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Surrogate measures of insulin sensitivity vs the hyperinsulinaemic-euglycaemic clamp: a meta-analysis. Reply to Bastard JP [letter]
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To the editor: We agree with Dr Bastard and colleagues [1] that the assessment of insulin sensitivity is not only complex but is also an opportunity to explore biodiversity. In our extensive literature search on surrogate measures of insulin sensitivity, we found estimations of the correlation to the hyperinsulinaemic-euglycaemic clamp (HEC) for 31 indices based on fasting samples and 65 indices based on the OGTT [2].

The correlation strength between the accepted reference method, HEC, and a surrogate index is strongly influenced by the accuracy of the HEC, which varies depending on factors as insulin dose and examination length. We therefore required a minimum of five papers for a given surrogate to be included in our review. However, the meta-analyses of the 76 surrogate measures reported in less than five papers can be found in the electronic supplementary material (ESM Table 2 for OGTT-based indices and ESM Table 3 for fasting indices).

The index SIisOGTT reported by Bastard et al [1] is described in ESM Table 2 [2]. The meta-analysis for SIisOGTT was based on three articles [3-5] and resulted in a pooled correlation of 0.74 (95% CI 0.60, 0.83). The correlation strength of 0.74 was slightly higher compared to the other indices reported in detail in our paper. However, the confidence interval was wider compared to Stumvoll MCR, Matsuda, Stumvoll ISI, Gutt and Revised QUICKI.

The meta-analysis for the Disse index based on two articles gave a pooled correlation of r = 0.73 (ESM Table 3). Avignon SiM was reported in three papers which summed up to r = 0.70 (ESM Table 2).

A strength of our meta-analysis is that none of the authors invented a surrogate index for insulin sensitivity that may bias the interpretation of our data. We aimed to rank the different surrogate measures found in the literature and to assess if fasting indices can be used instead of the more time-consuming OGTT-based measures. According to our interpretation the Revised QUICKI fasting surrogate index is as good as the OGTT-based Stumvoll MCR, OGIS, Matsuda, Stumvoll ISI and Gutt indices for estimating insulin sensitivity. However, we look forward to future studies that further examine the indices described in ESM Table 2 and 3 in relation to the HEC.
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**Duality of interest**
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**Contribution statement**
All authors were responsible for the conception and design of the manuscript, drafting the response letter and revising it critically for important intellectual content. All authors approved the version to be published.

**References**