Appendix A

Supplementary material for Chapter 2

A.1 Detailed results for material summarised in Section 2.3

A.1.1 Bipolar Disorder versus matched control

A.1.1.1 Spectral Analysis

Statistical comparisons Figure A.9 reveals a widespread increase of relative spectral power at centro-parietal, central and centro-frontal EEG channels in the beta2 and lowgamma1 ranges. Similarly, Figure A.10 reveals an increase of beta2 and lowgamma1 relative spectral power at several scattered virtual channels. There was an increase of relative spectral power in multiple bands for each of the preprocessing methods. In the parietal regions, the beta/lowgamma peak is considerably broader and smaller in amplitude, albeit statistically significant, compared to the frontal and central regions. Furthermore, the spectra from the AMICA preprocessing manipulation appeared to exhibit more relative power across the EEG bands compared to the spectra from the non-AMICA manipulation. The lowgamma1 band was the only band that exhibited statistically consistent spectral differences in both EEG channels and virtual channels (Table A.1).

Classification Table A.2 shows that there were many channels in many bands with consistently high bookmaker informedness scores. Moreover, there were diagnostic channels (highlighted in bold) that were consistent with the statistical results (i.e. also appear in Table A.1). Figure A.15 displays topographies of the bookmaker scores (-1 to +1) from SP features using EEG channel data and the SVM classification algorithm. There were high bookmaker informedness scores mostly apparent in the beta1, beta2, beta, lowgamma1, and lowgamma bands.

In virtual channels, Table A.2 reveals that there were consistently high bookmaker informedness scores broadly in many bands. Moreover, there was a single channel in the lowgamma1 band that was consistent with statistical results. Figure

A.16 displays the bookmaker scores from the SP features using virtual channel data. Similar to the EEG channel results, there were high bookmaker informedness scores in the beta2, beta, lowgamma1, and lowgamma bands.

A.1.1.2 Adjacency matrices

Statistical comparisons

Coherence - EEG With even segmentation, Table A.3 reveals that there were EEG channels consistently involved in statistically significant networks only in the theta band. Uneven segmentation revealed no networks. Figure A.21 reveals that the aforementioned networks have significantly **lower** connectivity for participants with bipolar disorder compared to their matched controls.

Transfer Entropy - EEG Table A.4 shows networks were revealed only in the beta2 and lowgamma bands using even segmentation. Consistent with the coherence measure, the uneven segmentation did not reveal any statistically consistent networks. Figure A.22 reveals that the statistically consistent channels in the beta2 band with even segments all revealed **lower** connectivity in the non-AMICA and AMICA manipulations for participants with bipolar disorder compared to their matched controls, whereas in the lowgamma band, the connectivity was **higher** in all three manipulations.

Coherence - Virtual Channels Table A.3 reveals that there were no significant networks with either segmentation method in agreement with no significant differences statistically (Figure A.23).

Transfer Entropy - Virtual Channels With even segmentation, Table A.4 reveals consistently involved statistically significant networks in the lowgamma1, lowgamma2, lowgamma, and highgamma2 bands. Uneven segments had significant networks only in the lowgamma band. Each of these bands displayed **higher** connectivity for participants with bipolar disorder, which is shown in Figure A.24.

Classification

Coherence - EEG With even segmentation, Table A.5 indicates that there were consistently high SVM classification results in the theta, alpha, beta1, beta2, lowgama2, lowgamma, highgamma1, highgamma2, highgamma, and the all-bands condition; and with uneven segmentation in the theta, alpha, beta1, beta, lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma, and all-bands conditions. Figure A.33 displays the AM-Coh SVM classification results. There were multiple isolated channels that had high bookmaker informedness scores in numerous bands and preprocessing manipulations. However, especially high bookmaker informedness scores were evident in multiple bands with the AMICA+Laplacian preprocessing manipulation with both segmentation methods.

Transfer Entropy - EEG Table A.6 reveals that there was consistently high SVM classification results in the theta, alpha, beta1, beta, lowgamma2, lowgamma, and all-bands condition with even segmentation; and in the theta, beta1, and all-bands condition with uneven segments. Figure A.34 indicates that there was only a small-degree of consistency of high bookmaker informedness scores in the beta2 and all-bands condition but only with even segments.

Coherence - Virtual Channels Table A.5 also reveals consistently high SVM classification results in the delta, theta, alpha, beta2, lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and the all-bands condition, with even segments; and in the delta, alpha, beta1, beta2, beta, lowgamma2, lowgamma, highgamma1, highgamma, and all-bands condition, with uneven segments. However, the majority of the bands comprise one virtual channel. This is evident in Figure A.35, where there were very few bands with a high spatial consistency of high bookmaker informedness scores.

Transfer Entropy - Virtual Channels Table A.6 reveals that the only consistently high bookmaker informedness scores were present in the lowgamma and all-bands condition with even segments; and in the alpha, beta1, and all-bands condition with uneven segments. Figure A.36 indicates that the virtual channels with high bookmaker informedness scores were only present in the lowgamma band and the all-bands condition.

A.1.1.3 Graph theory measures

Statistical comparisons

Coherence - EEG Table A.7 reveals that, using even segments, there were channels consistently involved in statistically significant networks in the delta, theta, beta, and all-bands condition, and in the delta, theta, and all-bands condition with uneven segments. Figure A.45 displays channels, using even segments, in the delta and theta bands with significantly **lower** clustering coefficients and local efficiency for bipolar disorder participants compared to their matched controls, whereas the channel in the beta band had significantly **higher** clustering coefficients for the participants with bipolar disorder. Moreover, the controls had a **shorter** path length in the delta, theta, and all-bands condition. Similar to even segments, bipolar disorder participants had significantly **lower** clustering coefficients in the theta band; a **lower** local efficiency in the delta and theta band; and a **longer** path length in the theta and all-bands condition with uneven segments.

Transfer Entropy - EEG With even segments, Table A.8 reveals that there were EEG channels in the delta, theta, alpha, beta2, beta, lowgamma1, and lowgamma bands, that were statistically significant over multiple preprocessing manipulations. Figure A.46 informs us that the channel in the beta band found to be statistically consistent with the clustering coefficient and local efficiency measures displayed **lower** values compared with controls; whereas, the channels found in the delta, lowgamma1, and lowgamma bands displayed **higher** values. As for the shortest path measure, the statistically consistent channels found in the theta, alpha, beta2, and beta bands all displayed **higher** paths compared to controls, whereas the lowgamma1 and lowgamma bands had channels which had **shorter** paths than controls. Table A.8 also reveals that there were statistically consistent EEG channels in the beta1, beta, and highgamma2 bands, using uneven segments. The channels in the beta1 and beta bands that were shown to be statistically consistent using clustering coefficient and local efficiency measures were found to have **smaller** values compared to controls. The channels in the beta1 and highgamma2 bands which were found to have statistical consistency with the shortest path measure had **longer** paths than controls.

Coherence - Virtual Channels There were similar findings with using virtual channels (Table A.7), where, using even segments, consistent channels were found in the delta, theta, alpha, beta1, beta, and lowgamma1 bands; and in the theta, alpha, beta1, lowgamma2, and highgamma1 bands, with uneven segments. Figure A.47 reveals that, with the even segments, the clustering coefficient and local efficiency is significantly **lower** for participants with bipolar disorder in the alpha and beta bands; and the shortest path lengths were significantly **higher** in the delta, theta, alpha, beta1, beta, and lowgamma1 bands. Similarly, the bipolar disorder participants had a significantly **higher** path length in the theta, alpha, beta1, lowgamma2, and highgamma1 bands, with uneven segments. With even segments, consistent channels were found in the lowgamma1, lowgamma2, lowgamma, and highgamma1 bands.

Transfer Entropy - Virtual Channels Statistically consistent channels were found to have **higher** clustering coefficients and local efficiency in the lowgamma1, and lowgamma bands (Figure A.48). As for the shortest path measure, statistically consistent channels were found in the lowgamma2, and lowgamma bands. These channels were all revealed to have a **shorter** path for participants with bipolar disorder compared to the controls. With regard to uneven segments, there was one statistically consistent channel in each of the lowgamma1 and highgamma2 bands. Both channels were found to have **shorter** paths for bipolar disorder participants. There was no statistical consistency in the clustering coefficient and local efficiency measures.

Classification

Coherence - EEG Table A.9 indicates that, using even segments, there were EEG channels with consistently high bookmaker informedness scores in the delta, theta, beta1, beta2, beta, lowgamma1, lowgamma2, lowgamma, highgamma2, and highgamma bands; and in the theta, alpha, beta1, beta, lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and all-bands condition with uneven segments. Figure A.57 does not display convincing high bookmaker informedness scores in terms of spatial consistency, however, there were numerous channels with high bookmaker informedness scores in the lowgamma1, lowgamma2, and lowgamma bands with both segmentation methods. Uneven segments can be seen to have more positive classification results compared to even segments.

