

## Supplementary File 4: Pareto $K$ diagnosis statistics

| Pareto $k$ diagnosis statistics for the phase model |                      |            |      |                        |            |      |                        |            |
|---|----------------------|------------|------|------------------------|------------|------|------------------------|------------|
| ESID  | Study                | Pareto $k$ | ESID | Study                  | Pareto $k$ | ESID | Study                  | Pareto $k$ |
| 1   | Bastian et al. 2022  | 0.204      | 31   | Hahn et al. 2020       | 0.401      | 61   | Ladenbauer et al. 2021 | 0.324      |
| 2   | Bastian et al. 2022  | 0.221      | 32   | Hahn et al. 2020       | 0.455      | 62   | Ladenbauer et al. 2021 | 0.358      |
| 3   | Bastian et al. 2022  | 0.282      | 33   | Hahn et al. 2020       | 0.571      | 63   | Mikutta et al. 2019    | 0.397      |
| 4   | Bastian et al. 2022  | 0.247      | 34   | Hahn et al. 2022       | 0.273      | 64   | Mikutta et al. 2019    | 0.229      |
| 5   | Cox et al. 2018      | 0.339      | 35   | Hahn et al. 2022       | 0.185      | 65   | Mylonas et al. 2020    | 0.399      |
| 6   | Cox et al. 2018      | 0.401      | 36   | Hahn et al. 2022       | 0.376      | 66   | Mylonas et al. 2022    | 0.395      |
| 7   | Cox et al. 2018      | 0.304      | 37   | Hahn et al. 2022       | 0.332      | 67   | Nicolas et al. 2022    | 0.434      |
| 8   | Cox et al. 2018      | 0.259      | 38   | Hahn et al. 2022       | 0.367      | 68   | Niknazar et al. 2015   | 0.489      |
| 9   | Cox et al. 2018      | 0.255      | 39   | Hahn et al. 2022       | 0.222      | 69   | Perrault et al. 2019   | 0.320      |
| 10  | Cox et al. 2018      | 0.296      | 40   | Halonen et al. 2021    | 0.453      | 70   | Perrault et al. 2019   | 0.237      |
| 11  | Cox et al. 2018      | 0.357      | 41   | Halonen et al. 2021    | 0.417      | 71   | Perrault et al. 2019   | 0.345      |
| 12  | Cox et al. 2018      | 0.279      | 42   | Halonen et al. 2022    | 0.705 *    | 72   | Perrault et al. 2019   | 0.210      |
| 13  | Cox et al. 2018      | 0.377      | 43   | Halonen et al. 2022    | 0.498      | 73   | Schreiner et al. 2021  | 0.391      |
| 14  | Cox et al. 2018      | 0.421      | 44   | Halonen et al. 2022    | 0.52       | 74   | Solano et al. 2022     | 0.103      |
| 15  | Cox et al. 2018      | 0.356      | 45   | Halonen et al. 2022    | 0.551      | 75   | Solano et al. 2022     | 0.166      |
| 16  | Cox et al. 2018      | 0.251      | 46   | Helfrich et al. 2018   | 0.531      | 76   | Solano et al. 2022     | 0.195      |
| 17  | Denis et al. 2022    | 0.432      | 47   | Kurz et al. 2021       | 0.365      | 77   | Solano et al. 2022     | 0.125      |
| 18  | Denis et al. 2022    | 0.403      | 48   | Kurz et al. 2021       | 0.255      | 78   | Solano et al. 2022     | 0.130      |
| 19  | Denis et al. 2021    | 0.331      | 49   | Kurz et al. 2021       | 0.328      | 79   | Solano et al. 2022     | 0.102      |
| 20  | Denis et al. 2021    | 0.324      | 50   | Kurz et al. 2021       | 0.322      | 80   | Solano et al. 2022     | 0.187      |
| 21  | Denis et al. 2021    | 0.373      | 51   | Kurz et al. 2021       | 0.285      | 81   | Solano et al. 2022     | 0.187      |
| 22  | Denis et al. 2021    | 0.380      | 52   | Kurz et al. 2021       | 0.369      | 82   | Solano et al. 2022     | 0.141      |
| 23  | Denis et al. 2021    | 0.235      | 53   | Kurz et al. 2023       | 0.289      | 83   | Solano et al. 2022     | 0.167      |
| 24  | Denis et al. 2021    | 0.403      | 54   | Kurz et al. 2023       | 0.304      | 84   | Solano et al. 2022     | 0.291      |
| 25  | Donnelly et al. 2022 | 0.253      | 55   | Kurz et al. 2023       | 0.304      | 85   | Solano et al. 2022     | 0.197      |
| 26  | Donnelly et al. 2022 | 0.288      | 56   | Kurz et al. 2023       | 0.413      | 86   | Weiner et al. 2023     | 0.340      |
| 27  | Donnelly et al. 2022 | 0.278      | 57   | Kurz et al. 2023       | 0.324      | 87   | Weiner et al. 2023     | 0.347      |
| 28  | Hahn et al. 2020     | 0.305      | 58   | Kurz et al. 2023       | 0.224      | 88   | Zhang et al. 2020      | 0.281      |
| 29  | Hahn et al. 2020     | 0.322      | 59   | Ladenbauer et al. 2021 | 0.272      | 89   | Zhang et al. 2020      | 0.342      |
| 30  | Hahn et al. 2020     | 0.293      | 60   | Ladenbauer et al. 2021 | 0.288      | 90   | Zhang et al. 2020      | 0.395      |

