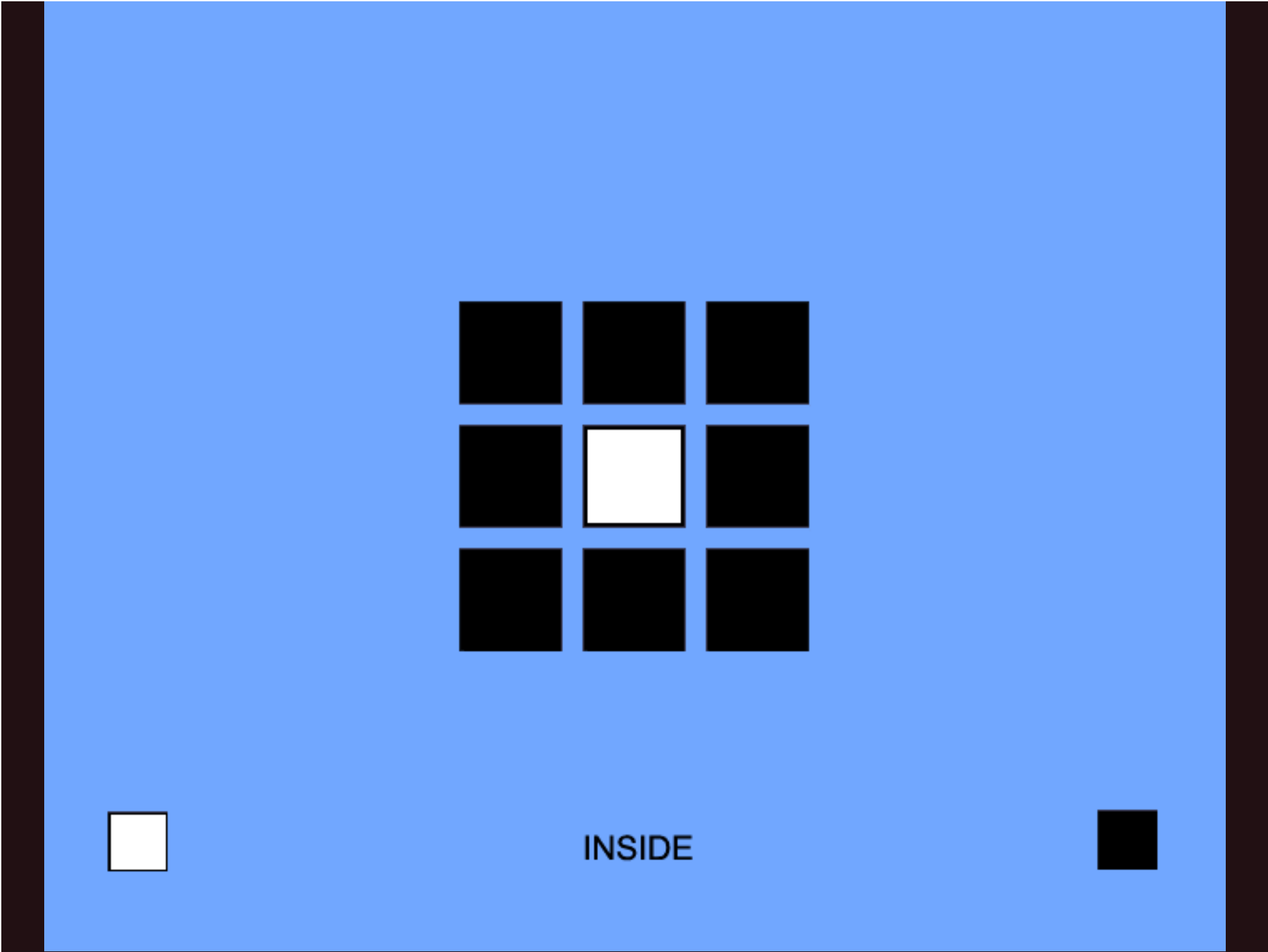
- Half received Colored Squares Condition
(symbolic stimuli)





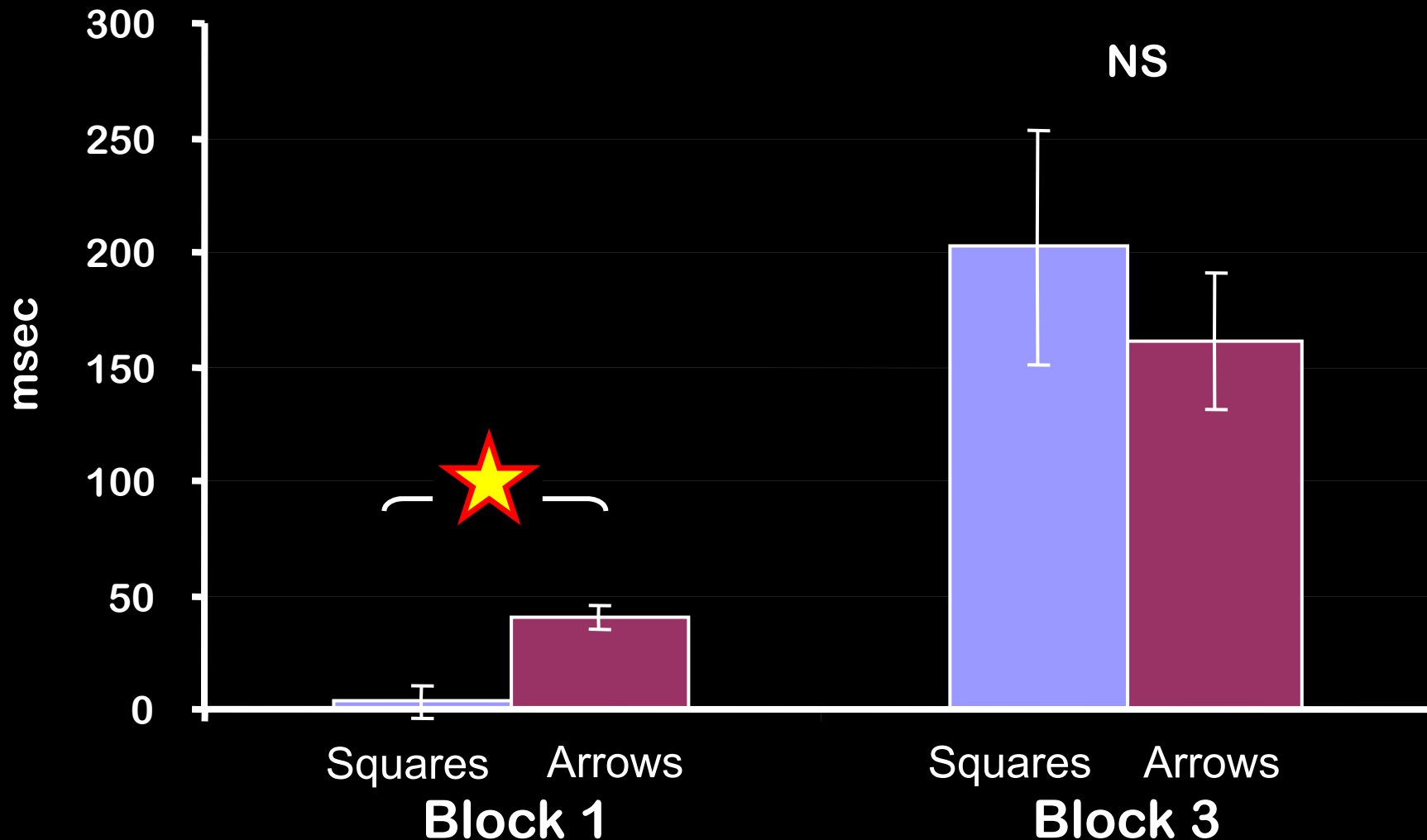
INSIDE





INSIDE

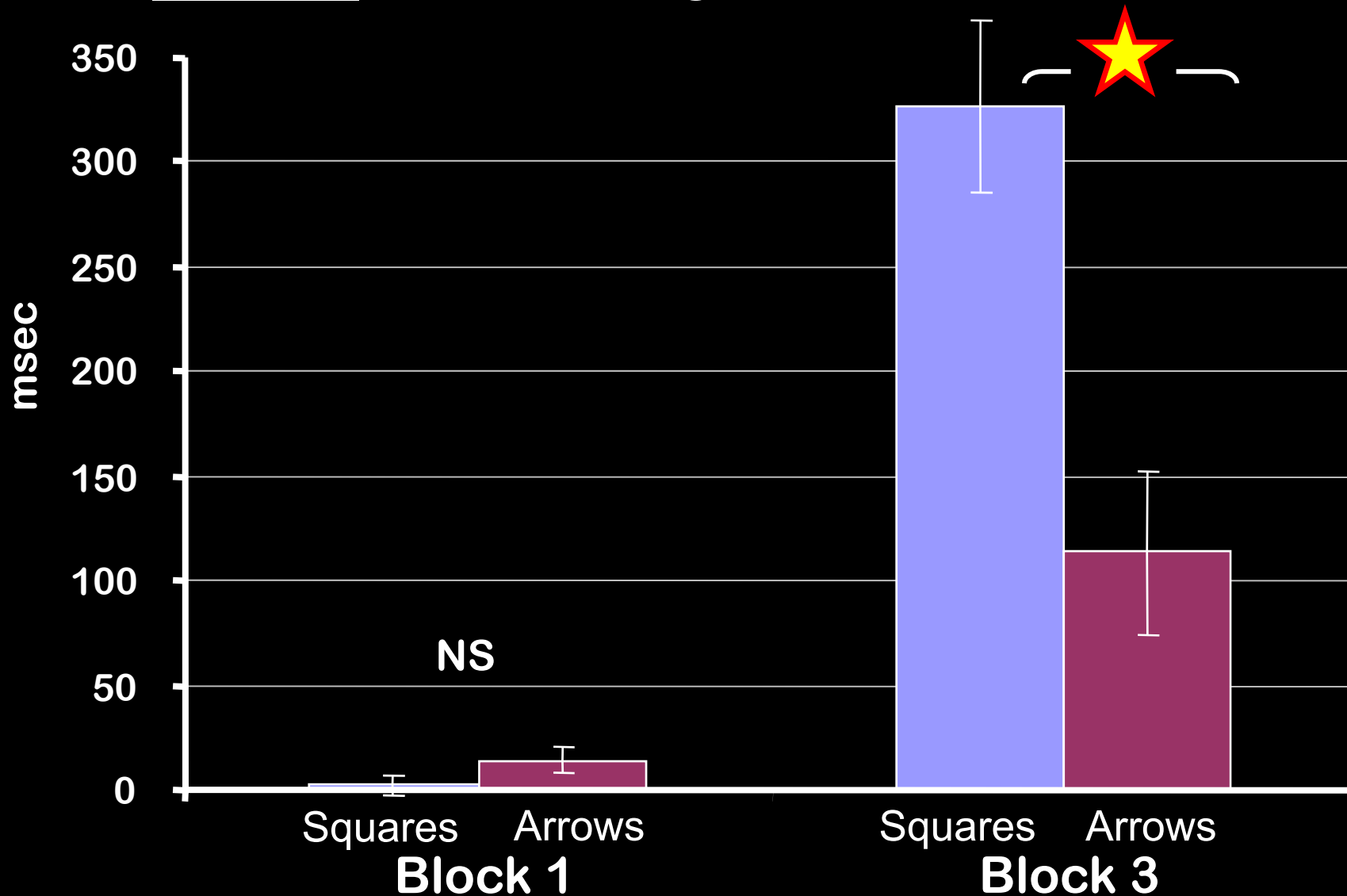
Flanker Effect: Squares vs. Arrows for Blocks 1 and 3 INSIDE, Non-Switching for Studies 1 and 2 Combined



Arrows are a more directional and more automatic cue – so flanking arrows are more likely to cause disruption.