Transfer Entropy - EEG For even segments, Table A.10 reveals that consistently high bookmaker informedness scores were found in the delta, alpha, beta1, beta, lowgamma, highgamma2, highgamma and the all-bands conditions; and the beta1, beta, and highgamma band with uneven segments. Moreover, there was a channel in the beta1 band which was consistent with the statistics. Figure A.58 shows that the high bookmaker informedness scores were most apparent in the lowgamma band (AMICA+Laplacian, evenly manipulation) and the all-bands condition (non-AMICA and AMICA+Laplacian, evenly manipulation).

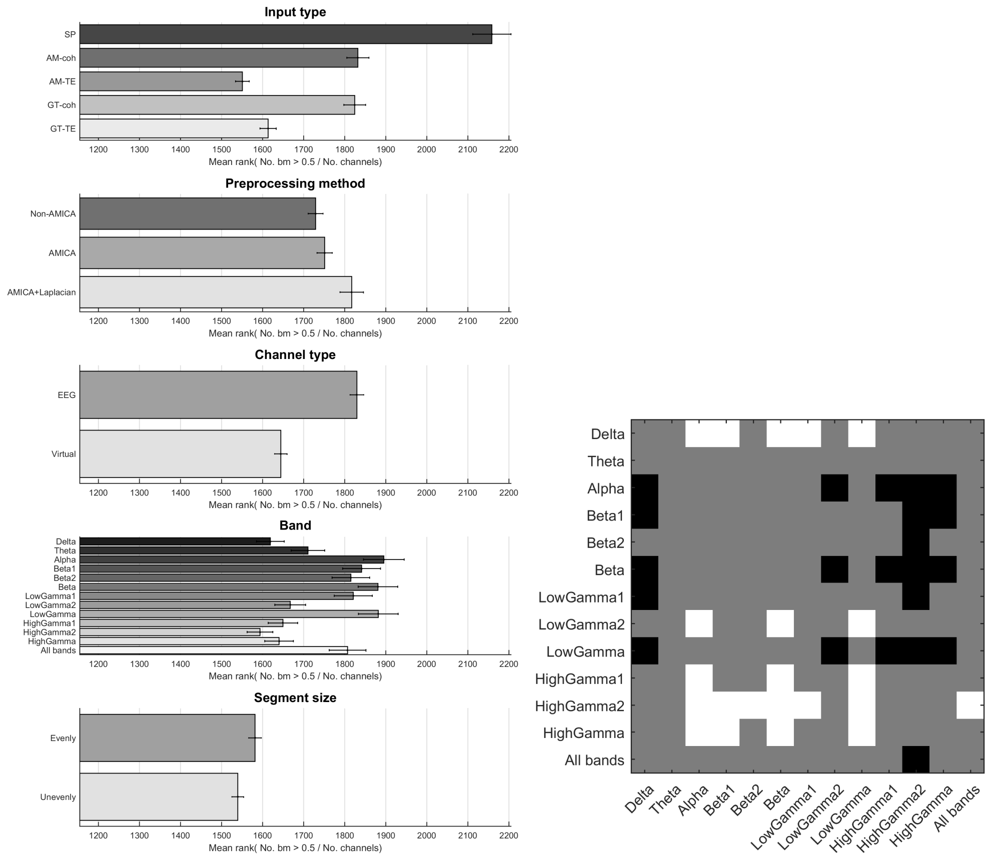
Coherence - Virtual Channels Table A.9 indicates that, using even segments, there were virtual channels with consistently high bookmaker informedness scores in the theta, alpha, beta1, beta2, beta, lowgamma2, and highgamma2 bands; and in the beta, lowgamma1, lowgamma, highgamma1, and highgamma bands with uneven segments. Moreover, there were channels in the alpha and beta bands with even segments that were consistent with the statistics. Figure A.59, however, does not show many bands with convincing high bookmaker informedness scores in terms of spatial consistency, with a potential exception in the highgamma band with uneven segments.

Transfer Entropy - Virtual Channels Table A.10 reveals the presence of consistently high bookmaker informedness scores in the delta, lowgamma1, lowgamma2, and lowgamma band with even segments; and the lowgamma and highgamma1 bands with uneven segments. There were channels in the lowgamma band with even segments which were consistent with statistics. Consistent with the EEG channel classification results, high bookmaker informedness scores were apparent in the lowgamma band for the virtual channels (Figure A.60).

A.1.1.4 One-way analysis of variance

Using a bookmaker threshold of 0.5, a number of main effects were found. The mean ranks of the proportion of informative channels (number of channels with a bookmaker score ≥ 0.5 divided by the total number of channels) are displayed in Figure A.1a. A main effect of **input type** was found, chi-sq $(4) = 244.276$, $p < 0.001$. A higher proportion of informative channels was found when using SP features as input to the classifier compared to AM-Coh, 95% C.I. [207.8, 445.0], AM-TE, 95% C.I. [489.1, 726.3], GT-Coh, 95% C.I. [215.4, 452.6], and GT-TE features, 95% C.I. [426.4, 663.6]. Additionally, a higher proportion of informative channels was found when using the AM-Coh features compared to AM-TE features, 95% C.I. [184.5, 378.1], and GT-TE features, 95% C.I. [121.8, 315.4]. Moreover, a higher proportion of informative channels was found when using GT-Coh features compared to AM-TE features, 95% C.I. [176.9, 370.5], and GT-TE features, 95% C.I [114.1, 307.8].

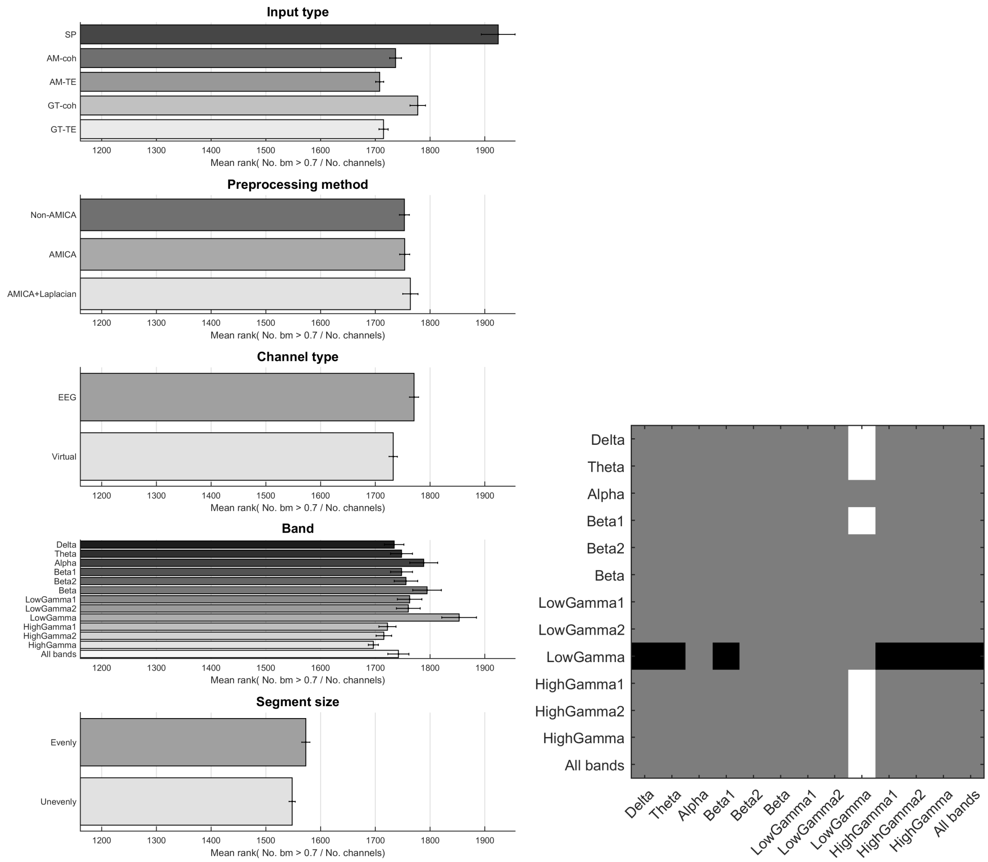
A main effect of **preprocessing manipulation** was found, chi-sq (2) = 7.453, p = 0.024. The AMICA+Laplacian manipulation had a higher proportion of informative channels compared to the non-AMICA manipulation, 95% C.I. [11.98, 163.9]. A main effect of **channel type** was also found, chi-sq (1) = 58.855, $p < 0.001$. There was a higher proportion of informative EEG channels compared to virtual channels, 95% C.I. [138.0, 232.6]. A main effect of **band** was also found, chi-sq (12) = 81.437, $p < 0.001$. Figure A.1b displays the post-hoc statistical comparisons between band conditions which came to significance. The alpha, beta, and lowgamma band were found to have a significantly higher proportion of informative channels compared to the delta, lowgamma2, highgamma1, highgamma2, and highgamma bands. The highgamma2 band was found to have a significantly lower proportion of informative channels compared to beta1, beta2, lowgamma1, and all-bands condition. Moreover, the beta1 band had a significantly higher proportion of informative channels compared to the highgammma2 band. Furthermore, there was a main effect of **segmentation size**, chi-sq (1) = 3.981, p = 0.046. There was a higher proportion of informative channels when using even segments compared to uneven segments, 95% C.I. [0.743, 83.31].



