**Supplementary Fig 1 Overall structure of the fecal bacterial communities.** **(a)** The rarefaction curve of the number of OTUs. The x-coordinate is the number of sequencing bars randomly selected from a sample, and the y-coordinate is the number of OTUs that can be constructed based on the sequencing bars, which is used to reflect the depth of sequencing. Different samples are represented by different-colored curves. **(b)** Rank abundance of the METH and Ctr groups. The x-coordinate is the ordinal number sorted by OTU abundance, and the y-coordinate is the relative abundance of the corresponding OTUs. Different samples are represented by dashed lines of different colors. The FB samples belong to the METH group; the FBC samples belong to the Ctr group. **(c)** Venn diagram based on OTU clustering. Each circle represents a group, the number of OTUs in the overlapping regions of the circles represents the number of common OTUs between the two groups, and the number of OTUs in non-overlapping regions represents the number of unique OTUs in each group.

**Supplementary Fig 2 Gut microbiota may be associated with age and the duration of METH use. (a), (c), (e), (g)** Correlation between age and the relative abundance of the taxa in phylum, class, order and family level respectively. **(b), (d), (f), (h)** Correlation between duration of the METH use and the relative abundance of the taxa in phylum, class, order and family level respectively.

**Supplementary Fig 3 Positive symptoms of schizophrenia were related to gut microbiota. (a)-(e)** Bacterial taxa were correlated with delusions, suspiciousness and total positive scale respectively.

**Supplementary Fig 4 Negative symptoms of schizophrenia were related to gut microbiota. (a)-(o)** Bacterial taxa were correlated with blunted affect, emotional withdrawal, passive-apathetic social withdrawal, difficulty in abstract thinking, lack of spontaneity & flow of conversation and total negative scale respectively.

**Supplementary Fig 5 General psychopathology and cognition were related to gut microbiota were related to gut microbiota. (a)-(h)** Bacterial taxa were correlated with motor retardation, unusual thought content, poor impulse control, active social avoidance, general psychopathology scale and abstraction respectively.

**We mainly recruited the patients with methamphetamine use disorder (MUD) in our research. The MUD is diagnosed based on the Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5) by the consensus of two psychiatrists. The details are as followed:**

The Diagnostic Criteria of MUD

A pattern of amphetamine-type substance, cocaine, or other stimulant use leading to clinically significant impairment or distress, as manifested by at least two of the following, occurring within a 12-month period:

1. The stimulant is often taken in larger amounts or over a longer period than was intended.
2. There is a persistent desire or unsuccessful efforts to cut down or control stimulant use.
3. A great deal of time is spent in activities necessary to obtain the stimulant, use the stimulant, or recover from its effects.
4. Craving, or a strong desire or urge to use the stimulant.
5. Recurrent stimulant use resulting in a failure to fulfill major role obligations at work, school, or home.
6. Continued stimulant use despite having persistent or recurrent social or inteφersonal problems caused or exacerbated by the effects of the stimulant.
7. Important social, occupational, or recreational activities are given up or reduced because of stimulant use.
8. Recurrent stimulant use in situations in which it is physically hazardous.
9. Stimulant use is continued despite knowledge of having a persistent or recurrent

physical or psychological problem that is likely to have been caused or exacerbated by the stimulant.

10. Tolerance, as defined by either of the following:

a. A need for markedly increased amounts of the stimulant to achieve intoxication or desired effect.

b. A markedly diminished effect with continued use of the same amount of the stimulant.

Note: This criterion is not considered to be met for those taking stimulant medications solely under appropriate medical supervision, such as medications for attention-deficit/hyperactivity disorder or narcolepsy.

11. Withdrawal, as manifested by either of the following:

a. The characteristic withdrawal syndrome for the stimulant (refer to Criteria A and B of the criteria set for stimulant withdrawal, p. 569).

b. The stimulant (or a closely related substance) is taken to relieve or avoid withdrawal symptoms.

Supplementary Table 1. Comparison of alpha diversity under the 97% consistency threshold in the two goups.

| group | observed_species | shannon | simpson | chao1 | ACE | goods_coverage |
|---|---|---|---|---|---|---|
| Ctr | 325 | 5.206 | 0.932 | 369.952 | 382.298 | 0.999 |
| METH | 306 | 4.935* | 0.922 | 342.294 | 354.654 | 0.999 |

cutoff=57339

Wilcoxon rank-sum test, *p<0.05

Supplementary Table 2. Relative abundance of top ten microbes of different levels in two groups.

phylum

| Taxonomy | METH | Ctr |
|---|---|---|
| Firmicutes | 0.691129 | 0.633175 |
| Proteobacteria | 0.089046 | 0.103454 |
| Actinobacteria | 0.13697 | 0.09035 |
| Bacteroidetes | 0.075762 | 0.162449 |
| Fusobacteria | 0.006247 | 0.009618 |
| Euryarchaeota | 0.00017 | 0 |
| unidentified_Bacteria | 0.000343 | 0.000443 |
| Tenericutes | 0.000013 | 0.000072 |
| Verrucomicrobia | 0.000081 | 0.000035 |
| Acidobacteria | 0.000087 | 0.000096 |
| Others | 0.000152 | 0.000308 |

class

| Taxonomy | METH | CTR |
|---|---|---|
| Clostridia | 0.606823 | 0.541457 |
| Gammaproteobacteria | 0.088193 | 0.102084 |
| Bacteroidia | 0.075668 | 0.162105 |
| unidentified_Actinobacteria | 0.092859 | 0.069014 |
| Coriobacteriia | 0.043815 | 0.021174 |
| Negativicutes | 0.035908 | 0.055461 |
| Bacilli | 0.036147 | 0.022614 |
| Fusobacteriia | 0.006238 | 0.009607 |
| Erysipelotrichia | 0.012575 | 0.014011 |
| Deltaproteobacteria | 0.000543 | 0.001186 |
| Others | 0.001232 | 0.001285 |

order

| Taxonomy | METH | CTR |
|---|---|---|
| Clostridiales | 0.606812 | 0.541431 |
| Enterobacteriales | 0.08599 | 0.094846 |
| Bacteroidales | 0.075648 | 0.162093 |
| Bifidobacteriales | 0.092374 | 0.068532 |
| Coriobacteriales | 0.043811 | 0.021173 |
| Selenomonadales | 0.035908 | 0.055461 |
| Lactobacillales | 0.036059 | 0.022525 |
| Fusobacteriales | 0.006238 | 0.009607 |
| Erysipelotrichales | 0.012575 | 0.014011 |
| unidentified_ Gammaproteobacteria | 0.001267 | 0.00683 |
| Others | 0.003319 | 0.003491 |

