**Appendix 1**

**Table S1.** Full search strategy.

|  |
| --- |
| **CLINICAL TRIALS** |
| **PubMed (from inception to 2023)** |
| **1 (**probiotic OR symbiotic OR prebiotic OR Lactobacillus OR Lactobacillus\* OR Bifidobacterium OR Bifidobacterium\* OR Enterococcus spp. OR Enterococcus\* OR Streptococci OR Streptococci\* OR Bacillus OR Bacillus\* OR Clostridium OR Clostridium\* OR saccharomycete OR saccharomycete\***)** |
| **2 (depress\* OR anxi\* OR anxiety OR mental health OR mental illness OR affective disorder OR affective illness OR stress OR psychological stress OR mental stress OR mood disorder)** |
| **3 (Randomized Controlled Trial OR controlled clinical trial OR random allocation OR double-blind OR singled-blind OR Placebo OR Randomly OR randomized OR clinical trial\* OR RCT OR Random\*)** |
| **Strategy of search** | **Results** |
| **1 AND 2 AND 3** | **1842** |
| **Web of Science (from inception to 2023)** |
| **1** TS= **(**probiotic OR symbiotic OR prebiotic OR Lactobacillus OR Lactobacillus\* OR Bifidobacterium OR Bifidobacterium\* OR Enterococcus spp. OR Enterococcus\* OR Streptococci OR Streptococci\* OR Bacillus OR Bacillus\* OR Clostridium OR Clostridium\* OR saccharomycete OR saccharomycete\***)** |
| **2** TS= **(depress\* OR anxi\* OR anxiety OR mental health OR mental illness OR affective disorder OR affective illness OR stress OR psychological stress OR mental stress OR mood disorder)** |
| 3 TS= **(Randomized Controlled Trial OR controlled clinical trial OR random allocation OR double-blind OR singled-blind OR Placebo OR Randomly OR randomized OR clinical trial\* OR RCT OR Random\*)** |
| **Strategy of search** | **Results** |
| **1 AND 2 AND 3** | **4153** |
| **Embase (from inception to 2023)** |
| **1 (**probiotic OR symbiotic OR prebiotic OR Lactobacillus OR Lactobacillus\* OR Bifidobacterium OR Bifidobacterium\* OR Enterococcus spp. OR Enterococcus\* OR Streptococci OR Streptococci\* OR Bacillus OR Bacillus\* OR Clostridium OR Clostridium\* OR saccharomycete OR saccharomycete\***)** |
| **2 (depress\* OR anxi\* OR anxiety OR mental health OR mental illness OR affective disorder OR affective illness OR stress OR psychological stress OR mental stress OR mood disorder)** |
| **3 (Randomized Controlled Trial OR controlled clinical trial OR random allocation OR double-blind OR singled-blind OR Placebo OR Randomly OR randomized OR clinical trial\* OR RCT OR Random\*)** |
| **Strategy of search** | **Results** |
| **1 AND 2 AND 3** | **3753** |
| **Cochrane (from inception to 2023)** |
| **1 (**probiotic OR symbiotic OR prebiotic OR Lactobacillus OR Lactobacillus\* OR Bifidobacterium OR Bifidobacterium\* OR Enterococcus spp. OR Enterococcus\* OR Streptococci OR Streptococci\* OR Bacillus OR Bacillus\* OR Clostridium OR Clostridium\* OR saccharomycete OR saccharomycete\***)** |
| **2 (depress\* OR anxi\* OR anxiety OR mental health OR mental illness OR affective disorder OR affective illness OR stress OR psychological stress OR mental stress OR mood disorder)** |
| **3 (Randomized Controlled Trial OR controlled clinical trial OR random allocation OR double-blind OR singled-blind OR Placebo OR Randomly OR randomized OR clinical trial\* OR RCT OR Random\*)** |
| **Strategy of search** | **Results** |
| **1 AND 2 AND 3** | **1198** |

**Figure S1**. (a) review authors' judgements about each risk of bias item presented as percentages across all included studies. (b) review authors' judgements about each risk of bias item for each included study.

