

# Blood pressure variability and the association with dementia or cognitive impairment: a systematic review and meta-analysis



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## BACKGROUND

- Recent empirical work demonstrates an association between intra-individual blood pressure variability (BPV) with stroke, cerebral small vessel disease, and major cardiovascular events, however, the association with brain function remains less clear.
- Intra-individual BPV is typically calculated from consecutive blood pressure measures such as 24-hour ambulatory blood pressure monitoring (ABPM) or between multiple visits to a general physician.
- It remains uncertain whether BPV or mean blood pressure holds more significance in understanding vascular contributions to cognitive impairment.

## OBJECTIVE

- Our objective was to systematically review the literature and quantify the association between intra-individual BPV with dementia or cognitive impairment, comparing the magnitude of the association between BPV and cognitive outcomes with the effect sizes for mean blood pressure.

## METHODS

- A systematic review of electronic databases was performed on MEDLINE, EMBASE, PSYCINFO and SCOPUS from inception until 20<sup>th</sup> April 2021 (PROSPERO CRD42017081977).

## Eligibility criteria

### Population

- Adults over 18 years with no upper age limit.
- With or without hypertension
- Free from sub-acute stroke within 4 weeks.
- Recruitment from primary care, community cohort, electronic database registry, or randomised controlled trial populations.

### Exposure

- BPV quantified by any metric over any duration.

### Comparison

- Low versus high or mean 1). BPV; 2) arterial pressure.

### Outcome

- Prevalent or incident dementia or cognitive impairment or cognitive decline diagnosed by standardised criteria.

## Statistical analyses

Multi-level meta-analyses of odds ratios (OR) in R version 3.5.2 using the *metafor* package (for dependence effect sizes)

## RESULTS

- 54 estimated ORs were reported; 21 for systolic BPV, 11 for mean systolic pressure, 15 for diastolic BPV, and 7 for diastolic pressure.
- Both higher systolic BPV (OR = 1.25; 95% CI 1.16 to 1.35,  $I^2 = 87%$ ) and mean systolic pressure per 10 mmHg increase were associated with higher odds for dementia/cognitive impairment (OR = 1.12; 95% CI 1.02 to 1.29,  $I^2 = 82%$ ) (Fig 1).
- Likewise, higher diastolic BPV was associated with higher odds for dementia/cognitive impairment (OR = 1.20; 95% CI 1.12 to 1.29,  $I^2 = 83%$ ), as was mean diastolic pressure per 5 mmHg increase (OR = 1.16; 95% CI 1.04 to 1.29,  $I^2 = 3%$ ).
- There was evidence of a pairwise interaction for BPV vs. mean pressure effect sizes ( $p < 0.01$ ), indicating that BPV was more strongly associated with dementia/cognitive impairment than were mean pressure effect sizes.

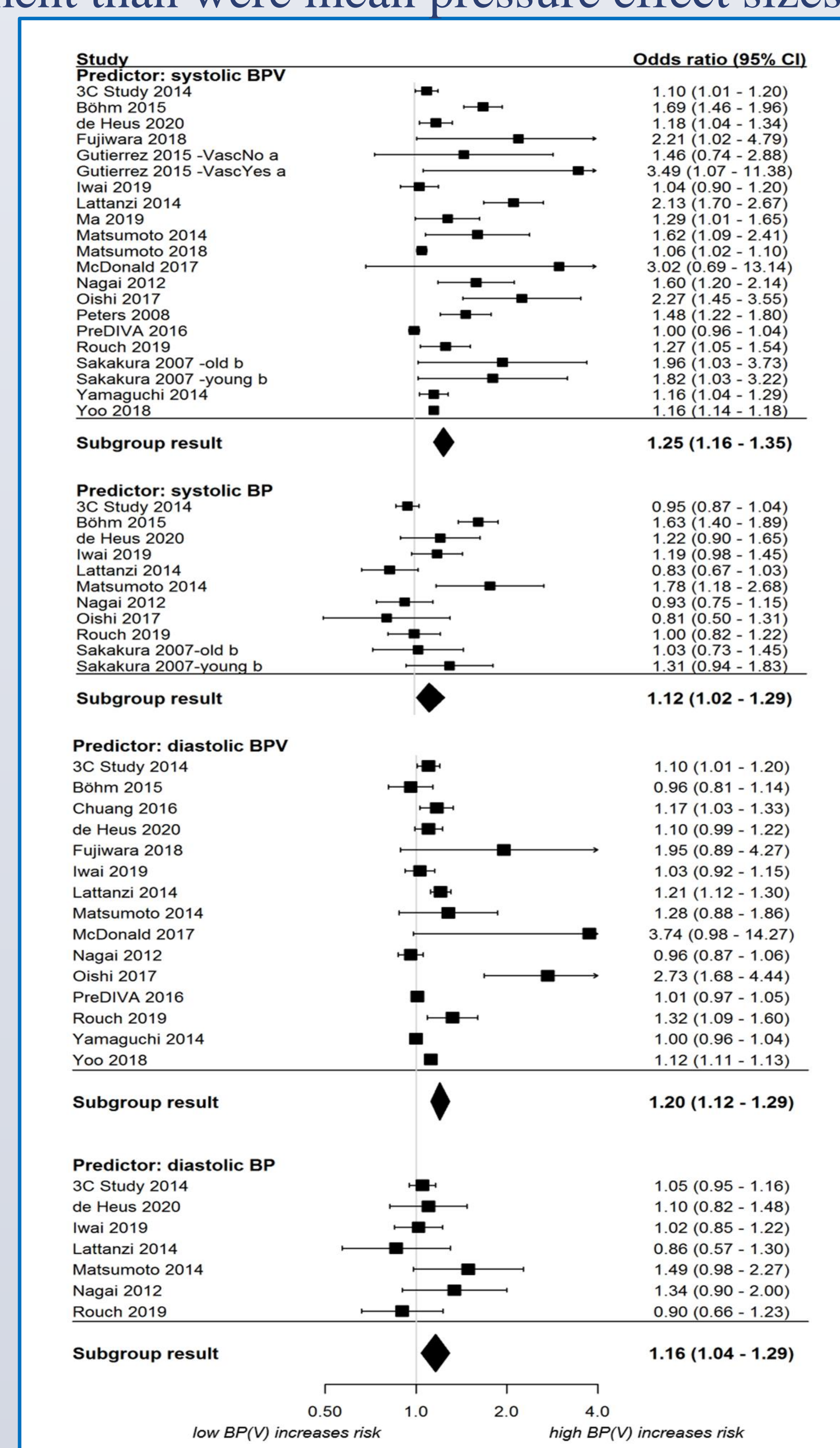


Figure 1: Forest plot of association between BPV and mean BP with dementia/cognitive impairment

## CONCLUSIONS

- Systolic and diastolic BPV were more strongly associated with dementia/cognitive impairment than were mean blood pressure effect sizes.

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