family

| Taxonomy | METH | CTR |
|---|---|---|
| Lachnospiraceae | 0.321415 | 0.286737 |
| Enterobacteriaceae | 0.08599 | 0.094846 |
| Ruminococcaceae | 0.181135 | 0.188753 |
| Bacteroidaceae | 0.059185 | 0.116566 |
| Bifidobacteriaceae | 0.092374 | 0.068532 |
| Peptostreptococcaceae | 0.079787 | 0.054748 |
| Coriobacteriaceae | 0.041497 | 0.019457 |
| Veillonellaceae | 0.03235 | 0.054599 |
| Streptococcaceae | 0.032094 | 0.021339 |
| Fusobacteriaceae | 0.006238 | 0.009607 |
| Others | 0.067936 | 0.084816 |

genus

| Taxonomy | METH | CTR |
|---|---|---|
| unidentified_Enterobacteriaceae | 0.071641 | 0.083155 |
| unidentified_ Ruminococcaceae | 0.056424 | 0.041479 |
| Bacteroides | 0.059185 | 0.116566 |
| Blautia | 0.117765 | 0.10988 |
| Bifidobacterium | 0.092346 | 0.068528 |
| Faecalibacterium | 0.079266 | 0.106997 |
| Romboutsia | 0.073408 | 0.039146 |
| Collinsella | 0.041485 | 0.019456 |
| Megamonas | 0.006586 | 0.012668 |
| unidentified _Lachnospiraceae | 0.071749 | 0.059381 |
| Others | 0.330146 | 0.342746 |

species

| Taxonomy | METH | CTR |
|---|---|---|
| Escherichia_ coli | 0.071641 | 0.083155 |
| Ruminococcus_bromii | 0.043127 | 0.019636 |
| Bifidobacterium_pseudocatenulatum | 0.082387 | 0.051101 |
| Collinsella_ aerofaciens | 0.041114 | 0.018949 |
| Ruminococcus_sp_5_1_39BFAA | 0.078941 | 0.064517 |
| Bacteroides_ plebeius | 0.016 | 0.002601 |
| Dialister _succinatiphilus | 0.004137 | 0.01129 |
| Fusobacterium_sp_RMA_1065 | 0.005827 | 0.009355 |
| [Ruminococcus]_gnavus | 0.014659 | 0.010364 |
| Bacteroides_ vulgatus | 0.015938 | 0.035737 |
| Others | 0.626229 | 0.693297 |

Supplementary Table 3. MetaStat of microbes with significant difference between the METH and Ctr groups.

class

| Taxa | mean (Ctr) | variance (Ctr) | standard error(Ctr) | mean (METH) | variance (METH) | standard error (METH) | p value | q value |
|---|---|---|---|---|---|---|---|---|
| k__Bacteria;p__Proteobacteria; c__Deltaproteobacteria; | 0.001168489 | 3.18E-07 | 0.00015079 | 0.000530834 | 7.37E-08 | 6.79E-05 | 0.000999 | 0.028971 |

Order

| Taxa | mean(Ctr) | variance(Ctr) | standard error(Ctr) | mean(METH) | variance (METH) | standard error (METH) | p value | q value |
|---|---|---|---|---|---|---|---|---|
| k__Bacteria;p__Proteobacteria;c__Deltaproteobacteria;o__Desulfovibrionales; | 0.001159769 | 3.19E-07 | 0.00015102 | 5.09E-04 | 6.63E-08 | 6.44E-05 | 0.000999 | 0.020979 |
| k__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Xanthomonadales; | 3.11E-05 | 5.23E-10 | 6.11E-06 | 7.74E-05 | 3.85E-09 | 1.55E-05 | 0.000999 | 0.020979 |
| k__Bacteria;p__Proteobacteria;c__Alphaproteobacteria;o__Sphingomonadales; | 5.11E-05 | 3.96E-10 | 5.32E-06 | 9.16E-05 | 9.53E-10 | 7.72E-06 | 0.000999 | 0.020979 |

Family

| Taxa | mean(Ctr) | variance(Ctr) | standard error(Ctr) | mean(METH) | variance (METH) | standard error (METH) | p value | q value |
|---|---|---|---|---|---|---|---|---|
| k__Bacteria;p__Bacteroidetes;c__Bacteroidia;o__Bacteroidales;f__Rikenellaceae; | 0.020880827 | 0.000488668 | 0.00590803 | 3.33E-03 | 6.24E-06 | 6.25E-04 | 0.000999 | 0.018815 |
| k__Bacteria;p__Firmicutes;c__Clostridia;o__Clostridiales;f__unidentified_ Clostridiales; | 6.72E-03 | 1.88E-05 | 1.16E-03 | 2.19E-02 | 2.44E-04 | 3.90E-03 | 0.000999 | 0.018815 |
| k__Bacteria;p__Bacteroidetes;c__Bacteroidia;o__Bacteroidales; f__Tannerellaceae; | 1.63E-02 | 1.53E-04 | 3.31E-03 | 4.80E-03 | 1.74E-05 | 1.04E-03 | 0.001998 | 0.032253 |
| k__Bacteria;p__Firmicutes;c__Bacilli;o__Lactobacillales;f__Lactobacillaceae; | 8.99E-04 | 1.87E-07 | 1.15E-04 | 3.73E-03 | 6.36E-06 | 6.30E-04 | 0.000999 | 0.018815 |
| k__Bacteria;p__Proteobacteria;c__Deltaproteobacteria;o__Desulfovibrionales; f__Desulfovibrionaceae; | 1.16E-03 | 3.19E-07 | 1.51E-04 | 5.09E-04 | 6.63E-08 | 6.44E-05 | 0.000999 | 0.018815 |
| k__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Xanthomonadales; f__Xanthomonadaceae; | 3.11E-05 | 5.23E-10 | 6.11E-06 | 7.30E-05 | 2.52E-09 | 1.26E-05 | 0.002997 | 0.042333 |
| k__Bacteria;p__Proteobacteria;c__Alphaproteobacteria; o__Sphingomonadales; f__Sphingomonadaceae; | 5.11E-05 | 3.96E-10 | 5.32E-06 | 9.16E-05 | 9.53E-10 | 7.72E-06 | 0.000999 | 0.018815 |
| k__Bacteria;p__Firmicutes;c__Clostridia; o__Clostridiales;f__Peptococcaceae; | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.31E-05 | 5.47E-10 | 5.85E-06 | 0.000636 | 0.018815 |