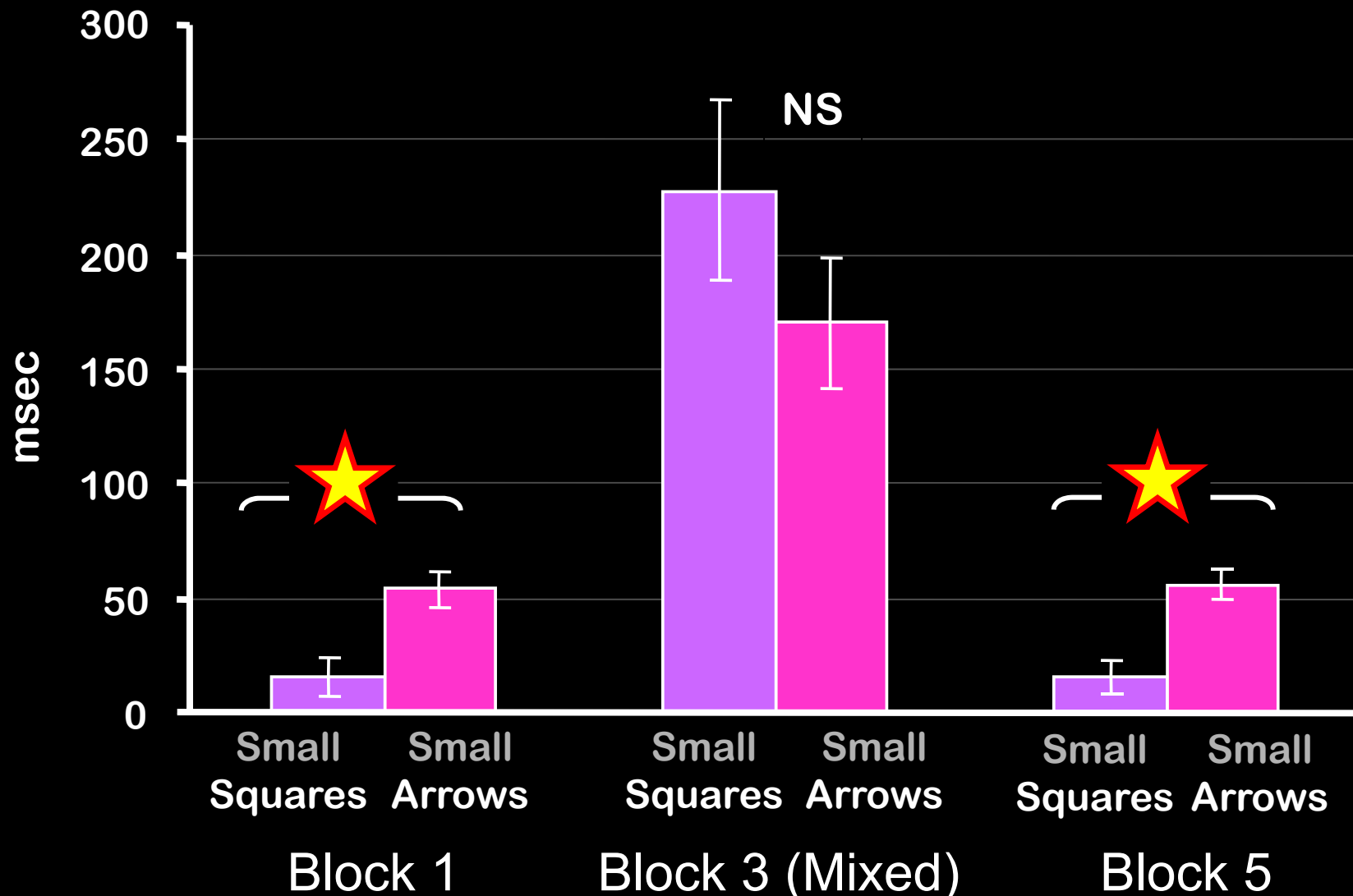
In the Mixed Block, we see the opposite trend (though insignificantly)

Flanker Effect: Squares vs. Arrows for Blocks 1 and 3 OUTSIDE, Non-Switching for Studies 1 and 2 Combined



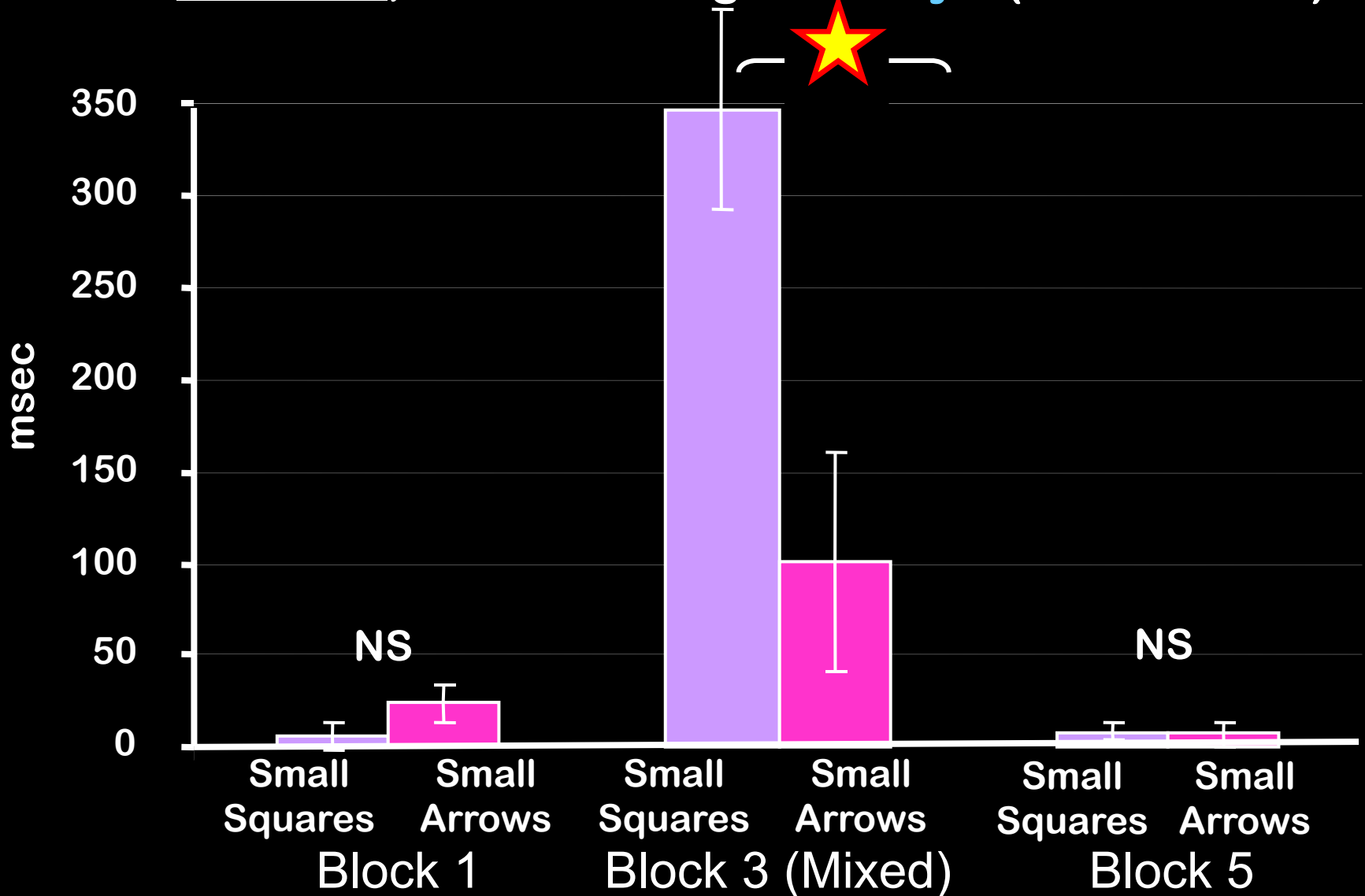
Squares – Outside trials have a much larger Flanker Effect than Arrows in Block 3. This seems to be always true for the harder condition – here the Outside Rule and Squares are both more difficult.

Flanker Effect: Squares vs. Arrows for Blocks 1, 3, and 5 INSIDE, Non-Switching for **Study 2** (Small Stimuli)



Study 2 Inside trials also show a larger Flanker Effect for Arrows in the single-task blocks (both for block 1 and 5) and an insignificant difference for the mixed-block.

Flanker Effect: Squares vs. Arrows for Blocks 1, 3, and 5 OUTSIDE, Non-Switching for **Study 2** (Small Stimuli)

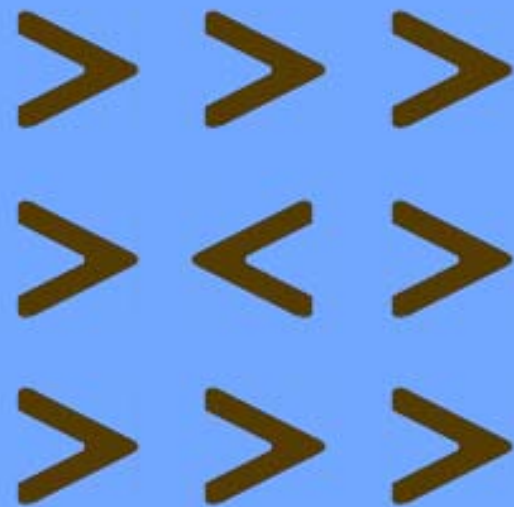


Again, a significantly larger Flanker Effect for Squares in the Mixed Block for Outside trials.

Rule Types

- Separated – An external cue indicates whether the target is Inside or Outside
(Background Color)
- Integrated – The cue for whether the target is Inside or Outside is part of the stimulus itself
(Stimulus Shape)

