Clustering of performers based on different statistical techniques

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Preliminary analysis for movement Op.38i

Pearson correlations between performers

Beat proportions and intensity fluctuations (both performers)

```
##             CH       DPB        FB      FvdP        GG       GGr       GGu
## CH   1.0000000 0.9531815 0.9512836 0.9456965 0.9587053 0.9571560 0.9612621
## DPB  0.9531815 1.0000000 0.9585092 0.9444712 0.9622570 0.9581066 0.9632615
## FB   0.9512836 0.9585092 1.0000000 0.9506488 0.9561146 0.9530443 0.9584703
## FvdP 0.9456965 0.9444712 0.9506488 1.0000000 0.9460334 0.9452998 0.9513626
## GG   0.9587053 0.9622570 0.9561146 0.9460334 1.0000000 0.9683811 0.9692207
## GGr  0.9571560 0.9581066 0.9530443 0.9452998 0.9683811 1.0000000 0.9712297
## GGu  0.9612621 0.9632615 0.9584703 0.9513626 0.9692207 0.9712297 1.0000000
## IH   0.9607199 0.9612495 0.9630767 0.9539005 0.9686863 0.9622892 0.9654265
## MA   0.9577994 0.9614223 0.9581056 0.9425407 0.9636148 0.9623579 0.9666204
## MG   0.9500120 0.9527242 0.9501875 0.9473975 0.9610390 0.9609190 0.9620236
## ML   0.9580110 0.9599386 0.9502508 0.9414416 0.9665917 0.9654645 0.9633568
## MP   0.9635413 0.9588870 0.9548645 0.9480152 0.9664562 0.9633707 0.9664400
## PN   0.9613178 0.9608625 0.9511474 0.9445671 0.9629056 0.9641748 0.9661441
## PR36 0.9542970 0.9584757 0.9569146 0.9537925 0.9573981 0.9559258 0.9605835
## PR66 0.9602102 0.9608088 0.9544620 0.9519831 0.9649963 0.9638995 0.9637649
## PS   0.9579390 0.9529783 0.9507882 0.9422790 0.9580070 0.9551010 0.9579426
## PV   0.9612466 0.9611475 0.9576222 0.9518495 0.9644610 0.9624393 0.9615509
## RS   0.9566457 0.9493038 0.9527743 0.9491487 0.9524581 0.9579118 0.9569086
## SB   0.9585954 0.9583258 0.9583323 0.9638230 0.9623021 0.9618309 0.9639127
## SS   0.9614979 0.9624061 0.9581970 0.9519497 0.9640265 0.9620020 0.9616599
##             IH        MA        MG        ML        MP        PN      PR36
## CH   0.9607199 0.9577994 0.9500120 0.9580110 0.9635413 0.9613178 0.9542970
## DPB  0.9612495 0.9614223 0.9527242 0.9599386 0.9588870 0.9608625 0.9584757
## FB   0.9630767 0.9581056 0.9501875 0.9502508 0.9548645 0.9511474 0.9569146
## FvdP 0.9539005 0.9425407 0.9473975 0.9414416 0.9480152 0.9445671 0.9537925
## GG   0.9686863 0.9636148 0.9610390 0.9665917 0.9664562 0.9629056 0.9573981
## GGr  0.9622892 0.9623579 0.9609190 0.9654645 0.9633707 0.9641748 0.9559258
## GGu  0.9654265 0.9666204 0.9620236 0.9633568 0.9664400 0.9661441 0.9605835
## IH   1.0000000 0.9648417 0.9612308 0.9638911 0.9652671 0.9630916 0.9615655
## MA   0.9648417 1.0000000 0.9558977 0.9623294 0.9647337 0.9667259 0.9596004
## MG   0.9612308 0.9558977 1.0000000 0.9575019 0.9574589 0.9560572 0.9529392
## ML   0.9638911 0.9623294 0.9575019 1.0000000 0.9630310 0.9656824 0.9578372
## MP   0.9652671 0.9647337 0.9574589 0.9630310 1.0000000 0.9664639 0.9558978
## PN   0.9630916 0.9667259 0.9560572 0.9656824 0.9664639 1.0000000 0.9572582
## PR36 0.9615655 0.9596004 0.9529392 0.9578372 0.9558978 0.9572582 1.0000000
```

```
## PR66 0.9658770 0.9629676 0.9557778 0.9615827 0.9626116 0.9609561 0.9653411
## PS   0.9611471 0.9554691 0.9461958 0.9542201 0.9563768 0.9546600 0.9578870
## PV   0.9639513 0.9623891 0.9595413 0.9610146 0.9631639 0.9612464 0.9628703
## RS   0.9574043 0.9562732 0.9525267 0.9543925 0.9545332 0.9590755 0.9584339
## SB   0.9654520 0.9636933 0.9608185 0.9597772 0.9637281 0.9625302 0.9634009
## SS   0.9637748 0.9624150 0.9591512 0.9608093 0.9621274 0.9618295 0.9637273
##           PR66        PS        PV        RS        SB        SS
## CH   0.9602102 0.9579390 0.9612466 0.9566457 0.9585954 0.9614979
## DPB  0.9608088 0.9529783 0.9611475 0.9493038 0.9583258 0.9624061
## FB   0.9544620 0.9507882 0.9576222 0.9527743 0.9583323 0.9581970
## FvdP 0.9519831 0.9422790 0.9518495 0.9491487 0.9638230 0.9519497
## GG   0.9649963 0.9580070 0.9644610 0.9524581 0.9623021 0.9640265
## GGr  0.9638995 0.9551010 0.9624393 0.9579118 0.9618309 0.9620020
## GGu  0.9637649 0.9579426 0.9615509 0.9569086 0.9639127 0.9616599
## IH   0.9658770 0.9611471 0.9639513 0.9574043 0.9654520 0.9637748
## MA   0.9629676 0.9554691 0.9623891 0.9562732 0.9636933 0.9624150
## MG   0.9557778 0.9461958 0.9595413 0.9525267 0.9608185 0.9591512
## ML   0.9615827 0.9542201 0.9610146 0.9543925 0.9597772 0.9608093
## MP   0.9626116 0.9563768 0.9631639 0.9545332 0.9637281 0.9621274
## PN   0.9609561 0.9546600 0.9612464 0.9590755 0.9625302 0.9618295
## PR36 0.9653411 0.9578870 0.9628703 0.9584339 0.9634009 0.9637273
## PR66 1.0000000 0.9608518 0.9649150 0.9534587 0.9649276 0.9655821
## PS   0.9608518 1.0000000 0.9582936 0.9517269 0.9551388 0.9588755
## PV   0.9649150 0.9582936 1.0000000 0.9608649 0.9708049 0.9964473
## RS   0.9534587 0.9517269 0.9608649 1.0000000 0.9624712 0.9615056
## SB   0.9649276 0.9551388 0.9708049 0.9624712 1.0000000 0.9704118
## SS   0.9655821 0.9588755 0.9964473 0.9615056 0.9704118 1.0000000
```

Note length (cellists)

```
##             CH       DPB        FB      FvdP        GG       GGr       GGu
## CH   1.0000000 0.9667869 0.9573907 0.9717331 0.9712709 0.9665624 0.9700948
## DPB  0.9667869 1.0000000 0.9649408 0.9776657 0.9794039 0.9821809 0.9689534
## FB   0.9573907 0.9649408 1.0000000 0.9699458 0.9671198 0.9647606 0.9585442
## FvdP 0.9717331 0.9776657 0.9699458 1.0000000 0.9867930 0.9813036 0.9774349
## GG   0.9712709 0.9794039 0.9671198 0.9867930 1.0000000 0.9865932 0.9712443
## GGr  0.9665624 0.9821809 0.9647606 0.9813036 0.9865932 1.0000000 0.9623749
## GGu  0.9700948 0.9689534 0.9585442 0.9774349 0.9712443 0.9623749 1.0000000
## IH   0.3418444 0.3322913 0.3070080 0.3186785 0.3268099 0.3241173 0.3166858
## MA   0.9756406 0.9866967 0.9726635 0.9844223 0.9856458 0.9830990 0.9789714
## MG   0.9397035 0.9569621 0.9379605 0.9503249 0.9554809 0.9466002 0.9438449
## ML   0.9634690 0.9815890 0.9614069 0.9737243 0.9785399 0.9817385 0.9607090
## MP   0.9754588 0.9842357 0.9717841 0.9875392 0.9853504 0.9821903 0.9830504
## PN   0.7636335 0.7611846 0.7491453 0.7659420 0.7644177 0.7607464 0.7552026
## PR36 0.9700082 0.9835933 0.9689935 0.9836862 0.9819442 0.9781010 0.9758601
## PR66 0.3977847 0.4126421 0.3906608 0.3795303 0.3881774 0.3881717 0.3937179
## PS   0.9597558 0.9753596 0.9668695 0.9791410 0.9792532 0.9816812 0.9568483
## PV   0.9720745 0.9808842 0.9727569 0.9891464 0.9838190 0.9790651 0.9769927
## RS   0.9735675 0.9811501 0.9714454 0.9895314 0.9869767 0.9804173 0.9807303
## SB   0.9746513 0.9768169 0.9689474 0.9880983 0.9851053 0.9776059 0.9813602
## SS   0.9545953 0.9573473 0.9579482 0.9746232 0.9649960 0.9553614 0.9614027
##             IH        MA        MG        ML        MP        PN      PR36
## CH   0.3418444 0.9756406 0.9397035 0.9634690 0.9754588 0.7636335 0.9700082
## DPB  0.3322913 0.9866967 0.9569621 0.9815890 0.9842357 0.7611846 0.9835933
```

```
## FB   0.3070080 0.9726635 0.9379605 0.9614069 0.9717841 0.7491453 0.9689935
## FvdP 0.3186785 0.9844223 0.9503249 0.9737243 0.9875392 0.7659420 0.9836862
## GG   0.3268099 0.9856458 0.9554809 0.9785399 0.9853504 0.7644177 0.9819442
## GGr  0.3241173 0.9830990 0.9466002 0.9817385 0.9821903 0.7607464 0.9781010
## GGu  0.3166858 0.9789714 0.9438449 0.9607090 0.9830504 0.7552026 0.9758601
## IH   1.0000000 0.3261228 0.3025313 0.3355327 0.3323822 0.2582606 0.3232396
## MA   0.3261228 1.0000000 0.9606846 0.9821945 0.9911958 0.7667028 0.9871266
## MG   0.3025313 0.9606846 1.0000000 0.9475222 0.9563581 0.7582798 0.9555047
## ML   0.3355327 0.9821945 0.9475222 1.0000000 0.9789341 0.7638669 0.9778728
## MP   0.3323822 0.9911958 0.9563581 0.9789341 1.0000000 0.7682784 0.9874058
## PN   0.2582606 0.7667028 0.7582798 0.7638669 0.7682784 1.0000000 0.7588200
## PR36 0.3232396 0.9871266 0.9555047 0.9778728 0.9874058 0.7588200 1.0000000
## PR66 0.5675339 0.4071421 0.4170518 0.4098774 0.3940486 0.2977591 0.4032639
## PS   0.3171816 0.9799691 0.9474288 0.9734188 0.9779102 0.7505050 0.9797239
## PV   0.3298838 0.9865120 0.9500012 0.9775710 0.9880043 0.7723578 0.9834702
## RS   0.3157052 0.9894658 0.9591058 0.9768591 0.9894414 0.7548110 0.9873705
## SB   0.3185946 0.9866579 0.9548573 0.9726746 0.9878680 0.7564433 0.9865077
## SS   0.3143701 0.9717526 0.9360098 0.9581732 0.9723183 0.7540820 0.9700100
##           PR66        PS        PV        RS        SB        SS
## CH   0.3977847 0.9597558 0.9720745 0.9735675 0.9746513 0.9545953
## DPB  0.4126421 0.9753596 0.9808842 0.9811501 0.9768169 0.9573473
## FB   0.3906608 0.9668695 0.9727569 0.9714454 0.9689474 0.9579482
## FvdP 0.3795303 0.9791410 0.9891464 0.9895314 0.9880983 0.9746232
## GG   0.3881774 0.9792532 0.9838190 0.9869767 0.9851053 0.9649960
## GGr  0.3881717 0.9816812 0.9790651 0.9804173 0.9776059 0.9553614
## GGu  0.3937179 0.9568483 0.9769927 0.9807303 0.9813602 0.9614027
## IH   0.5675339 0.3171816 0.3298838 0.3157052 0.3185946 0.3143701
## MA   0.4071421 0.9799691 0.9865120 0.9894658 0.9866579 0.9717526
## MG   0.4170518 0.9474288 0.9500012 0.9591058 0.9548573 0.9360098
## ML   0.4098774 0.9734188 0.9775710 0.9768591 0.9726746 0.9581732
## MP   0.3940486 0.9779102 0.9880043 0.9894414 0.9878680 0.9723183
## PN   0.2977591 0.7505050 0.7723578 0.7548110 0.7564433 0.7540820
## PR36 0.4032639 0.9797239 0.9834702 0.9873705 0.9865077 0.9700100
## PR66 1.0000000 0.4084904 0.3902477 0.4011594 0.3970864 0.3775720
## PS   0.4084904 1.0000000 0.9765537 0.9823578 0.9780663 0.9631382
## PV   0.3902477 0.9765537 1.0000000 0.9880733 0.9867173 0.9832325
## RS   0.4011594 0.9823578 0.9880733 1.0000000 0.9911724 0.9753837
## SB   0.3970864 0.9780663 0.9867173 0.9911724 1.0000000 0.9760030
## SS   0.3775720 0.9631382 0.9832325 0.9753837 0.9760030 1.0000000
```

Note length (pianinsts)

```
##             CH       DPB        FB      FvdP        GG       GGr       GGu
## CH   1.0000000 0.9806224 0.9632140 0.9786377 0.9837554 0.9846693 0.9798355
## DPB  0.9806224 1.0000000 0.9556286 0.9678436 0.9798830 0.9818379 0.9750676
## FB   0.9632140 0.9556286 1.0000000 0.9673834 0.9641601 0.9603359 0.9641894
## FvdP 0.9786377 0.9678436 0.9673834 1.0000000 0.9814015 0.9741765 0.9831002
## GG   0.9837554 0.9798830 0.9641601 0.9814015 1.0000000 0.9826988 0.9814560
## GGr  0.9846693 0.9818379 0.9603359 0.9741765 0.9826988 1.0000000 0.9775736
## GGu  0.9798355 0.9750676 0.9641894 0.9831002 0.9814560 0.9775736 1.0000000
## IH   0.7171397 0.7216360 0.7250365 0.7301148 0.7156814 0.7188343 0.7274809
## MA   0.9629720 0.9620726 0.9506806 0.9666511 0.9667960 0.9538343 0.9701632
## MG   0.9654095 0.9671974 0.9476033 0.9556470 0.9717163 0.9617129 0.9659121
## ML   0.9152039 0.9210818 0.8952921 0.9128394 0.9179186 0.9214403 0.9187598
```