(a) (b)

Figure A.1 – (a) Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.5 divided by the number of channels) in the classification of participants with bipolar disorder and their matched controls for each condition within each independent variable (input type, processing method, channel type, band, segment size). (b) Post hoc comparisons of the band main effect. A black square indicates a significantly ($p \leq 0.05$) higher number of informative channels for the band in the row compared to the band in the column. While a white square indicates a significantly lower number of informative channels. A grey square indicates no significant difference or no comparison was conducted (diagonal).

At the more stringent bookmaker threshold of 0.7, a number of main effects were found and the mean ranks of the proportion of informative channels (number of channels with a bookmaker score ≥ 0.7 divided by the total number of channels) are displayed in Figure A.2a. A main effect of input type was found, chi-sq (4) = 122.285, $p < 0.001$. Consistent with the 0.5 bookmaker threshold results, a higher proportion of informative channels was found when using SP features as input to the classifier compared to AM-Coh features, 95% C.I. [128.6, 246.4], AM-TE features, 95% C.I. [157.6, 275.5], GT-Coh features, 95% C.I. [88.05, 205.9], and GT-TE features, 95% C.I. [150.6, 268.4]. Additionally, a higher proportion of informative channels was found when using GT-Coh features compared to AM-TE features, 95% C.I. [21.49, 117.7], and GT-TE features, 95% C.I. [14.47, 110.7]. Inconsistent with the 0.5 bookmaker threshold results, a main effect of preprocessing manipulation was not found, chi-sq (2) = 0.526, $p = 0.769$. A main effect of channel type was found, chi-sq (1) = 10.079, $p = 0.001$. There was a significantly higher proportion of informative EEG channels compared to virtual channels, 95% C.I. [14.58, 61.61]. A main effect of band was found, chi-sq (12) = 42.632, $p < 0.001$. The lowgamma band was found to have a higher proportion of informative channels compared to the delta, theta, beta1, highgamma1, highgamma2, highgamma, and all-bands condition (Figure A.2b). Consistent with the 0.5 bookmaker thresholds, there was a main effect of segmentation method found, chi-sq (1) = 7.076, $p = 0.008$. A higher proportion of informative channels was found when using even segments compared to uneven segments, 95% C.I. [6.582, 43.44].



(a) (b)

Figure A.2 – (a) Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.7 divided by the number of channels) in the classification of participants with bipolar disorder and their matched controls for each condition within each independent variable (input type, processing method, channel type, band, segment size). (b) Post hoc comparisons of the band main effect. A black square indicates a significantly ($p \leq 0.05$) higher number of informative channels for the band in the row compared to the band in the column. While a white square indicates a significantly lower number of informative channels. A grey square indicates no significant difference or no comparison was conducted (diagonal).

A.1.2 Schizophrenia versus matched control

A.1.2.1 Spectral Analysis

Statistical comparisons Similar to the spectral montage comparison between participants with bipolar disorder and their matched controls, Figure A.69 and Figure A.70 reveal a widespread increase of spectral power for participants with schizophrenia (relative to controls) in the form of a beta/lowgamma peak that resides over medial fronto-central EEG channels and virtual channels, respectively. Although similar to the beta/lowgamma peak that is found with participants with bipolar disorder, the beta/lowgamma peak appears less widespread and does not venture into posterior regions. This phenomenon is also found with the virtual channels, where the peak is evident at left- and right-frontal-superior, left- and right-supplementary-motor-area, and cingulum-mid-right. Table A.11 reveals that there were statistically significant EEG channels in the delta, theta, alpha, beta1, beta2, beta, lowgamma1, lowgamma2, and lowgamma bands. Whereas, the alpha, beta1, lowgamma1, and lowgamma bands were revealed to have statistically significant virtual channels.

Classification Consistently high bookmaker informedness scores were apparent in the alpha, beta1, beta2, beta, and lowgamma1 bands (Figure A.75). Table A.12 reveals that there were consistently high bookmaker informedness scores in the delta, alpha, beta1, beta2, beta, lowgamma1, and the lowgamma band. With regards to the virtual channels, there were high bookmaker informedness scores in the frontal and peripheral regions at multiple bands (Figure A.76). However, the high bookmaker informedness scores were only evident with the non-AMICA manipulation. Table A.12 reveals that the left-precentral virtual channel had consistently high bookmaker informedness scores in the beta1, beta, and highgamma bands.

A.1.2.2 Adjacency matrices

Statistical comparisons

Coherence - EEG Table A.13 reveals that there were no consistent networks with either segmentation method.

Transfer Entropy - EEG With even segments, Table A.14 reveals that there were EEG channels consistently involved in statistically significant networks in the theta and lowgamma2 bands, and the highgamma2 bands with uneven segments. Figure A.82 reveals that networks in the theta and lowgamma2 bands with even segments all showed **higher** connectivity for participants with schizophrenia compared to their matched controls. The significantly different networks in the theta band comprised multiple fronto-temporal connections, whereas the significantly different networks in the lowgamma2 band comprised multiple fronto-central connections.

Coherence - Virtual Channels For virtual channels, Table A.13 reveals that, using even segments, there were virtual channels consistently involved in statistically significant networks in the delta, theta, beta1, and beta band; and in the delta, theta, beta1, beta2, beta, lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and all-bands condition with uneven segments. Figure A.83 displays **higher** connectivity values for the controls compared to the participants with schizophrenia in the networks in almost all of the bands with all of the preprocessing manipulations. Moreover, there were significant networks in the lowgamma1, lowgamma, and highgamma1 which had connectivity measures between cerebellum and visual regions that were **higher** for the participants with schizophrenia.

Transfer Entropy - Virtual Channels Table A.14 reveals that, with even segments, there were virtual channels consistently involved in statistically significant networks in the delta, beta1, beta, lowgamma1, highgamma1, highgamma2, and highgamma bands with even segments. There were no consistent statistically significant virtual channels with uneven segments. Similar to the EEG channels, Figure A.84 shows that the connections in the significantly different networks had **higher**

connectivity for the participants with schizophrenia compared to their matched controls.

Classification

Coherence - EEG Table A.15 reveals that there were EEG channels with consistently high bookmaker informedness scores in the lowgamma2, highgamma2 bands with even segments; and in the beta band with uneven segments. It is evident in Figure A.93 that these high bookmaker informedness scores were abundant in the non-AMICA and AMICA+Laplacian preprocessing manipulations with both segmentation methods, and surprisingly absent in the AMICA preprocessing manipulation.

Transfer Entropy - EEG Table A.16 reveals that there were EEG channels with consistently high bookmaker informedness scores in the delta, theta, alpha, beta1, beta2, beta, lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and the all-bands condition with even segments. There were no EEG channels with consistently high bookmaker informedness scores with uneven segments. Figure A.94 displays high bookmaker informedness scores at multiple channels in all of the band conditions and in all of the preprocessing manipulations with the evenly method, but not with uneven segments. There were channels in the beta1 and beta bands with even segments, and beta1 band with uneven segments, which were consistent with the statistical comparisons (indicated by bolded channel).

Coherence - Virtual Channels With regard to the virtual channels, Table A.15 reveals that there were virtual channels with consistently high bookmaker informedness scores in the delta, theta, alpha, beta1, beta, lowgamma1, lowgamma, and the all-bands condition with even segments; and in the alpha, beta1, beta, and all-bands condition with uneven segments. However, the classification results are not entirely convincing (displayed in Figure A.95) and appear almost random.

Transfer Entropy - Virtual Channels With regard to the virtual channels, Table A.16 reveals that there were virtual channels with consistently high bookmaker informedness scores in the delta, theta, alpha, beta1, beta2, beta, lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and the all-bands condition. It is noteworthy that channels in the beta1 and beta band were consistent with the statistical comparisons (channels are bold in the table). Similar to the EEG channels, Figure A.95 displays multiple virtual channels with high bookmaker informedness scores in multiple bands with even segments, but not uneven segments.