Genus

| Taxa | mean(Ctr) | variance(Ctr) | standard error(Ctr) | mean(METH) | variance (METH) | standard error (METH) | p value | q value |
|---|---|---|---|---|---|---|---|---|
| k__Bacteria;p__Bacteroidetes;c__Bacteroidia; o__Bacteroidales;f__Rikenellaceae; g__Alistipes; | 0.02078366 | 0.000486976 | 0.00589779 | 3.32E-03 | 6.23E-06 | 6.24E-04 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Clostridia; o__Clostridiales;f__unidentified_ Clostridiales; g__unidentified_Clostridiales; | 0.006480257 | 1.85E-05 | 0.00115012 | 2.17E-02 | 2.41E-04 | 3.88E-03 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Clostridia;o__Clostridiales;f__Lachnospiraceae; g__Roseburia; | 6.11E-03 | 1.64E-05 | 1.08E-03 | 0.01536912 | 0.0001274 | 0.002822 | 0.001998 | 0.034109 |
| k__Bacteria;p__Bacteroidetes;c__Bacteroidia;o__Bacteroidales; f__Tannerellaceae;g__Parabacteroides; | 1.63E-02 | 1.53E-04 | 3.31E-03 | 0.004798218 | 1.74E-05 | 0.001043 | 0.002997 | 0.044768 |
| k__Bacteria;p__Proteobacteria;c__Gammaproteobacteria; o__unidentified_Gammaproteobacteria;f__Burkholderiaceae;g__Sutterella; | 2.14E-03 | 9.62E-06 | 8.29E-04 | 0.000252882 | 7.92E-08 | 7.04E-05 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Clostridia;o__Clostridiales;f__Lachnospiraceae; g__Lachnospira; | 4.07E-03 | 5.11E-06 | 6.04E-04 | 0.001979456 | 1.84E-06 | 0.000339 | 0.001998 | 0.034109 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| k__Bacteria;p__Firmicutes;c__Bacilli;o__Lactobacillales;f__Lactobacillaceae; g__Lactobacillus; | 8.99E-04 | 1.87E-07 | 1.15E-04 | 0.003733279 | 6.36E-06 | 0.00063 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Negativicutes; o__Selenomonadales; f__Veillonellaceae;g__Mitsuokella; | 6.60E-05 | 4.72E-08 | 5.80E-05 | 0.003471677 | 1.31E-05 | 0.000905 | 0.001998 | 0.034109 |
| k__Bacteria;p__Bacteroidetes;c__Bacteroidia;o__Bacteroidales;f__Marinifilaceae;g__Butyricimonas; | 1.08E-03 | 4.22E-06 | 5.49E-04 | 9.05E-05 | 1.07E-08 | 2.59E-05 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Bacilli; o__Lactobacillales;f__Streptococcaceae; g__Lactococcus; | 0.000626599 | 5.14E-07 | 0.00019167 | 8.94E-05 | 1.65E-08 | 3.22E-05 | 0.000999 | 0.023876 |
| k__Bacteria;p__Proteobacteria; c__Deltaproteobacteria;o__Desulfovibrionales; f__Desulfovibrionaceae;g__Desulfovibrio; | 0.00058549 | 1.78E-07 | 0.00011287 | 0.000138431 | 1.17E-08 | 2.71E-05 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Clostridia; o__Clostridiales;f__Ruminococcaceae; g__Oscillospira; | 0.000342574 | 1.39E-07 | 9.97E-05 | 6.98E-05 | 1.57E-08 | 3.14E-05 | 0.002997 | 0.044768 |
| k__Bacteria;p__Firmicutes;c__Negativicutes; o__Selenomonadales; f__Veillonellaceae;g__Allisonella; | 0.00052445 | 2.01E-07 | 0.00011993 | 7.96E-05 | 6.65E-09 | 2.04E-05 | 0.000999 | 0.023876 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| k__Bacteria;p__Firmicutes;c__Clostridia; o__Clostridiales;f__Ruminococcaceae; g__Negativibacillus; | 0.000450952 | 8.13E-08 | 7.62E-05 | 0.000136251 | 3.44E-08 | 4.63E-05 | 0.000999 | 0.023876 |
| k__Bacteria;p__Firmicutes;c__Clostridia; o__Clostridiales;f__Ruminococcaceae; g__Fournierella; | 6.60E-05 | 6.23E-09 | 2.11E-05 | 1.20E-05 | 5.97E-10 | 6.11E-06 | 0.001998 | 0.034109 |
| k__Bacteria;p__Proteobacteria; c__Alphaproteobacteria;o__Sphingomonadales; f__Sphingomonadaceae;g__Sphingomonas; | 4.98E-05 | 4.61E-10 | 5.74E-06 | 8.72E-05 | 1.18E-09 | 8.57E-06 | 0.000999 | 0.023876 |

Supplementary Table 4. Spearman rank correlation between the microbes and the initial age of METH use, duration of METH use and age.