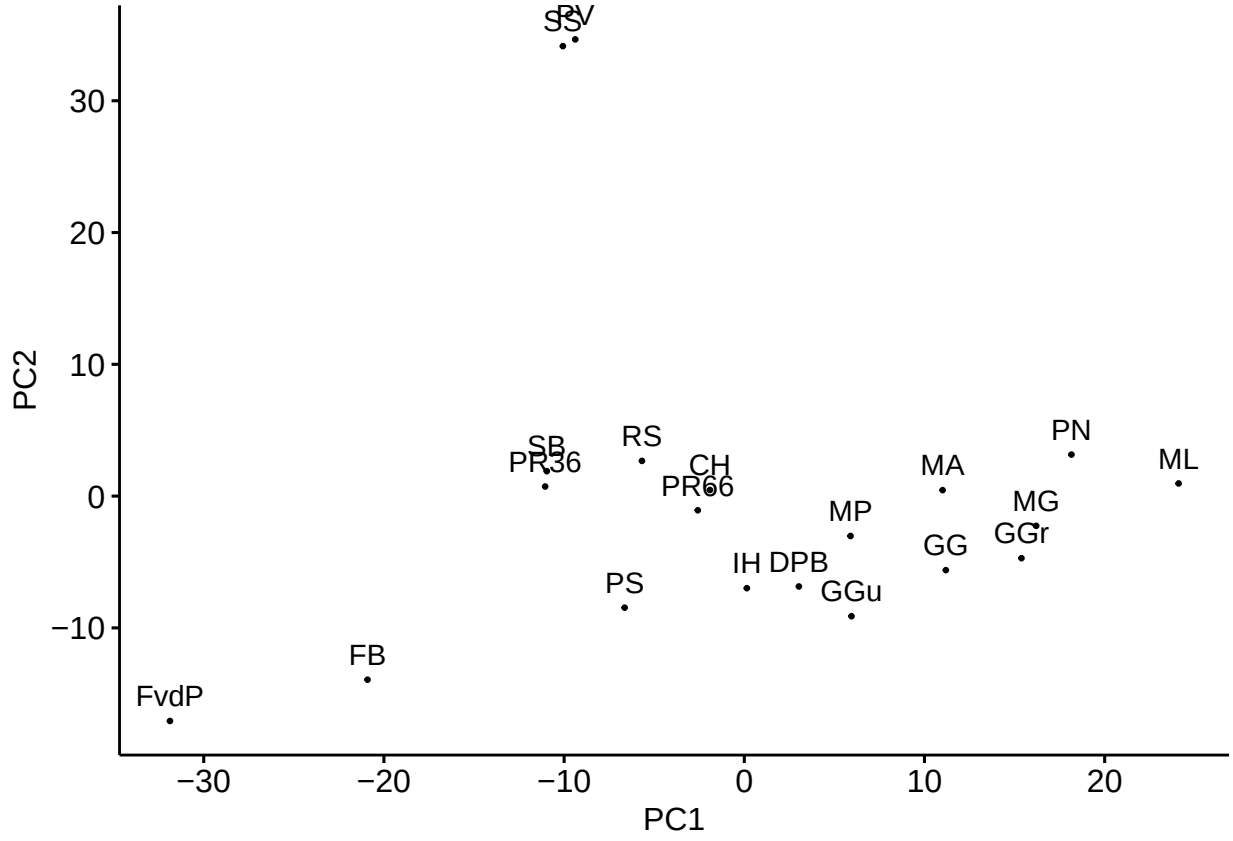
```
## MP   0.9838977 0.9800811 0.9656450 0.9818961 0.9835973 0.9790514 0.9852515
## PN   0.9841424 0.9818114 0.9640232 0.9756303 0.9869961 0.9875764 0.9800965
## PR36 0.9753213 0.9743151 0.9617045 0.9728058 0.9744394 0.9723772 0.9778731
## PR66 0.9783257 0.9738884 0.9670266 0.9815601 0.9790462 0.9730969 0.9835137
## PS   0.8900698 0.8874812 0.8821469 0.8959386 0.8947615 0.8907926 0.8988567
## PV   0.9786458 0.9749943 0.9644989 0.9816157 0.9814500 0.9743816 0.9772050
## RS   0.8285222 0.8351360 0.8126126 0.8325935 0.8277899 0.8289385 0.8278693
## SB   0.9270004 0.9238654 0.9188459 0.9458803 0.9371500 0.9199346 0.9464493
## SS   0.9643213 0.9635600 0.9505969 0.9673709 0.9685146 0.9631334 0.9647045
##             IH        MA        MG        ML        MP        PN      PR36
## CH   0.7171397 0.9629720 0.9654095 0.9152039 0.9838977 0.9841424 0.9753213
## DPB  0.7216360 0.9620726 0.9671974 0.9210818 0.9800811 0.9818114 0.9743151
## FB   0.7250365 0.9506806 0.9476033 0.8952921 0.9656450 0.9640232 0.9617045
## FvdP 0.7301148 0.9666511 0.9556470 0.9128394 0.9818961 0.9756303 0.9728058
## GG   0.7156814 0.9667960 0.9717163 0.9179186 0.9835973 0.9869961 0.9744394
## GGr  0.7188343 0.9538343 0.9617129 0.9214403 0.9790514 0.9875764 0.9723772
## GGu  0.7274809 0.9701632 0.9659121 0.9187598 0.9852515 0.9800965 0.9778731
## IH   1.0000000 0.7429870 0.6990945 0.7021744 0.7260459 0.7159121 0.7286807
## MA   0.7429870 1.0000000 0.9524990 0.8918468 0.9725278 0.9631844 0.9632218
## MG   0.6990945 0.9524990 1.0000000 0.9061342 0.9682399 0.9713493 0.9636377
## ML   0.7021744 0.8918468 0.9061342 1.0000000 0.9189143 0.9148692 0.9115103
## MP   0.7260459 0.9725278 0.9682399 0.9189143 1.0000000 0.9829999 0.9789246
## PN   0.7159121 0.9631844 0.9713493 0.9148692 0.9829999 1.0000000 0.9736033
## PR36 0.7286807 0.9632218 0.9636377 0.9115103 0.9789246 0.9736033 1.0000000
## PR66 0.7291755 0.9708124 0.9659589 0.9158768 0.9847333 0.9752941 0.9822682
## PS   0.7940306 0.9153286 0.8799235 0.8490185 0.8952168 0.8953810 0.8978381
## PV   0.7230654 0.9657360 0.9603907 0.9125275 0.9825864 0.9792513 0.9754857
## RS   0.7129126 0.8179262 0.8110011 0.8338261 0.8276732 0.8275864 0.8361934
## SB   0.7714064 0.9513657 0.9200073 0.8877429 0.9415216 0.9254705 0.9354279
## SS   0.7350889 0.9527445 0.9500085 0.9028541 0.9694750 0.9672584 0.9636132
##           PR66        PS        PV        RS        SB        SS
## CH   0.9783257 0.8900698 0.9786458 0.8285222 0.9270004 0.9643213
## DPB  0.9738884 0.8874812 0.9749943 0.8351360 0.9238654 0.9635600
## FB   0.9670266 0.8821469 0.9644989 0.8126126 0.9188459 0.9505969
## FvdP 0.9815601 0.8959386 0.9816157 0.8325935 0.9458803 0.9673709
## GG   0.9790462 0.8947615 0.9814500 0.8277899 0.9371500 0.9685146
## GGr  0.9730969 0.8907926 0.9743816 0.8289385 0.9199346 0.9631334
## GGu  0.9835137 0.8988567 0.9772050 0.8278693 0.9464493 0.9647045
## IH   0.7291755 0.7940306 0.7230654 0.7129126 0.7714064 0.7350889
## MA   0.9708124 0.9153286 0.9657360 0.8179262 0.9513657 0.9527445
## MG   0.9659589 0.8799235 0.9603907 0.8110011 0.9200073 0.9500085
## ML   0.9158768 0.8490185 0.9125275 0.8338261 0.8877429 0.9028541
## MP   0.9847333 0.8952168 0.9825864 0.8276732 0.9415216 0.9694750
## PN   0.9752941 0.8953810 0.9792513 0.8275864 0.9254705 0.9672584
## PR36 0.9822682 0.8978381 0.9754857 0.8361934 0.9354279 0.9636132
## PR66 1.0000000 0.8970269 0.9807395 0.8309055 0.9435544 0.9669144
## PS   0.8970269 1.0000000 0.8957204 0.7978088 0.9464841 0.8868000
## PV   0.9807395 0.8957204 1.0000000 0.8385536 0.9414758 0.9828197
## RS   0.8309055 0.7978088 0.8385536 1.0000000 0.8116067 0.8280435
## SB   0.9435544 0.9464841 0.9414758 0.8116067 1.0000000 0.9307497
## SS   0.9669144 0.8868000 0.9828197 0.8280435 0.9307497 1.0000000
```

Cluster analysis of performers by beat and intensity (both)

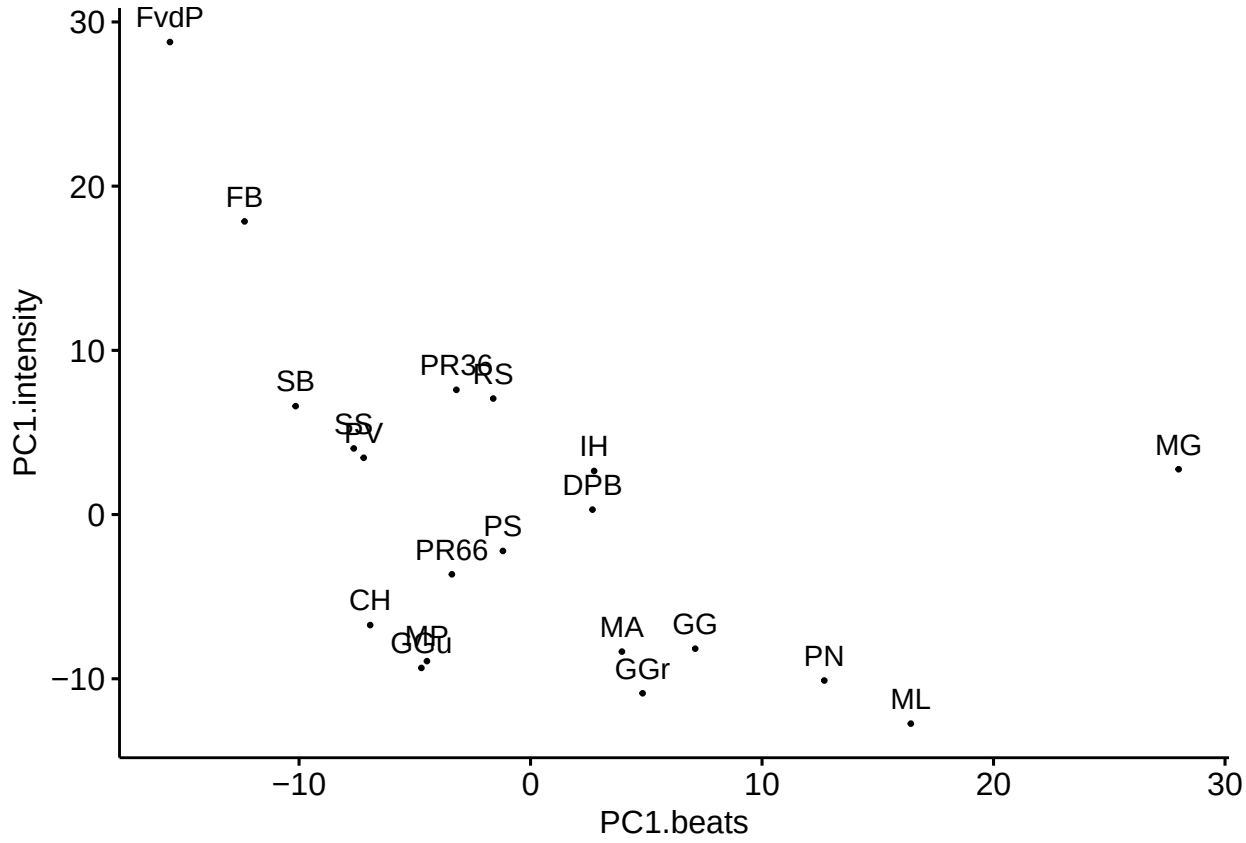
PCA

```
## Importance of components:
##                             PC1      PC2      PC3      PC4      PC5      PC6
## Standard deviation     13.96773 12.96788 12.69011 12.18284 11.89206 11.48675
## Proportion of Variance  0.09032  0.07785  0.07456  0.06871  0.06547  0.06109
## Cumulative Proportion   0.09032  0.16818  0.24273  0.31145  0.37692  0.43800
##                             PC7      PC8      PC9     PC10     PC11    PC12
## Standard deviation     11.1252 11.00024 10.64796 10.40829 10.18348 9.98254
## Proportion of Variance  0.0573  0.05602  0.05249  0.05015  0.04801 0.04613
## Cumulative Proportion   0.4953  0.55133  0.60382  0.65397  0.70198 0.74812
##                            PC13    PC14    PC15    PC16    PC17    PC18    PC19
## Standard deviation     9.71908 9.63471 9.49922 9.37178 9.02873 8.81153 4.42201
## Proportion of Variance 0.04373 0.04298 0.04178 0.04066 0.03774 0.03595 0.00905
## Cumulative Proportion  0.79185 0.83482 0.87660 0.91726 0.95500 0.99095 1.00000
##                            PC20
## Standard deviation     3e-14
## Proportion of Variance 0e+00
## Cumulative Proportion  1e+00
```

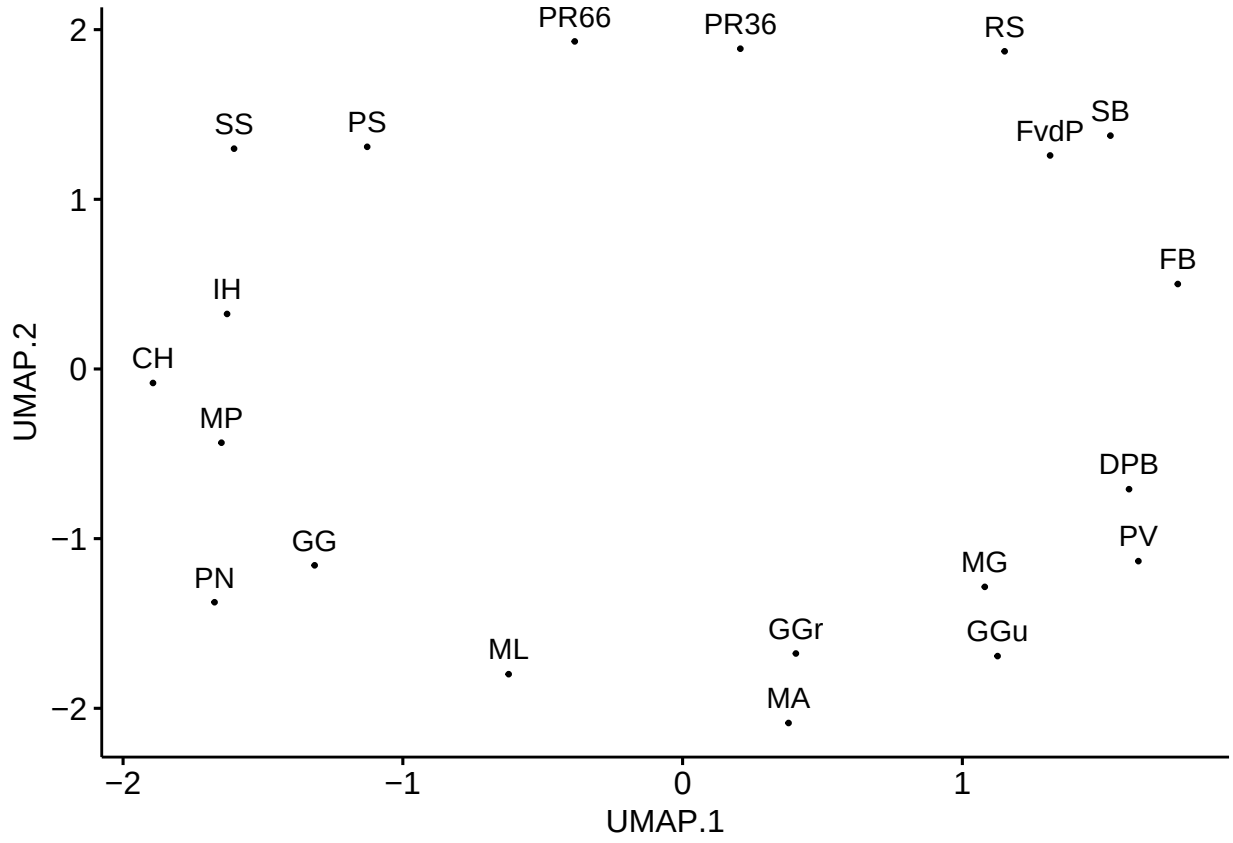
Plot of performers in PCA components



Plot of beat vs intensity (PC1 beat variables, PC1 intensity variables)