(a)



(b)

**Table S2.** GRADE evidence rating scale.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Outcomes** | **No of Participants(studies)**Follow up | **Quality of the evidence**(GRADE) | **Relative effect(95% CI)** | **Anticipated absolute effects** |
|  |
| **Risk with Control** | **Risk difference with Depression** (95% CI) |
| **Depression** | 2311(36 studies) | ⊕⊕⊕⊝**MODERATE**1due to inconsistency |  |  | The mean depression in the intervention groups was**0.33 lower**(0.51 to 0.16 lower) |
| **Anxiety**  | 2938(30 studies) | ⊕⊕⊕⊕**HIGH** |  |  | The mean anxiety (copy) in the intervention groups was**0.34 lower**(0.48 to 0.20 lower) |
| **Stress**  | 1549(12 studies) | ⊕⊕⊕⊝**MODERATE**1due to inconsistency |  |  | The mean stress (copy) in the intervention groups was**0.13 lower**(0.23 to 0.03 lower) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 Point estimates varied considerably between studies |

**Appendix 2**

**Figure S1.** Forest plot and the global inconsistency test result (anxiety). (chi2 = 51.69, *P* < 0.01)



**Label: A**= **1** = *Lactobacillus* **B**= **2** = *Bifidobacterium* **C**= **3** = *Lactobacillus* + *Bifidobacterium* **D**= **4** = *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= **5** = *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= **6** = *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= **9** = *Lacticaseibacillus* **H**= **10** = *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **I**= **11** = Placebo

**Table S1**. Local inconsistency test (anxiety).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Side | Direct | 　 | Indirect | 　 | Difference | 　 | 　 | tau |
| 　 | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. | P>z | 　 |
| A B  | 0.05  | 0.63  | -0.52  | 0.48  | 0.57  | 0.79  | 0.47  | 0.57  |
| A I  | 0.53  | 0.18  | -2.02  | 1.37  | 2.56  | 1.39  | 0.07  | 0.54  |
| B I  | 1.13  | 0.32  | -2.16  | 1.00  | 3.28  | 1.06  | 0.00  | 0.46  |
| C I  | 0.36  | 0.21  | 0.96  | 210.50  | -0.60  | 210.50  | 1.00  | 0.56  |
| D I  | -0.01  | 0.45  | 0.98  | 448.00  | -0.99  | 448.00  | 1.00  | 0.56  |
| E I  | 0.51  | 0.61  | 1.00  | 634.99  | -0.48  | 634.99  | 1.00  | 0.56  |
| F I  | 0.32  | 0.36  | 0.97  | 362.56  | -0.66  | 362.56  | 1.00  | 0.56  |
| G I  | 0.32  | 0.59  | 0.98  | 632.97  | -0.67  | 632.97  | 1.00  | 0.56  |
| H I  | 0.27  | 0.61  | 0.98  | 631.78  | -0.71  | 631.78  | 1.00  | 0.56  |

**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Lacticaseibacillus* **H**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **I**=Placebo

**Table S2.** SUCRA analysis: Mean Rank table (anxiety).

|  |  |  |  |
| --- | --- | --- | --- |
| Treat~t | SUCRA | PrBest | Mean Rank |
| A | 63.80  | 3.90  | 3.90  |
| B | 82.10  | 36.90  | 2.40  |
| C | 53.20  | 2.00  | 4.70  |
| D | 27.60  | 2.30  | 6.80  |
| E | 59.70  | 23.20  | 4.20  |
| F | 48.50  | 5.10  | 5.10  |
| G | 49.60  | 14.00  | 5.00  |
| H | 45.70  | 12.60  | 5.30  |
| I | 19.80  | 0.00  | 7.40  |

**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Lacticaseibacillus* **H**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **I**=Placebo

**Figure S2.** Assessment of loop inconsistency in networks (anxiety).

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**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **I**= Placebo

**Figure S3.** SUCRA ranking curve for anxiety.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Lacticaseibacillus* **H**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **I**=Placebo

**Figure S4**. Comparison-adjusted funnel plot for the network of anxiety in all comparisons.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Lacticaseibacillus* **H**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **I**=Placebo

**Figure S5.** Forest plot and the global inconsistency test result (depression).



**Label: 1**= *Lactobacillus* **2**= *Bifidobacterium* **3**= *Lactobacillus* + *Bifidobacterium* **4=** *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **5**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **6**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **7**= *Weissella* **8**= *Bacillus* **9**= *Lacticaseibacillus* **10**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **11**=Placebo