phylum

| p value | Firmicu-tes | Proteobacteria | Actinobacteria | Bacteroidetes | Fusobacteria | Euryarchaeota | unidentified_Bacteria | Verrucomicrobia | Acidobacteria | Gemmatimonadetes |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | 0.7558446 | 0.5954388 | 0.80198566 | 0.3736559 | 0.1487856 | 0.885448 | 0.7409473 | 0.2544258 | 0.4173 | 0.89467126 |
| duration of METH use | 0.9691767 | 0.5078123 | 0.42775926 | 0.2412082 | 0.0163304 | 0.4309328 | 0.7375117 | 0.5266131 | 0.34957 | 0.86454112 |
| age | 0.6072544 | 0.9392712 | 0.97395512 | 0.2031657 | 0.0289539 | 0.49822 | 0.9283455 | 0.3129951 | 0.32894 | 0.92973199 |

| R | Firmicutes | Proteobacteria | Actinobacteria | Bacteroidetes | Fusobacteria | Euryarchaeota | unidentified_Bacteria | Verrucomicrobia | Acidobacteria | Gemmatimonadetes |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | -0.084447 | -0.143708 | 0.06815002 | -0.238525 | -0.378066 | -0.039181 | -0.089764 | -0.302723 | -0.218 | -0.0360095 |
| duration of METH use | 0.0105128 | 0.1787182 | -0.2132603 | -0.31088 | -0.589152 | -0.211832 | 0.0909948 | -0.170994 | -0.2504 | 0.04638946 |
| age | -0.139159 | 0.0207258 | -0.0088825 | -0.336055 | -0.545195 | -0.18271 | 0.0244629 | -0.269388 | -0.261 | -0.0239884 |

class

| p value | Clostridia | Gammaproteobacteria | Bacteroidia | unidentified_Actinobacteria | Coriobacteriia | Bacilli | Negativicutes | Fusobacteriia | Erysipelotrichia | Methanobacteria |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | 0.4308763 | 0.5954388 | 0.37365591 | 0.9132576 | 0.5726212 | 0.4508989 | 0.2361371 | 0.1487856 | 0.65005 | 0.88544797 |
| duration of METH use | 0.5334778 | 0.5078123 | 0.2412082 | 0.198402 | 0.9735785 | 0.0798815 | 0.3547822 | 0.0163304 | 0.70666 | 0.43093276 |
| age | 0.5032534 | 0.9392712 | 0.20316574 | 0.7106716 | 0.9306139 | 0.2052882 | 0.634514 | 0.0289539 | 0.75187 | 0.49821995 |

| R | Clostridia | Gammaproteobacteria | Bacteroidia | unidentified_Actinobacteria | Coriobacteriia | Bacilli | Negativicutes | Fusobacteriia | Erysipelotrichia | Methanobacteria |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | -0.211858 | -0.143708 | -0.2385251 | -0.02963 | 0.1525968 | -0.202969 | 0.3140827 | -0.378066 | -0.123 | -0.0391814 |
| duration of METH use | 0.1682053 | 0.1787182 | -0.3108795 | -0.339414 | 0.009011 | -0.45055 | -0.247803 | -0.589152 | 0.10212 | -0.2118323 |
| age | -0.180611 | 0.0207258 | -0.3360548 | -0.100668 | 0.0236867 | -0.334574 | 0.1287963 | -0.545195 | -0.0859 | -0.1827102 |

order

| p value | Clostridiales | Enterobacteriales | Bacteroidales | Bifidobacteriales | Coriobacteriales | Lactobacillales | Selenomonadales | Fusobacteriales | Erysipelotrichales | unidentified_Gammaproteobacteria |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | 0.4308763 | 0.5954388 | 0.37365591 | 0.9565717 | 0.5726212 | 0.4508989 | 0.2361371 | 0.1487856 | 0.65005 | 0.22657193 |
| duration of METH use | 0.5334778 | 0.5078123 | 0.2412082 | 0.198402 | 0.9735785 | 0.0798815 | 0.3547822 | 0.0163304 | 0.70666 | 0.26806614 |
| age | 0.5032534 | 0.9392712 | 0.20316574 | 0.7229568 | 0.9306139 | 0.2052882 | 0.634514 | 0.0289539 | 0.75187 | 0.12938019 |
| R | Clostridiales | Enterobacteriales | Bacteroidales | Bifidobacteriales | Coriobacteriales | Lactobacillales | Selenomonadales | Fusobacteriales | Erysipelotrichales | unidentified_Gammaproteobacteria |
| initial age of METH use | -0.211858 | -0.143708 | -0.2385251 | -0.014815 | 0.1525968 | -0.202969 | 0.3140827 | -0.378066 | -0.123 | -0.3202443 |
| duration of METH use | 0.1682053 | 0.1787182 | -0.3108795 | -0.339414 | 0.009011 | -0.45055 | -0.247803 | -0.589152 | 0.10212 | -0.294576 |
| age | -0.180611 | 0.0207258 | -0.3360548 | -0.096227 | 0.0236867 | -0.334574 | 0.1287963 | -0.545195 | -0.0859 | -0.3955625 |

family

| p value | Enterobacteriaceae | Lachnospiraceae | Ruminococcaceae | Bacteroidaceae | Bifidobacteriaceae | Peptostreptococcaceae | Coriobacteriaceae | Streptococcaceae | Veillonellaceae | Fusobacteriaceae |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | 0.5954388 | 0.9046185 | 0.98262227 | 0.4993759 | 0.9565717 | 0.654018 | 0.5501807 | 0.4887861 | 0.20493 | 0.14878556 |
| duration of METH use | 0.5078123 | 0.2317531 | 0.52977604 | 0.2974575 | 0.198402 | 0.9911916 | 0.9647758 | 0.0880687 | 0.37311 | 0.01633044 |
| age | 0.9392712 | 0.7852844 | 0.89175927 | 0.3101511 | 0.7229568 | 0.7894878 | 0.9652778 | 0.2388431 | 0.58047 | 0.02895391 |
| R | Enterobacteriaceae | Lachnospiraceae | Ruminococcaceae | Bacteroidaceae | Bifidobacteriaceae | Peptostreptococcaceae | Coriobacteriaceae | Streptococcaceae | Veillonellaceae | Fusobacteriaceae |
| initial age of METH use | -0.143708 | -0.032593 | 0.00592609 | -0.182227 | -0.014815 | -0.121485 | 0.1614859 | -0.186672 | 0.33482 | -0.3780662 |
| duration of METH use | 0.1787182 | 0.3168868 | 0.16970717 | -0.277839 | -0.339414 | 0.0030037 | -0.012015 | -0.440037 | -0.2388 | -0.589152 |
| age | 0.0207258 | 0.0740209 | -0.0370104 | -0.270916 | -0.096227 | -0.07254 | 0.0118433 | -0.312368 | 0.14952 | -0.5451948 |

