

A new technique for measuring the critical spacing of crowding

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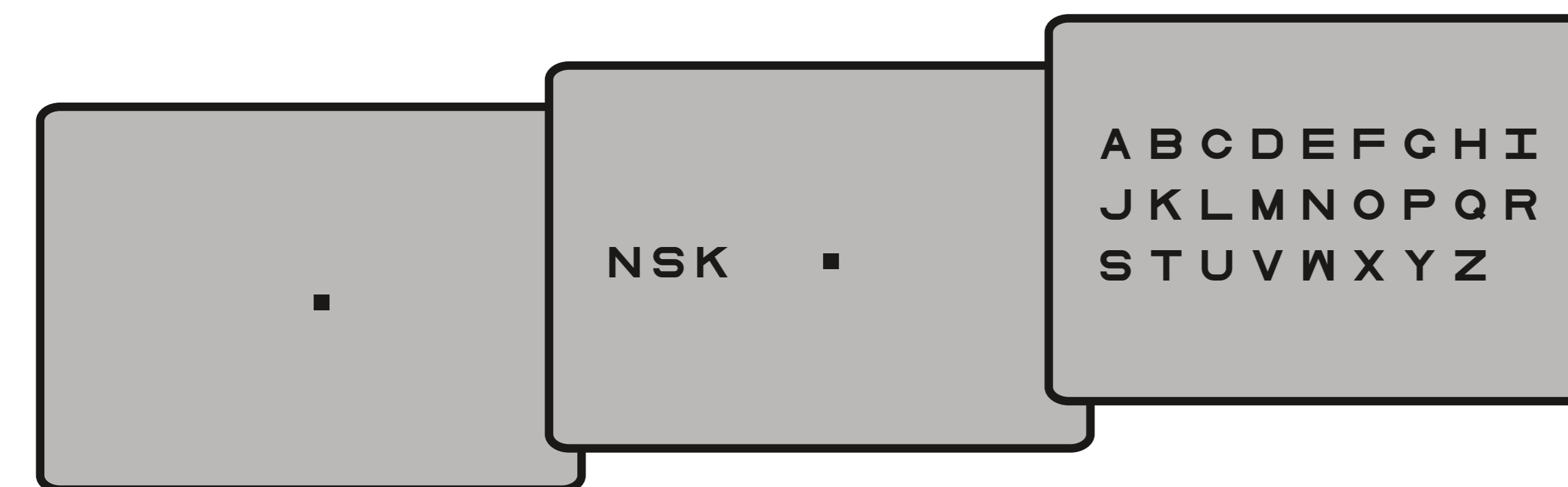
Introduction

Crowding is the inability to recognize a peripheral target when surrounded by flankers. Critical spacing is the minimal center-to-center distance needed between a target and flanker in order to escape crowding. This is usually measured using a target identification task, which relies on the observer's report. This method cannot be used with infants and other special populations. Here we develop a new technique which may be applicable to these populations.