Separated



INSIDE



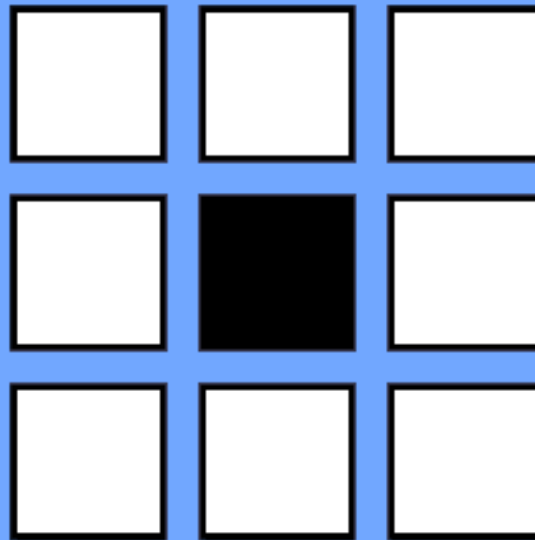
Separated



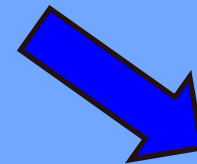
OUTSIDE



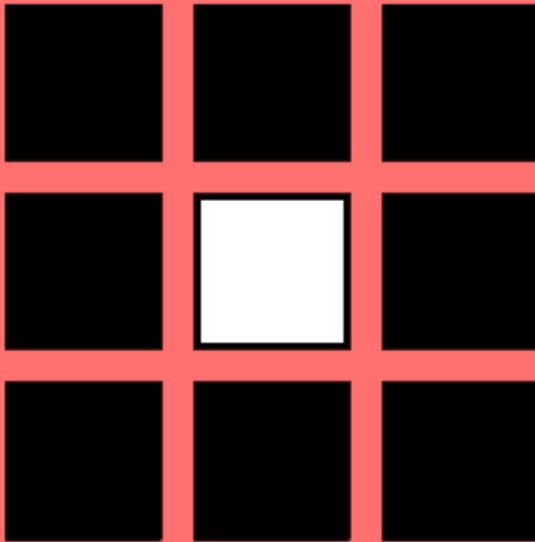
Separated



INSIDE



Separated



OUTSIDE



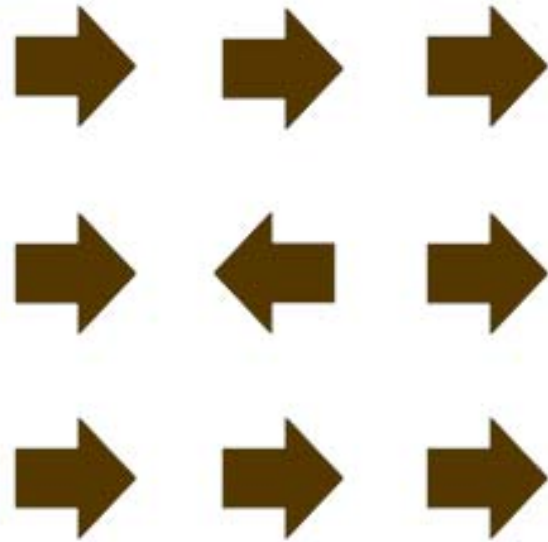
Integrated



INSIDE



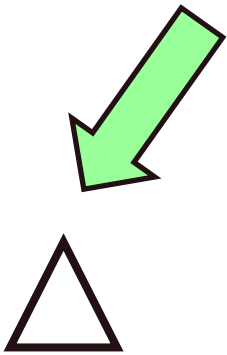
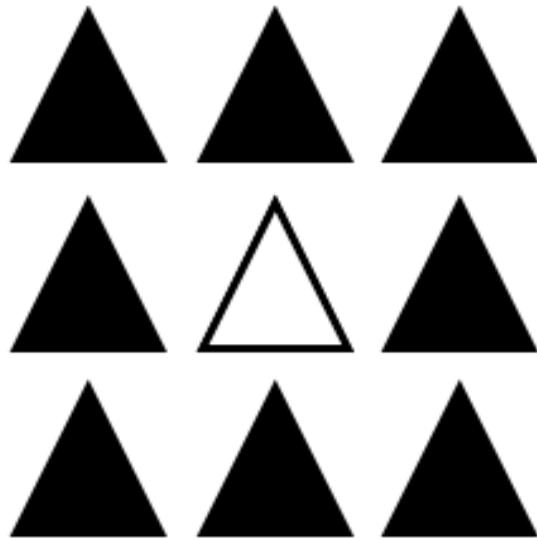
Integrated



OUTSIDE



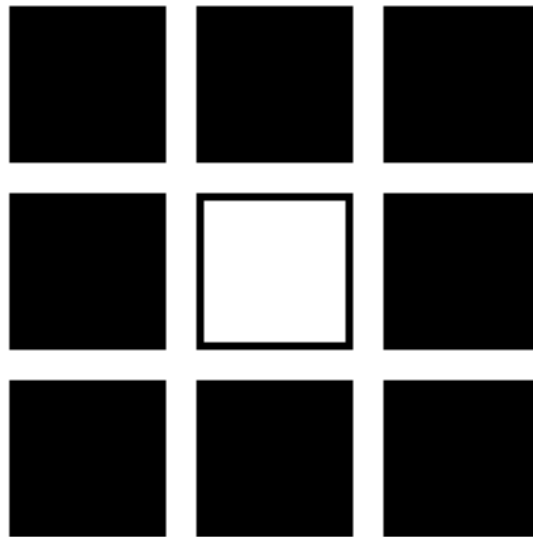
Integrated



INSIDE



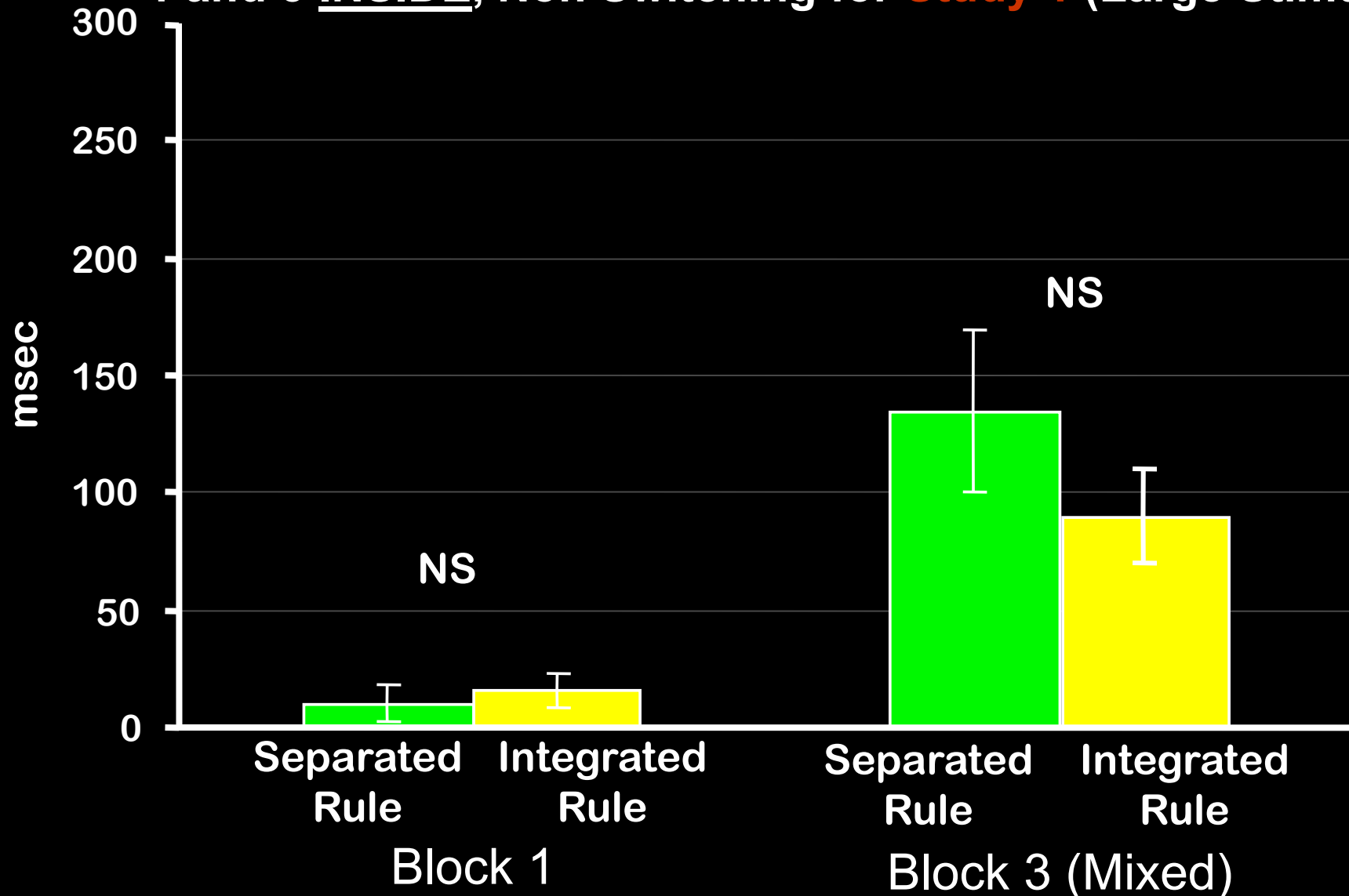
Integrated



OUTSIDE

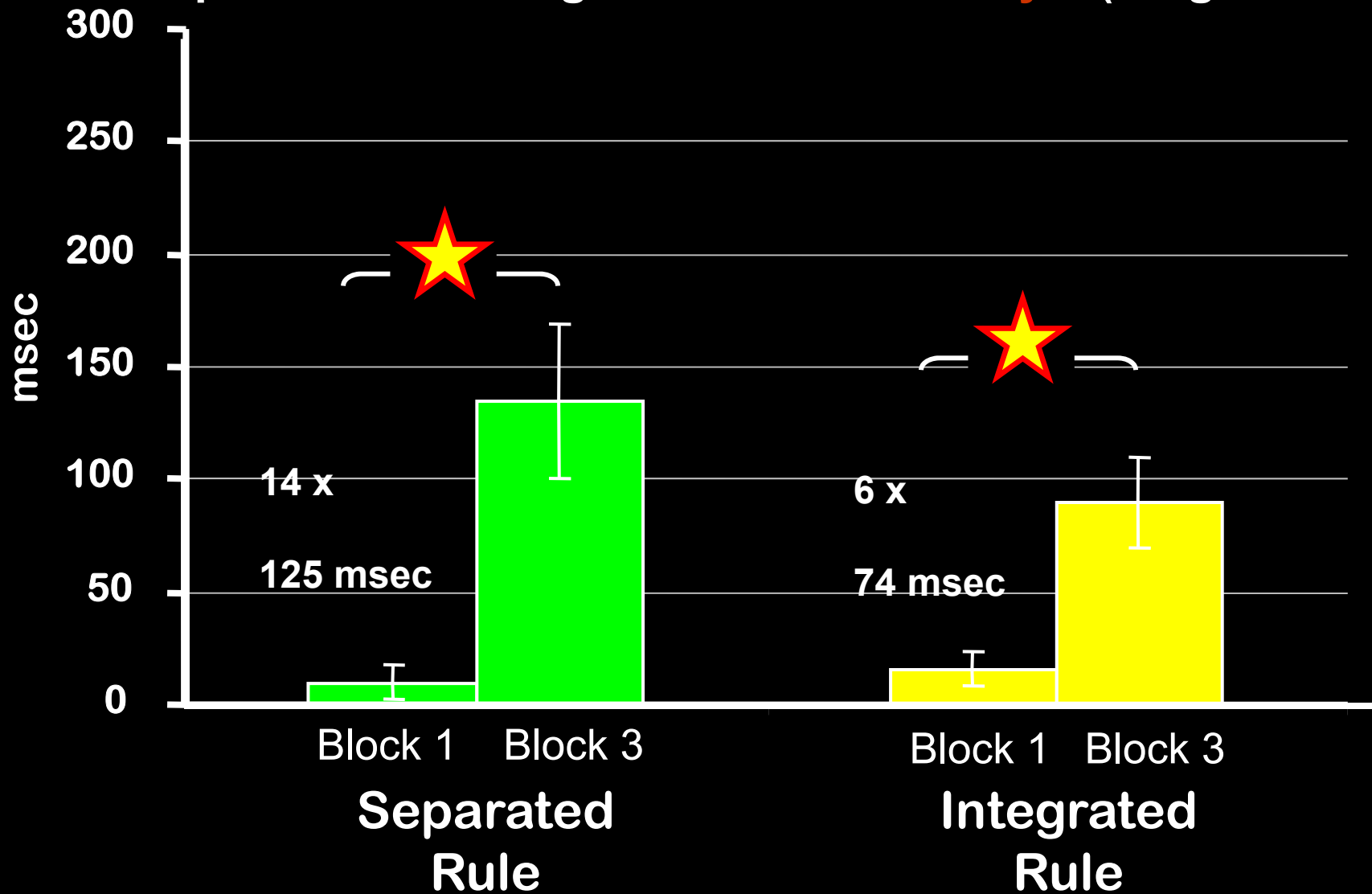


Flanker Effect: Separated vs. Integrated Rules for Block 1 and 3 INSIDE, Non Switching for **Study 1** (Large Stimuli)