genus

| p value | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Romboutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| initial age of METH use | 0.9956553 | 0.654018 | 0.49937588 | 0.9565717 | 0.3645463 | 0.7516856 | 0.5501807 | 0.9478961 | 0.22467 | 0.48878611 |
| duration of METH use | 0.4479855 | 0.4686832 | 0.29745751 | 0.198402 | 0.3793278 | 0.7316072 | 0.9647758 | 0.6216543 | 0.85971 | 0.08806874 |
| age | 0.5320905 | 0.6903453 | 0.31015105 | 0.7229568 | 0.2807905 | 1 | 0.9652778 | 0.857412 | 0.25806 | 0.23884307 |
| R | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Romboutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
| initial age of METH use | 0.0014815 | 0.1214848 | -0.1822272 | -0.014815 | 0.2429696 | -0.085928 | 0.1614859 | -0.017778 | 0.32149 | -0.1866718 |
| duration of METH use | 0.2042493 | -0.195238 | -0.2778392 | -0.339414 | 0.2357878 | 0.0931137 | -0.012015 | 0.1336632 | 0.04806 | -0.4400372 |
| age | 0.1687676 | -0.10807 | -0.2709164 | -0.096227 | 0.287201 | 0 | 0.0118433 | -0.048854 | 0.30052 | -0.3123681 |

correlation coefficient -1<R<1, R >0 positve correlation, R<0 negative correlation.

Supplementary Table 5. Results of PANSS and MoCA tests.

| Samples | Delusions | Conceptual disorganization | Hallucinatory behavior | Excitement | Grandiosity | Suspiciousness | Hostility | Positive Scale |
|---|---|---|---|---|---|---|---|---|
| FB1 | 3 | 3 | 3 | 7 | 3 | 4 | 7 | 30 |
| FB2 | 2 | 1 | 3 | 3 | 1 | 4 | 3 | 17 |
| FB3 | 4 | 6 | 3 | 3 | 1 | 4 | 3 | 24 |
| FB4 | 2 | 3 | 2 | 1 | 1 | 4 | 2 | 15 |
| FB5 | 3 | 4 | 3 | 6 | 1 | 4 | 6 | 27 |
| FB6 | 2 | 3 | 2 | 6 | 1 | 3 | 6 | 23 |
| FB7 | 2 | 3 | 2 | 5 | 1 | 3 | 5 | 21 |
| FB8 | 4 | 3 | 3 | 6 | 1 | 5 | 6 | 28 |
| FB13 | 6 | 5 | 3 | 7 | 1 | 5 | 7 | 34 |
| FB14 | 5 | 4 | 4 | 6 | 1 | 5 | 6 | 31 |
| FB15 | 4 | 3 | 3 | 3 | 1 | 5 | 5 | 24 |
| FB16 | 6 | 3 | 6 | 6 | 1 | 5 | 5 | 32 |
| FB17 | 6 | 3 | 3 | 6 | 1 | 6 | 5 | 30 |
| FB19 | 5 | 3 | 3 | 4 | 1 | 6 | 4 | 26 |
| FB20 | 5 | 2 | 6 | 5 | 1 | 6 | 5 | 30 |
| FB12 | 5 | 3 | 3 | 5 | 1 | 5 | 5 | 27 |

| Samples | Blunted affect | Emotional withdrawal | Poor rapport | Passive-apathetic social withdrawal | Difficulty in abstract thinking | Lack of spontaneity & flow of conversation | Stereotyped thinking | Negative Scale |
|---|---|---|---|---|---|---|---|---|
| FB1 | 2 | 5 | 4 | 5 | 4 | 3 | 1 | 24 |
| FB2 | 2 | 4 | 3 | 3 | 4 | 4 | 1 | 21 |
| FB3 | 5 | 4 | 5 | 5 | 5 | 6 | 1 | 31 |
| FB4 | 3 | 5 | 3 | 5 | 4 | 5 | 1 | 26 |
| FB5 | 1 | 3 | 3 | 3 | 4 | 4 | 1 | 19 |
| FB6 | 1 | 3 | 3 | 3 | 2 | 3 | 1 | 16 |
| FB7 | 1 | 3 | 3 | 3 | 2 | 3 | 1 | 16 |
| FB8 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 19 |
| FB13 | 1 | 2 | 3 | 1 | 5 | 1 | 1 | 14 |
| FB14 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 19 |
| FB15 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 18 |
| FB16 | 2 | 2 | 3 | 3 | 4 | 3 | 1 | 18 |
| FB17 | 3 | 2 | 3 | 3 | 4 | 3 | 1 | 19 |
| FB19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 |
| FB20 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 14 |
| FB12 | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 15 |

| Samples | Somatic concern | Anxiety | Guilt feelings | Tension | Mannerisms & posturing | Depression | Motor retardation | UncooperatJveness |
|---|---|---|---|---|---|---|---|---|
| FB1 | 1 | 5 | 1 | 5 | 1 | 1 | 1 | 6 |
| FB2 | 3 | 4 | 3 | 3 | 1 | 5 | 3 | 2 |
| FB3 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 4 |
| FB4 | 2 | 5 | 2 | 5 | 1 | 5 | 4 | 3 |
| FB5 | 1 | 4 | 1 | 4 | 1 | 2 | 1 | 6 |
| FB6 | 1 | 4 | 1 | 4 | 1 | 1 | 1 | 6 |
| FB7 | 1 | 3 | 1 | 4 | 1 | 1 | 1 | 5 |
| FB8 | 1 | 4 | 1 | 4 | 1 | 1 | 1 | 6 |
| FB13 | 1 | 6 | 1 | 5 | 1 | 2 | 1 | 6 |
| FB14 | 1 | 5 | 1 | 4 | 1 | 1 | 1 | 6 |
| FB15 | 1 | 3 | 1 | 3 | 1 | 1 | 1 | 5 |
| FB16 | 1 | 4 | 1 | 4 | 1 | 1 | 1 | 6 |
| FB17 | 1 | 4 | 1 | 4 | 1 | 1 | 1 | 5 |
| FB19 | 1 | 3 | 1 | 3 | 1 | 1 | 1 | 4 |
| FB20 | 1 | 4 | 1 | 3 | 1 | 1 | 1 | 5 |
| FB12 | 1 | 4 | 1 | 3 | 1 | 1 | 1 | 6 |