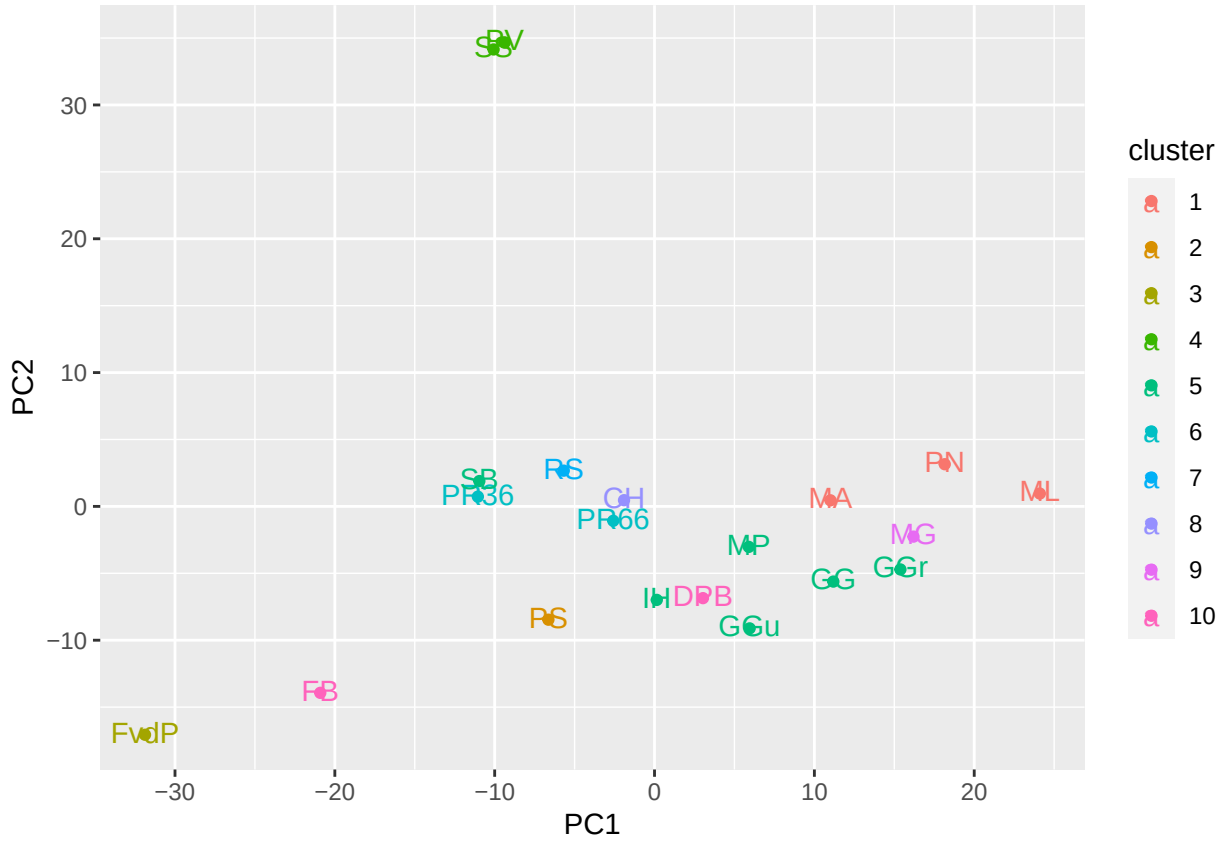
UMAP



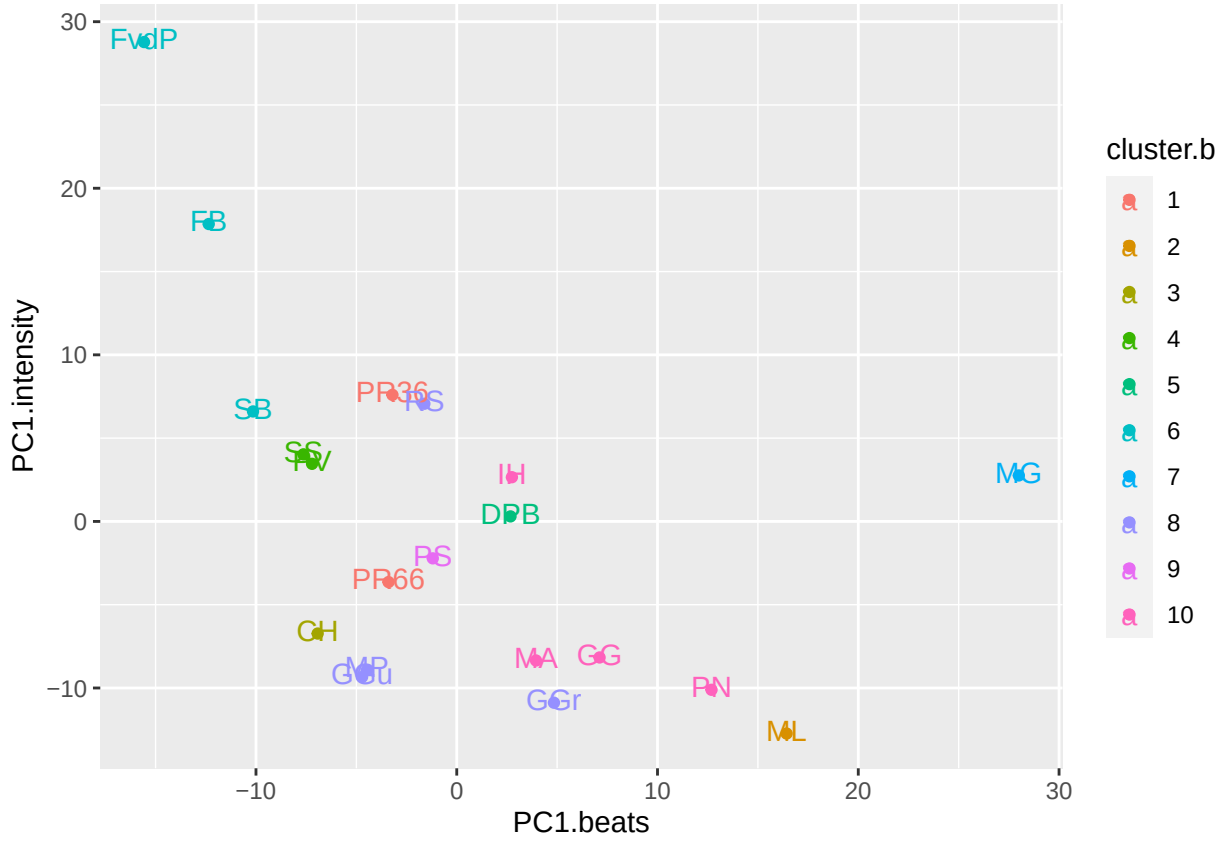
Very unstable, changes every time it's run significantly.

