

# Taking all bets!

## Is Post-decision Wagering a superior method for measuring conscious experience?

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### Background

Much consciousness research relies on introspective reports. Recently however, introspective reports have been criticised for not being exhaustive (i.e. subjects hold back information) because no external motivation is given to report as accurately as possible. This criticism questions the validity of the majority of behavioural and neuroscientific research into consciousness. To avoid relying on introspection, a method called post-decision wagering (PDW) has been introduced to provide such information. The present study compares PDW to introspection-based methods.

### Methods

Procedure (Fig. 1):

- Identify geometric figure (stimulus durations: 16-192ms)
- Report level of conscious awareness using one of three 4-point scales:
  - 1) Perceptual Awareness Scale (PAS): Describe the clarity of their visual experience.
  - 2) Confidence Rating (CR): Report confidence in being correct.
  - 3) Post-decision wagering (PDW): Place wager on being correct.

Analyses:

- Guessing criterion: Calculates the amount subliminal performance present when subjects report minimal conscious experience. The most exhaustive scale is the one that indicates the least above-chance performance.
- Zero correlation criterion: Indicates if conscious processing is present by calculating if accuracy varies across awareness ratings. If accuracy is the same for all awareness ratings, then subjects are not aware.
- Curve fitting of task accuracy and awareness ratings as sigmoid functions of stimulus intensity (i.e. duration). The difference between the centre point of the accuracy curve and the awareness curve is taken to be the lag between accuracy and awareness. The best scale is the one that indicates the least lag (i.e. the least subliminal processing).

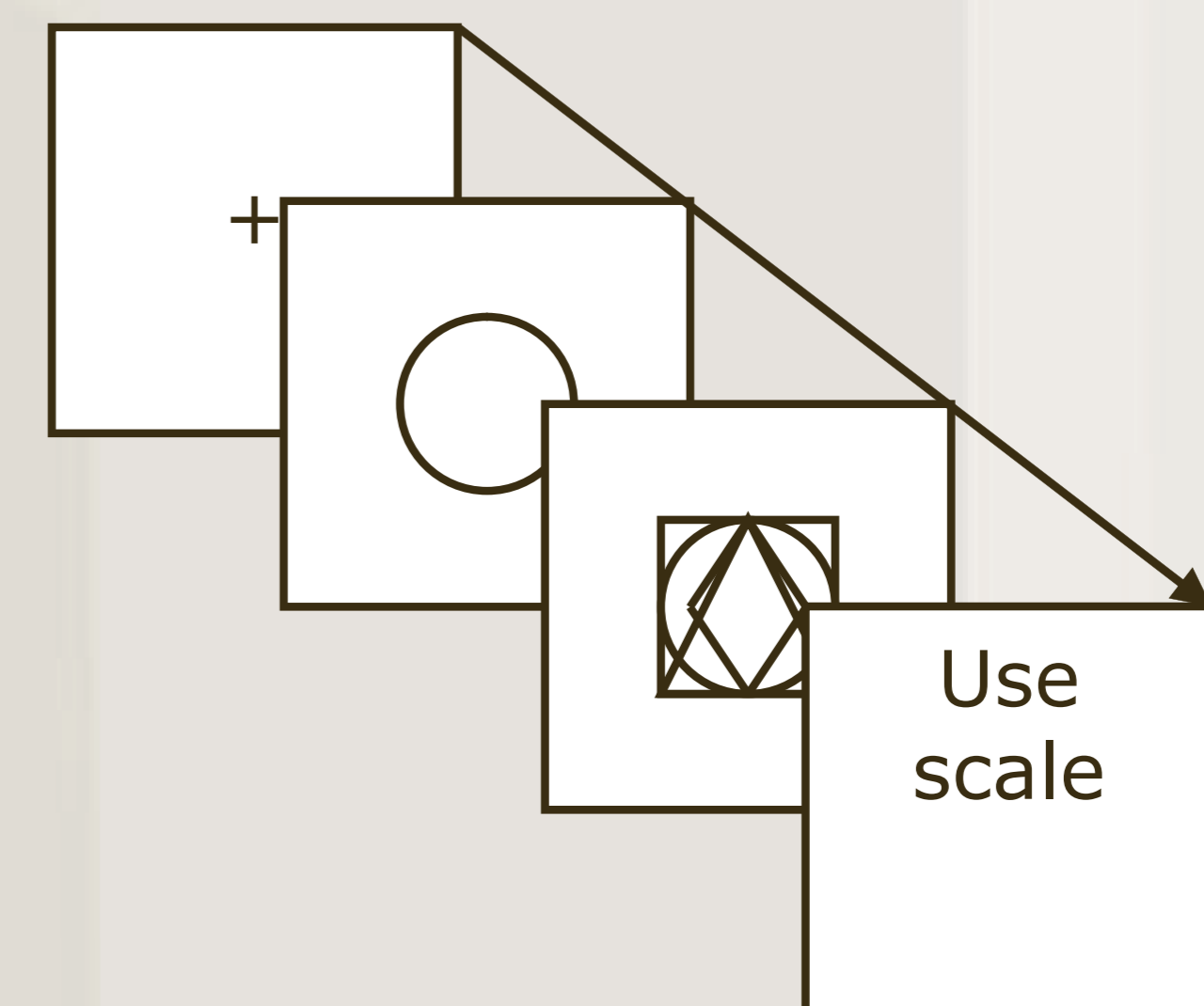


Figure 1: Trial sequence. 1) Fixation, 2) Geometric figure, 3) Mask (subjects report which figure they saw here), and 4) Request to use awareness scale.