A.1.2.3 Graph theory measures

Statistical comparisons

Coherence - EEG Table A.17 indicates that, using even segments, there were EEG channels in the delta, theta, beta1, beta2, and beta bands that were statistically significant in multiple preprocessing manipulations; and in the delta, theta, beta1, beta2, beta, lowgamma1, lowgamma bands with uneven segments. Figure A.105 reveals that for the schizophrenia participants (compared to their matched controls) the channels in the delta, beta1, and beta bands with even segments exhibited significantly **lower** clustering coefficients; the channels in the delta, beta1, beta2, and beta bands exhibited significantly **lower** local efficiency; and the channels in the theta band had significantly **longer** path lengths. Similar to even segments, the schizophrenia participants had significantly **lower** clustering coefficients at channels in the delta, theta, beta1, beta2, and beta bands with uneven segments; a **lower** local efficiency at channels in the beta1, beta2, and beta bands, and significantly **longer** path lengths at channels in the delta band.

Transfer Entropy - EEG With even segments, Table A.18 reveals that there were EEG channels in the delta, theta, highgamma2, highgamma, and the all-bands condition that were statistically significant in multiple preprocessing manipulations. As displayed in Figure A.106, the channels in the previously mentioned bands exhibited **higher** clustering coefficients, **higher** local efficiency, and **shorter** path lengths for the participants with schizophrenia compared to their matched controls, respectively. Table A.18 also reveals that there was a channel in the highgamma2 band that was statistically significant in multiple preprocessing manipulations with uneven segments. The channel in the highgamma2 band was statistically consistent with the clustering coefficient and local efficiency measures, both display **higher** values for the participants with schizophrenia over their match controls.

Coherence - Virtual Channels With regard to the virtual channels, Table A.18 reveals that, using even segments, there were statistically significant channels in the delta, theta, alpha, beta1, beta2, beta, lowgamma2, lowgamma, and highgamma1 bands. Whereas, with uneven segments, there were statistically consistent channels in the delta, alpha, beta1, beta2, beta, lowgamma1, lowgamma2, highgamma1, and highgamma bands. Figure A.107 reveals that, like with the EEG channels with the coherence measure, the schizophrenia participants had significantly lower clustering coefficients in the delta, theta, alpha, beta1, beta, lowgamma2, and highgamma1 bands with even segments; significantly lower local efficiency in the delta, theta, alpha, beta1, beta, and highgamma1 bands; and significantly longer path lengths at channels in the delta, theta, alpha, beta1, beta2, beta, lowgamma2, lowgamma, and highgamma1 bands. Similar to even segments, the participants with schizophrenia had, with uneven segments, significantly lower clustering coefficients in the delta, alpha, beta1, beta, and lowgamma1 bands, significantly lower local efficiency in the delta, alpha, beta1, beta2, beta, and lowgamma1 bands; and significantly longer path lengths in the delta, beta1, beta2, beta, lowgamma2, highgamma1, and highgamma bands.

Transfer Entropy - Virtual Channels As for the even segments, the beta1, beta, highgamma1, and highgamma2 bands contained channels that were statistically significant and consistent across more than one preprocessing manipulation. Similar to the EEG channels, the channels in these bands had higher clustering coefficients and local efficiency, and shorter path lengths (Figure A.108) for schizophrenia compared to their matched controls. With uneven segments, there were no statistically significant virtual channels that were consistent over preprocessing manipulation.

Classification

Coherence - EEG Table A.19 reveals that, using even segments, there were EEG channels in the lowgamma and all-bands condition with consistently high bookmaker informedness scores; and in the lowgamma and highgamma2 band with uneven segments. However, these results are not much evident in Figure A.117, with exception to the high bookmaker informedness scores in the lowgamma1, lowgamma2, and lowgamma bands with the non-AMICA manipulation and even segments.

Transfer Entropy - EEG With even segments, Table A.20 reveals that there were EEG channels with consistently high bookmaker informedness scores in the delta, theta, beta, lowgamma2, and highgamma2 bands. The channel in the highgamma2 band was consistent with the statistical comparisons (as indicated by the bolded channel). Additionally, there were EEG channels with consistently high bookmaker informedness scores in the highgamma2 band with uneven segments. Although there were channels with consistently high bookmaker informedness scores in the previously mentioned bands, there were numerous high bookmaker informedness scores in the theta band for both of the segmentation methods and both of the classification algorithms. Overall, the high bookmaker informedness scores were most apparent in even segments.

Coherence - Virtual Channels In contrast to the EEG results, Table A.19 reveals that there were virtual channels with consistently high bookmaker informedness scores in all of the band conditions, but only with uneven segments. This is highly evident in Figure A.119, with high bookmaker informedness scores at almost every channel in every band condition. It is noteworthy that there were channels in the alpha, beta1, beta2, beta, lowgamma2, highgamma1, highgamma2, and highgamma band with uneven segments that were consistent with the statistical comparisons.

Transfer Entropy - Virtual Channels Similar to the EEG results, there were virtual channels with consistently high bookmaker informedness scores in the lowgamma2 band, but only with even segments (refer to Table A.20). Referring to figure A.120, there were high bookmaker informedness scores at numerous channels in the lowgamma1 band with even segments and the all-bands condition with uneven segments.

A.1.2.4 One-way analysis of variance

Using a bookmaker threshold of 0.5, a number of statistically significant main effects were found and the mean ranks of the proportion of informative channels (number of channels with a bookmaker score ≥ 0.5 divided by the total number of channels) are displayed in Figure A.3. A main effect of **input type** was found, chi-sq (4) = 44.578, $p < 0.001$. A higher proportion of informative channels was found when using AM-Coh features as input to the classifier compared to SP features, 95% C.I. [15.60, 16.71], and GT-TE features, 95% C.I. [49.60, 173.3]. A higher proportion of informative channels was found when using AM-TE features compared to SP features, 95% C.I. [26.15, 177.6], and GT-TE features, 95% C.I. [60.15, 183.8]. Moreover, a higher proportion of informative channels was found when using GT-TE features compared to SP features, 95% C.I. [7.534, 159.0], and GT-TE features, 95% C.I. [41.53, 165.2].

However, a main effect of **preprocessing manipulation** was not found, chi-sq (2) = 5.727, $p = 0.057$. A main effect of **channel type** was found, chi-sq (1) = 9.468, p = 0.002. There was a higher proportion of informative virtual channels compared to EEG channels, 95% C.I. [17.23, 77.69]. However, a main effect of **band** was not found, chi-sq (12) = 9.468, p = 0.634. Further, a main effect of **segmentation size** was not found, chi-sq (1) = 1.363, p = 0.243.

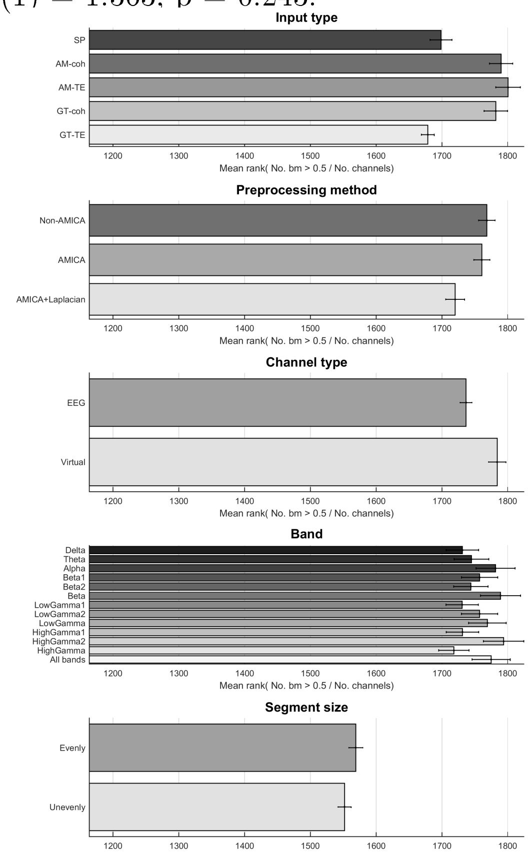


Figure A.3 – Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.5 divided by the number of channels) in the classification of participants with schizophrenia and their matched controls for each condition within each independent variable (input type, processing method, channel type, band, segment size).

At the more stringent bookmaker threshold of 0.7, a number of main effects were found and the mean ranks of the informative channels (number of channels with a bookmaker score ≥ 0.7 divided by the total number of channels) are displayed in Figure A.4. A main effect of **input type** was found, chi-sq (4) = 62.367, $p < 0.001$.

A higher proportion of informative channels was found when using GT-Coh features as input to the classifier compared to SP features, 95% C.I. [36.11, 118.0], AM-Coh features, 95% C.I. [36.99, 103.8], AM-TE features, 95% C.I. [5.514, 72.35], and GT-TE features, 95% C.I. [52.54, 119.4]. Moreover, a higher proportion of informative channels was found when using AM-TE features compared with GT-TE features, 95% C.I. [13.61, 80.45].