Methods

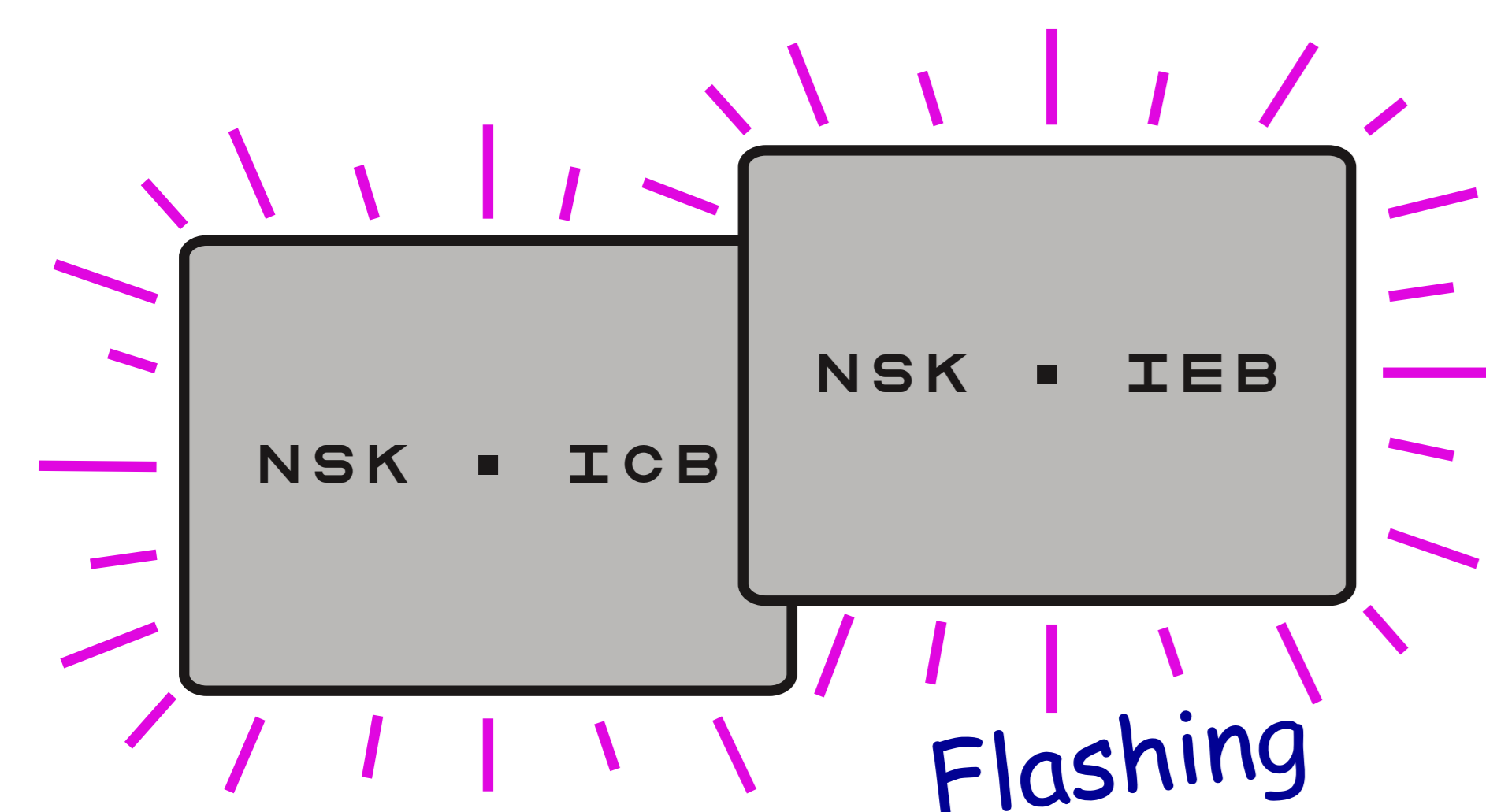
Target identification: explicit instructions