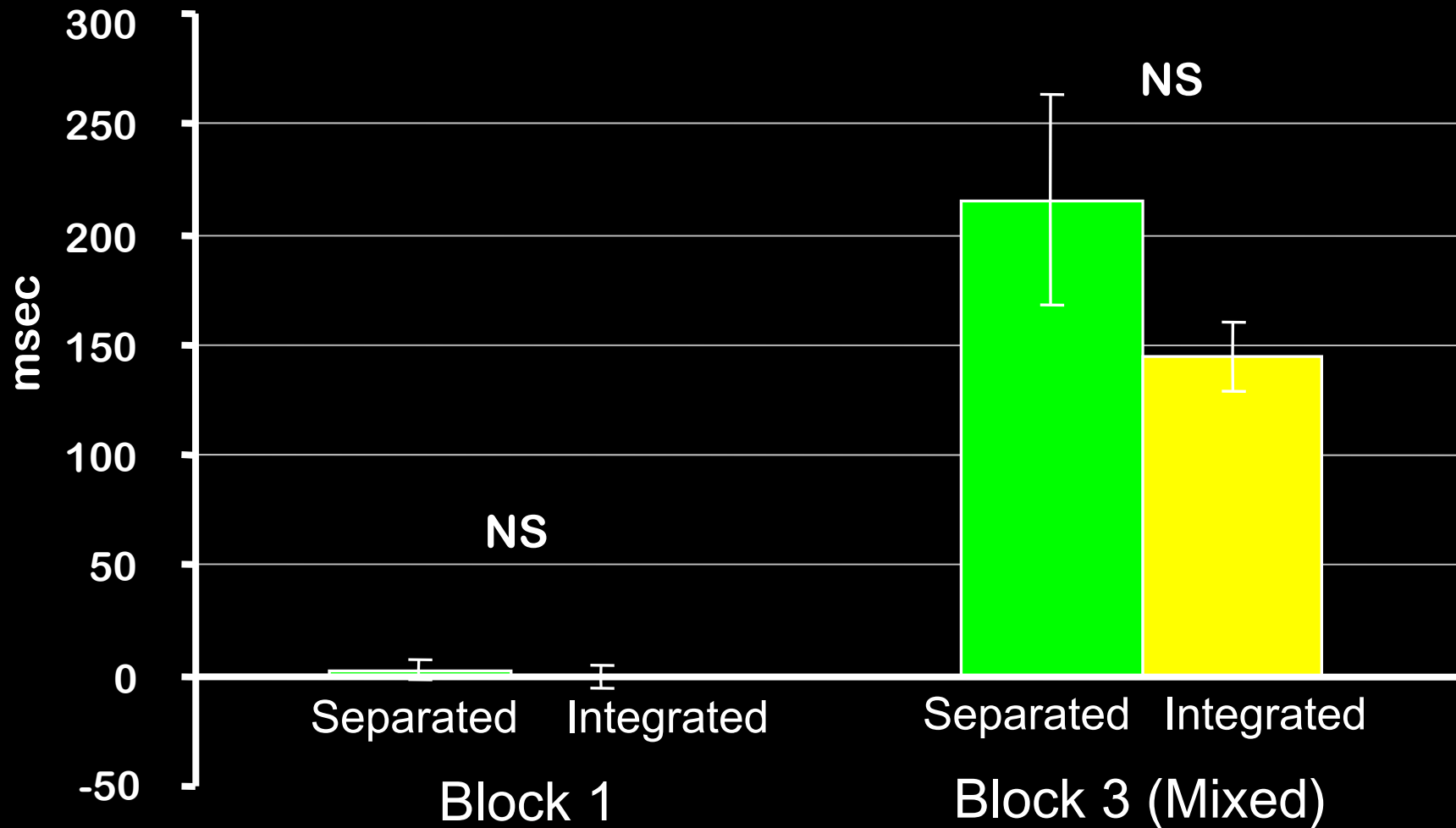
Rule type has an insignificant effect on the Flanker Effect for either the single-task block or the mixed block.

Flanker Effect: Block 1 vs. Block 3 INSIDE, Non-Switching for Separated and Integrated Rules in **Study 1** (Large Stimuli)



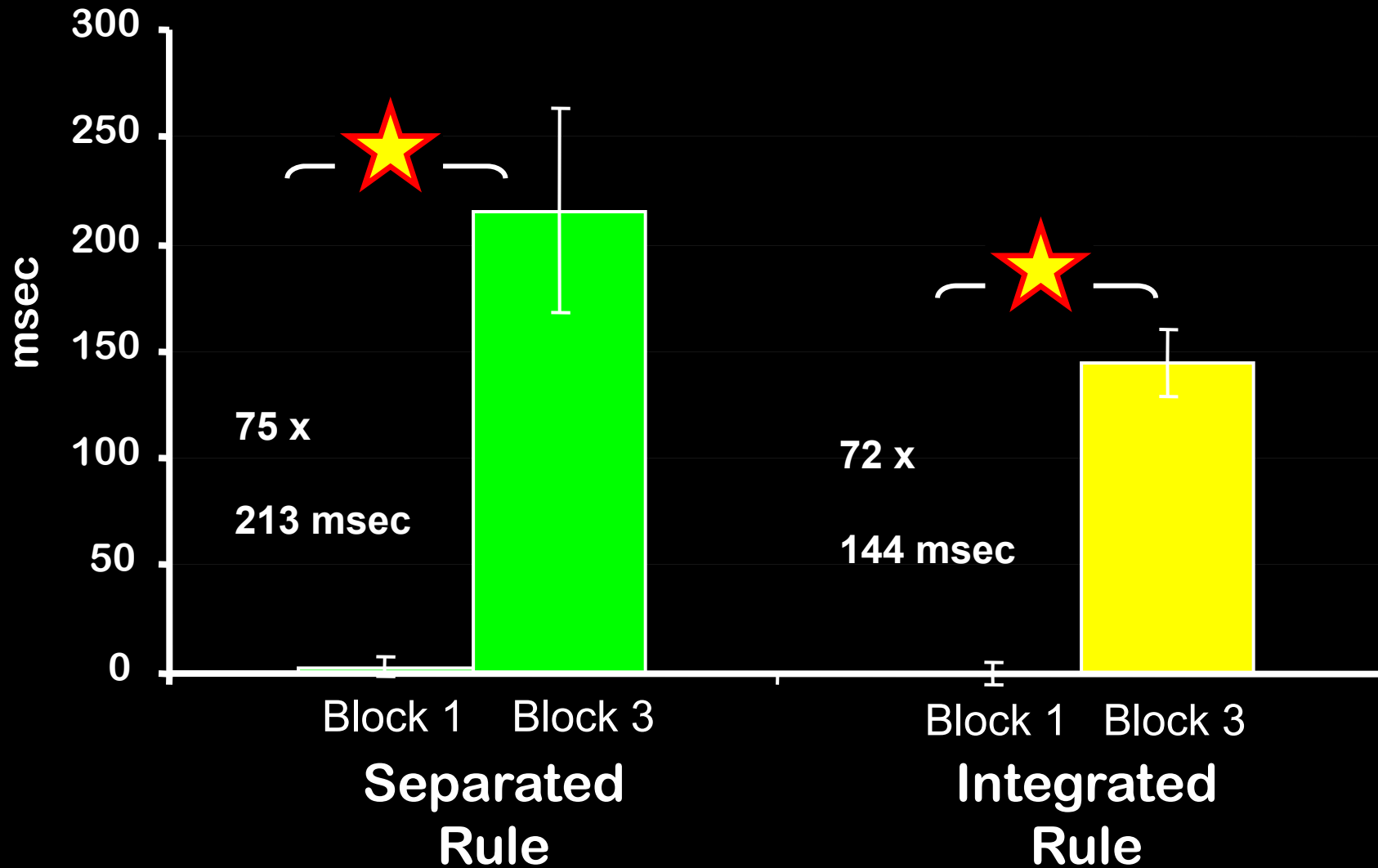
The Mixed Block is significantly larger than the Single Task Block for both rule types.

Flanker Effect: Separated vs. Integrated Rules for Block 1 and 3 OUTSIDE, Non Switching for **Study 1** (Large Stimuli)



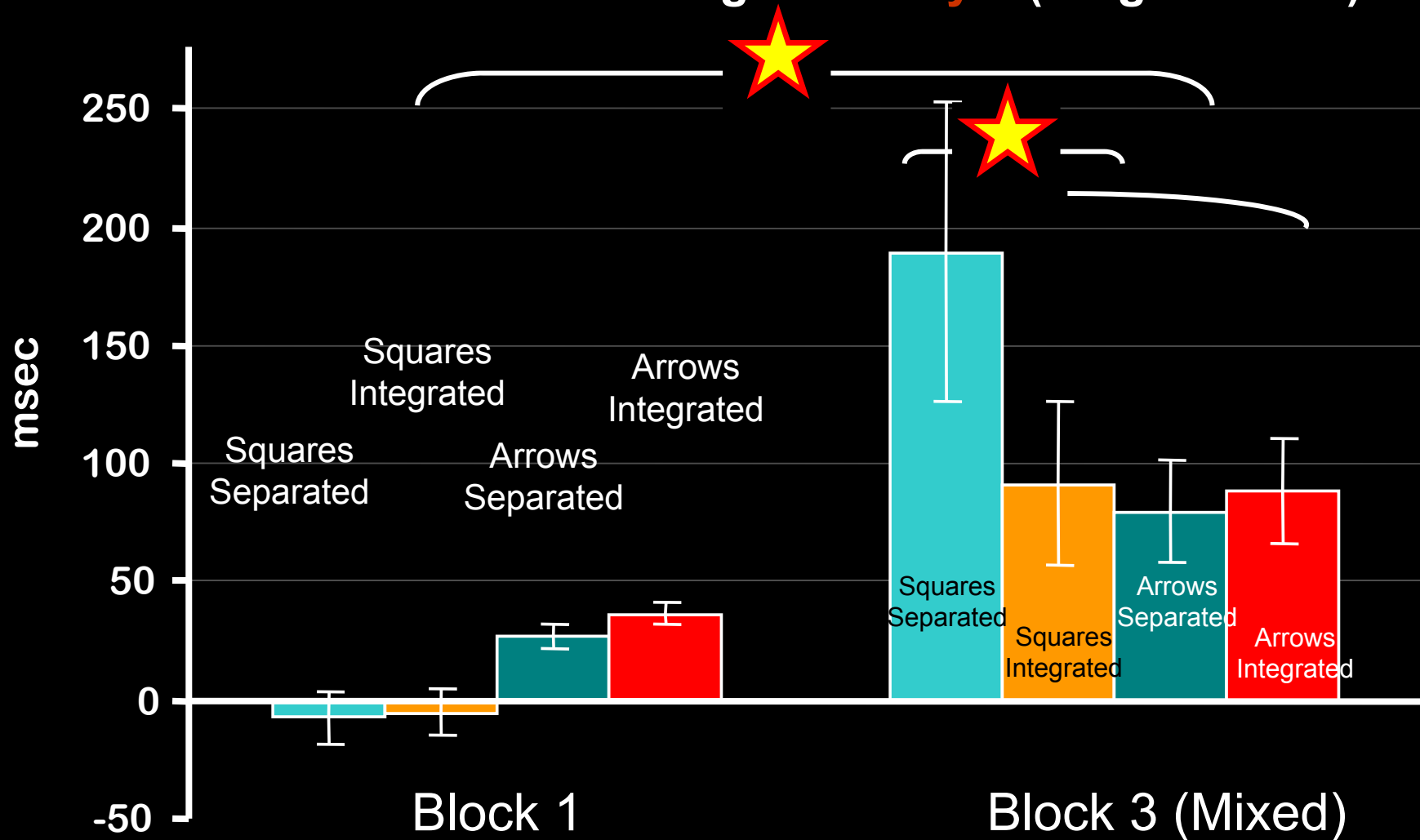
Rule type has an insignificant effect on the Flanker Effect for either the single-task block or the mixed block for Outside trials as well.