Consistent with the 0.5 bookmaker threshold results, a main effect of **preprocessing manipulation** was not found, chi-sq (2) = 5.643, $p = 0.060$. A main effect of **channel type** was also found, chi-sq (1) = 22.269, $p < 0.001$. Further consistent with the 0.5 bookmaker threshold results, there was a higher proportion of informative virtual channels compared to EEG channels, 95% C.I. [23.00, 55.68]. However, a main effect of **band** was not found, chi-sq (12) = 5.493, $p = 0.939$. Inconsistent with the 0.5 bookmaker thresholds, there was a main effect of **segmentation method**, chi-sq (1) = 4.132, $p = 0.042$. A higher proportion of informative channels was found with unevenly segments compared to evenly segments, 95% C.I. [0.585, 32.10].

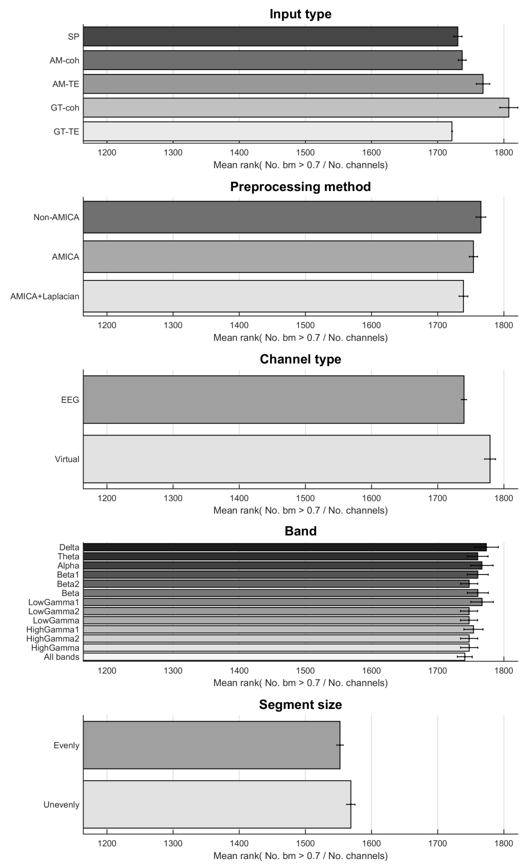


Figure A.4 – Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.7 divided by the number of channels) in the classification of participants with schizophrenia and their matched controls for each condition within each independent variable (input type, processing method, channel type, band, segment size).

A.1.3 Dementia versus matched controls

A.1.3.1 Spectral Analysis

Statistical comparisons As seen in Table A.21, the delta, theta, alpha, lowgamma2, lowgamma, highgamma1, and the all-bands condition had EEG channels that were statistically significant and consistent over preprocessing manipulation. The channels in the previously mentioned bands exhibited higher power for the matched controls compared to the participants with dementia. Furthermore, the channels in the left-frontal region show a delta/theta peak for the matched controls. In contrast to the EEG channels, there were no virtual channels that were statistically significant and consistent over preprocessing manipulation. The majority of virtual channels display higher power for matched controls over all of the band conditions.

Classification Table A.22 reveals that there were EEG channels in the delta, theta, alpha, beta, lowgamma1, lowgamma, highgamma1, highgamma2, highgamma, and the all-bands condition, that had consistently high bookmaker informedness scores. Figure A.135 displays high bookmaker informedness scores in the delta and theta bands at channels in the left-temporal scalp region. High bookmaker informedness scores were also evident at numerous channels in the frontal region in the lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and the all-bands condition in the non-AMICA manipulation, but to a lesser extent in the other two preprocessing manipulations. As for the virtual channels, Table A.21 reveals that there were high bookmaker informedness scores which were consistent over preprocessing manipulation, in the delta, lowgamma1, lowgamma2, highgamma1, highgamma2, and the highgamma band. Similar to the EEG channels, there were numerous left-frontal virtual channels that displayed high bookmaker informedness scores. This trend was more evident in the AMICA manipulation compared to the non-AMICA manipulation.

A.1.3.2 Adjacency matrices

Statistical comparisons

Coherence - EEG Table A.23 reveals that, using both segmentation methods, there were EEG channels in the theta band that were consistently involved in a statistically significant network. Figure A.141 confirms the tabulated results, and reveals that the controls had statistically **higher** connectivity in the theta band compared to the matched controls.

Transfer Entropy - EEG Whereas, with even segments, Table A.24 reveals that there were EEG channels that were consistently involved in a statistically significant network in the beta1 and beta2 band; and in the alpha, beta1, beta, lowgamma1, lowgamma2, lowgamma, and the highgamma1 band with the unevenly method. Figure A.142 shows that, with even segments, the connectivity values were **higher** for participants with dementia than the matched controls in the beta1 and beta2 band. Similar to even segments, the connectivity values were **higher** with uneven segments for participants with dementia in the alpha, beta1, beta, lowgamma1, lowgamma2, lowgamma, and highgamma1 band. The difference in connectivity values were visually higher with the uneven segments compared to even segments.

Coherence - Virtual Channels With regard to the virtual channels and even segments, Table A.23 reveals that there were virtual channels in the delta, beta2, lowgamma2, and all-bands condition that were consistently involved in a statistically significant network; and in the delta, beta2, lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma2, highgamma, and all-bands condition with uneven segments. Figure A.143 displays significant networks in many bands for both segmentation methods. The networks in the previously mentioned bands have connectivity values that were significantly **higher** for participants with dementia compared to their matched controls.

Transfer Entropy - Virtual Channels Table A.24 reveals that there were no significant networks for either segmentation method.

Classification

Coherence - EEG Table A.25 reveals that, using even segments, there were EEG channels with consistently high bookmaker informedness scores in the delta, theta, beta2, lowgamma, highgamma1, highgamma2, and highgamma bands; and in the delta, theta, beta2, highgamma1, highgamma, and all-bands condition with even segments. The high bookmaker informedness scores appear to be most prominent in the theta band across all of the preprocessing manipulations. Moreover, the high bookmaker informedness scores in the delta band appear most prominently with the AMICA+Laplacian preprocessing manipulation.

Transfer Entropy - EEG Table A.26 reveals that, using even segments, there were EEG channels with consistently high bookmaker informedness scores in the alpha and highgamma2 bands; and in the delta, beta1, beta, highgamma1, highgamma, and the all-bands condition with uneven segments. Figure A.154 shows that the consistently high bookmaker informedness scores in the beta1 and beta2 bands were not apparent in terms of spatial consistency. The most apparent high bookmaker informedness scores were at frontal channels in the majority of the band conditions. There was also good spatial consistency at centro-parietal EEG channels in the theta, alpha, beta1, beta2, and beta band, but only in the AMICA manipulation. As for uneven segments, the spatial consistency of the high bookmaker informedness scores were more apparent compared to even segments, especially at the alpha, beta, and all-bands condition.

Coherence - Virtual Channels For the virtual channels there were channels with consistently high bookmaker informedness scores in the alpha, beta1, beta2, beta, and lowgamma2 bands but only with uneven segments (refer to Table A.25). It is evident in Figure A.155, that the non-AMICA manipulation had a higher number of virtual channels with high bookmaker informedness scores compared to the AMICA manipulation. This phenomenon occurred in almost all of the band conditions.

Transfer Entropy - Virtual Channels As for the transfer entropy measure, there were channels with consistently high bookmaker informedness scores in the delta and lowgamma band but only with uneven segments (refer to Table A.26). Figure A.156 shows that the majority of high bookmaker informedness scores occurred in the non-AMICA manipulation for both segmentation methods. Furthermore, there was high spatial consistency in the theta, alpha, beta1, beta2, beta, lowgamma1, lowgamma2, and lowgamma bands with even segments, and the alpha, beta1, and lowgamma bands with uneven segments.

A.1.3.3 Graph theory measures

Statistical comparisons

Coherence - EEG Table A.27 reveals that there were EEG channels that were statistically significant over multiple preprocessing manipulations in the alpha and beta1 band but only with even segments. In Figure A.165, it is evident that the controls have a significantly shorter path compared to the participants with dementia.

Transfer Entropy - EEG Table A.28 reveals that, with even segments, there were EEG channels in the beta1 and beta2 band that were statistically significant over multiple preprocessing manipulations. However, there were EEG channels in the alpha, beta1, lowgamma1, lowgamma2, lowgamma, and highgamma1 band with uneven segments that were statistically significant and consistent over multiple preprocessing manipulations. Figure A.166 displays, with uneven segments, significantly higher clustering coefficients and local efficiency for participants with dementia compared to their matched controls in the theta, beta1, and beta2 band. Whereas, significantly shorter path lengths for participants with dementia were found compared to their matched controls in the alpha, beta1, beta2, lowgamma1, lowgamma, and the highgamma1 band.

Coherence - Virtual Channels Using even segments, it was found that the beta2 band contained virtual channels that were statistically significant and consistent over multiple preprocessing manipulations; and in the delta, beta1, and beta2 band with uneven segments. It can be seen in Figure A.167, that the participants with dementia had, with even segments, a significantly **shorter** path length at channels in the beta2 band. Whereas, with uneven segments, the participants with dementia had significantly **higher** clustering coefficients in the beta2 band; and significantly **higher** local efficiency in the delta and beta2 bands. Moreover, the controls had a significantly shorter path in the beta1 band.