Figure 1: Pareto  $k$  diagnostic statistics for the coupling phase model

| Pareto k diagnosis statistics for the SP amplitude model |                      |          |      |                        |          |      |                        |          |
|--|----------------------|----------|------|------------------------|----------|------|------------------------|----------|
| ESID   | Study                | Pareto k | ESID | Study                  | Pareto k | ESID | Study                  | Pareto k |
| 1  | Bastian et al. 2022  | 0.224    | 27   | Hahn et al. 2022       | 0.303    | 53   | Ladenbauer et al. 2021 | 0.357    |
| 2  | Bastian et al. 2022  | 0.173    | 28   | Halonen et al. 2022    | 0.658    | 54   | Ladenbauer et al. 2021 | 0.283    |
| 3  | Bastian et al. 2022  | 0.291    | 29   | Halonen et al. 2022    | 0.591    | 55   | Ladenbauer et al. 2021 | 0.407    |
| 4  | Bastian et al. 2022  | 0.195    | 30   | Halonen et al. 2022    | 0.529    | 56   | Mikutta et al. 2019    | 0.292    |
| 5  | Denis et al. 2022    | 0.453    | 31   | Halonen et al. 2022    | 0.737 *  | 57   | Mikutta et al. 2019    | 0.313    |
| 6  | Denis et al. 2022    | 0.489    | 32   | Kurz et al. 2021       | 0.354    | 58   | Mikutta et al. 2019    | 0.321    |
| 7  | Denis et al. 2021    | 0.411    | 33   | Kurz et al. 2021       | 0.302    | 59   | Mikutta et al. 2019    | 0.270    |
| 8  | Denis et al. 2021    | 0.389    | 34   | Kurz et al. 2021       | 0.247    | 60   | Mylonas et al. 2020    | 0.581    |
| 9  | Denis et al. 2021    | 0.324    | 35   | Kurz et al. 2021       | 0.345    | 61   | Mylonas et al. 2022    | 0.576    |
| 10   | Denis et al. 2021    | 0.342    | 36   | Kurz et al. 2021       | 0.342    | 62   | Nicolas et al. 2022    | 0.401    |
| 11   | Denis et al. 2021    | 0.427    | 37   | Kurz et al. 2021       | 0.252    | 63   | Nicolas et al. 2022    | 0.347    |
| 12   | Denis et al. 2021    | 0.371    | 38   | Kurz et al. 2023       | 0.311    | 64   | Nicolas et al. 2022    | 0.393    |
| 13   | Donnelly et al. 2022 | 0.413    | 39   | Kurz et al. 2023       | 0.286    | 65   | Niknazar et al. 2015   | 0.568    |
| 14   | Donnelly et al. 2022 | 0.381    | 40   | Kurz et al. 2023       | 0.426    | 66   | Perrault et al. 2019   | 0.309    |
| 15   | Donnelly et al. 2022 | 0.336    | 41   | Kurz et al. 2023       | 0.485    | 67   | Perrault et al. 2019   | 0.218    |
| 16   | Hahn et al. 2020     | 0.500    | 42   | Kurz et al. 2023       | 0.339    | 68   | Perrault et al. 2019   | 0.265    |
| 17   | Hahn et al. 2020     | 0.403    | 43   | Kurz et al. 2023       | 0.353    | 69   | Perrault et al. 2019   | 0.300    |
| 18   | Hahn et al. 2020     | 0.428    | 44   | Ladenbauer et al. 2021 | 0.298    | 70   | Schreiner et al. 2021  | 0.542    |
| 19   | Hahn et al. 2020     | 0.442    | 45   | Ladenbauer et al. 2021 | 0.352    | 71   | Solano et al. 2022     | 0.120    |
| 20   | Hahn et al. 2020     | 0.458    | 46   | Ladenbauer et al. 2021 | 0.334    | 72   | Solano et al. 2022     | 0.288    |
| 21   | Hahn et al. 2020     | 0.442    | 47   | Ladenbauer et al. 2021 | 0.281    | 73   | Solano et al. 2022     | 0.167    |
| 22   | Hahn et al. 2022     | 0.288    | 48   | Ladenbauer et al. 2021 | 0.203    | 74   | Solano et al. 2022     | 0.151    |
| 23   | Hahn et al. 2022     | 0.277    | 49   | Ladenbauer et al. 2021 | 0.469    | 75   | Solano et al. 2022     | 0.180    |
| 24   | Hahn et al. 2022     | 0.391    | 50   | Ladenbauer et al. 2021 | 0.388    | 76   | Solano et al. 2022     | 0.165    |
| 25   | Hahn et al. 2022     | 0.286    | 51   | Ladenbauer et al. 2021 | 0.229    | 77   | Weiner et al. 2023     | 0.358    |
| 26   | Hahn et al. 2022     | 0.378    | 52   | Ladenbauer et al. 2021 | 0.3      | 78   | Weiner et al. 2023     | 0.389    |