| Samples | Unusual thought content | Disorientation | Poor attention | Lack of judgment & insight | Disturbance of volition | Poor impulse control | Preoccupation | Active social avoidance | General Psychopathology Scale |
|---|---|---|---|---|---|---|---|---|---|
| FB1 | 2 | 1 | 5 | 6 | 3 | 5 | 1 | 4 | 48 |
| FB2 | 1 | 1 | 4 | 5 | 5 | 3 | 1 | 4 | 48 |
| FB3 | 3 | 1 | 5 | 6 | 5 | 2 | 1 | 6 | 43 |
| FB4 | 1 | 1 | 4 | 4 | 4 | 2 | 1 | 5 | 49 |
| FB5 | 1 | 1 | 5 | 6 | 1 | 6 | 1 | 4 | 45 |
| FB6 | 1 | 1 | 5 | 5 | 1 | 6 | 1 | 3 | 42 |
| FB7 | 1 | 1 | 4 | 5 | 1 | 5 | 1 | 4 | 39 |
| FB8 | 1 | 1 | 5 | 6 | 2 | 6 | 1 | 5 | 46 |
| FB13 | 3 | 1 | 7 | 7 | 1 | 7 | 1 | 5 | 55 |
| FB14 | 2 | 1 | 5 | 5 | 4 | 6 | 1 | 4 | 48 |
| FB15 | 1 | 1 | 5 | 5 | 4 | 4 | 1 | 3 | 40 |
| FB16 | 4 | 1 | 5 | 6 | 1 | 6 | 1 | 4 | 47 |
| FB17 | 3 | 1 | 5 | 6 | 2 | 6 | 1 | 4 | 46 |
| FB19 | 3 | 1 | 4 | 5 | 1 | 5 | 1 | 3 | 38 |
| FB20 | 3 | 1 | 4 | 5 | 2 | 5 | 1 | 3 | 41 |
| FB12 | 3 | 1 | 2 | 6 | 3 | 6 | 1 | 3 | 43 |

| Samples | visuospatial executive | naming | attention | calculation | language | abstraction | delayed recall | orientation | total MoCA |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FB1 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 6 | 27 |
| FB2 | 4 | 3 | 3 | 1 | 2 | 2 | 5 | 6 | 26 |
| FB3 | 5 | 3 | 3 | 3 | 3 | 1 | 1 | 6 | 25 |
| FB4 | 4 | 3 | 2 | 3 | 2 | 2 | 1 | 6 | 23 |
| FB5 | 5 | 2 | 2 | 3 | 1 | 1 | 0 | 6 | 20 |
| FB6 | 4 | 3 | 3 | 1 | 3 | 2 | 0 | 6 | 22 |
| FB7 | 3 | 3 | 3 | 3 | 3 | 2 | 4 | 6 | 27 |
| FB8 | 3 | 2 | 3 | 3 | 1 | 1 | 3 | 6 | 22 |
| FB13 | 3 | 3 | 3 | 3 | 2 | 2 | 5 | 6 | 27 |
| FB14 | 4 | 3 | 2 | 3 | 1 | 1 | 2 | 6 | 22 |
| FB15 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 6 | 23 |
| FB16 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 6 | 23 |
| FB17 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 6 | 25 |
| FB19 | 5 | 3 | 3 | 3 | 3 | 2 | 3 | 6 | 28 |
| FB20 | 4 | 3 | 2 | 3 | 3 | 2 | 2 | 6 | 25 |
| FB12 | 5 | 3 | 3 | 3 | 2 | 1 | 2 | 6 | 25 |

FB belong to the METH group, FBC belong to the Ctr group.
Lower scores indicate less severe symptoms.

Supplementary Table 6. Spearman rank correlation between the microbes and the scales of PNASS and MoCA tests.

positive scale

| R | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Rombutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| Delusions | 0.6162 | -0.4885 | 0.5230 | -0.3667 | -0.0240 | -0.4569 | -0.1323 | -0.2435 | 0.2450 | -0.0240 |
| Conceptual disorganization | 0.0152 | -0.0744 | 0.2131 | -0.0406 | 0.1675 | -0.0660 | -0.1235 | -0.3045 | 0.2774 | 0.1793 |
| Hallucinatory behavior | 0.3855 | -0.1189 | 0.1240 | -0.2241 | 0.0458 | -0.1392 | -0.0696 | -0.0560 | 0.1511 | 0.3447 |
| Excitement | 0.3619 | -0.3969 | 0.1718 | -0.3543 | 0.0715 | 0.0791 | -0.2281 | -0.0547 | 0.1566 | -0.0745 |
| Grandiosity | 0.3081 | -0.3641 | -0.3081 | 0.0840 | 0.4201 | 0.3081 | -0.1960 | -0.3641 | 0.3641 | 0.0840 |
| Suspiciousness | 0.5683 | -0.4697 | 0.4482 | -0.3157 | -0.0370 | -0.3958 | -0.0662 | -0.0801 | 0.1710 | -0.1679 |
| Hostility | 0.2881 | -0.3506 | 0.0412 | -0.3597 | 0.1692 | 0.2317 | -0.1753 | -0.0290 | 0.1494 | -0.2012 |
| Positive Scale | 0.6204 | -0.5067 | 0.2836 | -0.3811 | 0.1152 | -0.1891 | -0.2496 | -0.2245 | 0.3117 | 0.1211 |

| p value | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Romboutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| Delusions | 0.0110 | 0.0549 | 0.0376 | 0.1624 | 0.9296 | 0.0752 | 0.6253 | 0.3635 | 0.3605 | 0.9296 |
| Conceptual disorganization | 0.9554 | 0.7841 | 0.4281 | 0.8813 | 0.5353 | 0.8082 | 0.6487 | 0.2516 | 0.2983 | 0.5064 |
| Hallucinatory behavior | 0.1404 | 0.6611 | 0.6474 | 0.4040 | 0.8661 | 0.6070 | 0.7978 | 0.8367 | 0.5764 | 0.1910 |
| Excitement | 0.1684 | 0.1280 | 0.5246 | 0.1782 | 0.7925 | 0.7710 | 0.3955 | 0.8404 | 0.5624 | 0.7839 |
| Grandiosity | 0.2457 | 0.1657 | 0.2457 | 0.7571 | 0.1052 | 0.2457 | 0.4668 | 0.1657 | 0.1657 | 0.7571 |
| Suspiciousness | 0.0216 | 0.0664 | 0.0817 | 0.2336 | 0.8919 | 0.1291 | 0.8075 | 0.7681 | 0.5267 | 0.5343 |
| Hostility | 0.2793 | 0.1831 | 0.8797 | 0.1712 | 0.5311 | 0.3879 | 0.5161 | 0.9152 | 0.5809 | 0.4549 |
| Positive Scale | 0.0103 | 0.0452 | 0.2871 | 0.1453 | 0.6709 | 0.4831 | 0.3511 | 0.4032 | 0.2399 | 0.6550 |

