

Statistical analysis of split sample laboratory studies: observations from a systematic review of irradiated platelets

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BACKGROUND: We included laboratory studies of split (paired) samples in a systematic review of the effects of irradiation on platelets.

AIMS: To establish the statistical methods used for the paired data in these studies, and the availability of results for meta-analysis.

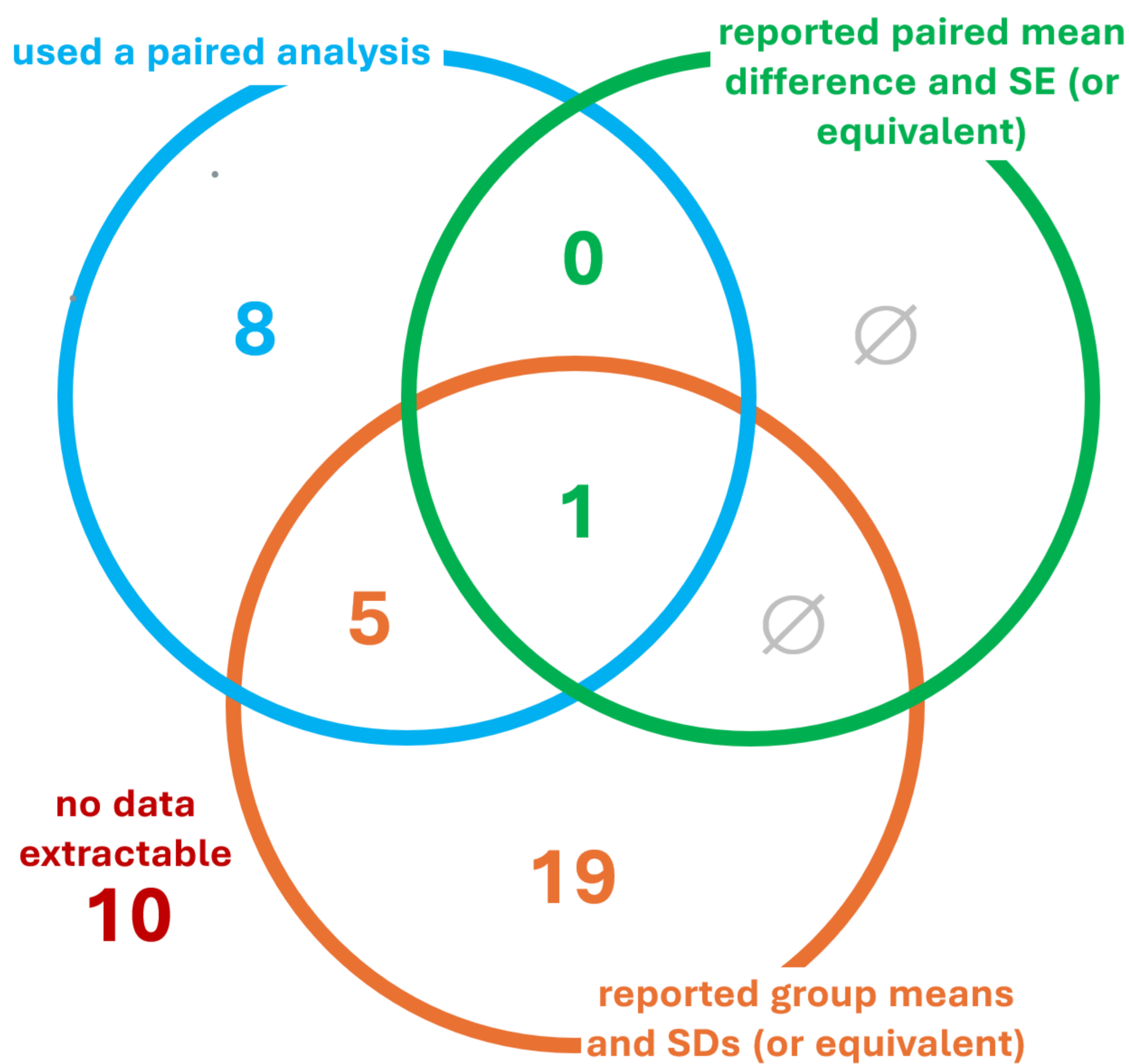
METHODS: The protocol for this review was prospectively registered on PROSPERO [CRD42023441930].

As part of quality assessment and data extraction, for each included study we checked statistical methods sections and reporting of results to establish whether the data had been analysed as pairs or independent groups, and whether the results (for pairs or groups) could be extracted in sufficient detail for inclusion in a meta-analysis.

RESULTS: We identified 43 in-vitro (laboratory) studies; 33 had a full text available, 10 had only an abstract.