Figure 2: Pareto  $k$  diagnostic statistics for the spindle amplitude model

| Pareto k diagnosis statistics for the strength model |                      |          |      |                      |          |      |                        |          |
|--|----------------------|----------|------|----------------------|----------|------|------------------------|----------|
| ESID   | Study                | Pareto k | ESID | Study                | Pareto k | ESID | Study                  | Pareto k |
| 1  | Bastian et al. 2022  | 0.315    | 30   | Hahn et al. 2020     | 0.485    | 59   | Kurz et al. 2023       | 0.313    |
| 2  | Bastian et al. 2022  | 0.434    | 31   | Hahn et al. 2020     | 0.425    | 60   | Ladenbauer et al. 2021 | 0.284    |
| 3  | Bastian et al. 2022  | 0.401    | 32   | Hahn et al. 2020     | 0.48     | 61   | Ladenbauer et al. 2021 | 0.260    |
| 4  | Bastian et al. 2022  | 0.404    | 33   | Hahn et al. 2020     | 0.464    | 62   | Ladenbauer et al. 2021 | 0.278    |
| 5  | Cox et al. 2018      | 0.345    | 34   | Hahn et al. 2022     | 0.271    | 63   | Ladenbauer et al. 2021 | 0.278    |
| 6  | Cox et al. 2018      | 0.459    | 35   | Hahn et al. 2022     | 0.348    | 64   | Mikutta et al. 2019    | 0.321    |
| 7  | Cox et al. 2018      | 0.394    | 36   | Hahn et al. 2022     | 0.281    | 65   | Mikutta et al. 2019    | 0.305    |
| 8  | Cox et al. 2018      | 0.332    | 37   | Hahn et al. 2022     | 0.318    | 66   | Mylonas et al. 2020    | 0.403    |
| 9  | Cox et al. 2018      | 0.271    | 38   | Hahn et al. 2022     | 0.475    | 67   | Mylonas et al. 2022    | 0.319    |
| 10   | Cox et al. 2018      | 0.363    | 39   | Hahn et al. 2022     | 0.473    | 68   | Niknazar et al. 2015   | 0.410    |
| 11   | Cox et al. 2018      | 0.221    | 40   | Halonen et al. 2021  | 0.349    | 69   | Schreiner et al. 2021  | 0.394    |
| 12   | Cox et al. 2018      | 0.396    | 41   | Halonen et al. 2021  | 0.334    | 70   | Solano et al. 2022     | 0.267    |
| 13   | Cox et al. 2018      | 0.436    | 42   | Halonen et al. 2022  | 0.703 *  | 71   | Solano et al. 2022     | 0.228    |
| 14   | Cox et al. 2018      | 0.425    | 43   | Halonen et al. 2022  | 0.567    | 72   | Solano et al. 2022     | 0.261    |
| 15   | Cox et al. 2018      | 0.319    | 44   | Halonen et al. 2022  | 0.659    | 73   | Solano et al. 2022     | 0.191    |
| 16   | Cox et al. 2018      | 0.253    | 45   | Halonen et al. 2022  | 0.594    | 74   | Solano et al. 2022     | 0.187    |
| 17   | Denis et al. 2022    | 0.324    | 46   | Helfrich et al. 2018 | 0.441    | 75   | Solano et al. 2022     | 0.300    |
| 18   | Denis et al. 2022    | 0.394    | 47   | Helfrich et al. 2018 | 0.363    | 76   | Solano et al. 2022     | 0.197    |
| 19   | Denis et al. 2021    | 0.392    | 48   | Kurz et al. 2021     | 0.317    | 77   | Solano et al. 2022     | 0.187    |
| 20   | Denis et al. 2021    | 0.441    | 49   | Kurz et al. 2021     | 0.345    | 78   | Solano et al. 2022     | 0.222    |
| 21   | Denis et al. 2021    | 0.376    | 50   | Kurz et al. 2021     | 0.288    | 79   | Solano et al. 2022     | 0.300    |
| 22   | Denis et al. 2021    | 0.324    | 51   | Kurz et al. 2021     | 0.427    | 80   | Solano et al. 2022     | 0.209    |
| 23   | Denis et al. 2021    | 0.432    | 52   | Kurz et al. 2021     | 0.42     | 81   | Solano et al. 2022     | 0.285    |
| 24   | Denis et al. 2021    | 0.407    | 53   | Kurz et al. 2021     | 0.276    | 82   | Weiner et al. 2023     | 0.362    |
| 25   | Donnelly et al. 2022 | 0.248    | 54   | Kurz et al. 2023     | 0.413    | 83   | Weiner et al. 2023     | 0.414    |
| 26   | Donnelly et al. 2022 | 0.353    | 55   | Kurz et al. 2023     | 0.464    | 84   | Zhang et al. 2020      | 0.404    |
| 27   | Donnelly et al. 2022 | 0.197    | 56   | Kurz et al. 2023     | 0.412    | 85   | Zhang et al. 2020      | 0.380    |
| 28   | Hahn et al. 2020     | 0.477    | 57   | Kurz et al. 2023     | 0.347    | 86   | Zhang et al. 2020      | 0.404    |
| 29   | Hahn et al. 2020     | 0.496    | 58   | Kurz et al. 2023     | 0.376    | NA   | NA                     | NA       |