The negative scale

| R | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Romboutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| Blunted affect | -0.1109 | 0.0832 | -0.1386 | 0.5698 | 0.1725 | -0.2495 | 0.0770 | -0.3481 | 0.0647 | 0.3881 |
| Emotional withdrawal | -0.4747 | 0.3518 | -0.6192 | 0.5608 | 0.2658 | 0.3411 | 0.0046 | -0.2151 | 0.0384 | 0.4148 |
| Poor rapport | -0.3204 | 0.2452 | -0.4367 | 0.5817 | 0.4493 | 0.2041 | 0.1002 | -0.4511 | 0.3132 | 0.3490 |
| Passive-apathetic social withdrawal | -0.4242 | 0.3213 | -0.3767 | 0.6521 | 0.1551 | 0.1219 | 0.0032 | -0.1361 | 0.0142 | 0.5682 |
| Difficulty in abstract thinking | -0.0338 | -0.0676 | -0.0369 | 0.2212 | 0.3011 | -0.3503 | -0.2397 | -0.5101 | 0.5009 | 0.5485 |
| Lack of spontaneity & flow of conversation | -0.7143 | 0.5373 | -0.2078 | 0.5942 | -0.0179 | -0.1120 | 0.0536 | 0.0260 | -0.1753 | 0.5649 |
| Stereotyped thinking | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Negative Scale | -0.4529 | 0.2970 | -0.3415 | 0.6504 | 0.1930 | -0.0059 | -0.0297 | -0.2702 | 0.0564 | 0.6162 |

| p value | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Romboutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| Blunted affect | 0.6827 | 0.7594 | 0.6087 | 0.0212 | 0.5229 | 0.3514 | 0.7768 | 0.1865 | 0.8119 | 0.1374 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Emotional withdrawal | 0.0631 | 0.1814 | 0.0105 | 0.0238 | 0.3197 | 0.1961 | 0.9865 | 0.4237 | 0.8877 | 0.1101 |
| Poor rapport | 0.2263 | 0.3600 | 0.0908 | 0.0181 | 0.0808 | 0.4484 | 0.7119 | 0.0795 | 0.2375 | 0.1852 |
| Passive-apathetic social withdrawal | 0.1015 | 0.2249 | 0.1504 | 0.0062 | 0.5662 | 0.6530 | 0.9907 | 0.6152 | 0.9582 | 0.0217 |
| Difficulty in abstract thinking | 0.9011 | 0.8036 | 0.8922 | 0.4103 | 0.2571 | 0.1835 | 0.3713 | 0.0435 | 0.0481 | 0.0278 |
| Lack of spontaneity & flow of conversation | 0.0019 | 0.0318 | 0.4400 | 0.0152 | 0.9477 | 0.6796 | 0.8438 | 0.9239 | 0.5160 | 0.0226 |
| Stereotyped thinking | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Negative Scale | 0.0781 | 0.2640 | 0.1955 | 0.0064 | 0.4738 | 0.9826 | 0.9131 | 0.3114 | 0.8356 | 0.0110 |

the general psychopathology scale

| R | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Romboutsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Somatic concern | -0.3017 | 0.2301 | -0.3017 | 0.1892 | -0.2096 | -0.0205 | -0.1508 | -0.1074 | -0.1815 | 0.4014 |
| Anxiety | 0.3890 | -0.4713 | -0.0269 | -0.3732 | -0.0127 | -0.0127 | -0.4855 | -0.3384 | 0.1755 | 0.3384 |
| Guilt feelings | -0.3017 | 0.2301 | -0.3017 | 0.1892 | -0.2096 | -0.0205 | -0.1508 | -0.1074 | -0.1815 | 0.4014 |
| Tension | 0.2380 | -0.4321 | -0.0282 | -0.0219 | 0.0720 | -0.0125 | -0.3476 | -0.2943 | 0.2004 | 0.1566 |
| Mannerisms & posturing | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Depression | -0.2440 | 0.0659 | -0.0813 | -0.0697 | -0.0930 | -0.1433 | -0.3022 | -0.1046 | 0.0775 | 0.3486 |
| Motor retardation | -0.3803 | 0.3738 | -0.3068 | 0.4624 | 0.0043 | -0.0411 | -0.0583 | -0.2485 | 0.0540 | 0.5099 |
| Uncooperat Jveness | 0.3298 | -0.3805 | 0.3298 | -0.3266 | -0.1459 | -0.0539 | -0.3155 | 0.0666 | -0.0967 | -0.0111 |
| Unusual thought content | 0.6057 | -0.3827 | 0.4033 | -0.3005 | -0.0016 | -0.3448 | -0.1502 | -0.2625 | 0.3084 | 0.1154 |
| Disorientation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Poor attention | 0.0891 | -0.1155 | 0.0660 | 0.1023 | 0.3466 | 0.0495 | 0.0660 | -0.4588 | 0.4522 | -0.0132 |
| Lack of judgment & insight | 0.2832 | -0.4023 | 0.4087 | -0.0772 | 0.0290 | -0.4344 | -0.3958 | -0.1513 | 0.2124 | 0.0869 |
| Disturbance of volition | -0.2328 | 0.2359 | -0.4246 | 0.3272 | 0.2009 | 0.0578 | 0.0609 | -0.3394 | 0.0061 | 0.3972 |
| Poor impulse control | 0.3206 | -0.3764 | 0.5220 | -0.5452 | -0.3005 | -0.2122 | -0.2540 | 0.1595 | -0.1549 | -0.1719 |
| Preoccupation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Active social avoidance | -0.1065 | -0.0031 | -0.1597 | 0.4697 | 0.0595 | -0.2035 | -0.3789 | -0.3162 | 0.1659 | 0.5730 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| General Psychopathology Scale | 0.1861 | -0.2821 | -0.0812 | -0.0266 | -0.0414 | -0.1654 | -0.5037 | -0.5022 | 0.1492 | 0.6174 |