K-means

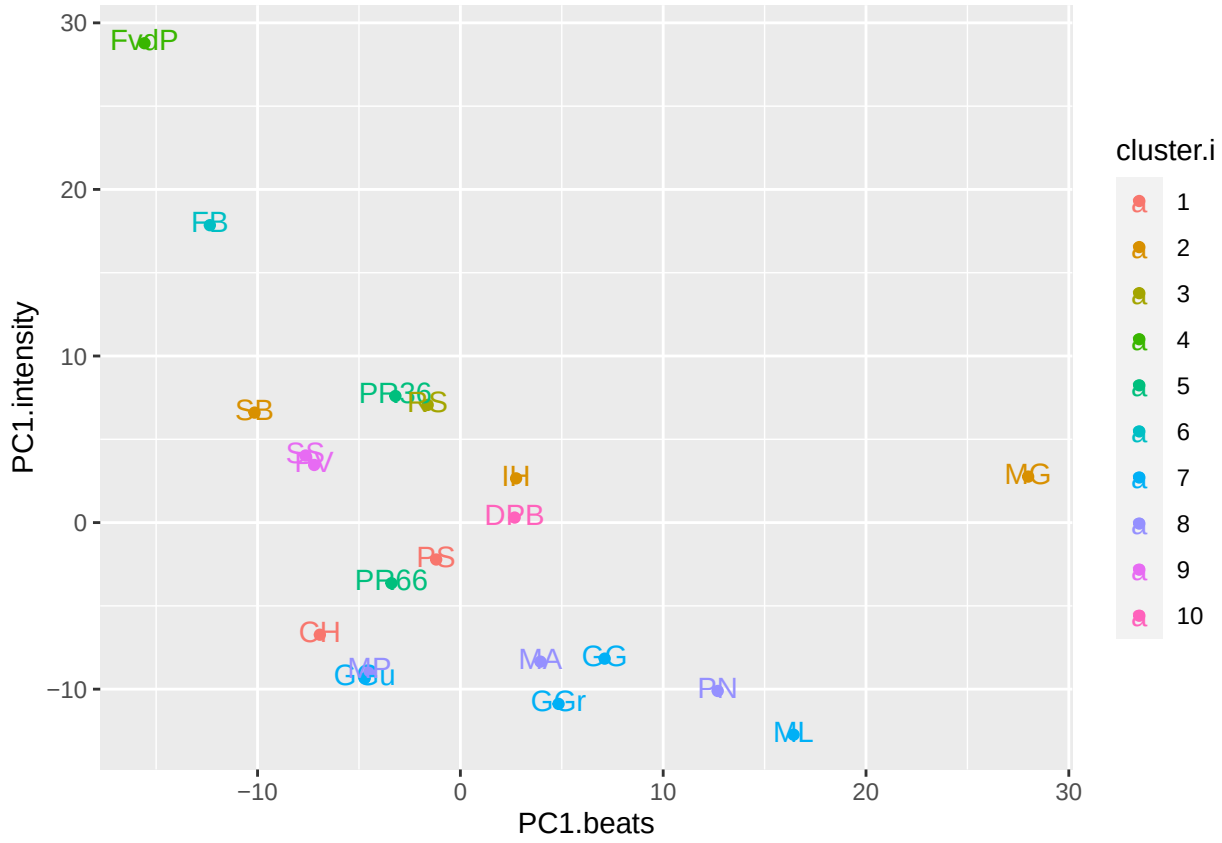
10 clusters beat+intensity



10 clusters beat variables

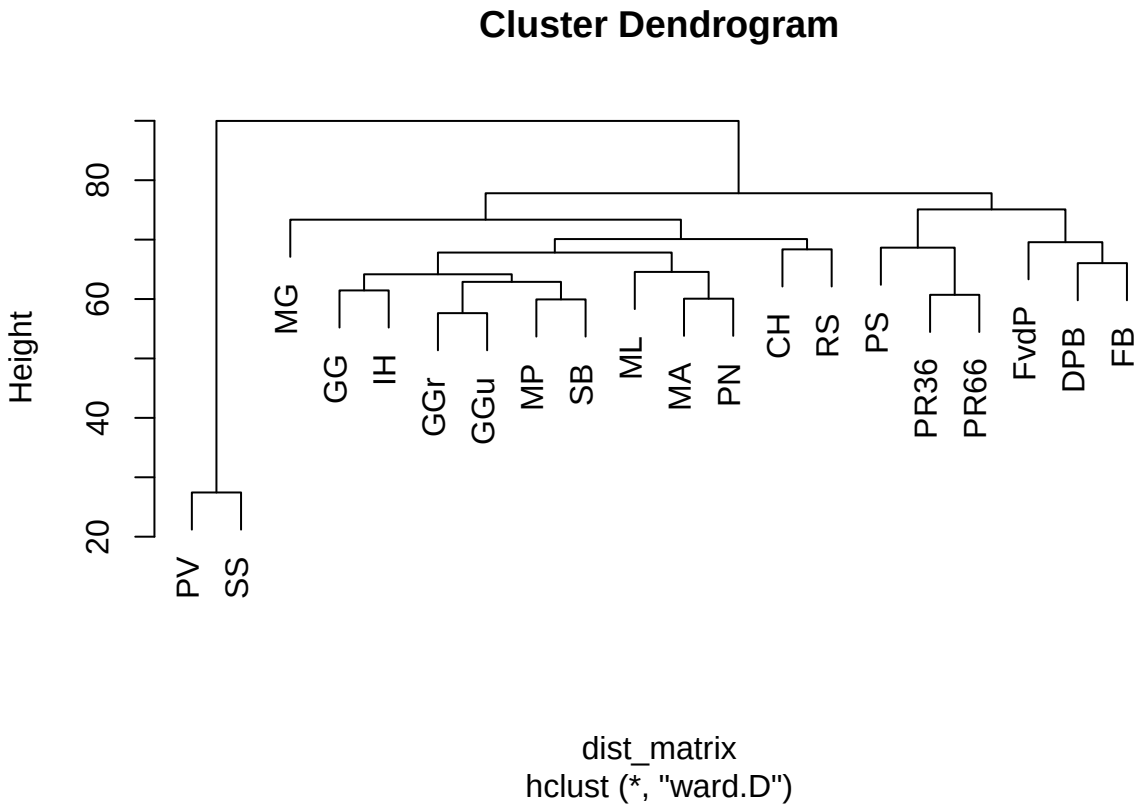


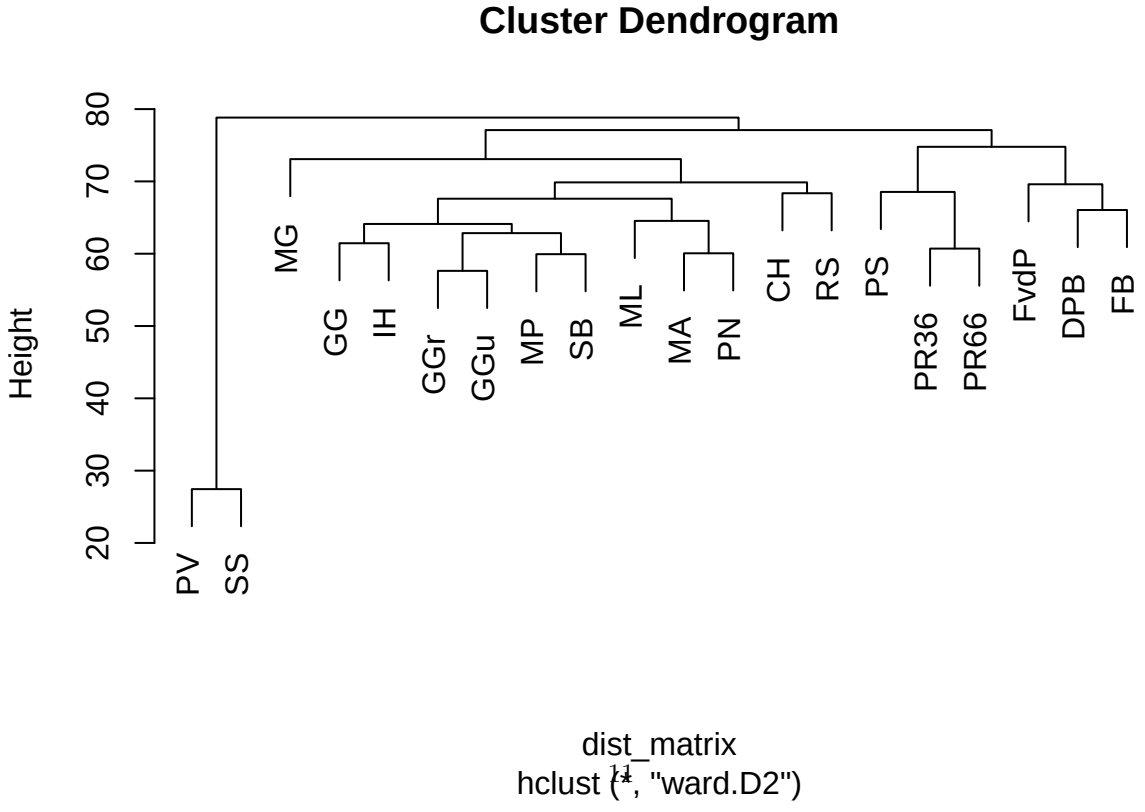
10 clusters intensity variables

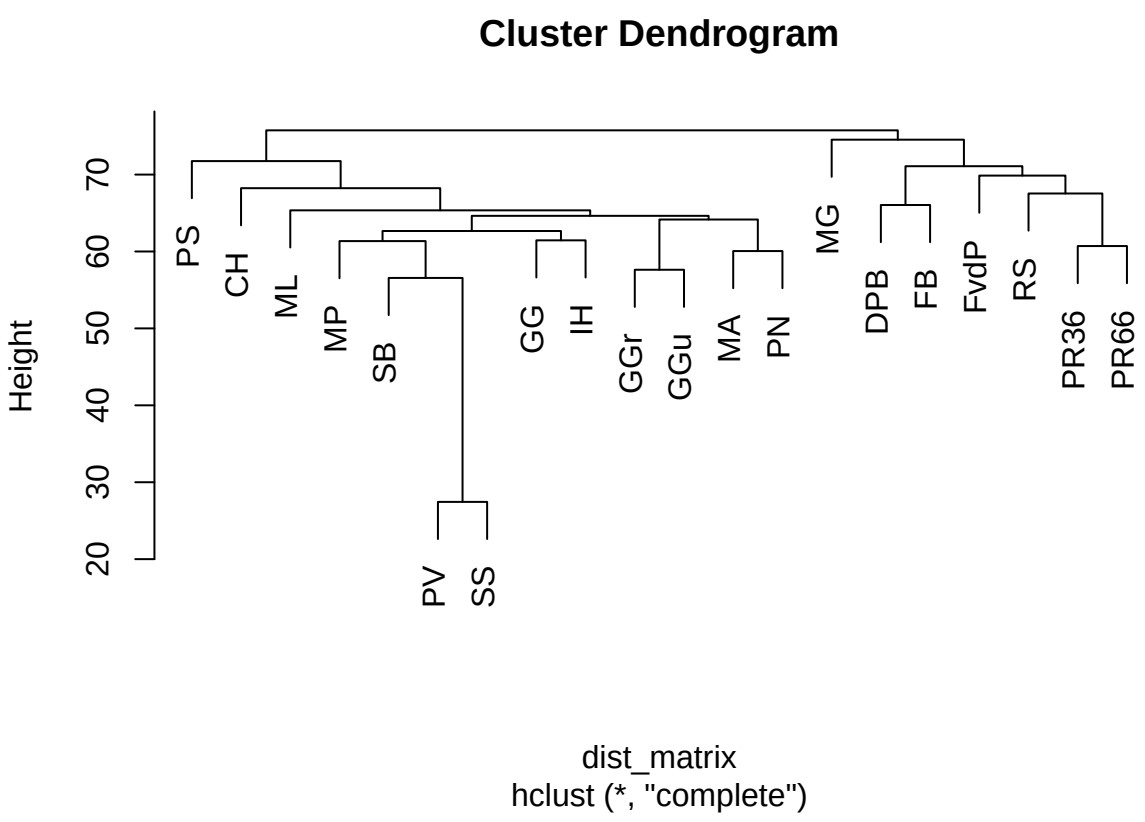


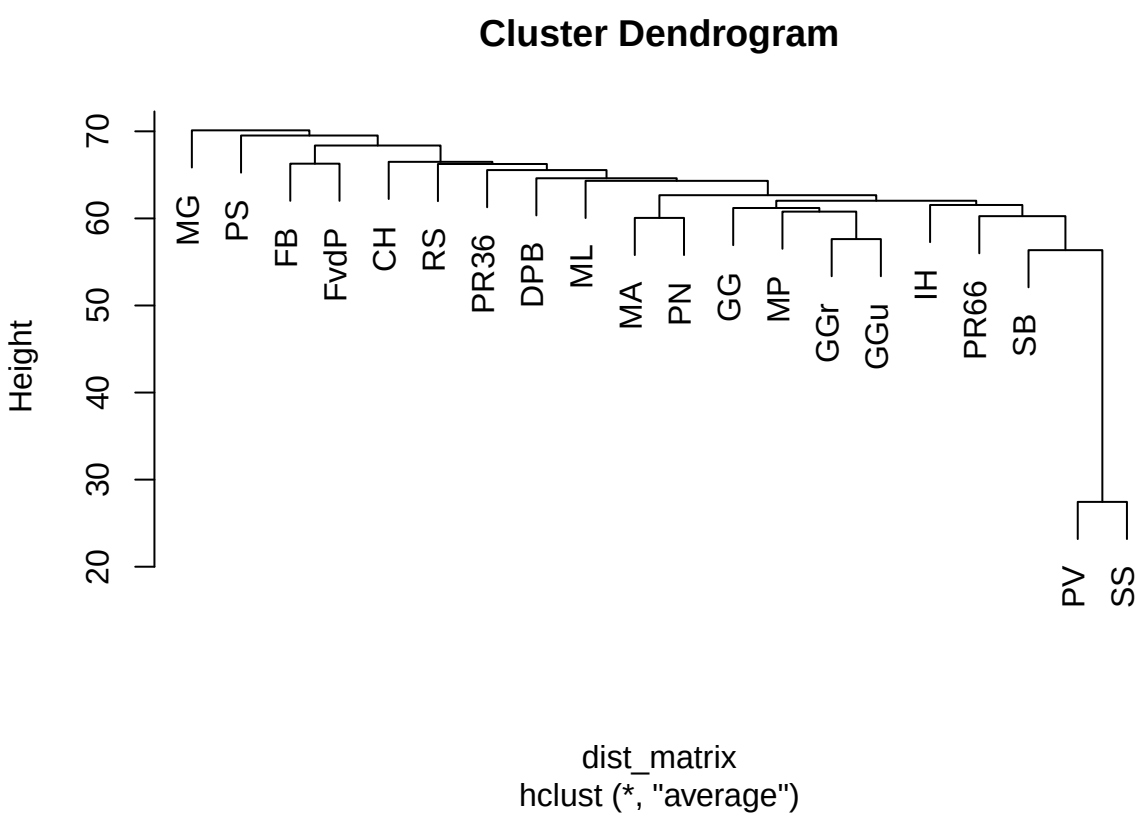
Dendograms

Dendograms beat+intensity

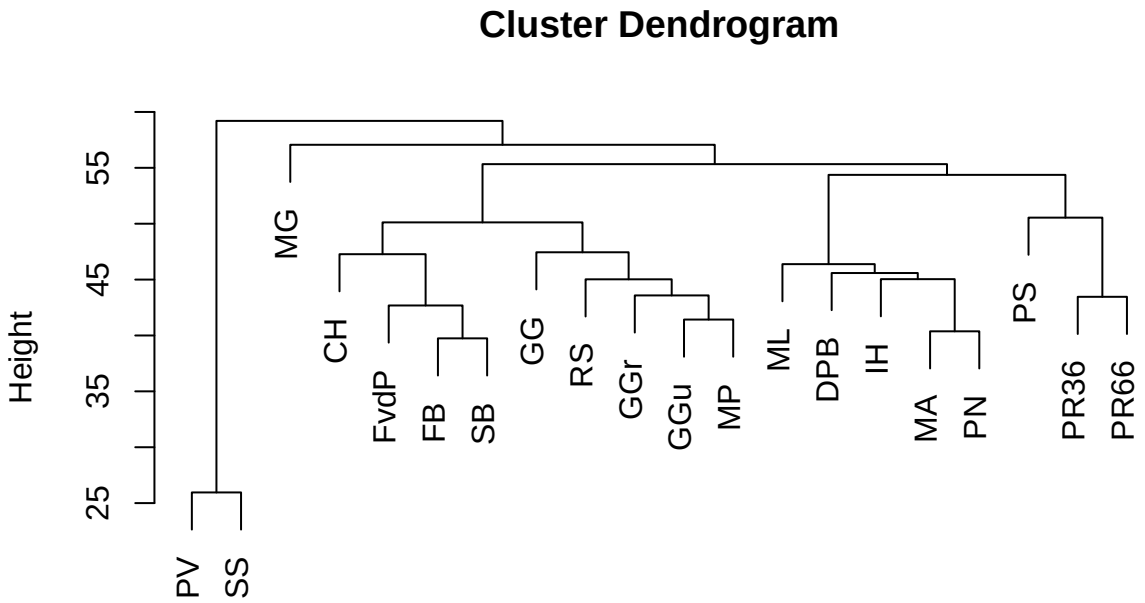


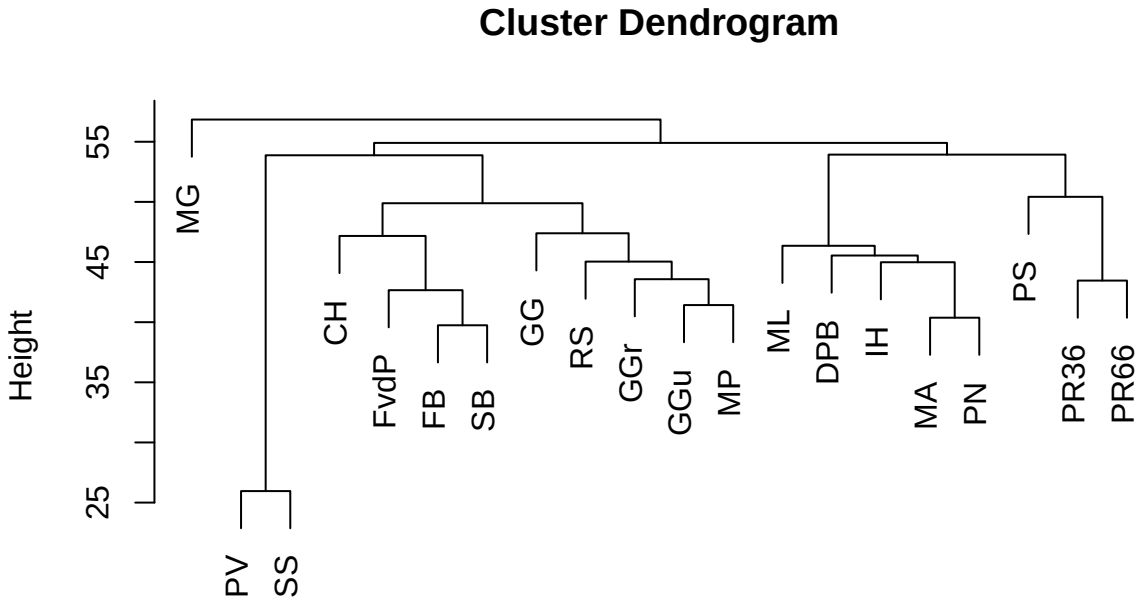


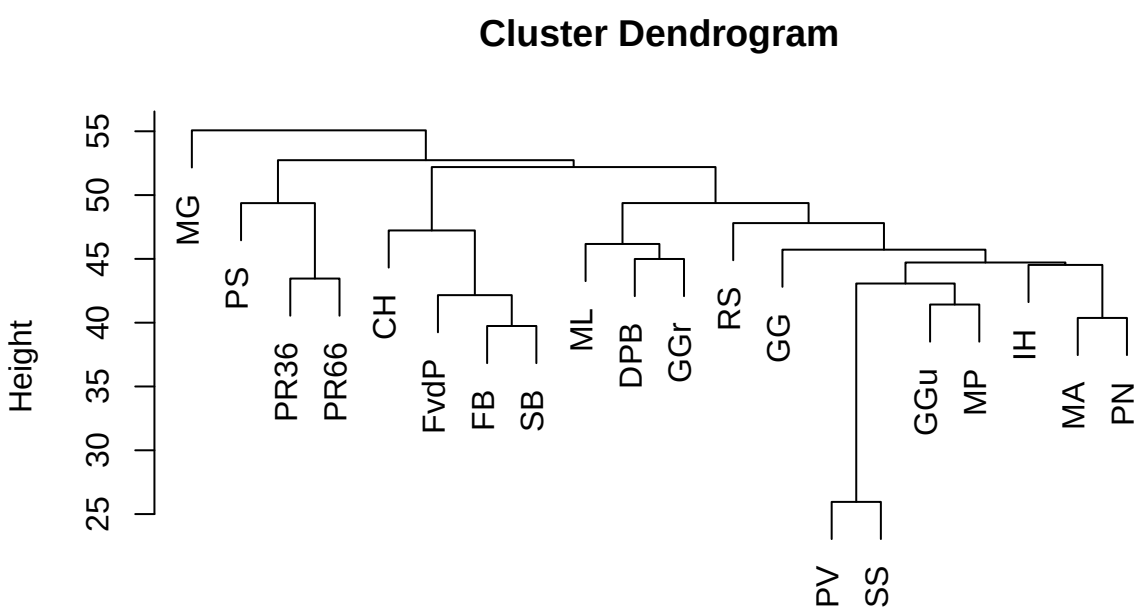

Cluster Dendrogram
Height
20
30
40
50
60
70
PS
CH
ML
MP
SB
PV
SS
GG
IH
GGr
GGu
MA
PN
MG
DPB
FB
FvdP
RS
PR36
PR66
dist_matrix
hclust (*, "complete")

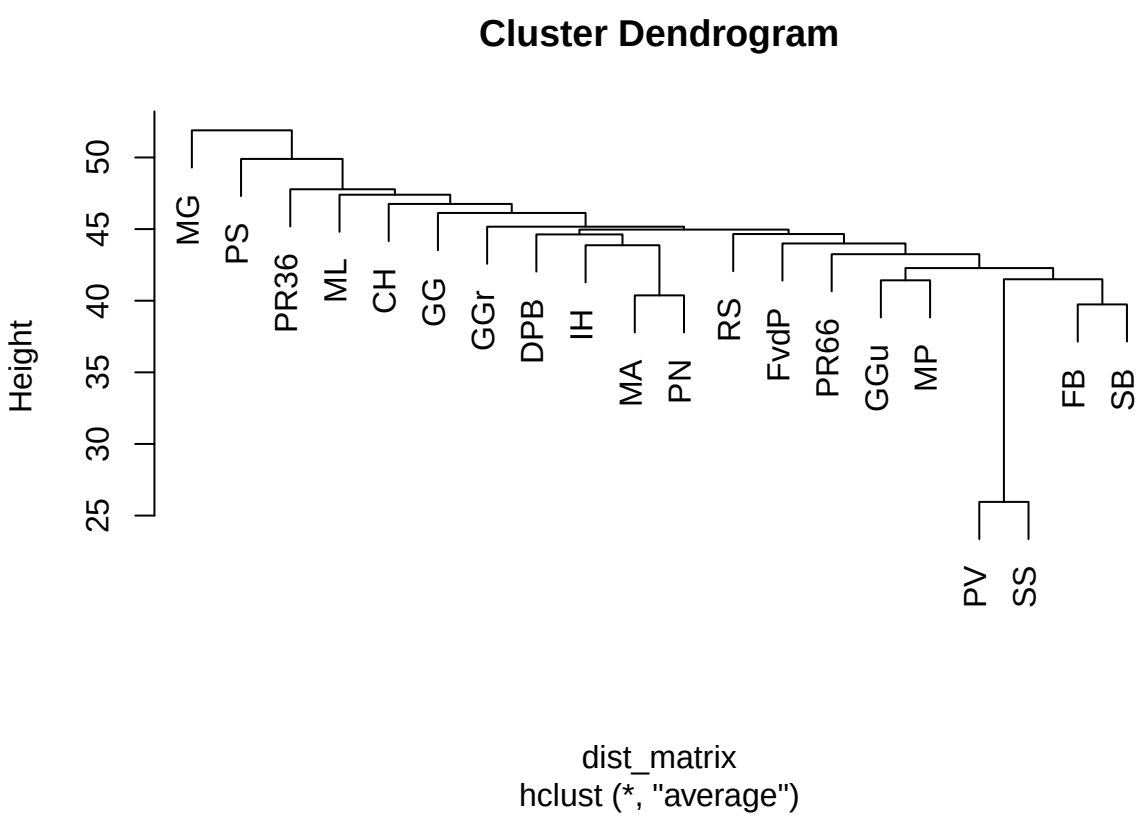

Cluster Dendrogram
Height
70
60
50
40
30
20
MG
PS
FB
FvdP
CH
RS
PR36
DPB
ML
MA
PN
GG
MP
GGr
GGu
IH
PR66
SB
PV
SS
dist_matrix
hclust (*, "average")