- Observer reports target by using a cursor to select a letter



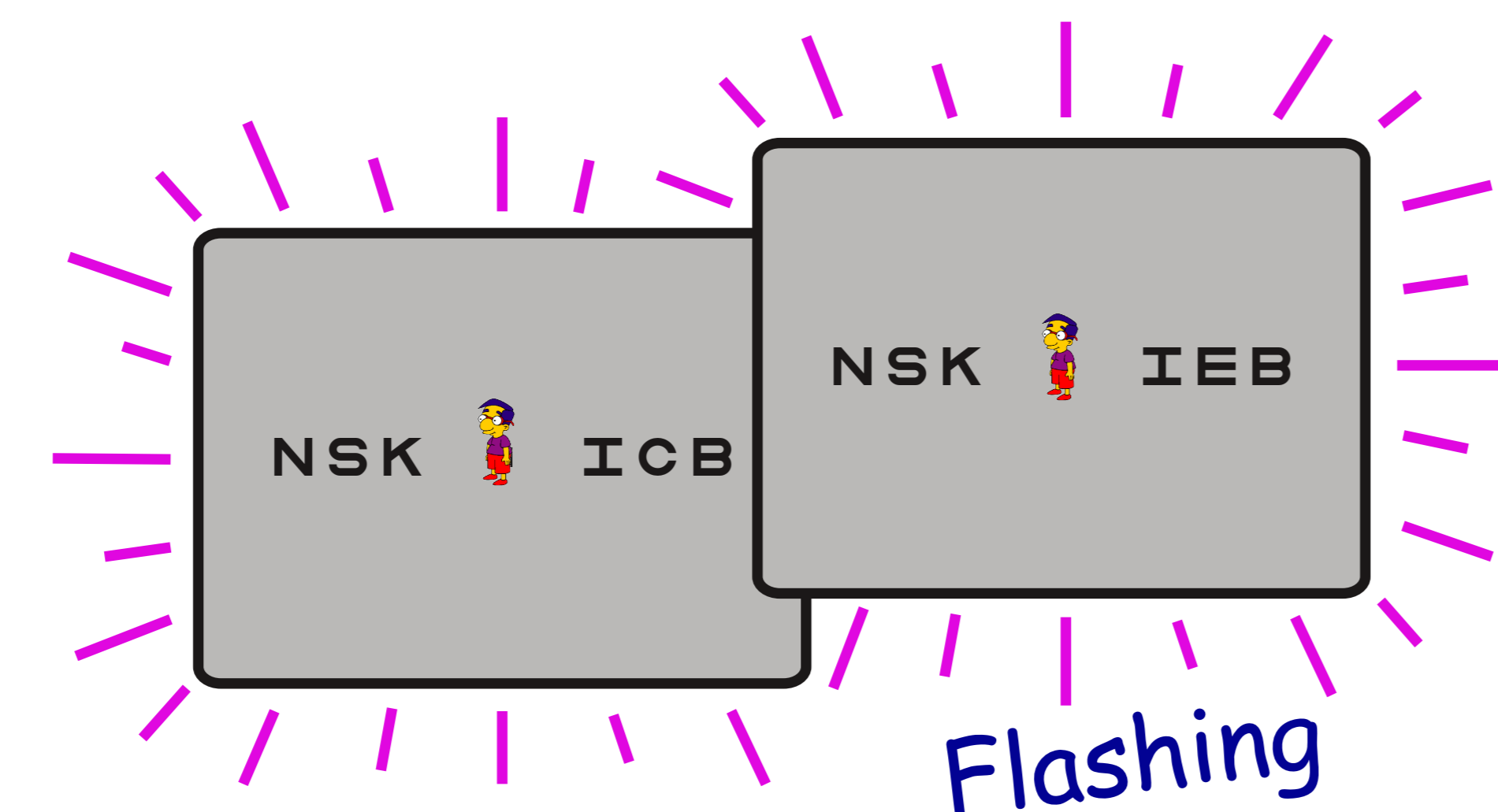
Change detection: explicit instructions

- Target and flankers flashed at 2 Hz
- Observer reports side of change with keypress