Figure 3: Pareto  $k$  diagnostic statistics for the coupling strength model

| Pareto k diagnosis statistics for the percentage model |                     |          |      |                     |          |      |                       |          |
|--|---------------------|----------|------|---------------------|----------|------|-----------------------|----------|
| ESID   | Study               | Pareto k | ESID | Study               | Pareto k | ESID | Study                 | Pareto k |
| 1  | Bastian et al. 2022 | 0.228    | 16   | Hahn et al. 2020    | 0.471    | 31   | Schreiner et al. 2021 | 0.488    |
| 2  | Bastian et al. 2022 | 0.251    | 17   | Halonen et al. 2021 | 0.479    | 32   | Solano et al. 2022    | 0.304    |
| 3  | Bastian et al. 2022 | 0.289    | 18   | Halonen et al. 2021 | 0.437    | 33   | Solano et al. 2022    | 0.308    |
| 4  | Bastian et al. 2022 | 0.385    | 19   | Halonen et al. 2022 | 0.814 *  | 34   | Solano et al. 2022    | 0.159    |
| 5  | Denis et al. 2022   | 0.466    | 20   | Halonen et al. 2022 | 0.702 *  | 35   | Solano et al. 2022    | 0.221    |
| 6  | Denis et al. 2022   | 0.524    | 21   | Halonen et al. 2022 | 0.543    | 36   | Solano et al. 2022    | 0.314    |
| 7  | Denis et al. 2021   | 0.406    | 22   | Halonen et al. 2022 | 0.754 *  | 37   | Solano et al. 2022    | 0.255    |
| 8  | Denis et al. 2021   | 0.461    | 23   | Kurz et al. 2021    | 0.355    | 38   | Solano et al. 2022    | 0.284    |
| 9  | Denis et al. 2021   | 0.553    | 24   | Kurz et al. 2021    | 0.347    | 39   | Solano et al. 2022    | 0.332    |
| 10   | Denis et al. 2021   | 0.466    | 25   | Kurz et al. 2021    | 0.331    | 40   | Solano et al. 2022    | 0.237    |
| 11   | Denis et al. 2021   | 0.296    | 26   | Kurz et al. 2021    | 0.309    | 41   | Solano et al. 2022    | 0.167    |
| 12   | Denis et al. 2021   | 0.361    | 27   | Kurz et al. 2021    | 0.374    | 42   | Solano et al. 2022    | 0.319    |
| 13   | Hahn et al. 2020    | 0.295    | 28   | Kurz et al. 2021    | 0.322    | 43   | Solano et al. 2022    | 0.252    |
| 14   | Hahn et al. 2020    | 0.403    | 29   | Mylonas et al. 2020 | 0.462    | NA   | NA                    | NA       |
| 15   | Hahn et al. 2020    | 0.540    | 30   | Mylonas et al. 2022 | 0.493    | NA   | NA                    | NA       |

Figure 4: Pareto  $k$  diagnostic statistics for the coupling percentage model

Notes. Pareto  $k$  can be interpreted in a similar way to Cook's distance in frequentist analysis. When an effect size has a Pareto  $k$  value larger than 0.7 or even 1.0, it can be classified as an influential data point and might introduce the issue of misspecification of the model. Consequently, we excluded all studies with Pareto  $k$  values larger than 0.7 from the focal analysis. ESID corresponds to the esid column labeled in Source data of Figure 4, 6-8.