Dendograms beat

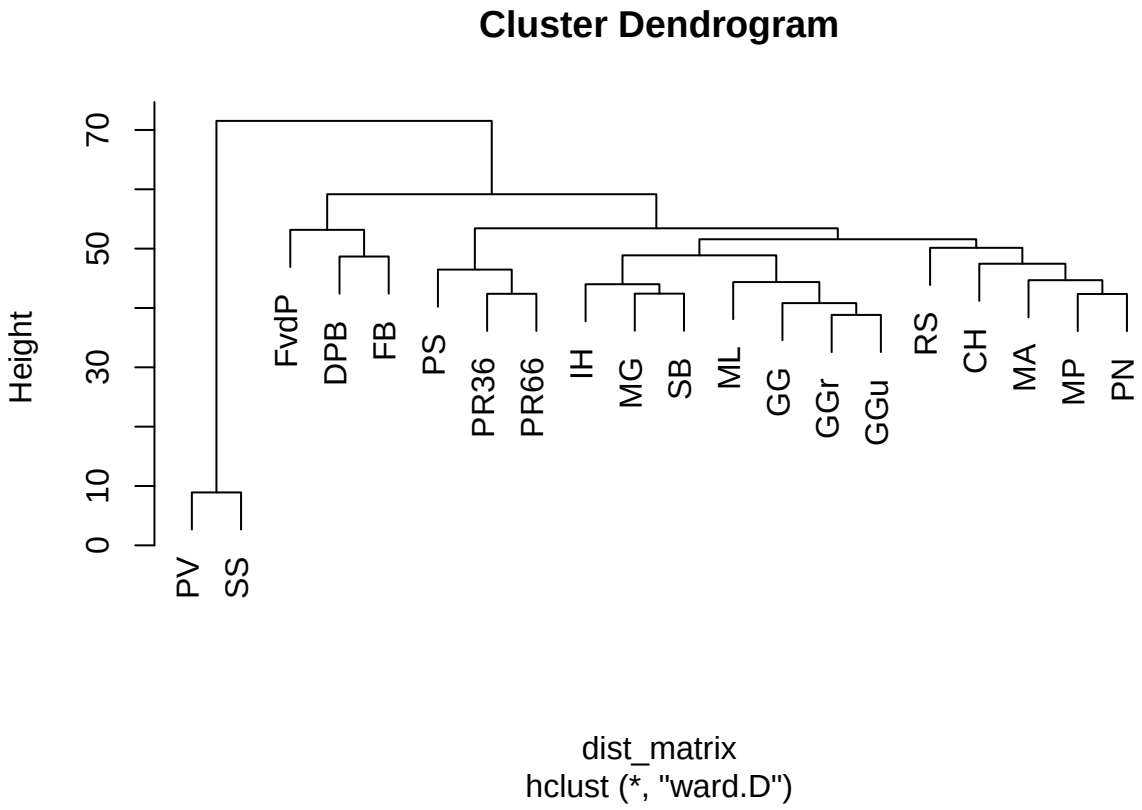


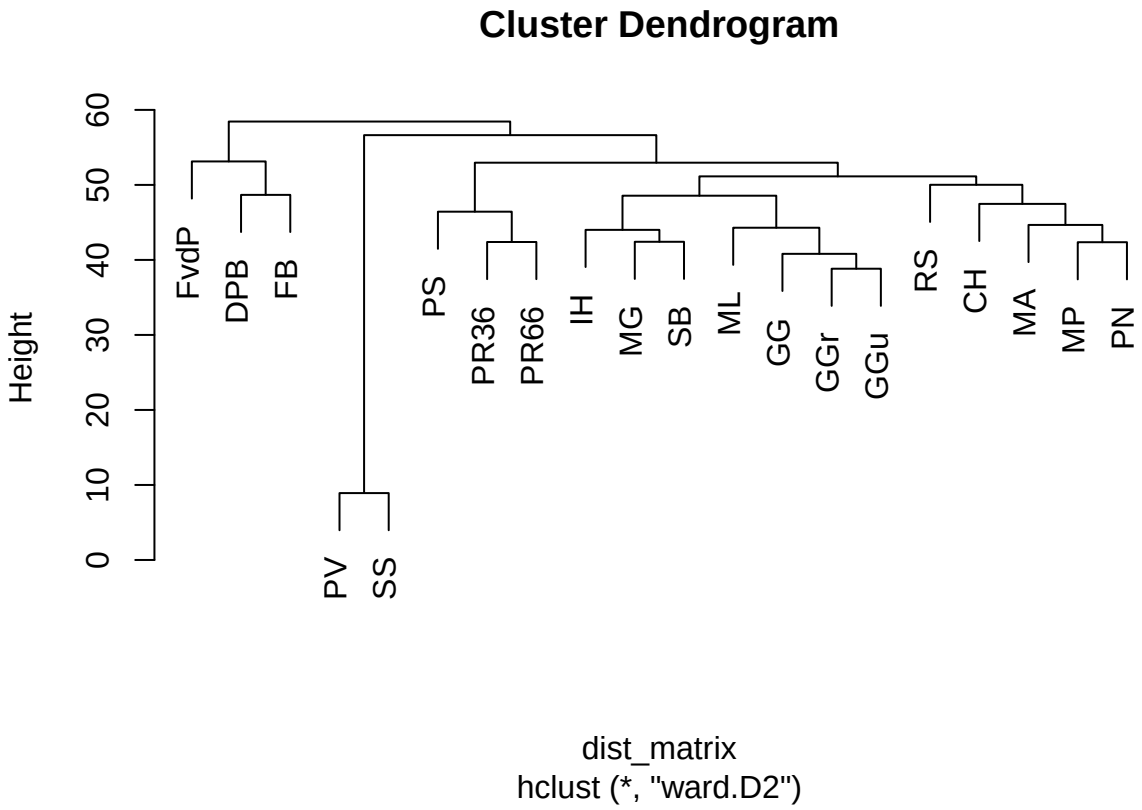


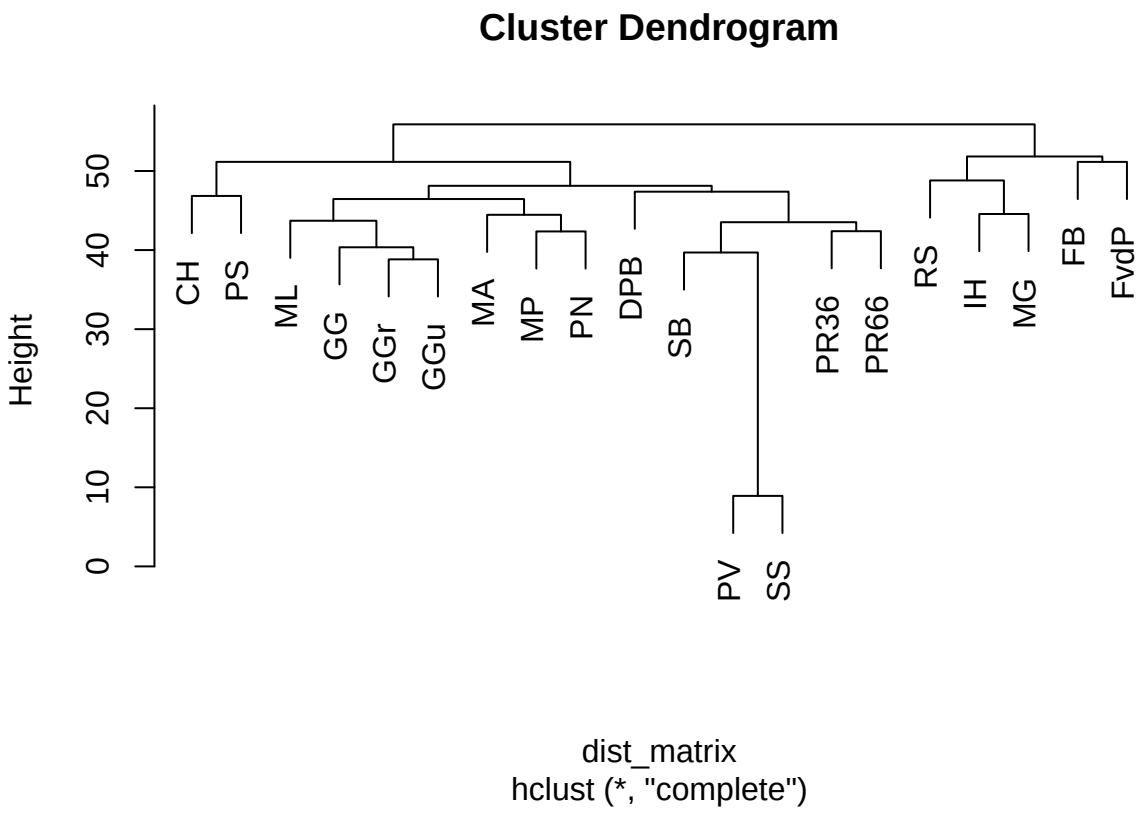

Cluster Dendrogram
Height
25
30
35
40
45
50
55
MG
PS
PR36
PR66
CH
FvdP
FB
SB
ML
DPB
GGr
RS
GG
PV
SS
GGu
MP
IH
MA
PN
dist_matrix
hclust (*, "complete")

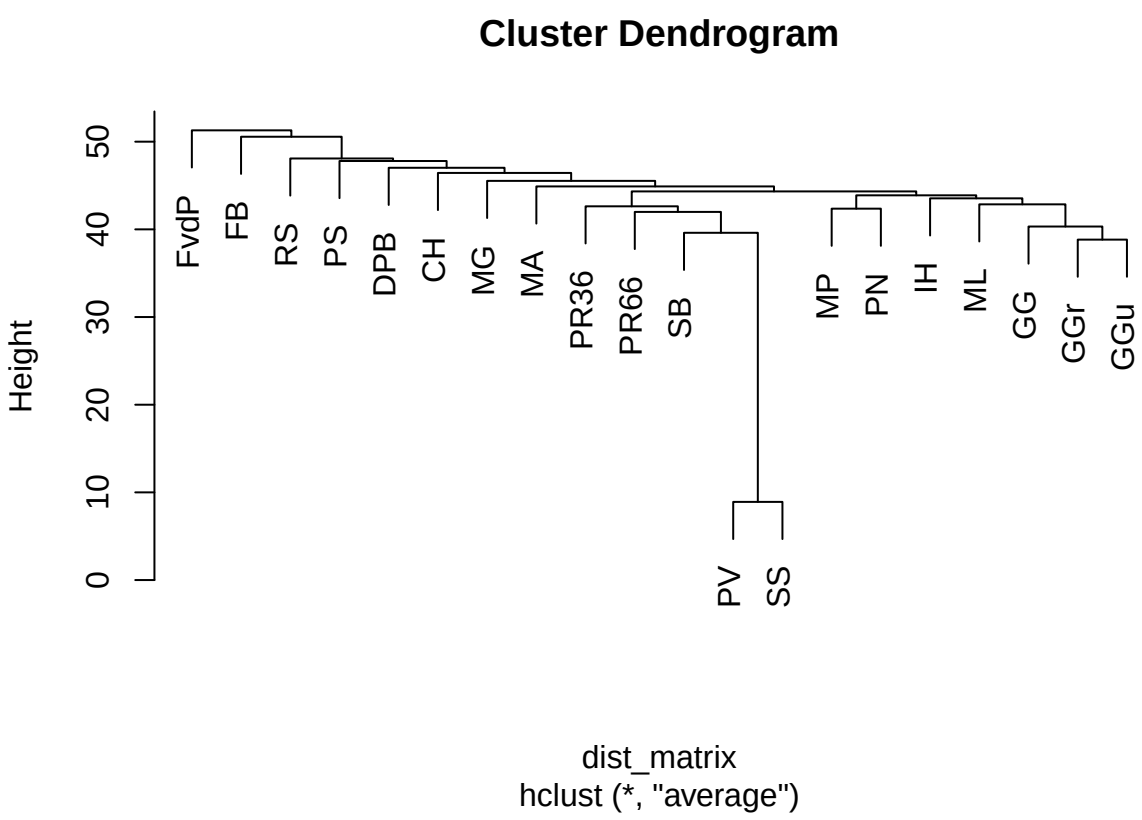

Cluster Dendrogram
Height
25
30
35
40
45
50
MG
PS
PR36
ML
CH
GG
GGr
DPB
IH
MA
PN
RS
FvdP
PR66
GGu
MP
PV
SS
FB
SB
dist_matrix
hclust (*, "average")

Dendograms intensity






Cluster Dendrogram
Height
0
10
20
30
40
50
CH
PS
ML
GG
GGr
GGu
MA
MP
PN
DPB
SB
PV
SS
PR36
PR66
RS
IH
MG
FB
FvdP
dist_matrix
hclust (*, "complete")

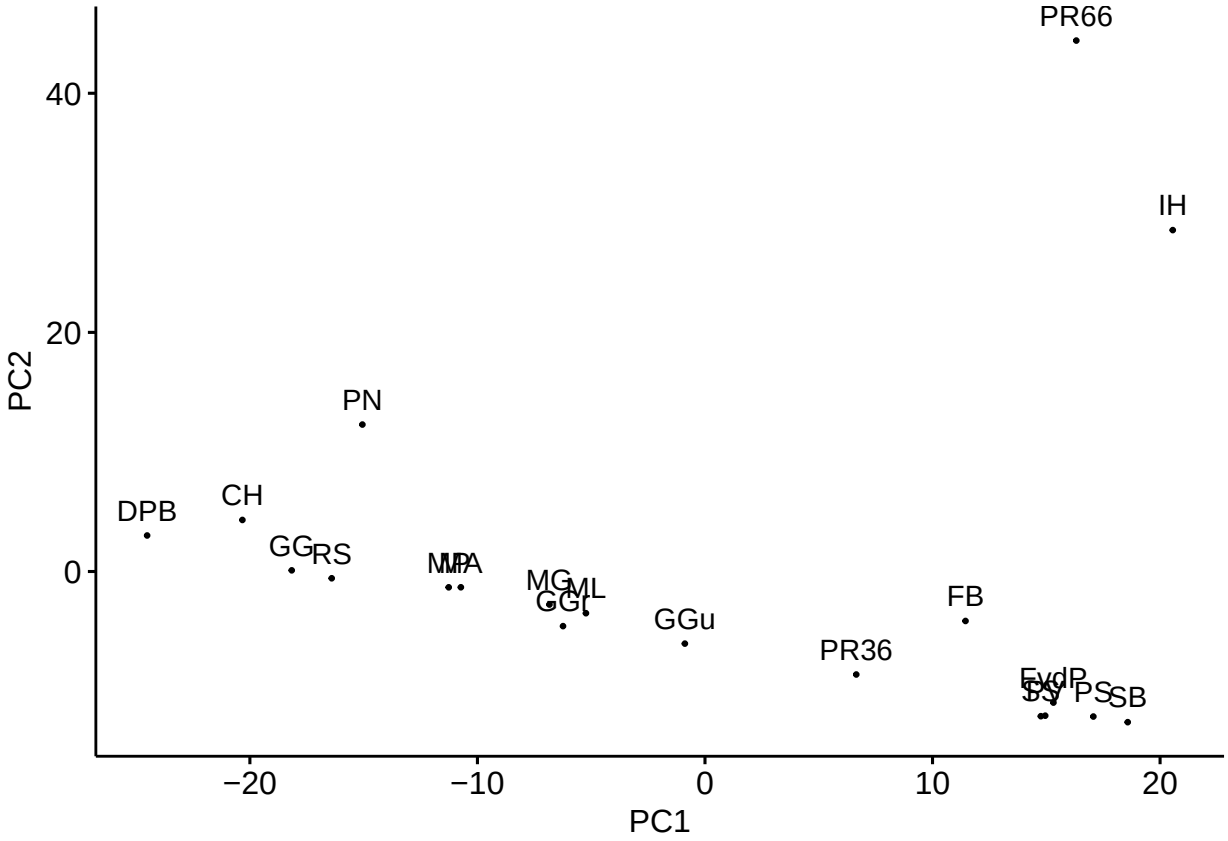


Cluster analysis for cellists (note length)

PCA

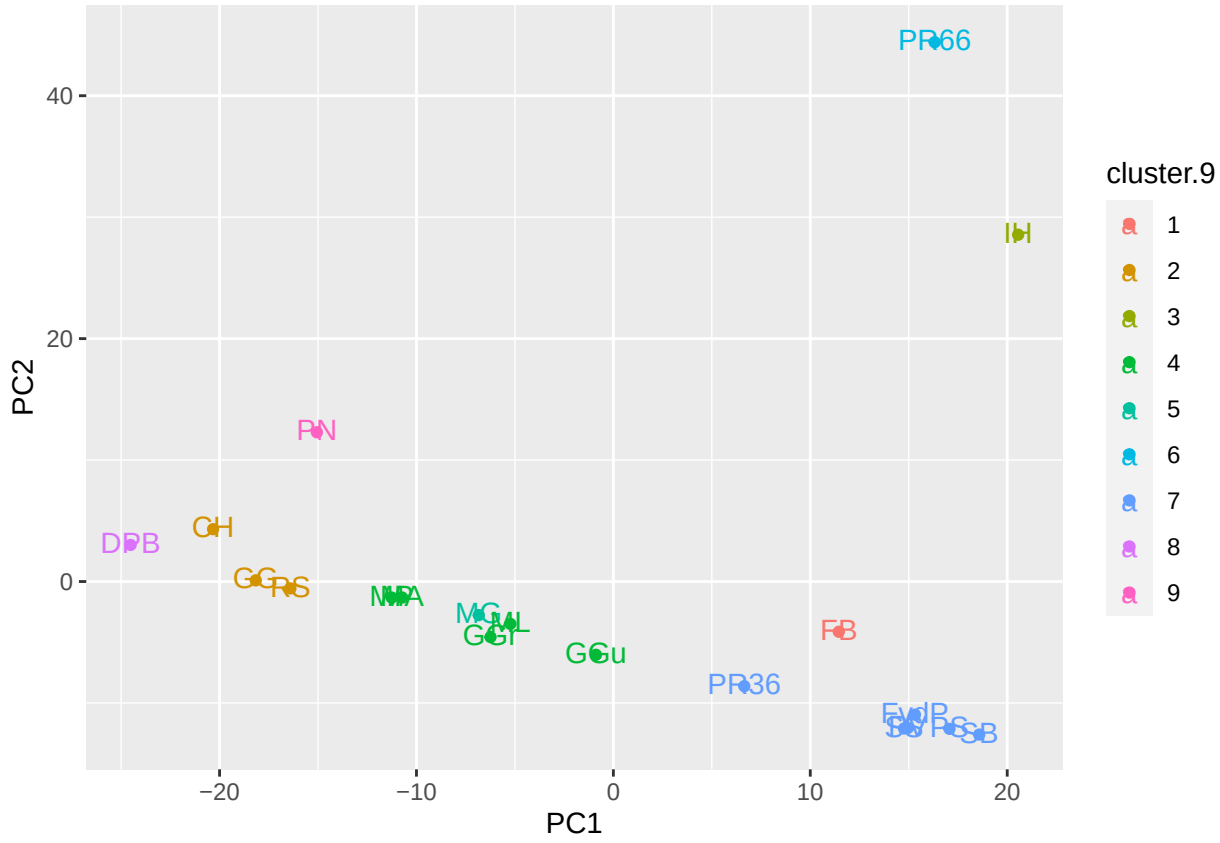
```
## Importance of components:
##                            PC1     PC2     PC3     PC4     PC5    PC6     PC7
## Standard deviation     15.1694 14.2465 11.5318 8.95145 6.36640 5.6852 5.29180
## Proportion of Variance  0.2456  0.2166  0.1419 0.08552 0.04326 0.0345 0.02989
## Cumulative Proportion   0.2456  0.4622  0.6041 0.68963 0.73289 0.7674 0.79727
##                            PC8    PC9    PC10    PC11    PC12   PC13    PC14
## Standard deviation     5.12125 4.7326 4.66097 4.44032 4.24400 3.9320 3.83974
## Proportion of Variance 0.02799 0.0239 0.02319 0.02104 0.01922 0.0165 0.01573
## Cumulative Proportion  0.82526 0.8492 0.87235 0.89339 0.91261 0.9291 0.94485
##                           PC15    PC16    PC17   PC18   PC19      PC20
## Standard deviation     3.63833 3.53873 3.43084 2.9680 2.3103 1.133e-14
## Proportion of Variance 0.01413 0.01336 0.01256 0.0094 0.0057 0.000e+00
## Cumulative Proportion  0.95898 0.97234 0.98490 0.9943 1.0000 1.000e+00
```