Transfer Entropy - Virtual Channels There were no virtual channels that were statistically significant and consistent over multiple preprocessing manipulations with either segmentation method.

Classification

Coherence - EEG Table A.29 reveals that, using even segments, there were EEG channels in the alpha, beta1, beta2, beta, highgamma, and all-bands condition with consistently high bookmaker informedness scores; and in the alpha, beta1, beta2, beta, highgamma1, and all-bands condition with uneven segments. With both segmentation methods, the high bookmaker informedness scores were abundant with the AMICA manipulation in the alpha, beta1, beta2, beta, lowgamma1, lowgamma2, and lowgamma bands at EEG channels in the posterior and occipital regions.

Transfer Entropy - EEG When even segments, Table A.30 reveals EEG channels with consistently high bookmaker informedness scores in the all-bands condition. Whereas, with the uneven segments, there were EEG channels in the theta, alpha, beta1, beta2, lowgamma1, lowgamma2, lowgamma, and highgamma band. Figure A.135 displays high bookmaker informedness scores at multiple channels but with little consistency over preprocessing manipulation. With even segments, EEG channels had the highest spatial consistency of high bookmaker informedness scores in the all-band condition with the AMICA+Laplacian manipulation. Whereas, with uneven segments, EEG channels had the highest spatial consistency of high bookmaker informedness scores in the alpha, beta2, lowgamma1, and lowgamma bands with the non-AMICA manipulation.

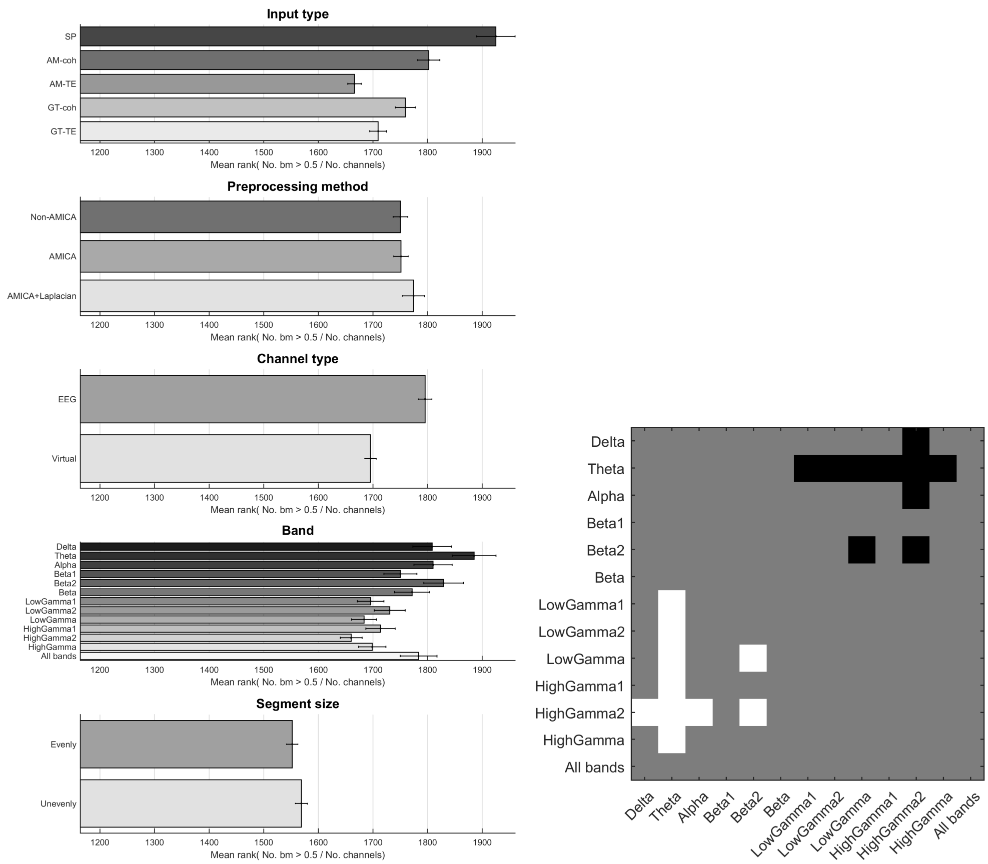
Coherence - Virtual Channels Table A.29 reveals that, using even segments, there were virtual channels in the theta band with consistently high bookmaker informedness scores. However, rather than in the theta band, Figure A.179 reveals that were a number of virtual channels with high bookmaker informedness scores in the beta1, beta2, and beta bands with the non-AMICA preprocessing manipulation. With exception to the alpha band, there were few bands with channels that had high bookmaker informedness scores with the unevenly method.

Transfer Entropy - Virtual Channels With even segments, Table A.30 reveals that there were virtual channels in the beta1 and highgamma1 bands with consistently high bookmaker informedness scores, and in the delta and lowgamma2 bands with uneven segments. With even segments, Figure A.180 displays high bookmaker informedness scores in the beta1 and highgamma1 band with the non-AMICA manipulation.

A.1.3.4 One-way analysis of variance

Using a bookmaker threshold of 0.5, a number of main effects were found and the mean ranks of the proportion of informative channels (number of channels with a bookmaker score ≥ 0.5 divided by the total number of channels) are displayed in Figure A.5. A main effect of **input type** was found, chi-sq (4) = 81.477, $p < 0.001$. A higher proportion of informative channels was found when using SP features as input to the classifier compared to AM-Coh features, 95% C.I. [37.50, 208.5], AM-TE features, 95% C.I. [173.4, 344.4], GT-Coh features, 95% C.I. [80.15, 251.1], and GT-TE features, 95% C.I. [130.2, 301.2]. There was also a higher proportion of informative channels with AM-Coh features compared to AM-TE features, 95% C.I. [66.11, 205.7], GT-TE features, 95% C.I. [22.92, 162.5]. Additionally, a higher proportion of informative channels was found when using GT-Coh features compared to AM-TE features, 95% C.I. [23.47, 163.1].

A main effect of **preprocessing manipulation** was not found, chi-sq (2) = 1.226, $p = 0.542$. In addition, there was a main effect of **channel type**, chi-sq (1) = 33.007, $p < 0.001$. There was a higher proportion of informative EEG channels compared to virtual channels, 95% C.I. [65.89, 134.1]. A main effect of **band** was also found, chi-sq(12) = 55.579, $p < 0.001$. Figure A.5a displays a higher proportion of informative channels in the theta band compared to the lowgamma1, lowgamma2, lowgamma, highgamma1, highgamma2, and highgamma bands. A higher proportion of informative channels was also found with the beta2 band compared with the lowgamma and highgamma2 bands. Moreover, the highgamma2 band had a significantly lower proportion of informative channels compared to the delta, and alpha band. A main effect of **segmentation size** was not found, chi-sq (1) = 1.237, $p = 0.266$.



(a) **(b)**

Figure A.5 – (a) Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.5 divided by the number of channels) in the classification of participants with dementia and their matched controls for each condition within each independent variable (input type, processing method, channel type, band, segment size). (b) Post hoc comparisons of the band main effect. A black square indicates a significantly ($p \leq 0.05$) higher number of informative channels for the band in the row compared to the band in the column. While a white square indicates a significantly lower number of informative channels. A grey square indicates no significant difference or no comparison was conducted (diagonal).

At the more stringent bookmaker threshold of 0.7, a number of main effects were found and the mean ranks of the proportion of informative channels (number of channels with a bookmaker score ≥ 0.7 divided by the total number of channels) are displayed in Figure A.6. A main effect of **input type** was found, chi-sq 4) = 14.013, p = 0.007. Consistent with the 0.5 bookmaker threshold results, a higher proportion of informative channels was found when using SP features compared to AM-TE features, 95% C.I. [6.965, 60.72], GT-Coh features, 95% C.I. [4.737, 58.49], GT-TE features, 95% C.I. [2.514, 56.27].

Consistent with the 0.5 bookmaker threshold results, there was no main effect of **preprocessing manipulation**, chi-sq (2) = 0.054, p = 0.973. Unlike with the 0.5 bookmaker threshold results, a main effect of **channel type** was not found, chi-sq (1) = 0.062, p = 0.803. Moreover, a main effect of **band** was not found, chi-sq (12) = 12.848, p = 0.380. Consistent with the 0.5 bookmaker threshold results, a main effect of **segmentation method** was not found, chi-sq (1) = 0.000, p = 0.998.