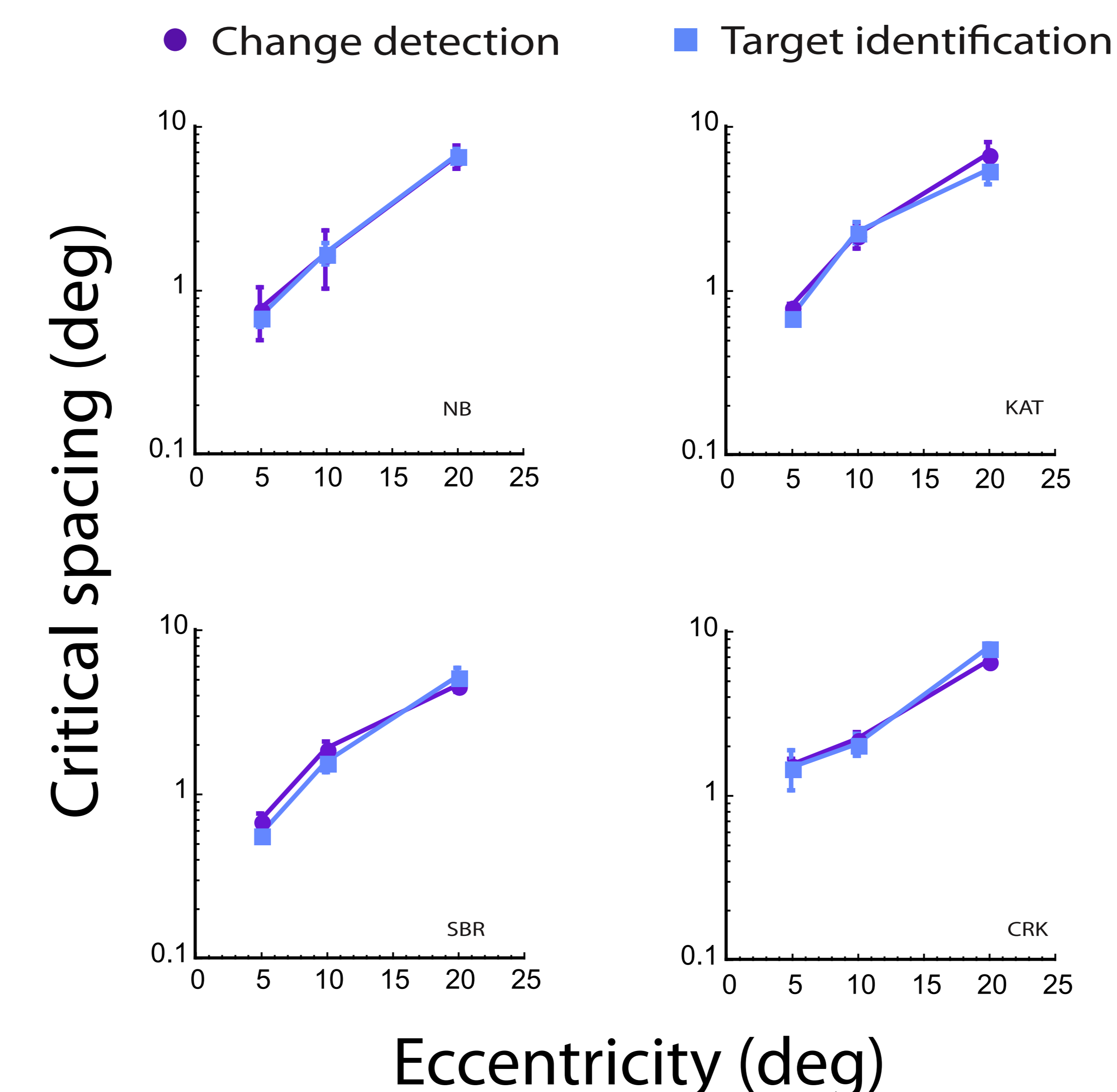
Change detection eye-tracking: no explicit instructions

- Target and flankers flashed at 2 Hz
- Change does not occur until subject fixates cartoon
- After change, infer choice from direction of saccade