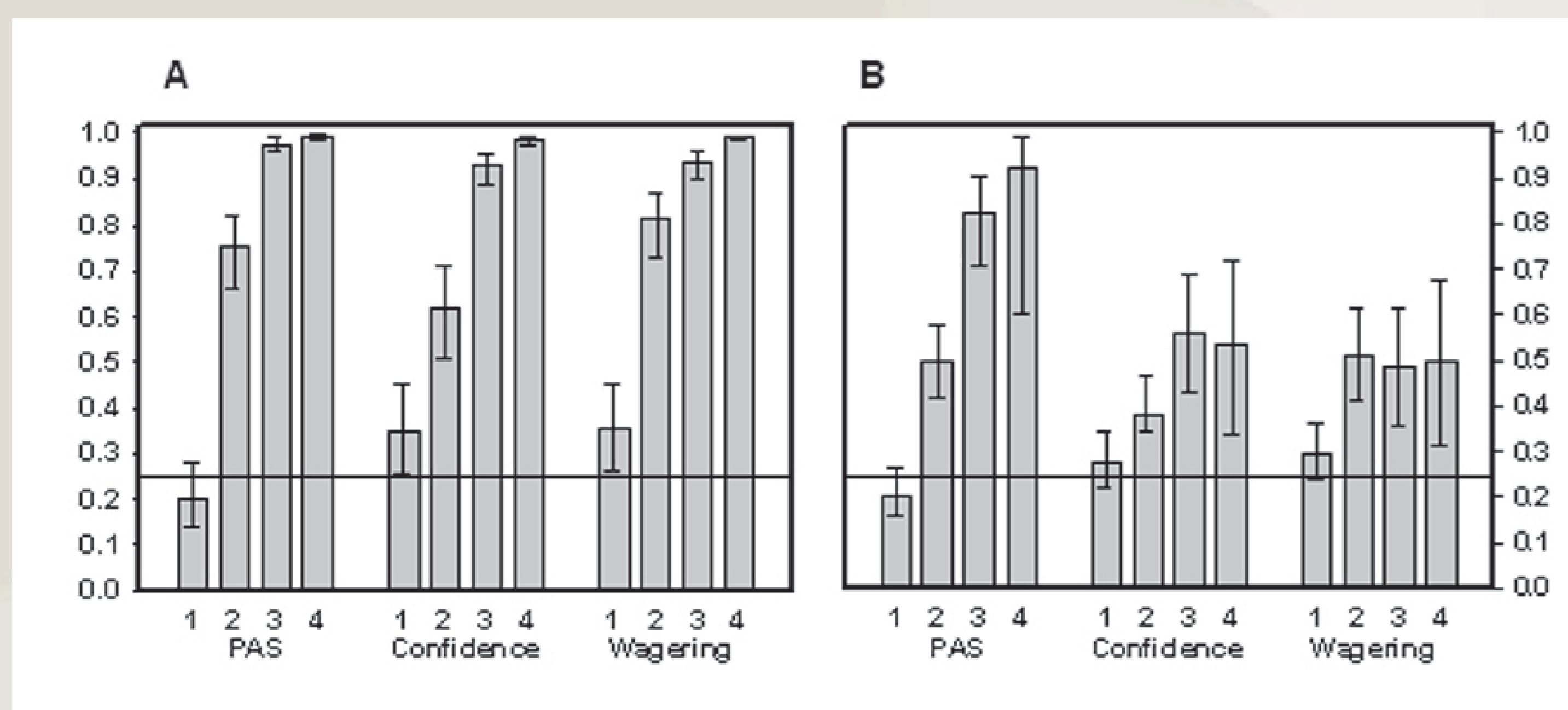


Figure 2: Task accuracy as a function of awareness rating for each group. Bars represent the average task accuracy associated with each awareness rating (ranging from 1 to 4) for each subject group (labelled by the scale used). Error bars represent 95% confidence intervals. The vertical black line is chance level. (a) All presentation times. (b) Presentation times 16-64ms (hard stimuli).