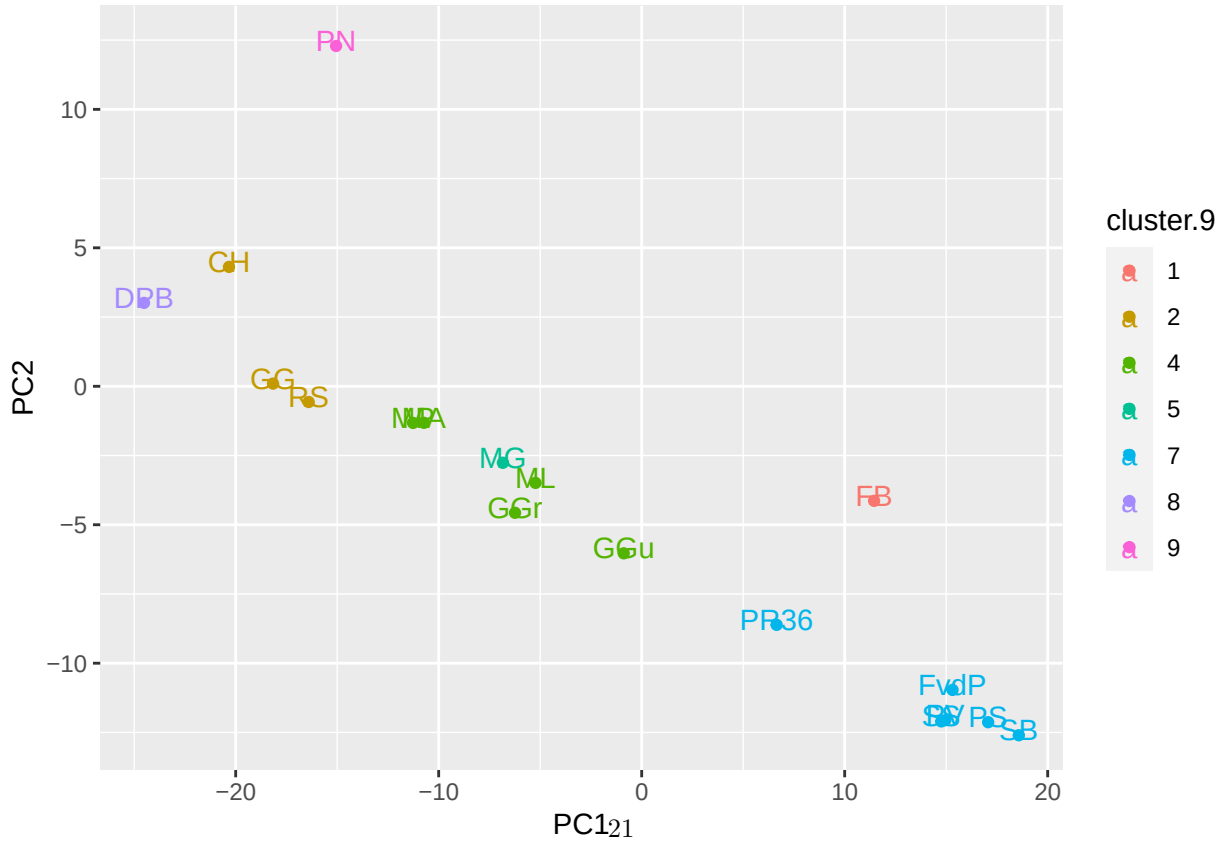
Plot of performers in PCA components



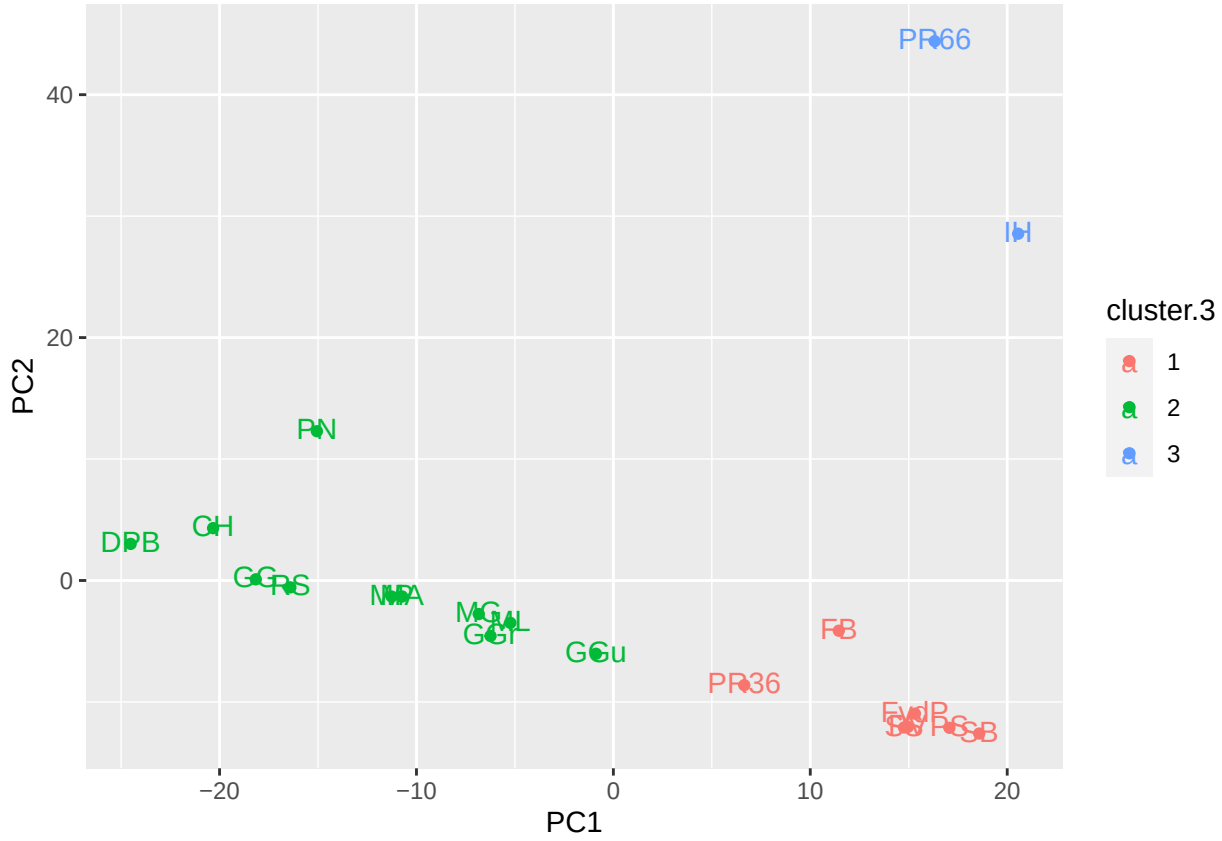
K-means

9 clusters cellists

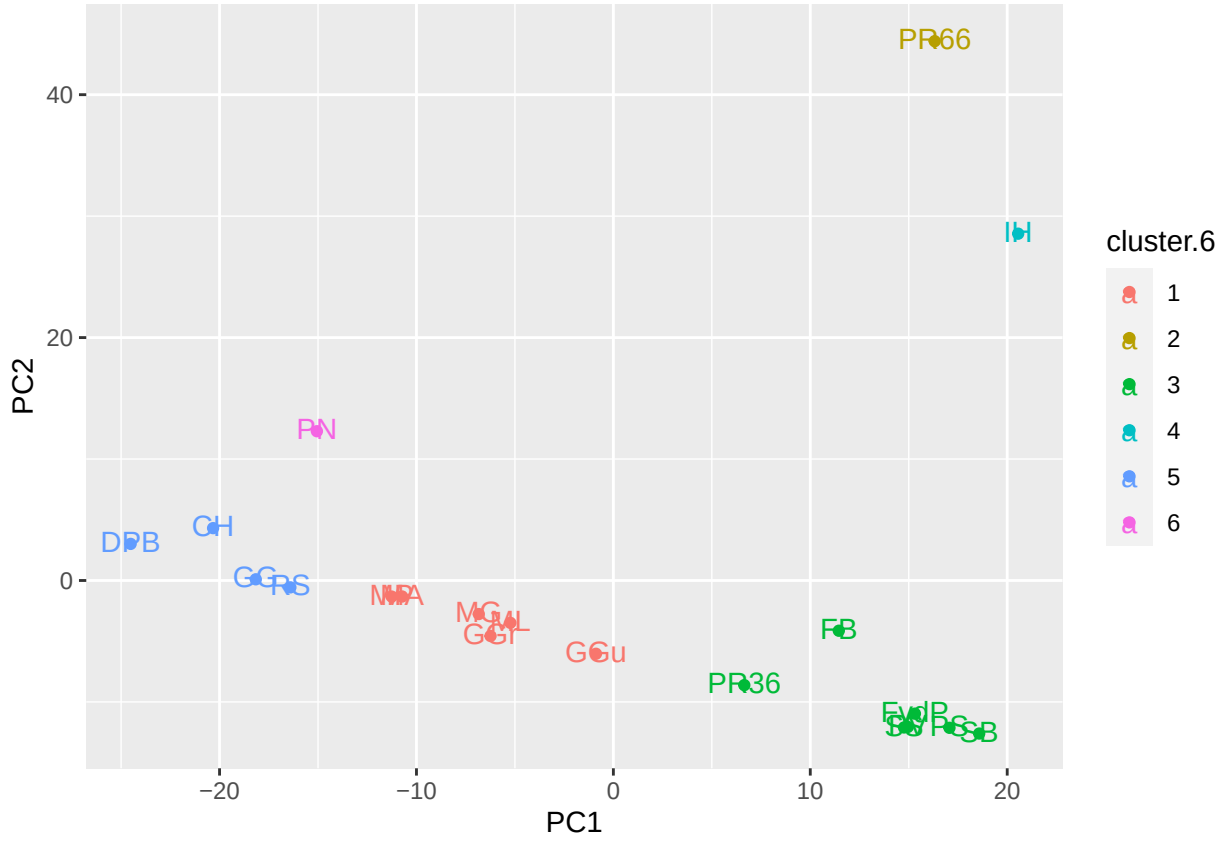


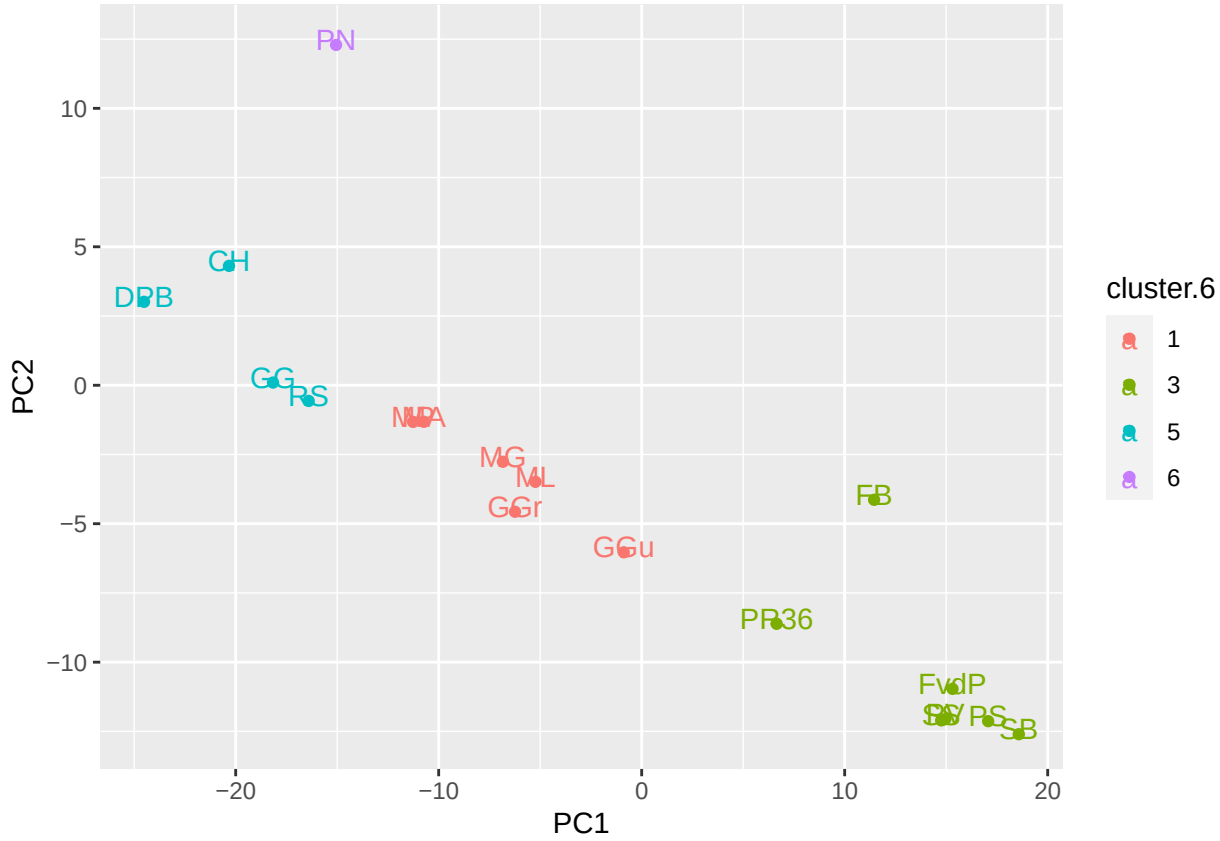


3 clusters cellists

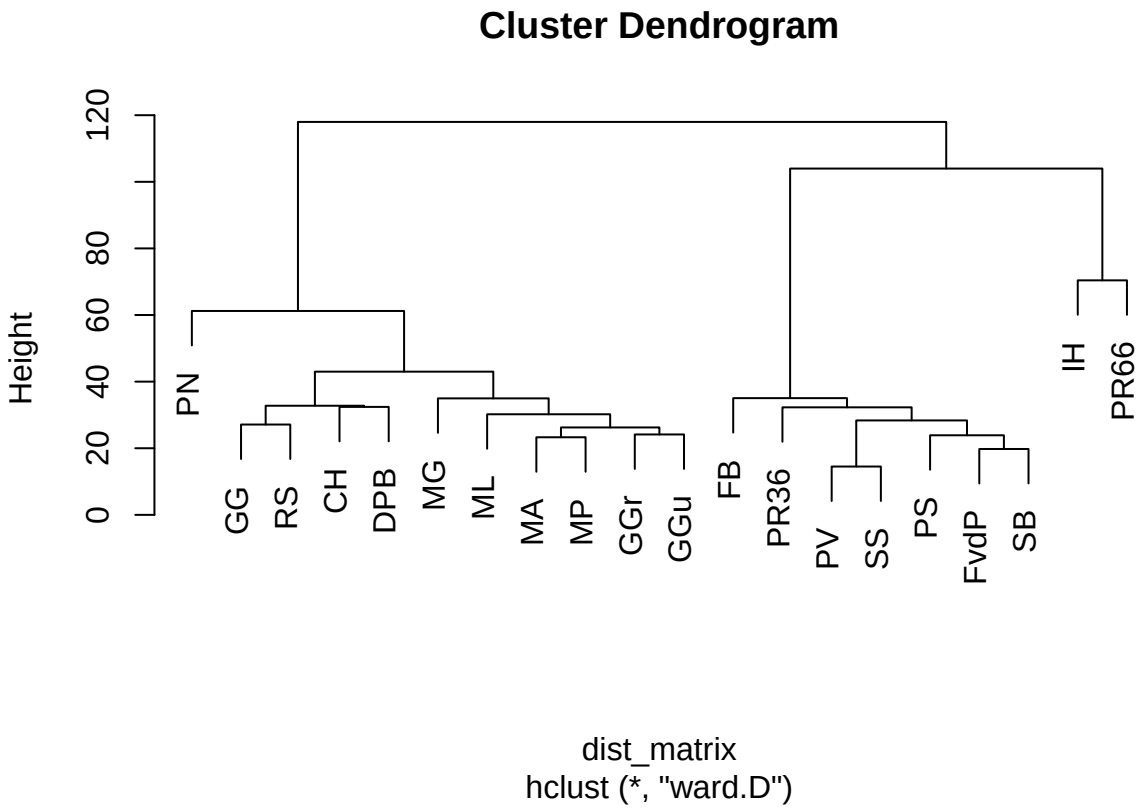


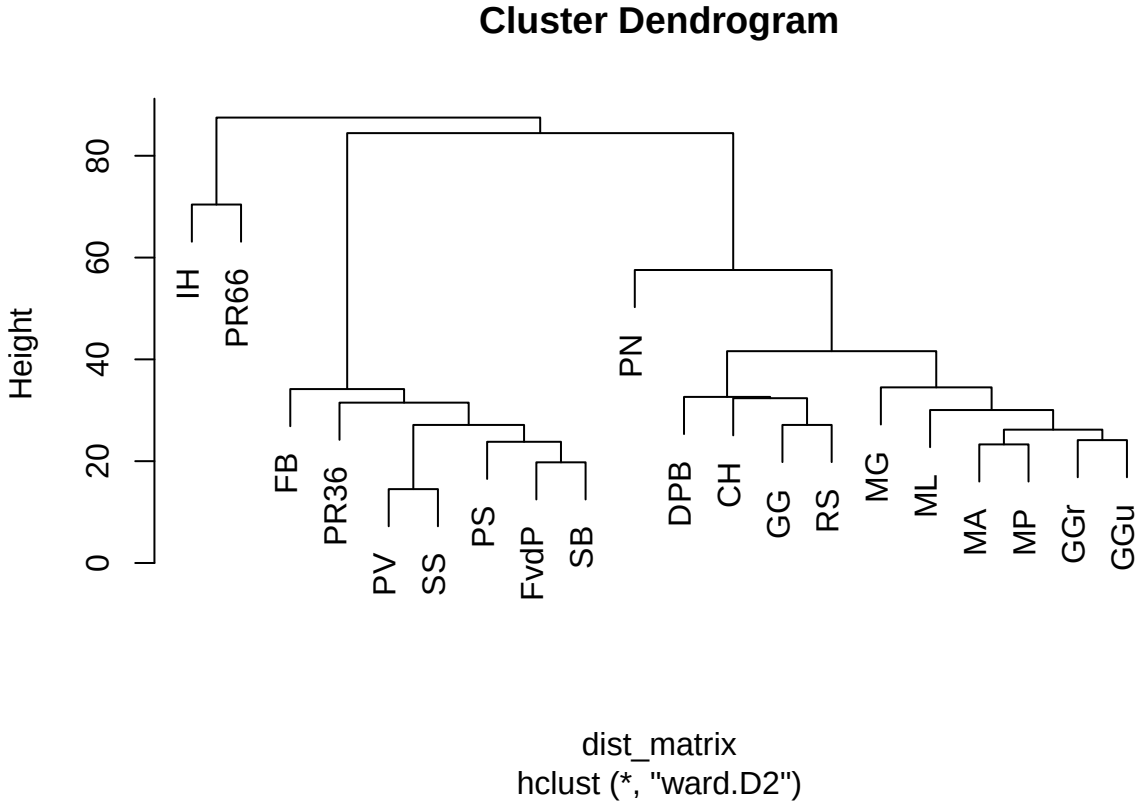
6 clusters cellists

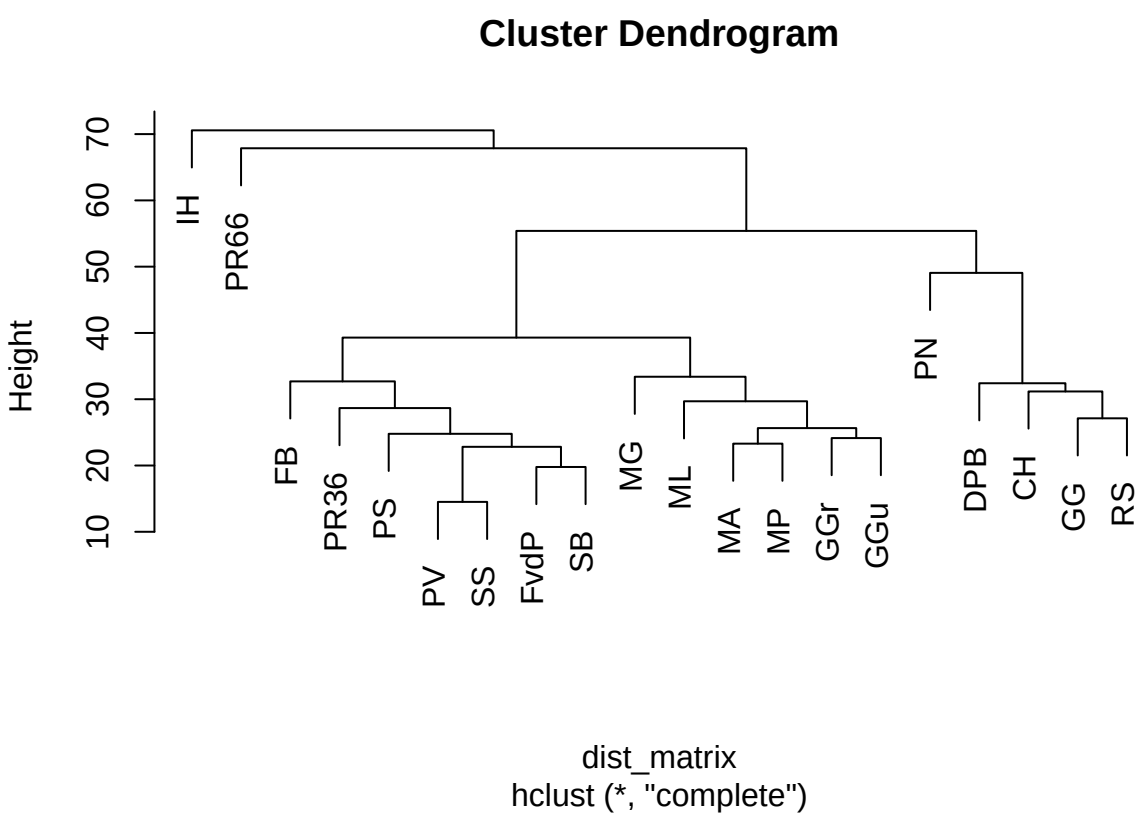


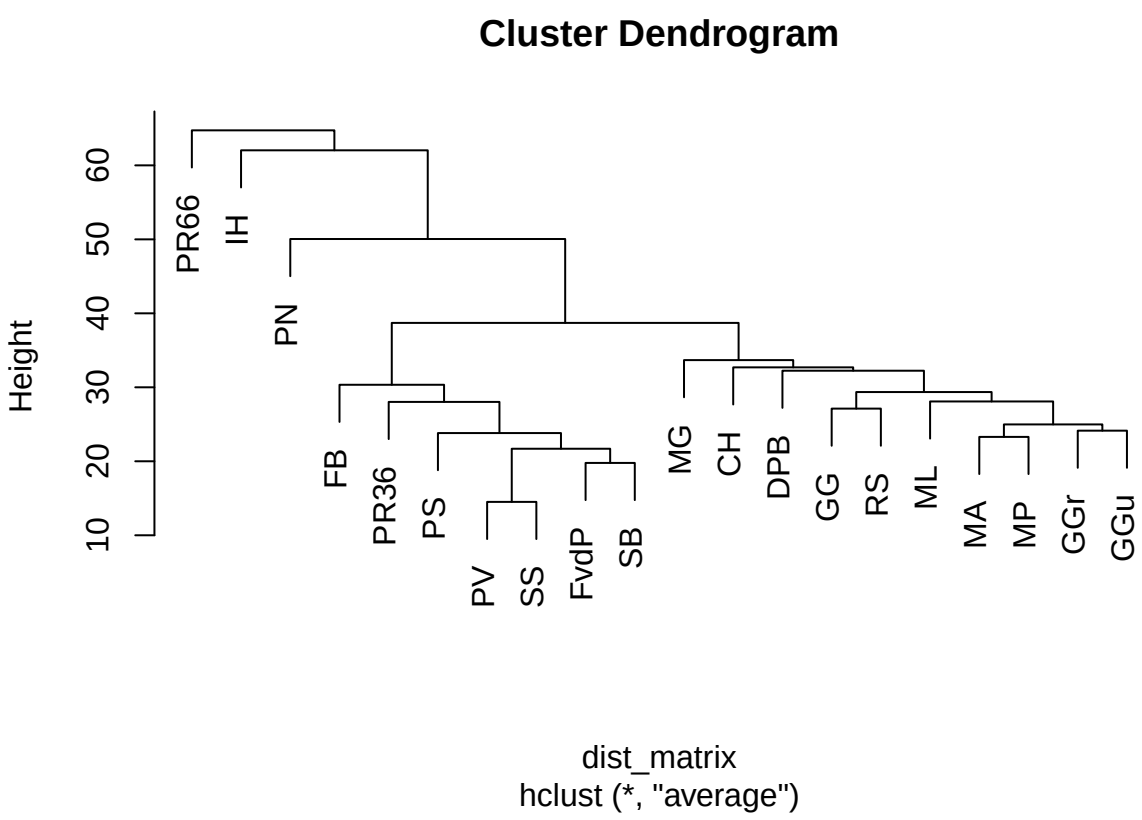


Dendograms cellists






Cluster Dendrogram
Height
10
20
30
40
50
60
70
IH
PR66
FB
PR36
PS
PV
SS
FvdP
SB
MG
ML
MA
MP
GGr
GGu
PN
DPB
CH
GG
RS
dist_matrix
hclust (*, "complete")

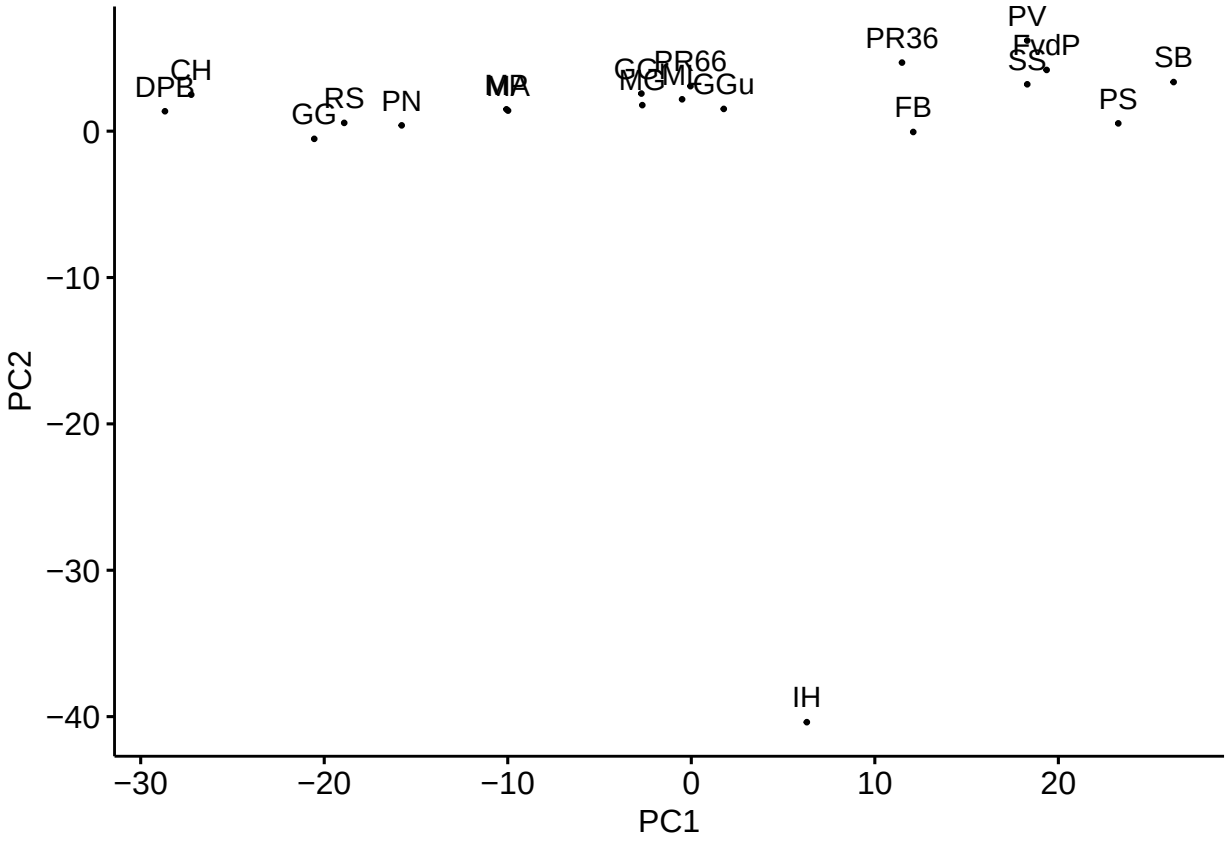


Cluster analysis for pianists (note length)

PCA

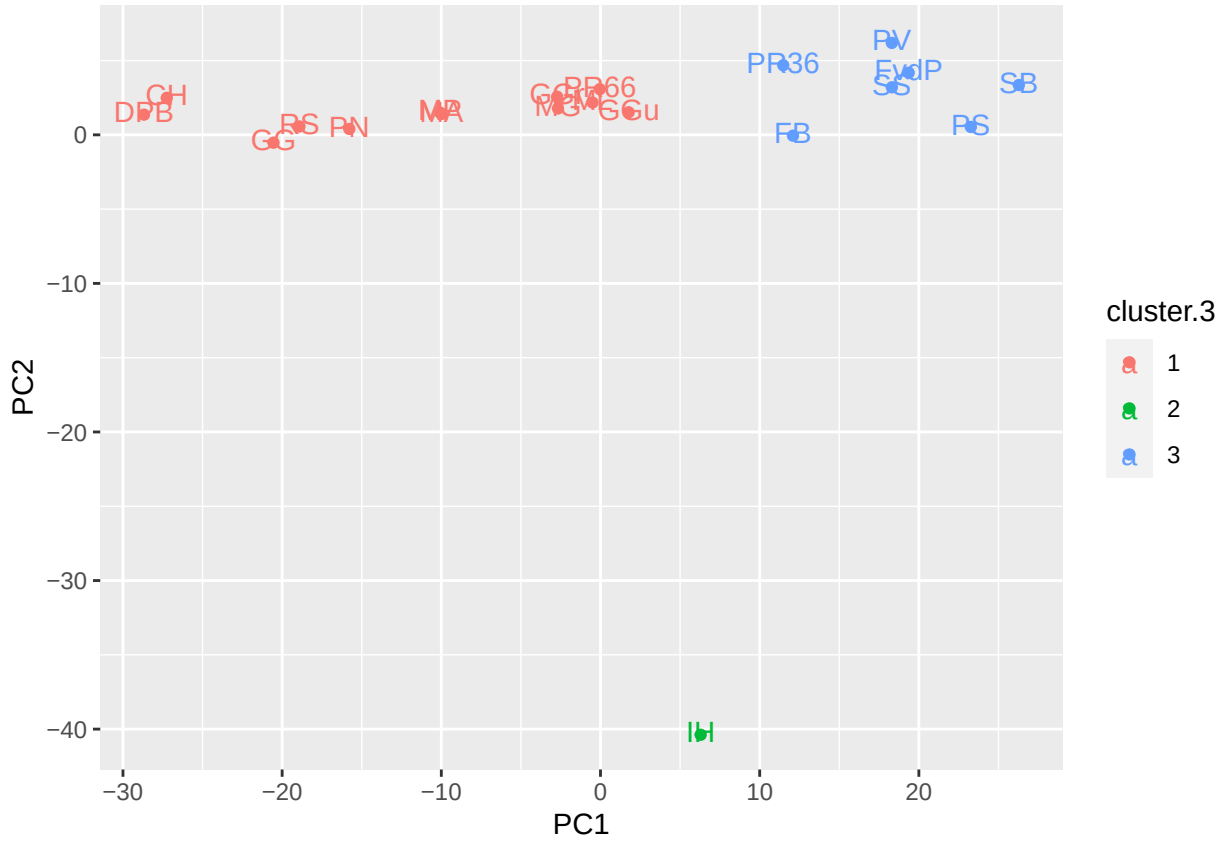
```
## Importance of components:
##                            PC1     PC2     PC3     PC4     PC5    PC6     PC7
## Standard deviation     16.8694 9.64987 