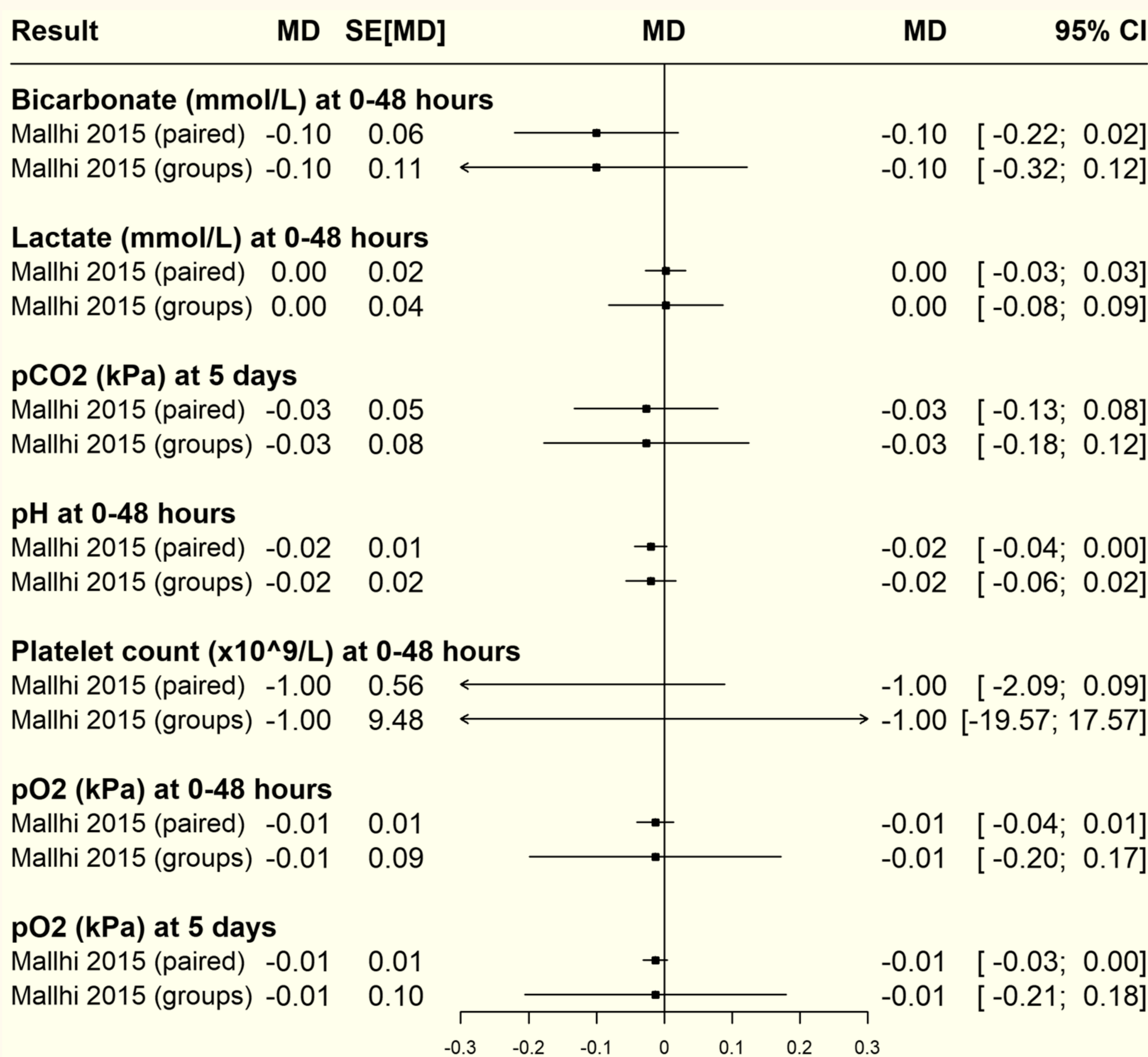
- **14 (33%) of these studies used a paired analysis.**
- Only one study reported its paired analysis in enough detail to allow the standard error (SE) to be extracted.
- 25 of the 43 studies (58%) reported enough information to be included in a meta-analysis comparing the groups instead of the pairs.
- Some results could not be included because medians and ranges were reported without any means or standard deviations (SD).

Split sample studies of irradiated platelets (n=43)



DISCUSSION:

- We included studies which had used split (paired) samples to minimise the potential for bias.
- Only a third of studies used a paired analysis for their paired data.
- **Only one study reported the results of its paired analysis in sufficient detail for inclusion in a meta-analysis (see “why it matters” below).**
- Analysing groups instead of pairs does not introduce bias but the effective sample size is smaller because the comparison of groups necessarily includes additional ‘noise’ due to population variability (see plot below).
- Researchers using paired samples should use paired analysis and report the SD, SE, or a confidence interval for the mean difference between pairs.
- If it is considered more appropriate to report and analyse medians and interquartile ranges due to non-normal data, it is useful to also report means and SDs.



WHY IT MATTERS

- The forest plot shows some of the results reported by Mallhi 2015, the only study which reported the results of paired analysis in enough detail to obtain an SE for the mean difference.
- **Each duo shows the result of analysing pairs vs analysing independent groups.**
- The mean difference (MD) for each analysis is the same but the SE is smaller for pairs and so the 95% confidence intervals are narrower.
- The difference between pairs will always be estimated more accurately than the difference between groups because population variability is eliminated in a paired analysis.