| p value | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Rombo utsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| Somatic concern | 0.2562 | 0.3913 | 0.2562 | 0.4828 | 0.4358 | 0.9401 | 0.5771 | 0.6922 | 0.5011 | 0.1233 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Anxiety | 0.1364 | 0.0654 | 0.9213 | 0.1545 | 0.9629 | 0.9629 | 0.0566 | 0.1998 | 0.5155 | 0.1998 |
| Guilt feelings | 0.2562 | 0.3913 | 0.2562 | 0.4828 | 0.4358 | 0.9401 | 0.5771 | 0.6922 | 0.5011 | 0.1233 |
| Tension | 0.3748 | 0.0946 | 0.9175 | 0.9358 | 0.7910 | 0.9633 | 0.1872 | 0.2685 | 0.4568 | 0.5626 |
| Mannerisms & posturing | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Depression | 0.3624 | 0.8085 | 0.7646 | 0.7975 | 0.7320 | 0.5964 | 0.2554 | 0.6999 | 0.7755 | 0.1857 |
| Motor retardation | 0.1462 | 0.1538 | 0.2477 | 0.0713 | 0.9873 | 0.8800 | 0.8301 | 0.3534 | 0.8425 | 0.0436 |
| Uncooperat Jveness | 0.2123 | 0.1460 | 0.2123 | 0.2169 | 0.5899 | 0.8428 | 0.2339 | 0.8064 | 0.7216 | 0.9675 |
| Unusual thought content | 0.0129 | 0.1435 | 0.1214 | 0.2581 | 0.9954 | 0.1910 | 0.5786 | 0.3260 | 0.2452 | 0.6703 |
| Disorientation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Poor attention | 0.7428 | 0.6701 | 0.8081 | 0.7061 | 0.1885 | 0.8555 | 0.8081 | 0.0739 | 0.0787 | 0.9613 |
| Lack of judgment & insight | 0.2879 | 0.1224 | 0.1160 | 0.7762 | 0.9152 | 0.0927 | 0.1291 | 0.5761 | 0.4297 | 0.7490 |
| Disturbance of volition | 0.3855 | 0.3791 | 0.1012 | 0.2161 | 0.4557 | 0.8315 | 0.8228 | 0.1985 | 0.9821 | 0.1277 |
| Poor impulse control | 0.2260 | 0.1508 | 0.0381 | 0.0290 | 0.2581 | 0.4301 | 0.3424 | 0.5551 | 0.5668 | 0.5243 |
| Preoccupation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Active social avoidance | 0.6948 | 0.9908 | 0.5547 | 0.0664 | 0.8268 | 0.4496 | 0.1479 | 0.2328 | 0.5391 | 0.0203 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| General Psychopathology Scale | 0.4901 | 0.2897 | 0.7649 | 0.9221 | 0.8791 | 0.5403 | 0.0467 | 0.0474 | 0.5813 | 0.0108 |

MoCA

| R | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Rombo utsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| visuospatial executive | -0.1917 | 0.2109 | 0.2684 | -0.1917 | 0.0192 | -0.0192 | 0.0959 | 0.1342 | 0.0383 | -0.0192 |
| naming | 0.2460 | 0.0820 | -0.2870 | -0.2050 | 0.2460 | 0.2460 | 0.3280 | -0.4920 | 0.2460 | -0.1230 |
| attention | 0.1566 | -0.1566 | 0.1252 | 0.1566 | -0.1252 | -0.0626 | 0.0000 | -0.2192 | -0.1252 | -0.4070 |
| calculation | 0.4127 | -0.4559 | 0.2658 | -0.0259 | 0.0238 | -0.3889 | -0.4473 | 0.0194 | 0.1880 | 0.3435 |
| language | 0.0032 | 0.2934 | -0.2181 | -0.0016 | 0.1876 | 0.3351 | 0.4169 | 0.0545 | 0.2197 | -0.4313 |
| abstraction | 0.1423 | -0.1339 | -0.4435 | -0.0921 | 0.5021 | 0.4184 | 0.2678 | -0.3096 | 0.4603 | -0.4770 |
| delayed recall | 0.3790 | -0.2978 | -0.2497 | -0.2377 | -0.0707 | 0.1248 | -0.3460 | -0.0692 | -0.1173 | -0.0391 |
| orientation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| total MoCA | 0.3722 | -0.2078 | -0.2183 | -0.2257 | 0.2452 | 0.1495 | -0.0688 | -0.2467 | 0.2706 | -0.2541 |

| p value | unidentified_Enterobacteriaceae | unidentified_Ruminococcaceae | Bacteroides | Bifidobacterium | Blautia | Rombo utsia | Collinsella | Faecalibacterium | unidentified_Lachnospiraceae | Streptococcus |
|---|---|---|---|---|---|---|---|---|---|---|
| visuospatial executive | 0.4768 | 0.4330 | 0.3148 | 0.4768 | 0.9438 | 0.9438 | 0.7239 | 0.6202 | 0.8879 | 0.9438 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| naming | 0.3585 | 0.7627 | 0.2812 | 0.4463 | 0.3585 | 0.3585 | 0.2149 | 0.0529 | 0.3585 | 0.6500 |
| attention | 0.5626 | 0.5626 | 0.6440 | 0.5626 | 0.6440 | 0.8178 | 1.0000 | 0.4147 | 0.6440 | 0.1176 |
| calculation | 0.1121 | 0.0759 | 0.3198 | 0.9241 | 0.9304 | 0.1365 | 0.0824 | 0.9430 | 0.4857 | 0.1926 |
| language | 0.9906 | 0.2700 | 0.4172 | 0.9953 | 0.4866 | 0.2045 | 0.1082 | 0.8411 | 0.4137 | 0.0953 |
| abstraction | 0.5992 | 0.6211 | 0.0853 | 0.7346 | 0.0475 | 0.1068 | 0.3160 | 0.2432 | 0.0728 | 0.0617 |
| delayed recall | 0.1477 | 0.2626 | 0.3510 | 0.3755 | 0.7947 | 0.6450 | 0.1893 | 0.7990 | 0.6652 | 0.8857 |
| orientation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| total MoCA | 0.1557 | 0.4400 | 0.4167 | 0.4005 | 0.3601 | 0.5805 | 0.8002 | 0.3571 | 0.3108 | 0.3422 |

correlation coefficient -1<R<1, R >0 positve correlation, R<0 negative correlation.