7.54648 7.11032 7.07040 6.4861 6.28314
## Proportion of Variance  0.3037 0.09938 0.06078 0.05396 0.05335 0.0449 0.04213
## Cumulative Proportion   0.3037 0.40309 0.46387 0.51783 0.57118 0.6161 0.65821
##                            PC8     PC9    PC10    PC11    PC12    PC13    PC14
## Standard deviation     6.08622 6.03170 5.81967 5.70716 5.33477 5.14669 5.04024
## Proportion of Variance 0.03953 0.03883 0.03615 0.03476 0.03037 0.02827 0.02711
## Cumulative Proportion  0.69774 0.73657 0.77271 0.80748 0.83785 0.86612 0.89323
##                           PC15    PC16    PC17    PC18    PC19      PC20
## Standard deviation     4.92567 4.77399 4.64024 4.04716 3.88318 1.298e-14
## Proportion of Variance 0.02589 0.02432 0.02298 0.01748 0.01609 0.000e+00
## Cumulative Proportion  0.91912 0.94345 0.96643 0.98391 1.00000 1.000e+00
```

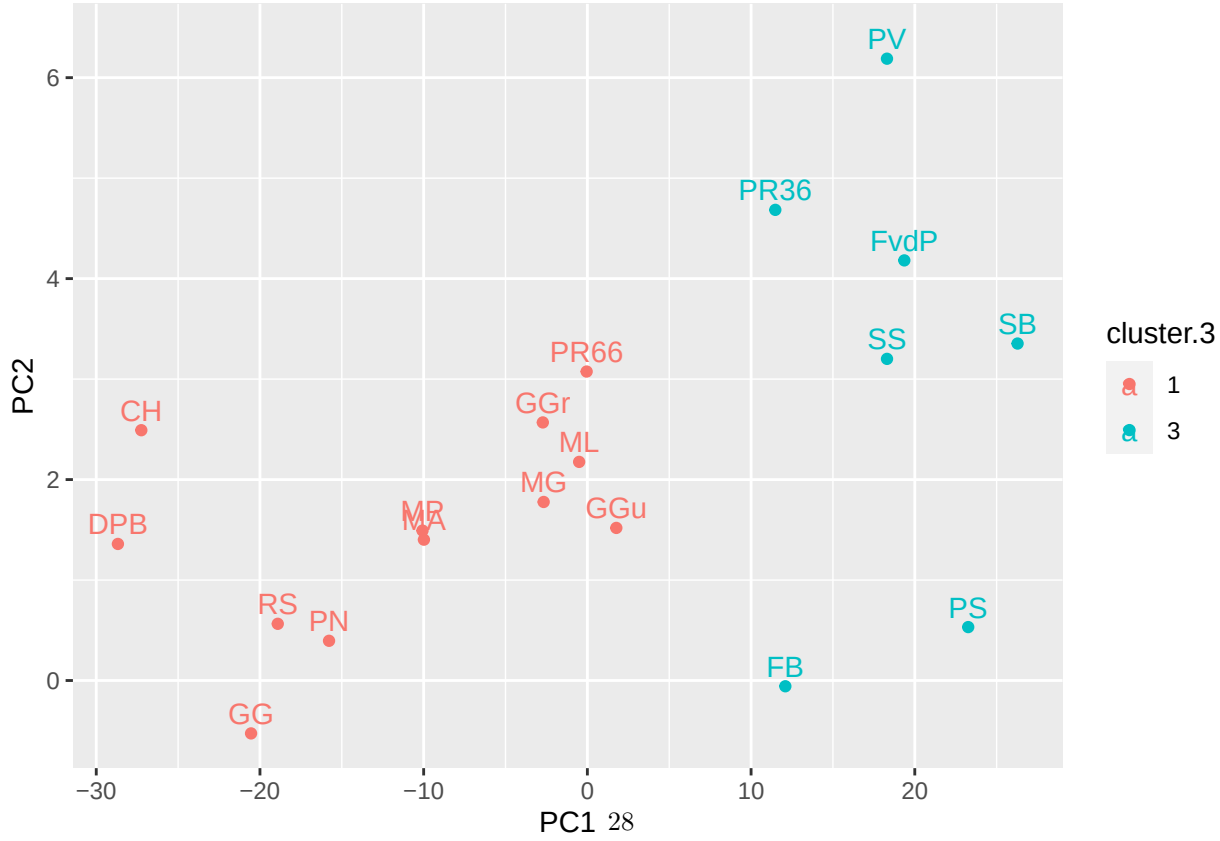
Plot of pianists given by PCA components