**Table S3**. Local inconsistency test (depression).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Side | Direct | 　 | Indirect | 　 | Difference | 　 | 　 | tau |
| 　 | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. | P>z | 　 |
| A K  | 0.04  | 0.30  | 0.19  | 55.98  | -0.15  | 55.98  | 1.00  | 0.62  |
| B K  | 0.46  | 0.40  | 0.07  | 365.68  | 0.38  | 365.68  | 1.00  | 0.62  |
| C K  | 0.41  | 0.16  | 0.07  | 149.34  | 0.34  | 149.34  | 1.00  | 0.62  |
| D K  | 0.18  | 0.68  | 0.09  | 633.41  | 0.10  | 633.42  | 1.00  | 0.62  |
| E K  | 0.03  | 0.66  | 0.08  | 632.55  | -0.06  | 632.55  | 1.00  | 0.62  |
| F K  | 0.49  | 0.34  | 0.08  | 316.23  | 0.41  | 316.23  | 1.00  | 0.62  |
| G K  | -0.17  | 0.67  | 0.10  | 633.78  | -0.27  | 633.78  | 1.00  | 0.62  |
| H K  | 0.89  | 0.70  | 0.08  | 632.92  | 0.80  | 632.92  | 1.00  | 0.62  |
| I K  | 0.16  | 0.46  | 0.07  | 446.08  | 0.09  | 446.08  | 1.00  | 0.62  |
| J K  | 0.21  | 0.66  | 0.08  | 632.79  | 0.13  | 632.79  | 1.00  | 0.62  |

**Label:** **A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D=** *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Weissella* **H**= *Bacillus* **I**= *Lacticaseibacillus* **J**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **K** =Placebo

**Table S4**. SUCRA analysis: Mean Rank table (depression).

|  |  |  |  |
| --- | --- | --- | --- |
| Treat~t | SUCRA | PrBest | Mean Rank |
| A | 36.00  | 0.50  | 7.40  |
| B | 64.10  | 9.60  | 4.60  |
| C | 64.10  | 1.80  | 4.60  |
| D | 46.70  | 10.10  | 6.30  |
| E | 38.90  | 6.20  | 7.10  |
| F | 67.80  | 8.90  | 4.20  |
| G | 30.20  | 3.60  | 8.00  |
| H | 79.10  | 45.20  | 3.10  |
| I | 45.30  | 4.10  | 6.50  |
| J | 48.30  | 10.10  | 6.20  |
| K | 29.50  | 0.00  | 8.00  |

**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D=** *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Weissella* **H**= *Bacillus* **I**= *Lacticaseibacillus* **J**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **K** =Placebo

**Figure S6.** SUCRA ranking curve for depression.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D=** *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Weissella* **H**= *Bacillus* **I**= *Lacticaseibacillus* **J**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **K** =Placebo

**Figure S7.** Comparison-adjusted funnel plot for the network of depression in all comparisons.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D=** *Bacillus* + *Bifidobacterium* + *Lactobacillus* + *Streptococcus* **E**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **F**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **G**= *Weissella* **H**= *Bacillus* **I**= *Lacticaseibacillus* **J**= *Limosilactobacillus* + *Lacticaseibacillus* + *Lactiplantibacillus* + *Bifidobacterium* **K** =Placebo

**Figure S8.** Forest plot and the global inconsistency test result (stress).



**Label: 1**= *Lactobacillus* **2**= *Bifidobacterium* **3**= *Lactobacillus* + *Bifidobacterium* **5**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **6**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **9**= *Lacticaseibacillus* **11**= Placebo

**Table S5**. Local inconsistency test (stress).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Side | Direct | 　 | Indirect | 　 | Difference | 　 | 　 | tau |
| 　 | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. | P>z | 　 |
| A G  | 0.39  | 0.29  | 0.13  | 111.57  | 0.26  | 111.57  | 1.00  | 0.48  |
| B G  | 0.46  | 0.40  | 0.75  | 446.53  | -0.30  | 446.53  | 1.00  | 0.48  |
| C G  | 0.17  | 0.32  | 0.77  | 365.62  | -0.60  | 365.62  | 1.00  | 0.48  |
| D G  | 0.02  | 0.54  | 0.77  | 631.61  | -0.76  | 631.61  | 1.00  | 0.48  |
| E G  | 0.28  | 0.54  | 0.77  | 634.35  | -0.50  | 634.35  | 1.00  | 0.48  |
| F G  | 0.28  | 0.52  | 0.78  | 632.73  | -0.50  | 632.73  | 1.00  | 0.48  |