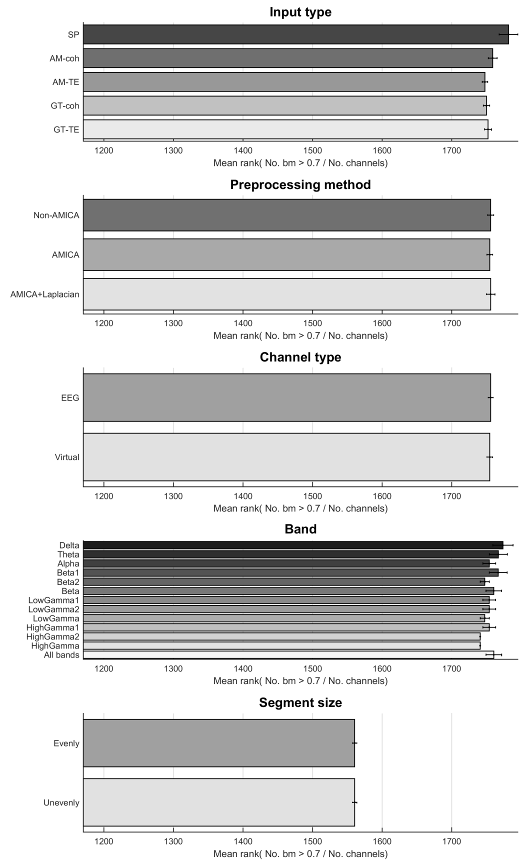


Figure A.6 – Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.7 divided by the number of channels) in the classification of participants with dementia and their matched controls for each condition within each independent variable (input type, processing method, channel type, band, segment size).

A.1.4 Bipolar disorder versus schizophrenia

A.1.4.1 Spectral Analysis

Statistical comparisons As seen in Table A.31, there were EEG channels in the theta, beta1, beta2, lowgamma1, and lowgamma band that were statistically significant and consistent over multiple manipulations. Evident in Section **??** and Section

??, both participants with bipolar disorder and participants with schizophrenia display a widespread increase of relative spectral power in the beta and lowgamma bands. When statistically compared, this spectral peak has a higher power for the participants with bipolar disorder, as shown at multiple channels in Figure A.189. In addition, participants with schizophrenia have a small spectral peak in the theta band, which is statistically significant at EEG channels in the centro-parietal region.

With regard to the virtual channels, Table A.31 reveals that there were no virtual channels which were statistically significant and consistent over multiple preprocessing manipulations. Similar to the EEG channels, the spectral peak in the beta and lowgamma bands and spectral peak in the theta band is evident at numerous virtual channels. However, there were few virtual channels where these spectral peaks were statistically significant.

Classification Table A.32 reveals that there were EEG channels in the delta, beta2, beta, lowgamma1, lowgamma2, lowgamma, and all-bands condition that have consistently high bookmaker informedness scores. Figure A.195 displays high bookmaker informedness scores across all three preprocessing manipulations in the beta2, beta, lowgamma1, and lowgamma bands. Numerous channels were found in the beta band at fronto-central channels. However, there were fewer channels in the AMICA+Laplacian with high bookmaker informedness scores compared to the other two preprocessing manipulations. Similarly, Table A.32 reveals that there were virtual channels in the beta2, beta, lowgamma1, lowgamma2, lowgamma, and highgamma band which had consistently high bookmaker informedness scores. Figure A.196 displays high bookmaker informedness scores in the beta2, beta, lowgamma1, and lowgamma band. However, the classification results were evidently higher in the non-AMICA manipulation.

A.1.4.2 Adjacency matrices

Statistical comparisons

Coherence - EEG Table A.43 reveals that there were no EEG channels that were consistently involved in a network with either segmentation method. Further to this point, Figure A.213 displays that the only significant networks reside in the beta2 and beta bands with the AMICA+Laplacian preprocessing manipulation and uneven segments.

Transfer Entropy - EEG With even segments, Table A.44 reveals that the EEG channels that were consistently involved in a network resided in the lowgamma band. The uneven segments did not have any statistically consistent channels. The statistically consistent channels in the lowgamma band using even segments had **higher** connectivity in the non-AMICA and AMICA+Laplacian manipulation for participants with bipolar disorder compared to the participants with schizophrenia.

Coherence - Virtual Channels Similar to the EEG channels, Table A.33 reveals that there were no virtual channels that were consistently involved in a statistically significant network with either segmentation method. Furthermore, Figure A.215 does not show any bands close to being consistent over the preprocessing manipulations with either segmentation method.

Transfer Entropy - Virtual Channels Table A.34 reveals that, with even segments, there were virtual channels in the delta and lowgamma bands that were consistently involved in a statistically significant network. However, uneven segments were not found to have any virtual channels that were consistently involved in a statistically consistent network. Both of the previously mentioned bands with even segments display **higher** connectivity for participants with bipolar disorder compared to the participants with schizophrenia, which can be seen in Figure A.204.

Classification

Coherence - EEG Table A.35 reveals that there were EEG channels with consistently high bookmaker informedness scores in the lowgamma2 band but only with uneven segments. The lack of consistently high bookmaker informedness scores is evident in Figure A.213, however, there does appear to be EEG channels with high bookmaker informedness scores in abundance in the non-AMICA preprocessing manipulation. These channels appear to be located in the right-frontal region.

Transfer Entropy - EEG Table A.36 reveals that, with even segments, there were EEG channels with consistently high bookmaker informedness scores in the highgamma1, highgamma2, and highgamma bands; and in the theta and alpha band with uneven segments. As can be seen in Figure A.214, there were a number of channels, with even segments, that have high bookmaker informedness scores in the lowgamma band with the non-AMICA and AMICA+Laplacian manipulation.

Coherence - Virtual Channels For the virtual channels, Table A.35 reveals that there were no virtual channels with consistently high bookmaker informedness scores with either segmentation method. Consistent with the EEG channels, using the coherence measure, there were very few virtual channels that had high bookmaker informedness scores.

Transfer Entropy - Virtual Channels Table A.36 reveals that there were consistently high bookmaker informedness scores in the theta, lowgamma, and all-bands condition but only with uneven segments. Figure A.216 displays numerous high bookmaker informedness scores in the lowgamma band.

A.1.4.3 Graph theory measures

Statistical comparisons

Coherence - EEG Table A.57 reveals that, using even segments, there were channels in the alpha band that were statistically significant and consistent over multiple preprocessing manipulations; and in the lowgamma1 band with uneven segments. The participants with schizophrenia had a significantly **shorter** path length in the alpha band with even segments. Whereas, the participants with bipolar disorder had significantly **higher** clustering coefficients and local efficiency in the lowgamma1 band with uneven segments (Figure A.345).

Transfer Entropy - EEG Table A.58 reveals that, with even segments, there were channels in the delta, theta, and beta bands that were statistically significant and consistent over multiple preprocessing manipulations. There were no bands containing channels that were consistent with the unevenly segmentation method. Figure A.346 shows high spatial consistency of channels with statistically significant clustering coefficient and local efficiency results in the delta and beta bands with even segments, but the latter band only had results with high spatial consistency in the non-AMICA manipulation. Similar results were also found with the shortest path length measure, with statistically significant results that were consistent over the preprocessing manipulations in the delta band.

Coherence - Virtual Channels For the virtual channels, Table A.39 reveals that, using even segments, the alpha band was found to have virtual channels that were statistically significant and consistent over multiple preprocessing manipulations; and in the delta, theta, beta2, beta, and all-bands condition with uneven segments. With even segments, the participants with schizophrenia had significantly **higher** clustering coefficients and local efficiency in the alpha band (Figure A.347). Whereas, with uneven segments, the participants with bipolar disorder were found to have significantly **higher** clustering coefficients in the delta, theta, beta2, beta, and all-bands condition; and significantly **high**er local efficiency in the delta, theta, beta2, beta and band.

Transfer Entropy - Virtual Channels Table A.58 reveals that, using even segments, there were virtual channels that were statistically significant over multiple preprocessing manipulations in the lowgamma and highgamma1 bands; and in the beta2 and lowgamma1 bands with the unevenly segmentation method. The channel in the lowgamma band with even segments was found to have a **higher** clustering coefficient and local efficiency and a **shorter** path length for participants with bipolar disorder compared to the participants with schizophrenia. The channel in the highgamma1 band displayed significantly **higher** clustering coefficients and local efficiency. With uneven segments, the channel in the beta2 band displayed a significantly **shorter** path length, and the channel in the lowgamma1 band displayed significantly **higher** clustering coefficients and local efficiency.

Classification

Coherence - EEG Table A.37 reveals that, using even segments, there were EEG channels with consistently high bookmaker informedness scores in the theta, alpha, beta2, lowgamma2, lowgamma, and all-bands condition; and in the beta, lowgamma1, and lowgamma2 bands with uneven segments. With both segmentation methods, Figure A.237 displays numerous channels with high bookmaker informedness scores in the beta1, beta2, beta, lowgamma1, highgamma2, and highgamma bands with the non-AMICA preprocessing manipulation.