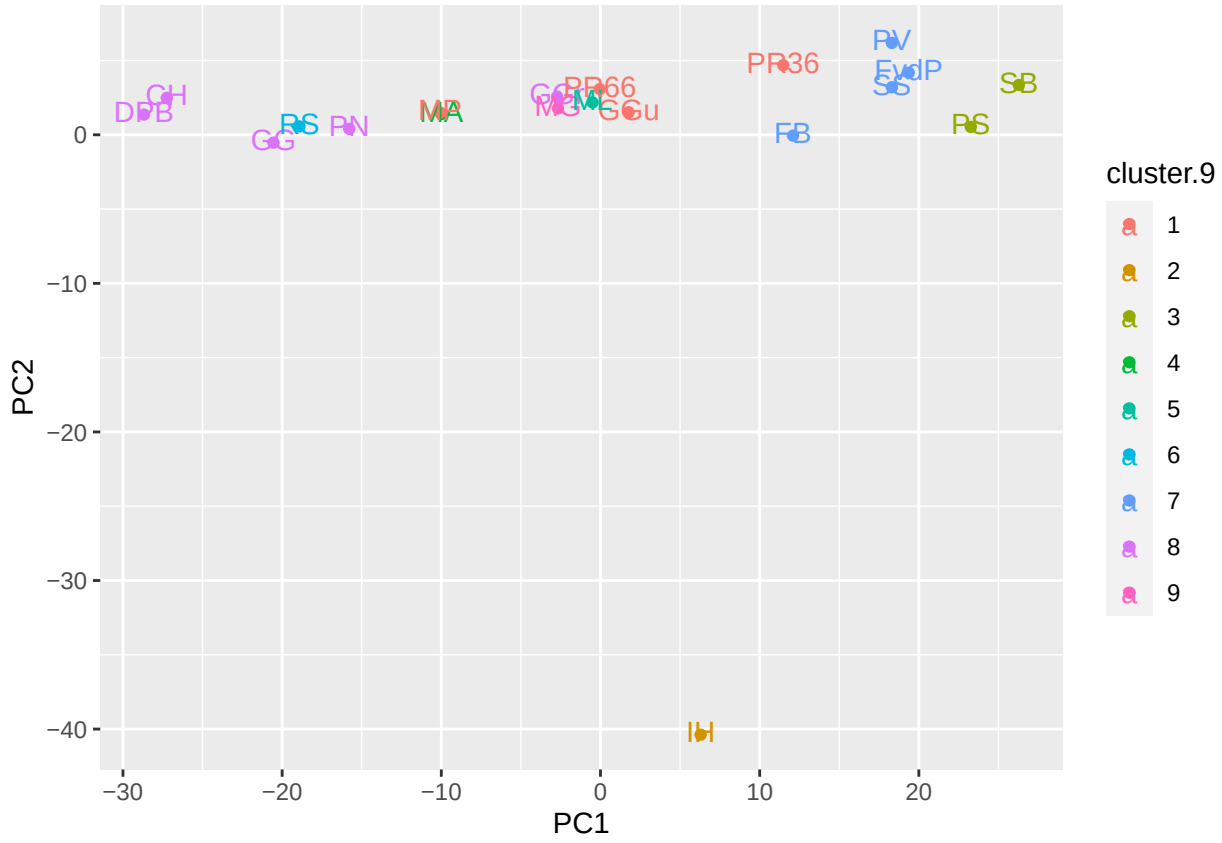
K-means

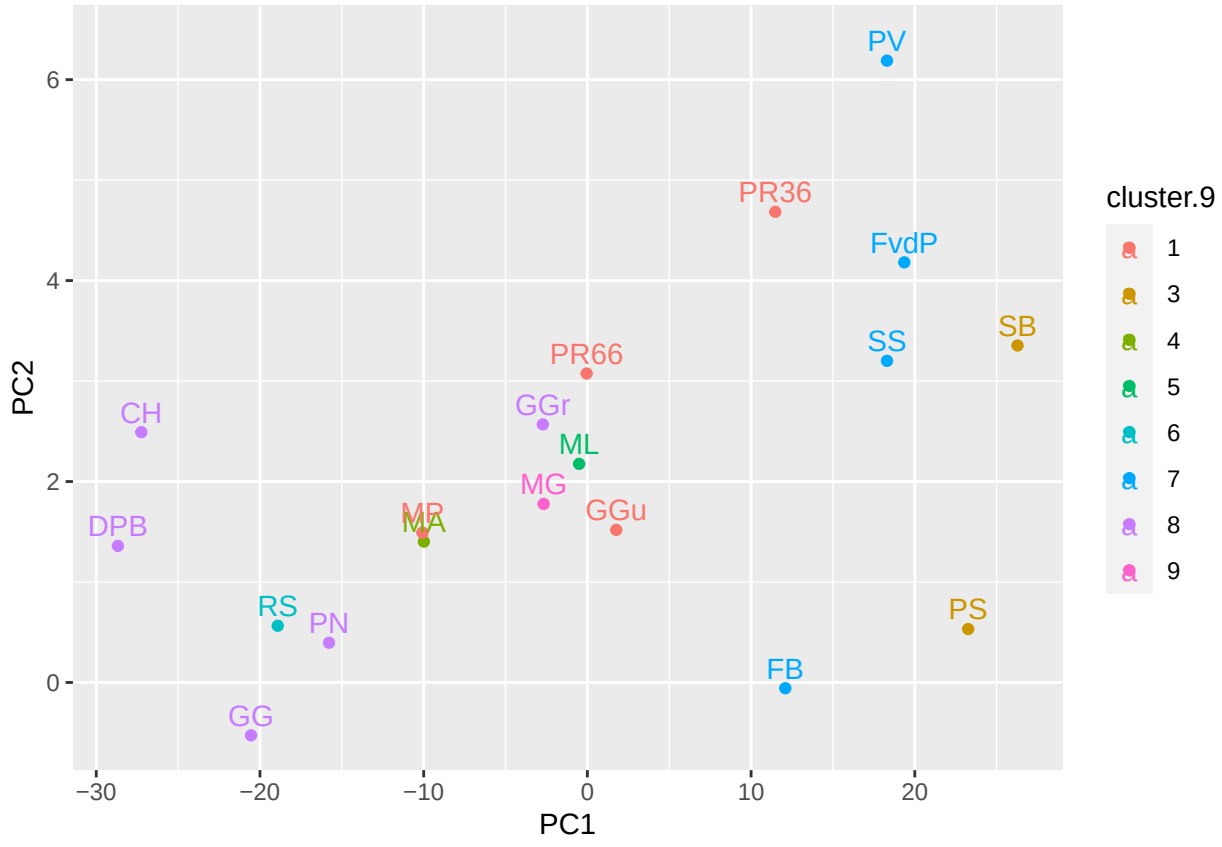
3 clusters pianists



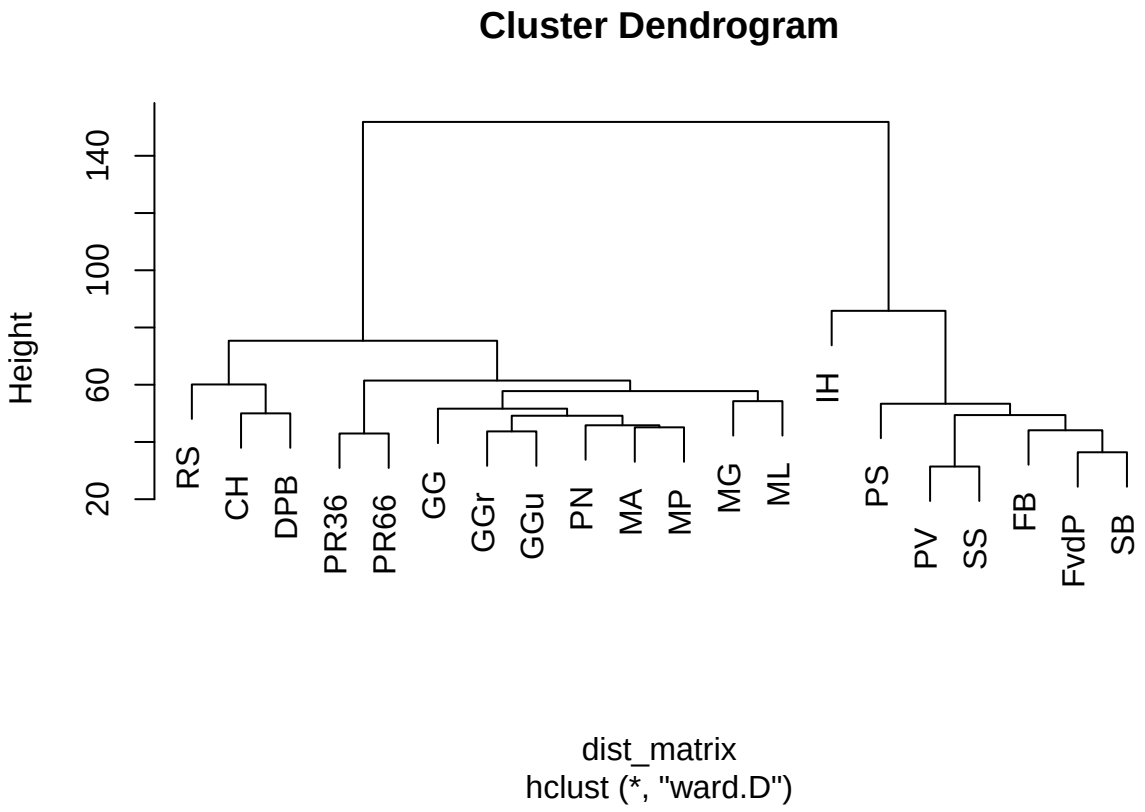


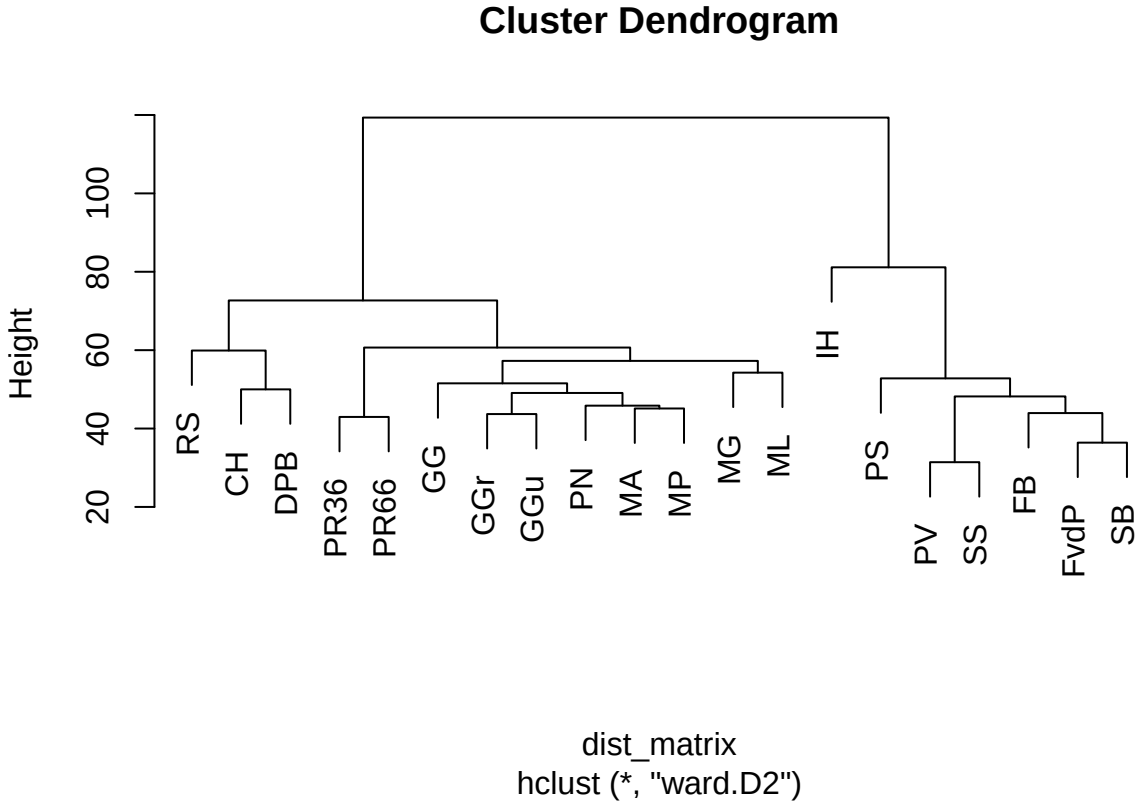
9 clusters pianists

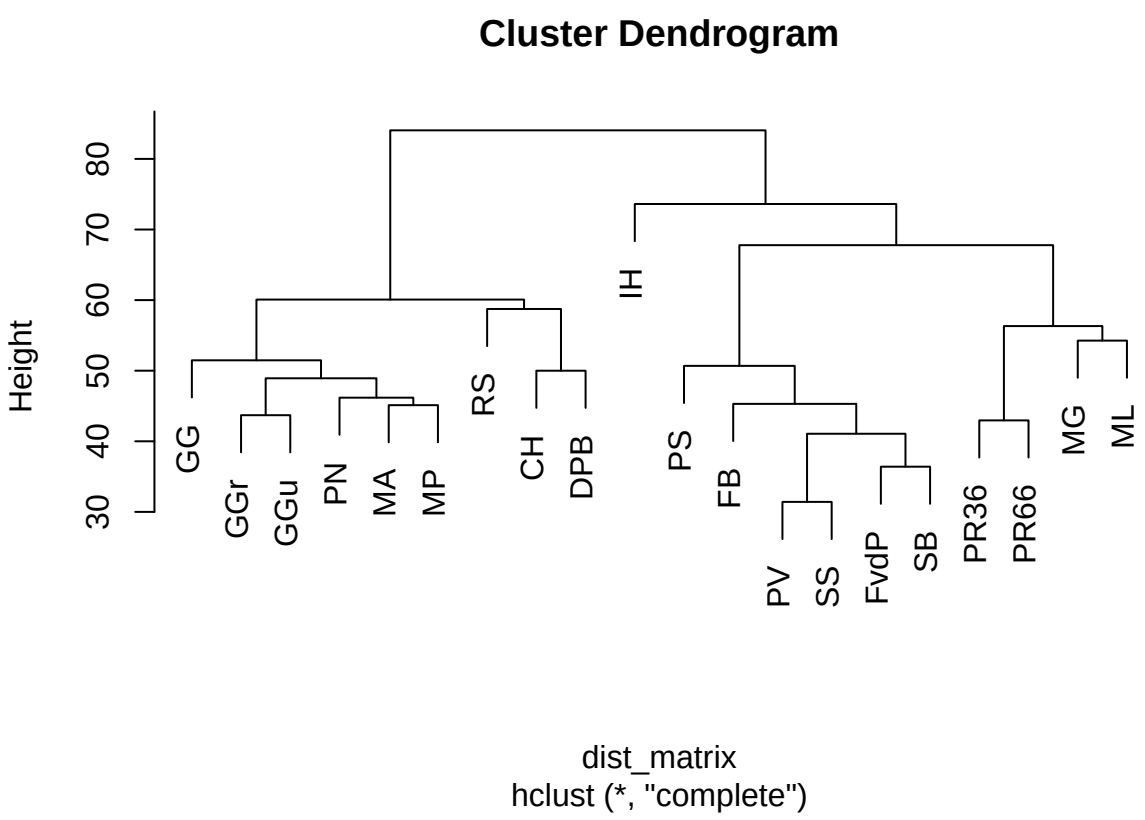


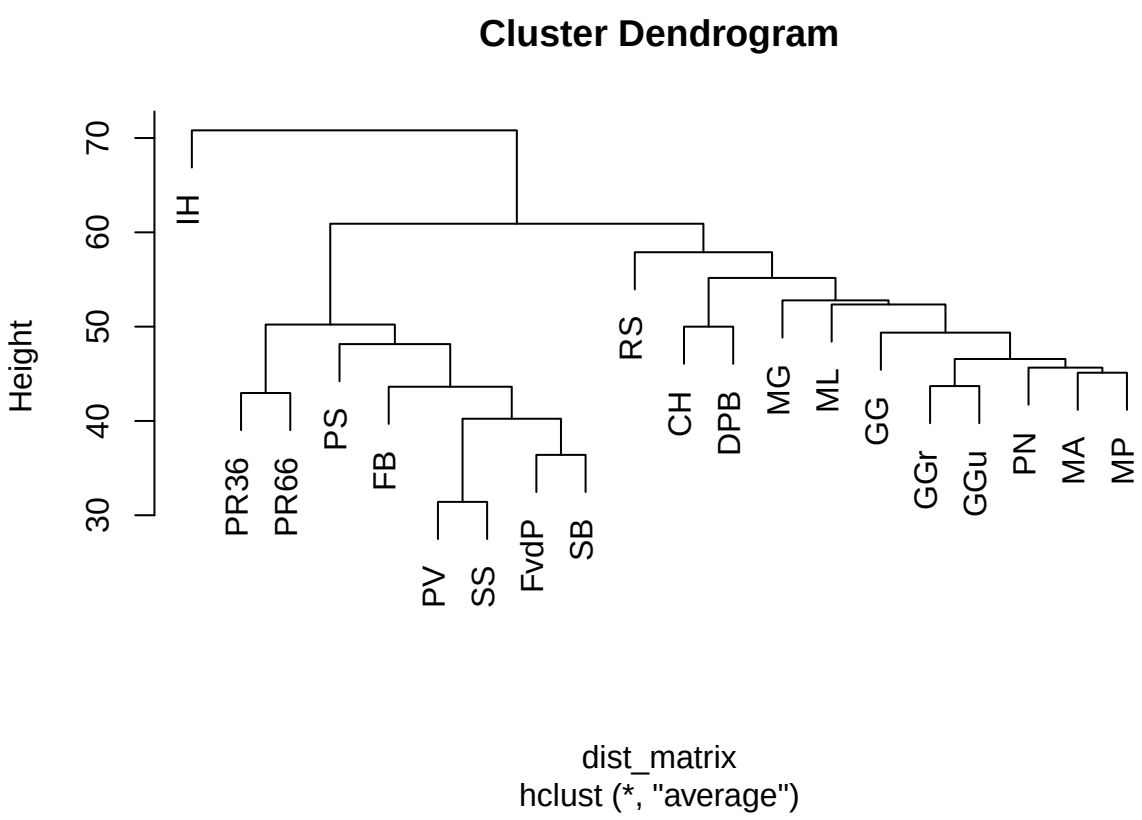


Dendograms pianists






Cluster Dendrogram
Height
30
40
50
60
70
80
GG
GGr
GGu
PN
MA
MP
RS
CH
DPB
IH
PS
FB
PV
SS
FvdP
SB
PR36
PR66
MG
ML
dist_matrix
hclust (*, "complete")



Summary

PV-SS always together. Also PR36-PR66.

FvdP different in intensity, MG different in beat.

Clusters:

beat + intensity

SB-IH-MP-GGu-GG-GGr MA-PN-ML PV-SS DPB-FB PR36-PR66 FvdP MG PS RS CH

beat

IH-MA-GG-PN MP-GGu-GGr-RS FvdP-FB-SB PV-SS PR36-PR66 PS DPB ML MG CH

intensity

GG-GGu-GGr-ML
MP-MA-PN
SB-IH-MG
PV-SS PR36-PR66 PS-CH FvdP FB PS CH