Flanker Effect: Separated vs. Integrated Rule for Blocks 1 and 3 OUTSIDE Non-Switching in **Study 1**



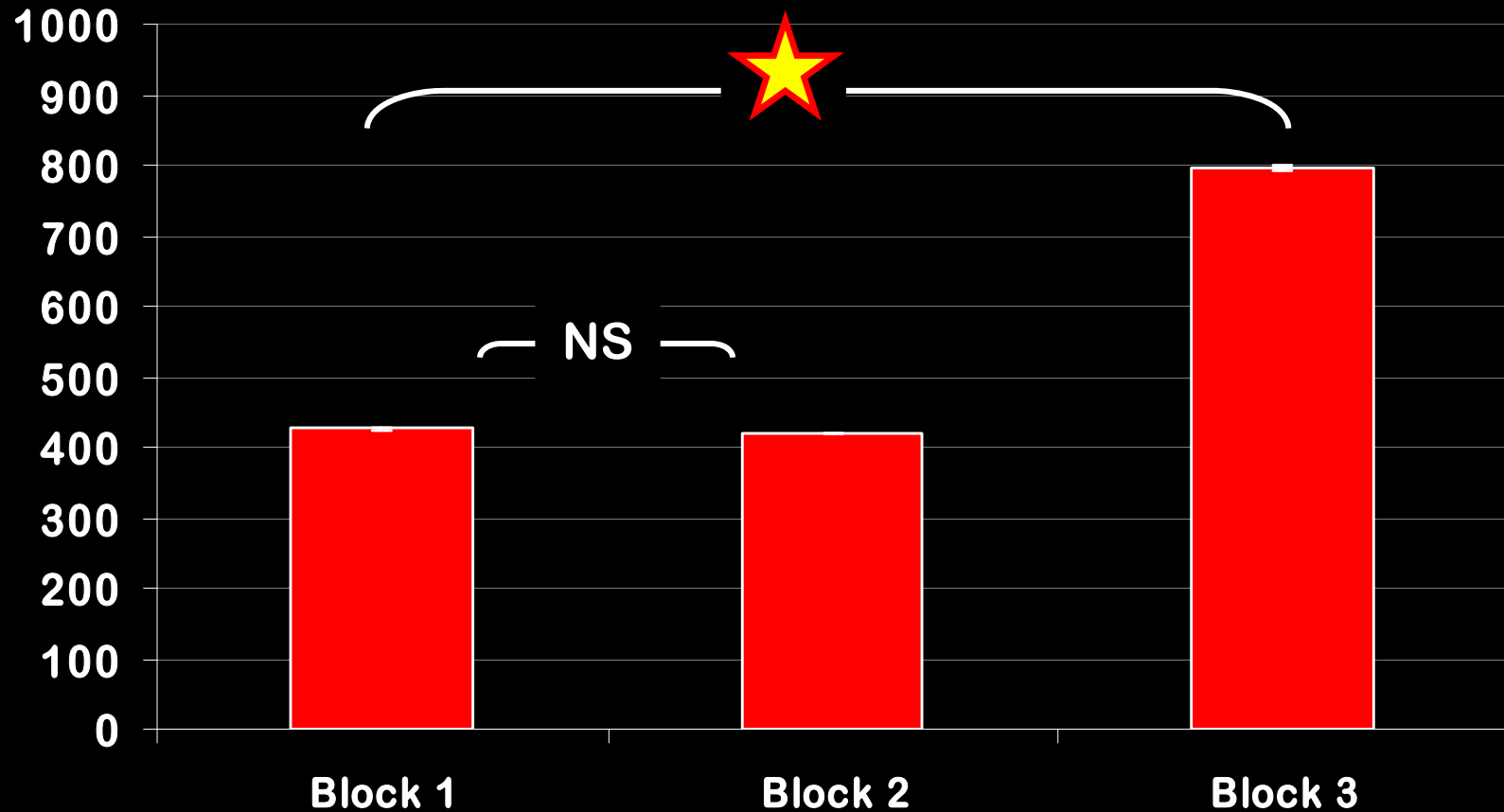
The Mixed Block is significantly larger than the Single Task Block for both rule types. for Outside trials as well.

Flanker Effect: Comparison by Condition for Block 1 and Block 3 Non Switching for Study 1 (Large Stimuli)



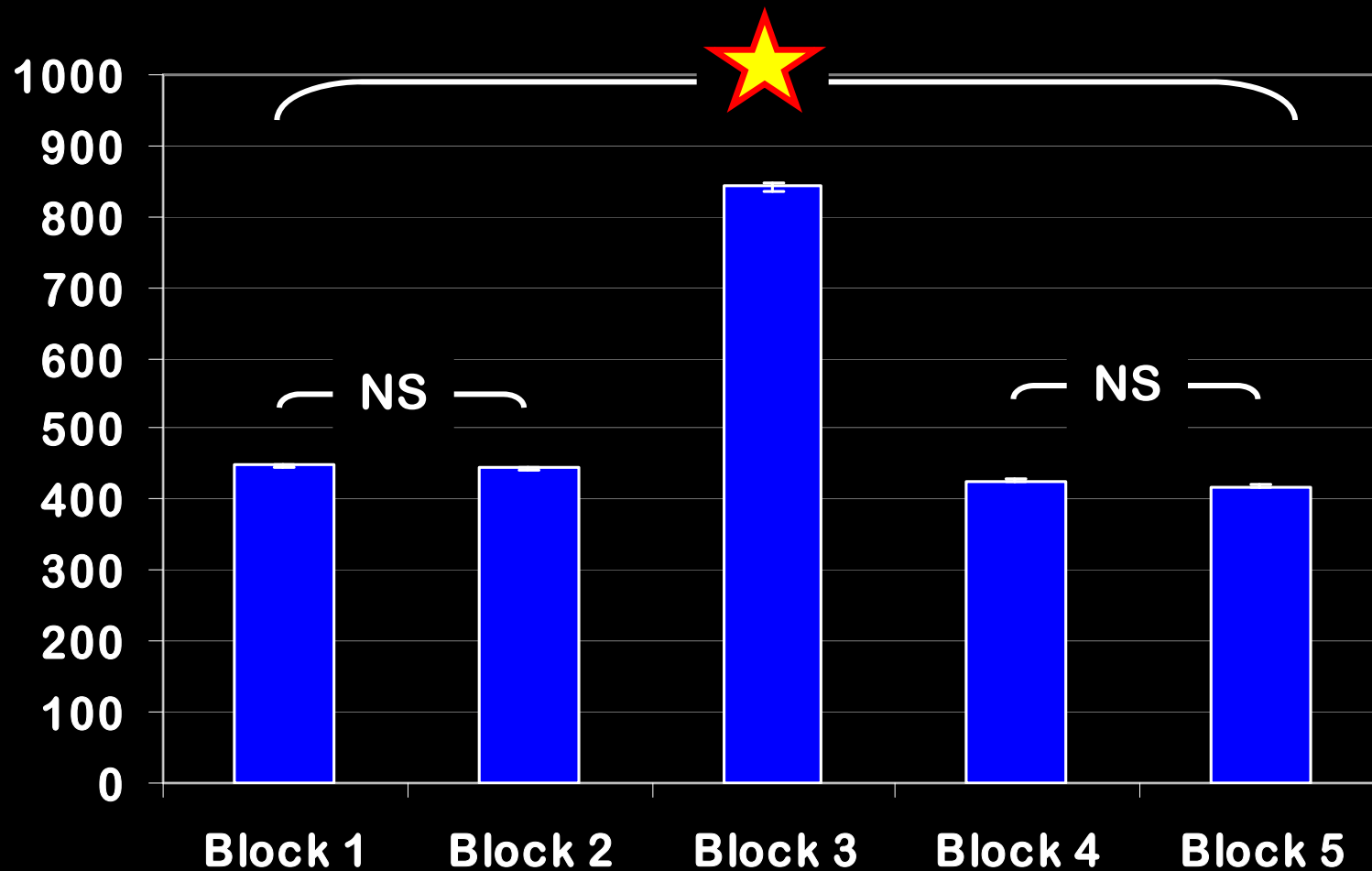
- Regardless of Stimuli Type/Rule Type combination, the Mixed Block for *any* conditions has a greater Flanker Effect than ALL Single-Task blocks.
- Squares Separated – A combo of two conceptually more difficult rules

RT: Study 1, Non-Switching Trials



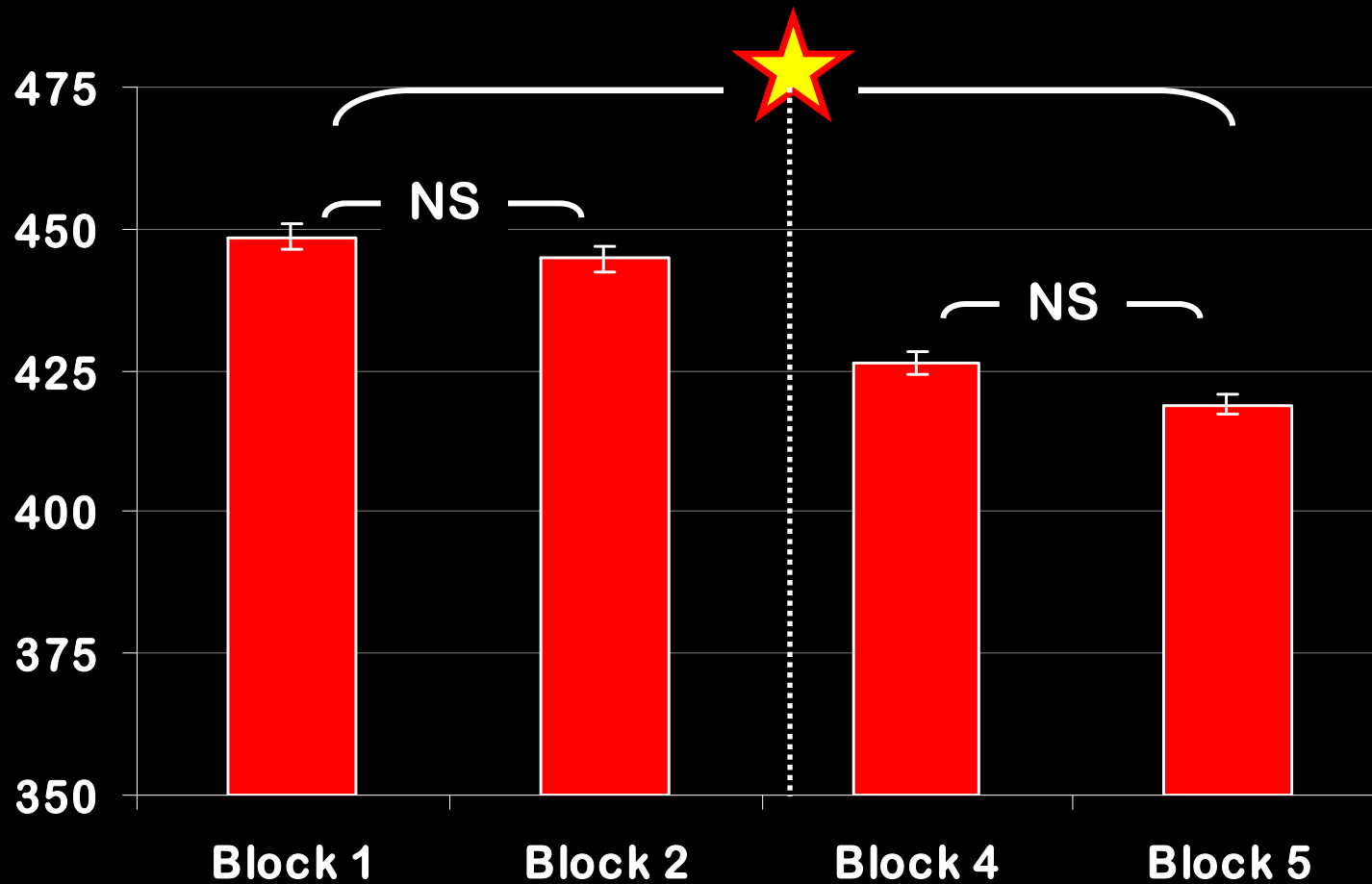
Single-Task Blocks in Study 1 are NOT significantly different from one another. The Mixed Block has a significantly longer RT than either Block 1 or 2.