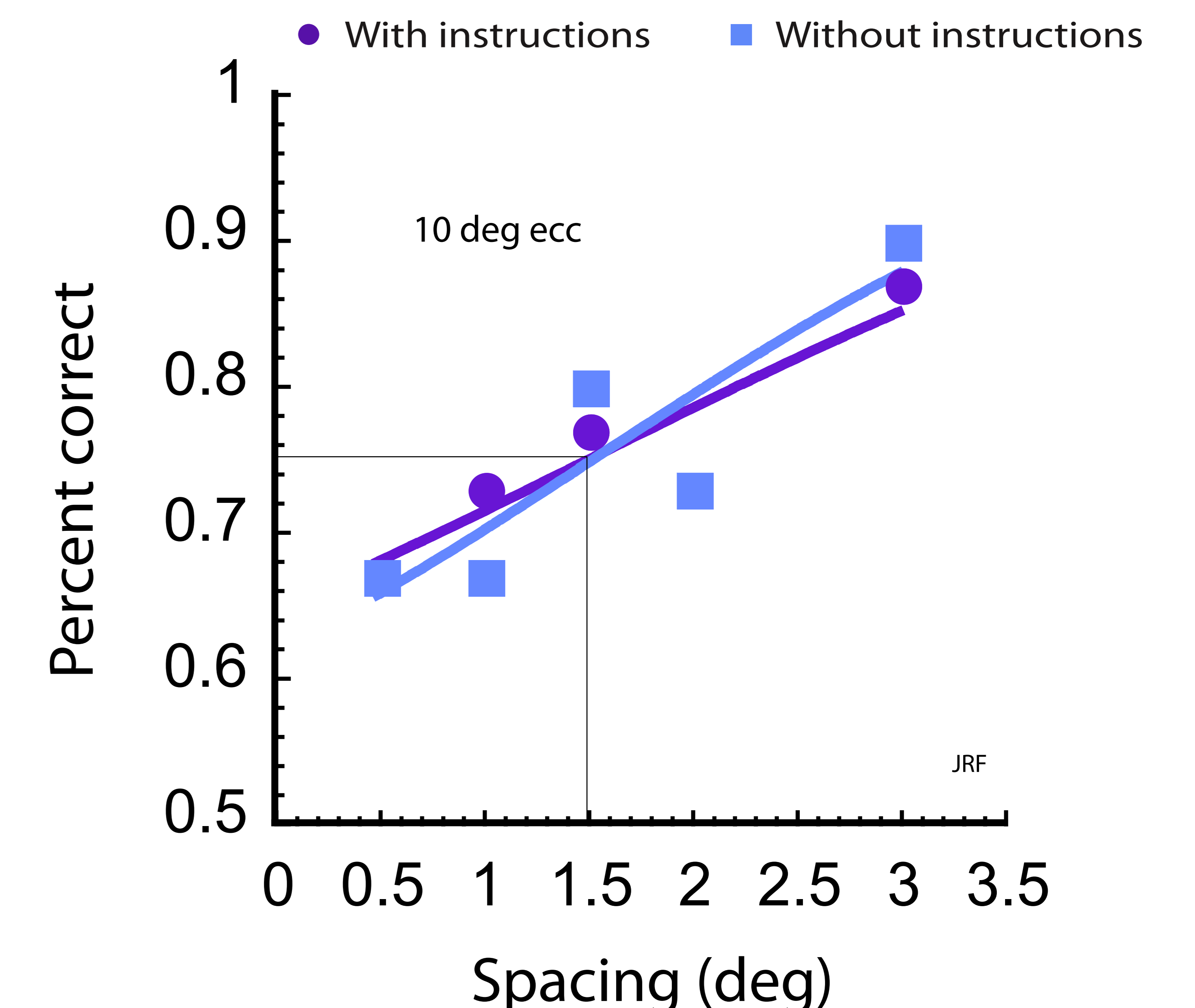
Results

Measures of critical spacing:
Target identification vs change detection



With target identification threshold at 65% and change detection threshold at 85%, the two methods provide identical results.

Change detection with and without instructions



Psychometric curves (probit) are fitted to performance as a function of spacing. Performance on the change detection task is the same when measured with and without instructions.

Conclusion

Our change-detection method for measuring the critical spacing of crowding gives results equivalent to those obtained with the target identification method. With eye-tracking, it provides a test that does not require explicit instructions. This is likely to be useful for infants and other special populations.