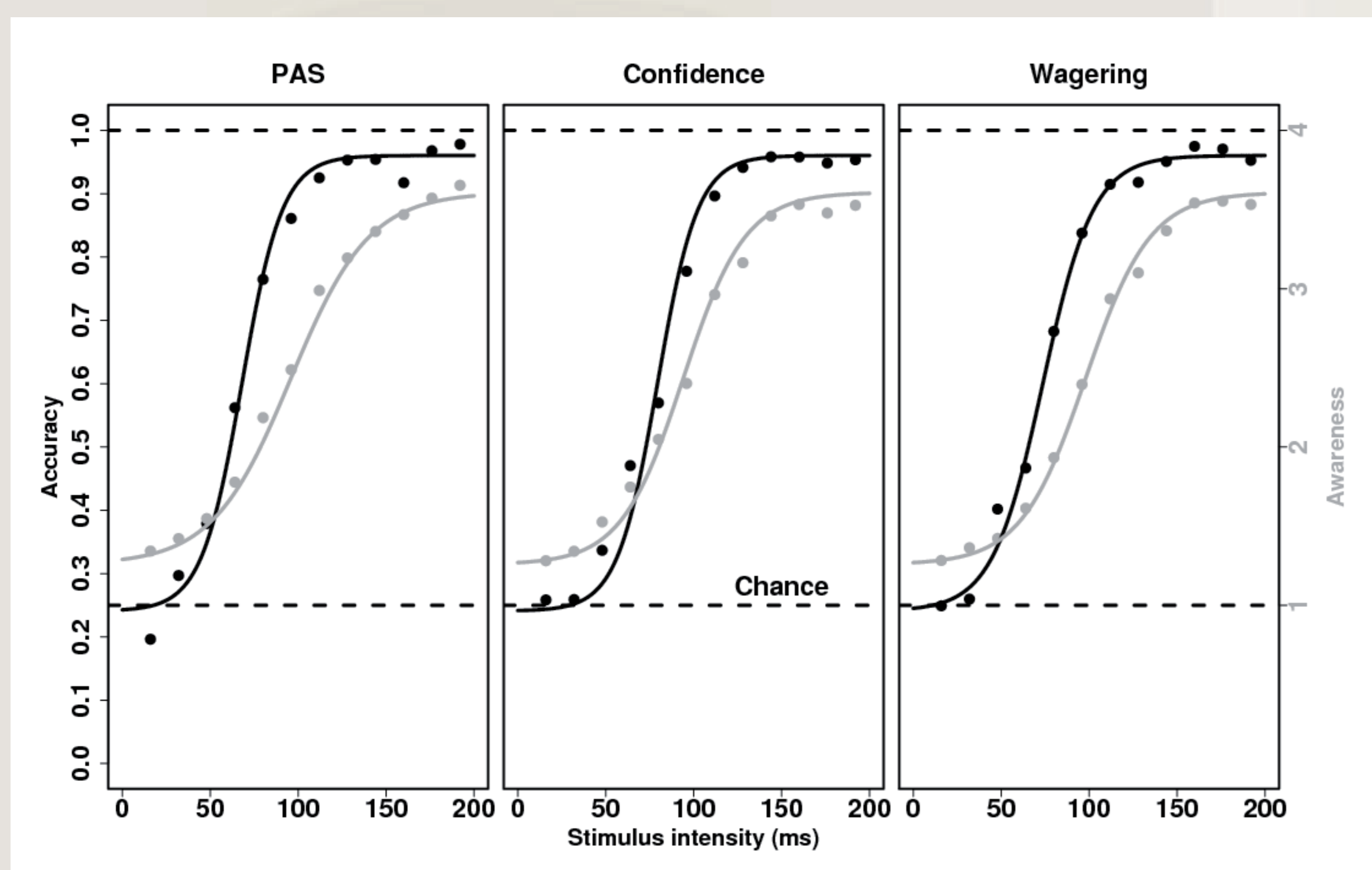


Figure 3: Accuracy and awareness ratings as functions of stimulus duration displayed for each group. Sigmoid functions are fitted to the results.

### Results

- Guessing criterion: Tested separately, CR and PDW indicated subliminal performance ( $p=0.029$ ;  $p=0.024$ ), whereas PAS did not ( $p=0.202$ ) (see Fig. 2), but interscale differences were not significant ( $p=0.171$ ). The common accuracy was above chance level ( $p=0.0095$ ).
- Zero correlation criterion: Accuracy was found to vary as a function of awareness rating for all scales individually ( $p<0.001$  for all scales) and to be explained by an interaction of awareness rating and group ( $p<0.0001$ ). For all scales, accuracy increased when awareness rating increased by one ( $p<0.001$  (uncorrected) for all calculations). As absence of awareness is most likely to occur for hard stimuli, the same tests were made for stimulus durations 16-64ms. Results were similar in this case, except that more differences in accuracy for different awareness ratings were found for PAS than for CR and for CR than PDW.
- In the curve analysis (Fig. 3), all scales showed presence of subliminal processing ( $p<0.001$  for all calculations). The scales did not indicate the same lag ( $p<0.05$ ). CR indicated a smaller lag than PAS ( $p<0.05$ ), and there was a tendency for PDW to indicate a larger lag than the CR ( $p=0.06$ ). No difference was found between PDW and PAS ( $p=0.501$ ).

### Conclusion

PDW failed to prove superior to introspection-based methods. Using traditional statistical measures, the purely introspective method, PAS, showed a slightly better relationship between awareness and task accuracy. Using a novel method, the other introspection-based method, CR, was slightly superior.