RT: Study 2, Non-Switching



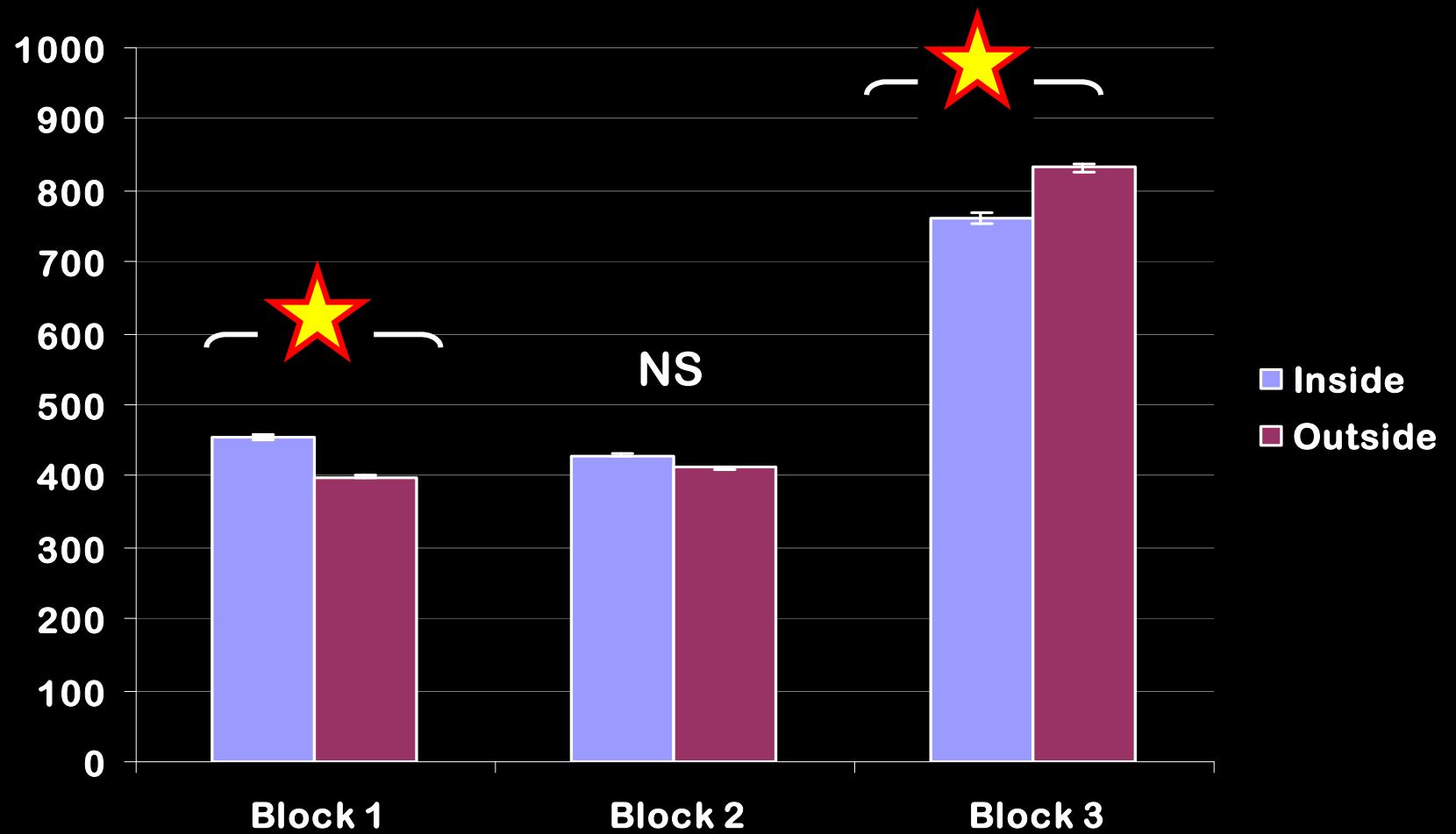
Similarly, in Study 2, the first set of single-task blocks are insignificantly different from one another and the second set of single-task blocks show no difference in RT. The mixed block has a significantly great RT than all the others

RT: Study 2, Single-Task Blocks

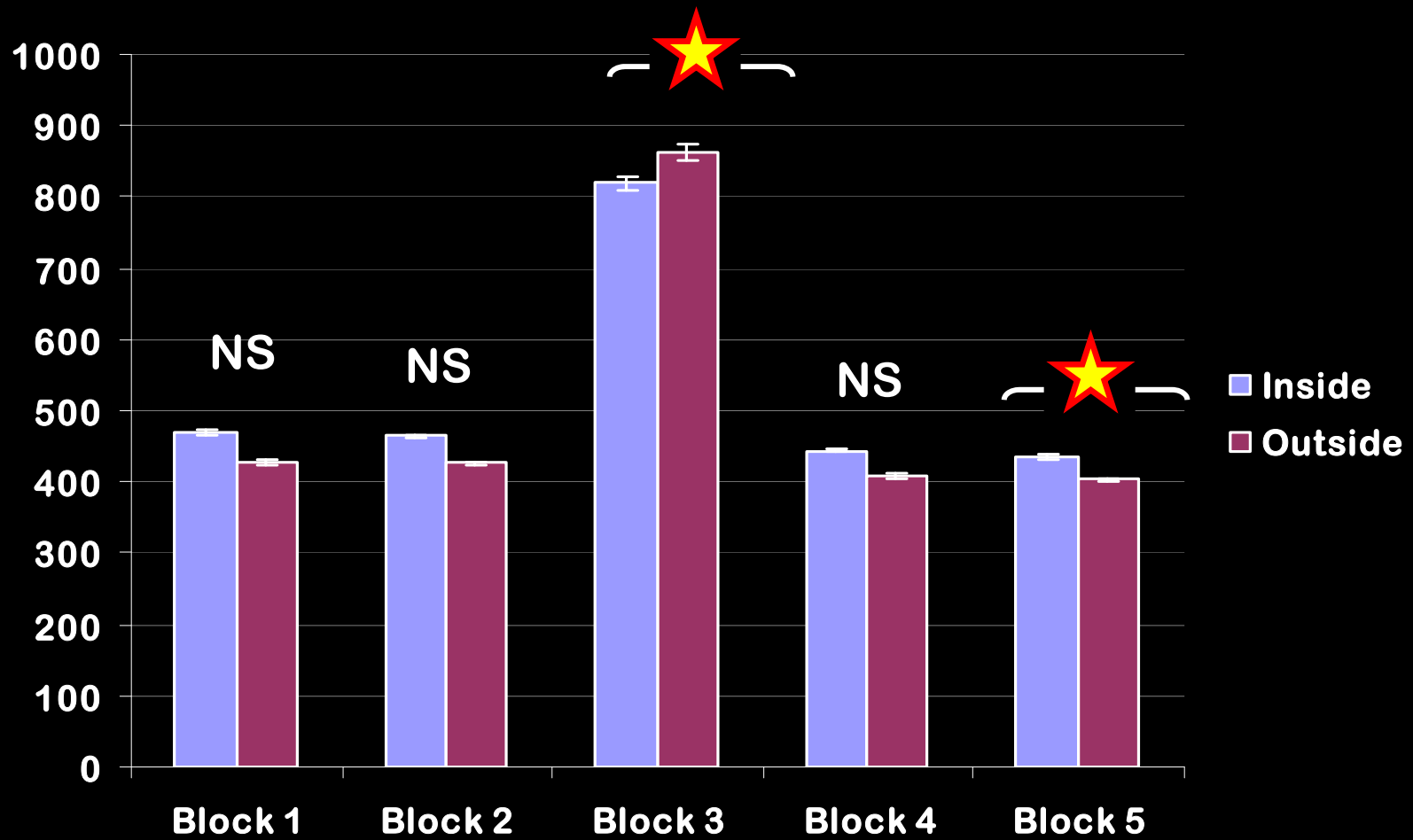


Blocks 4 and 5 display a practice effect on RT for the task. But remember, the Flanker Effect for the second two single blocks was *insignificantly different* from the first two.