Transfer Entropy - EEG Table A.38 reveals that, with even segments, there were EEG channels with consistently high bookmaker informedness scores in the delta, alpha, beta1, lowgamma2, lowgamma, highgamma1, and highgamma2 band; and in the theta, beta2, lowgamma1, and lowgamma2 bands with uneven segments. Although these bands contained channels with consistently high bookmaker informedness scores, there were only convincing classification results at frontal-medial channels in the beta1 and highgamma2 bands with the non-AMICA-evenly manipulation.

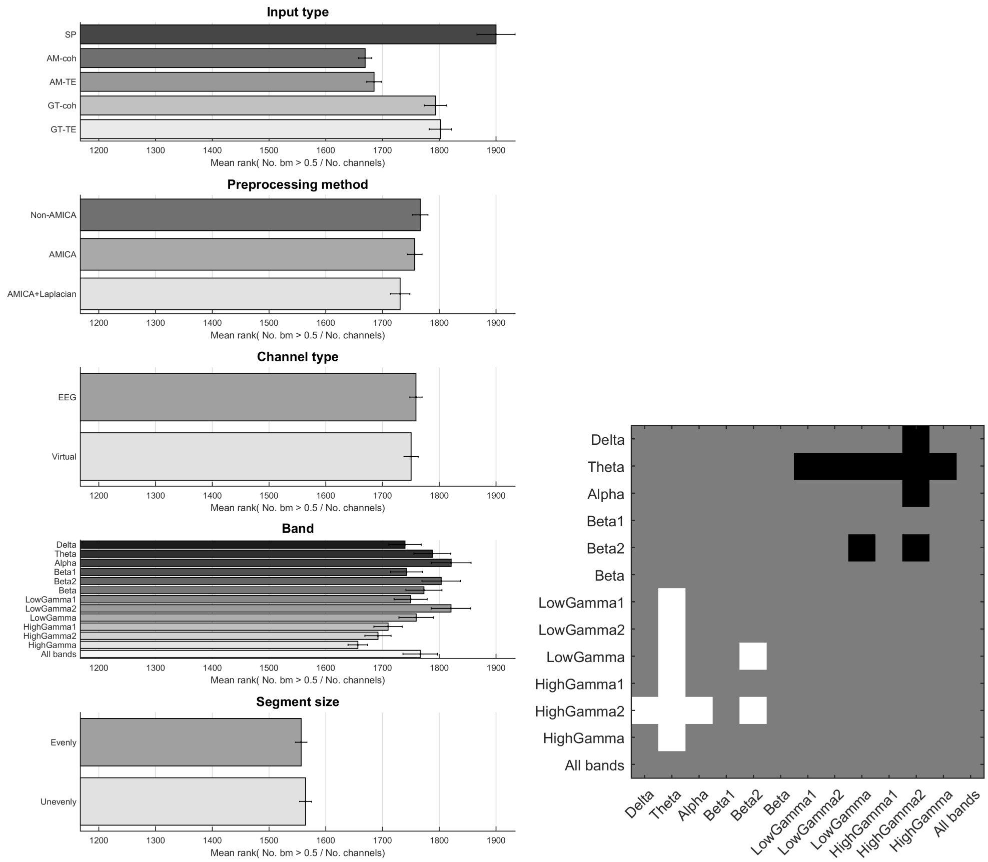
Coherence - Virtual Channels For the virtual channels, Table A.39 informs us that, with even segments, there were virtual channels with consistently high bookmaker informedness scores in the beta1, beta2, beta, highgamma, and all-bands condition; and in the delta, theta, alpha, beta1, beta2, beta, lowgamma2, lowgamma, highgamma1, highgamma2, and all-bands condition with uneven segments. Evident in Figure A.239, there were numerous virtual channels that had high bookmaker informedness scores with uneven segments, which were prominent in almost all of the band conditions.

Transfer Entropy - Virtual Channels There were virtual channels, with even segments, with consistently high bookmaker informedness scores in the alpha and lowgamma bands; and the beta1, lowgamma1, and lowgamma bands with uneven segments. Consistent with the EEG channels when using the transfer entropy measure, there were no convincing classification results.

A.1.4.4 One-way analysis of variance

Using a bookmaker threshold of 0.5, a number of main effects were found and the mean ranks of the proportion of informative channels (number of channels with a bookmaker score ≥ 0.5 divided by the total number of channels) are displayed in Figure A.7. A main effect of **input type** was found, chi-sq (4) = 86.095, $p < 0.001$. A higher proportion of informative channels was found when using SP features as input to the classifier compared to AM-Coh features, 95% C.I. [147.9, 313.4], AM-TE features, 95% C.I. [132.2, 297.7], GT-Coh features 95% C.I. [24.00, 189.5], and GT-TE features, 95% C.I. [152.4, 180.7]. Similarly, there was a higher proportion of informative channels with GT-Coh features compared to AM-Coh features, 95% C.I. [56.32, 191.4], and AM-TE features, 95% C.I. [40.61, 175.5]. Further, there was a higher proportion of informative channels with GT-TE features compared to AM-Coh features, 95% C.I. [65.08, 200.2] and AM-TE features, 95% C.I. [49.37, 184.5].

However, a main effect of **preprocessing manipulation** was not found, chi-sq (2) = 2.478, p = 0.290. Moreover, there was no main effect of **channel type** found, chi-sq (1) = 0.255, p = 0.614. In contrast, a main effect of **band** was found, chi-sq (12) = 32.387, p = 0.001. The highgamma band had a significantly lower proportion of informative channels compared to the alpha, beta2, and lowgamma band. A main effect of **segmentation size** was not found, chi-sq (1) = 0.276, p = 0.599.



(a) **(b)**

Figure A.7 – (a) Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.5 divided by the number of channels) in the classification of participants with bipolar disorder and participants with schizophrenia for each condition within each independent variable (input type, processing method, channel type, band, segment size). (b) Post hoc comparisons of the band main effect. A black square indicates a significantly ($p \leq 0.05$) higher number of informative channels for the band in the row compared to the band in the column. While a white square indicates a significantly lower number of informative channels. A grey square indicates no significant difference or no comparison was conducted (diagonal).

At the more stringent bookmaker threshold of 0.7, a number of main effects were found and the mean ranks of the proportion of informative channels (number of channels with a bookmaker score$\geq$0.7 divided by the total number of channels) are displayed in Figure A.8. A main effect of **input type** was found, chi-sq (4) = 35.712, $p < 0.001$. Consistent with the 0.5 bookmaker threshold results, a higher proportion of informative channels was found when using SP features as input to the classifier compared to AM-Coh features, 95% C.I. [30.20, 91.65], AM-TE features, 95% C.I. [27.95, 89.40], GT-Coh features, 95% C.I. [9.998, 71.46], and GT-TE features 95% C.I. [7.769, 69.23].

There was no main effect of **preprocessing manipulation** found, chi-sq (2) = 0.027, p = 0.987. Further, a main effect of **channel type** was not found, chi-sq (1) = 0.007, p = 0.931. Moreover, a main effect of **band** was not found, chi-sq (12) = 20.428, p = 0.059. Also, a main effect of **segmentation method** was not found, chi-sq (1) = 0.000, p = 0.998.

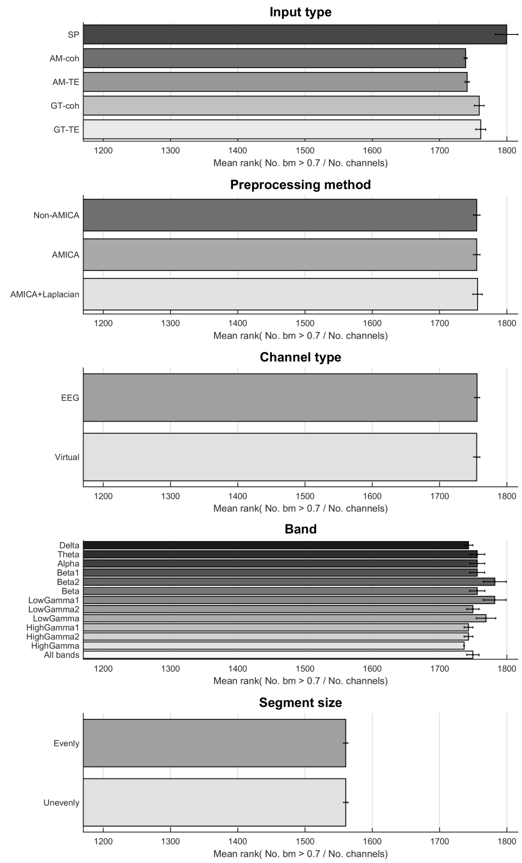


Figure A.8 – Mean ranks and standard errors of the proportion of informative channels (number of channels with a bookmaker score greater than or equal to 0.7 divided by the number of channels) in the classification of participants with bipolar disorder and participants with schizophrenia for each condition within each independent variable (input type, processing method, channel type, band, segment size).