RT: Inside vs. Outside Trials, Study 1



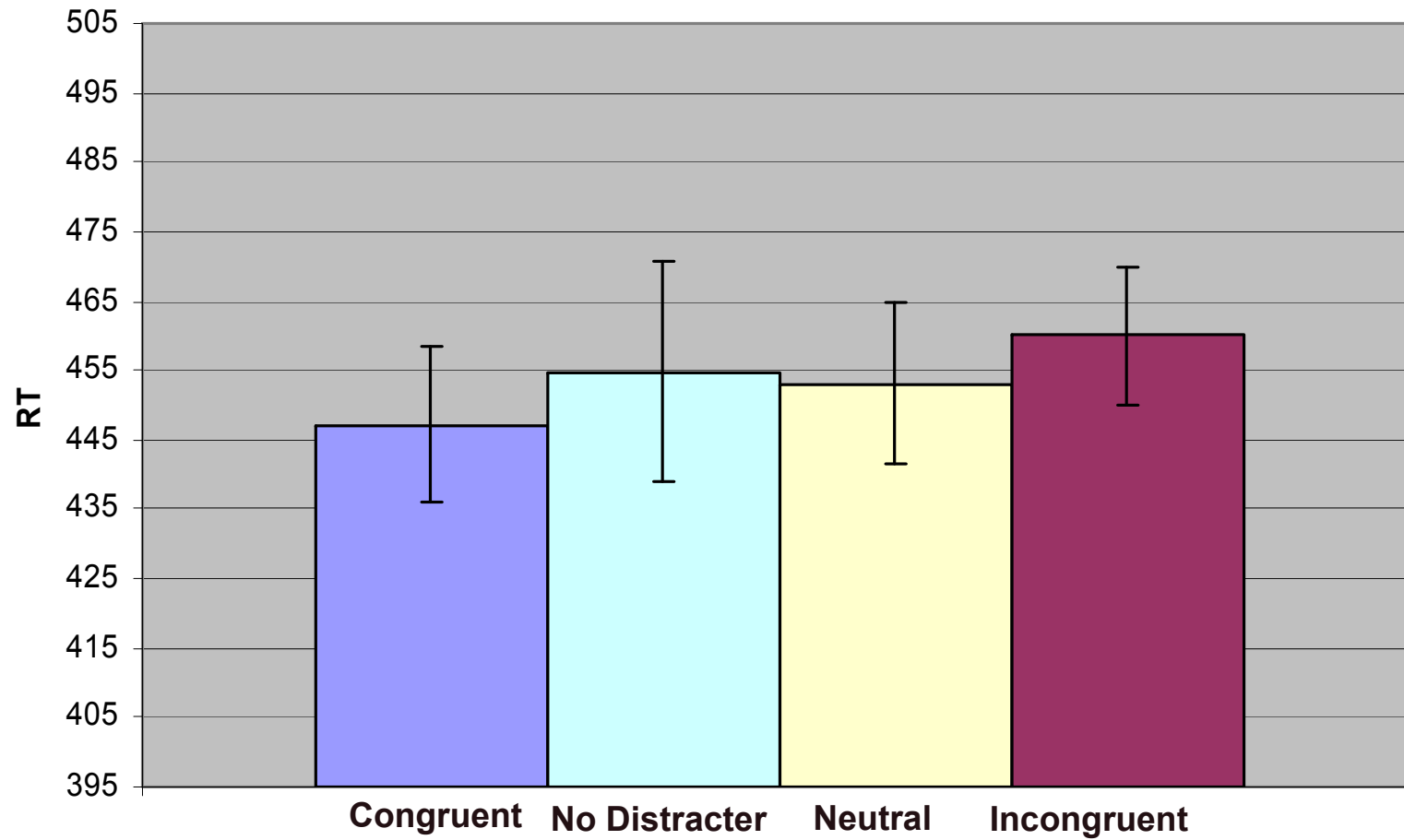
RT: Inside vs. Outside Trials, Study 2



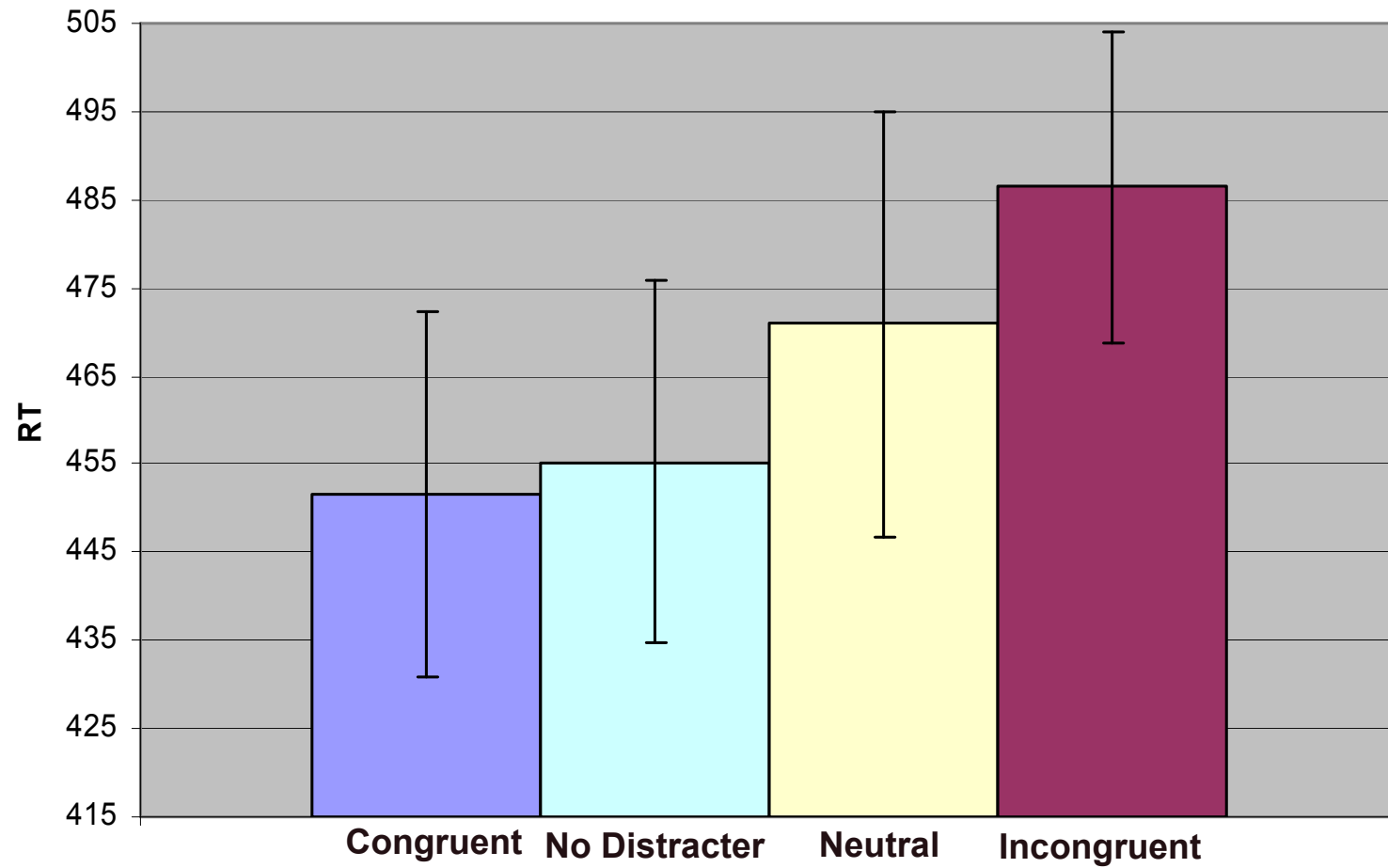
Trial Types

- 43% Incongruent Trials
 - 29% Congruent Trials
 - 14% Neutral Trials
 - 14% No-Distractor Trials
-
- Order of trial-types and Switching (of Responses, Inside/Outside, and between trial-types) were counterbalanced within blocks.

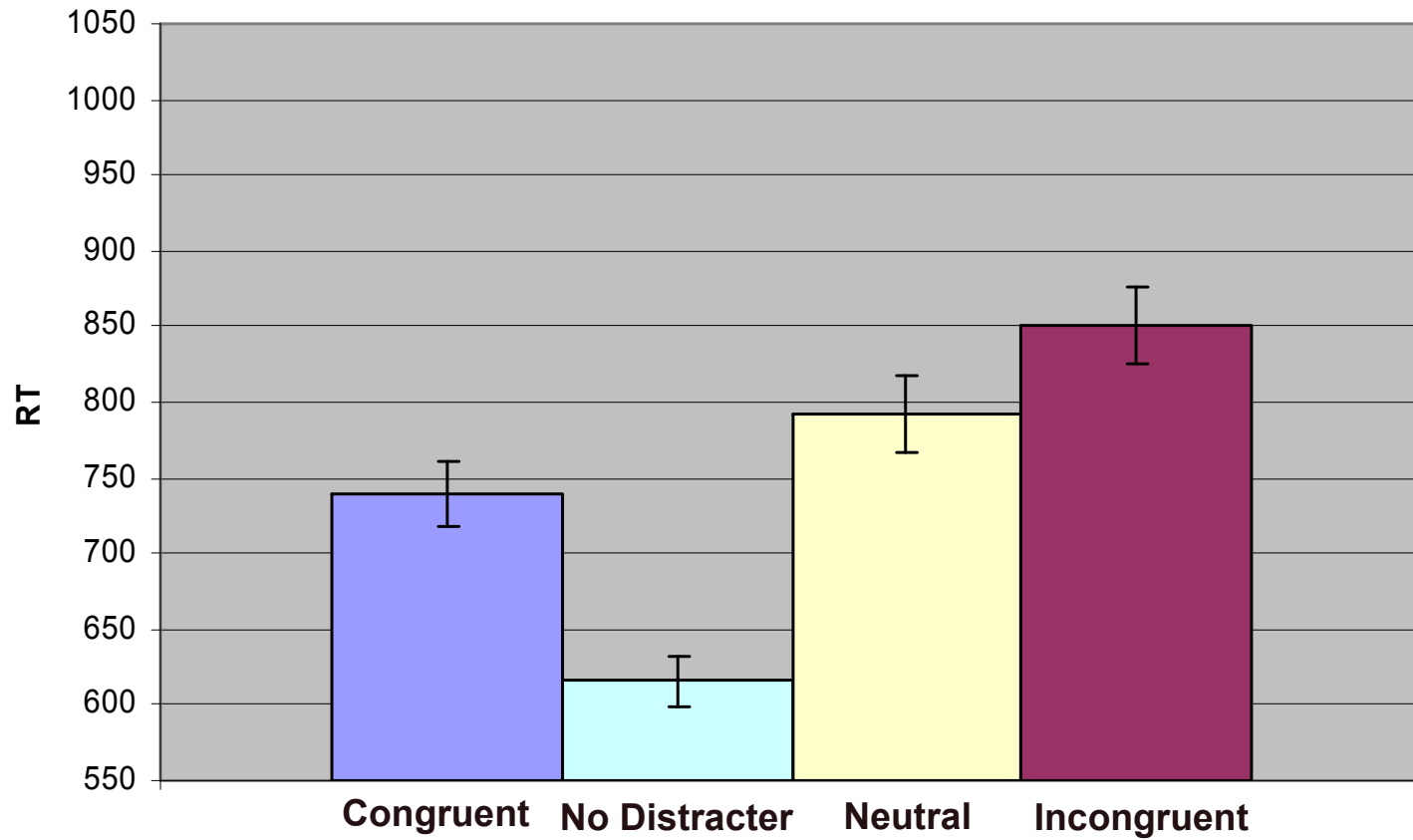
Study 1 INSIDE Block 1



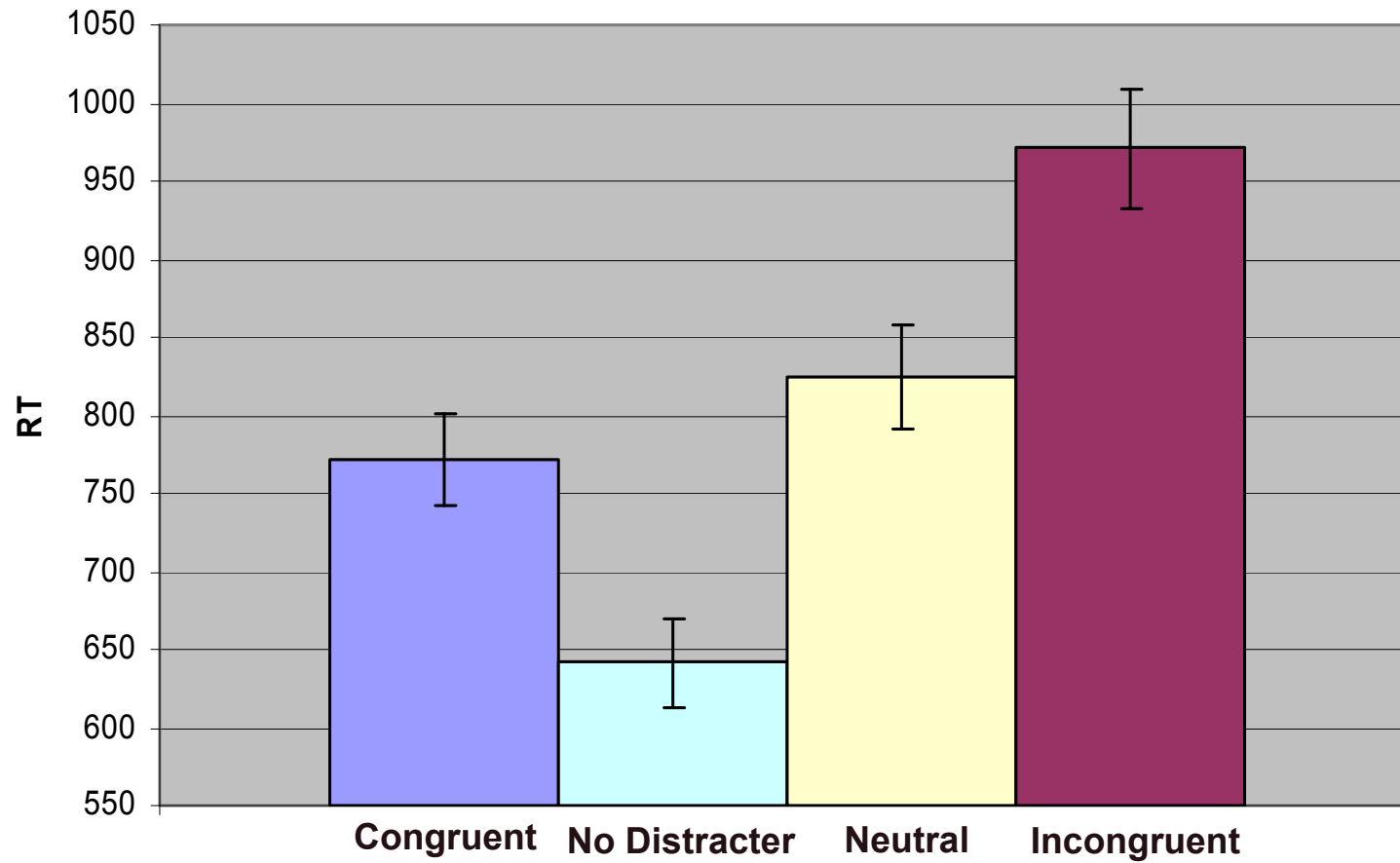
Study 2 INSIDE Block 1



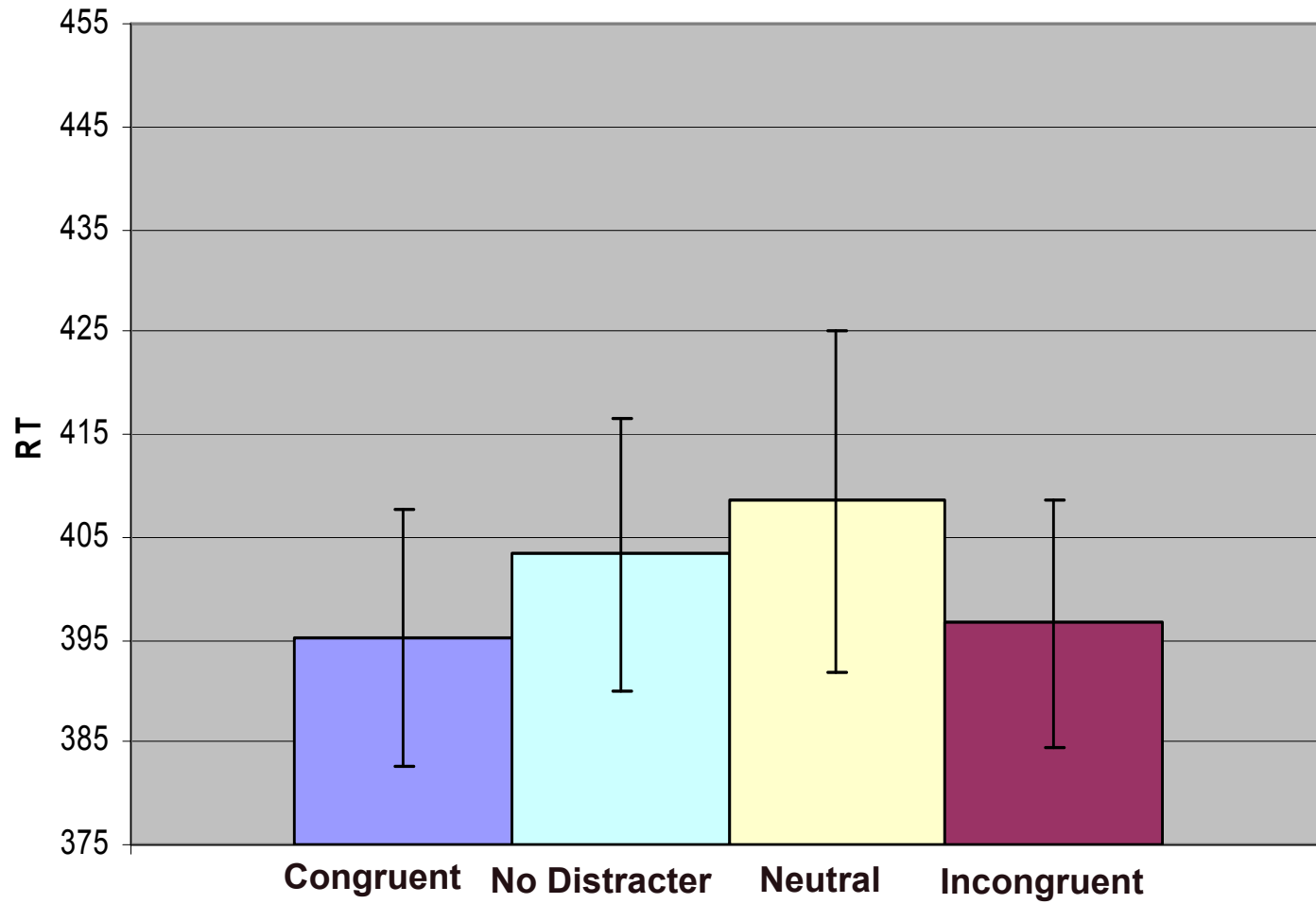
Study 1 INSIDE Non-Switch Block 3



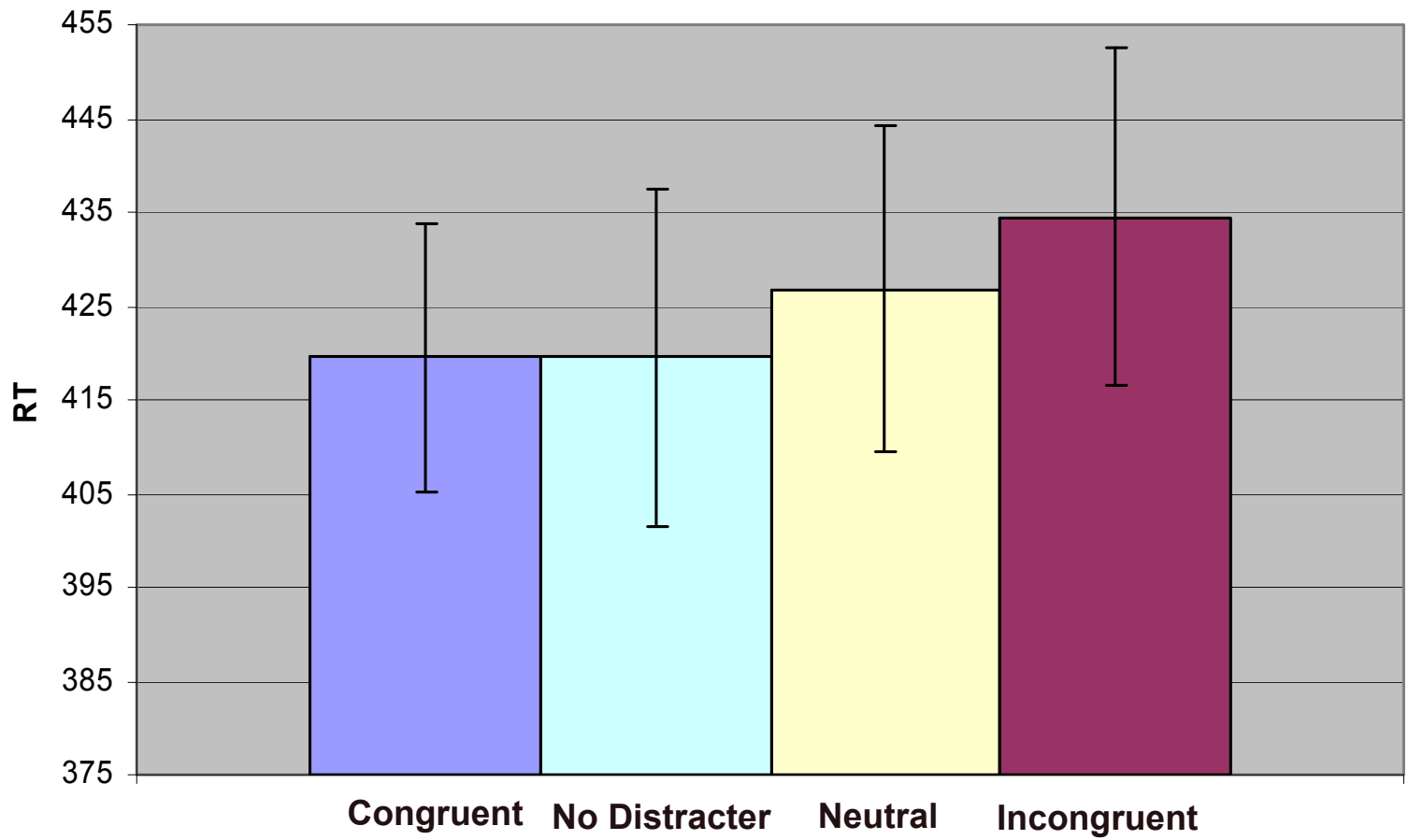
Study 2 nonSwitch inside Block 3



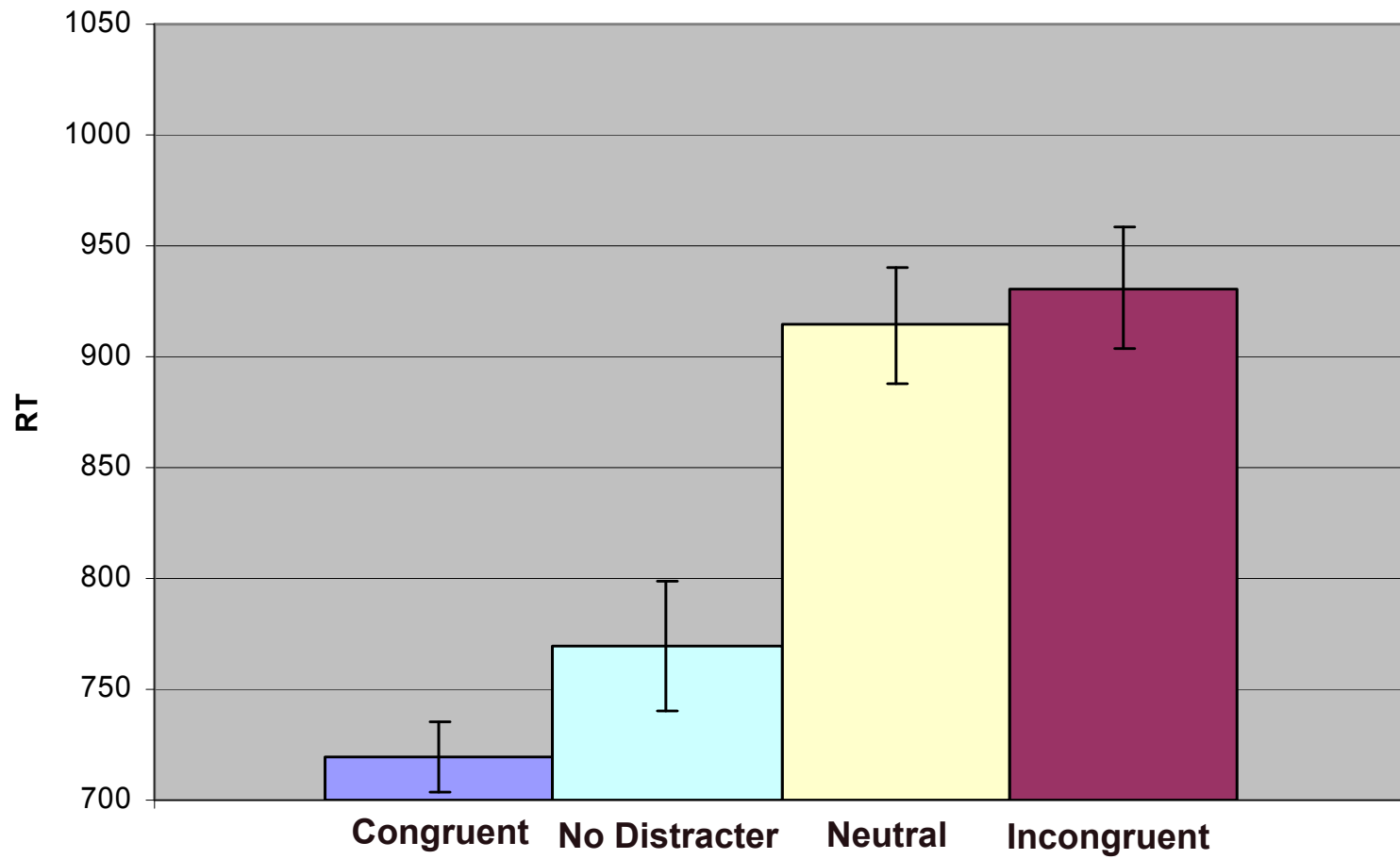
Study 1 OUTSIDE Block 1



Study 2 OUTSIDE Block 1



Study 1 OUTSIDE Non-Switch Block 3



Study 2 OUTSIDE Block 3