**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **E**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **F**= *Lacticaseibacillus* **G** = Placebo

**Table S6**. SUCRA analysis: Mean Rank table (stress).

|  |  |  |  |
| --- | --- | --- | --- |
| Treat~t | SUCRA | PrBest | Mean Rank |
| A | 65.20  | 16.50  | 3.10  |
| B | 68.60  | 27.80  | 2.90  |
| C | 45.50  | 5.60  | 4.30  |
| D | 36.20  | 9.80  | 4.80  |
| E | 53.50  | 20.60  | 3.80  |
| F | 54.30  | 19.60  | 3.70  |
| G | 26.70  | 0.00  | 5.40  |

**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **E**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **F**= *Lacticaseibacillus* **G**= Placebo

**Figure S9.** SUCRA ranking curve for stress.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **E**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **F**= *Lacticaseibacillus* **G**= Placebo

**Figure S10.** Comparison-adjusted funnel plot for the network of stress in all comparisons.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **E**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **F**= *Lacticaseibacillus* **G**= Placebo

**Figure S11.** Pooled effect size (ES) and confidence interval (CI) for stress by network meta-analysis and traditional meta-analysis.



**Label: A**= *Lactobacillus* **B**= *Bifidobacterium* **C**= *Lactobacillus* + *Bifidobacterium* **D**= *Biﬁdobacterium* + *Lactobacillus* + *Lactococcus* **E**= *Lactobacillus* + *Biﬁdobacterium* + *Streptococcus* **F**= *Lacticaseibacillus* **G**= Placebo

**Appendix 3**

**Subgroup analysis**

**Table S1.** The standardized mean difference (95% confidence interval) and the rank order (SUCRA ranks) of the intervention time compared to placebo (Anxiety).

|  |  |
| --- | --- |
| **Intervention** | Anxiety |
| SMD (95%CI)  | SUCRA rank |
| 1 (12w) | **-0.88 (-1.68, -0.08)** | **2** |
| 2 (12w) | **-1.82 (-3.29, -0.34)** | **1** |
| 1 (24w) | -0.14 (-1.72, 1.45) | 11 |
| 3 (22w) | -0.13 (-1.68, 1.43) | 12 |
| 3 (8w) | -0.43 (-1.16, 0.29) | 5 |
| 3 (12w) | -0.66 (-2.30, 0.99) | 4 |
| 3 (48w) | -0.17 (-1.71, 1.37) | 10 |
| 3 (9w) | -0.21 (-1.88, 1.46) | 9 |
| 1 (8w) | -0.25 (-1.87, 1.38) | 8 |
| 1 (6w) | -0.27 (-1.22, 0.68) | 7 |
| 2 (6w) | -0.28 (-1.44, 0.87) | 6 |
| 1 (10w) | -0.11 (-1.65, 1.42) | 1 |
| 1 (3 w) | -1.30 (-2.93, 0.32) | 3 |
| PLA | reference | reference |

1 = *Lactobacillus* 2 = *Bifidobacterium* 3 = *Lactobacillus* +*Bifidobacterium* PLA = placebo

**Table S2.** The standardized mean difference (95% confidence interval) and the rank order (SUCRA ranks) of the intervention time compared to placebo (Depression).

|  |  |
| --- | --- |
| **Intervention** | Depression |
| SMD (95%CI)  | SUCRA rank |
| 3 (8w) | -0.51 (-1.10, 0.08) | 5 |
| 1 (24w) | -0.14 (-1.64, 1.37) | 10 |
| 3 (22w) | 0.20 (-1.27, 1.68) | 13 |
| 3 (12w) | -0.41 (-1.50, 0.69) | 6 |
| 3 (48w) | -0.35 (-1.41, 0.71) | 7 |
| 2 (12w) | -0.19 (-1.72, 1.35) | 9 |
| 3 (4w) | -0.10 (-1.63, 1.43) | 12 |
| 3 (9w) | -0.34 (-1.44, 0.76) | 8 |
| 1 (8w) | -0.93 (-2.49, 0.63) | 2 |
| 2 (6w) | -0.91 (-2.48, 0.66) | 3 |
| 3 (4w) | -0.12 (-1.20, 0.96) | 11 |
| 1 (12w) | -0.60 (-1.70, 0.50) | 4 |
| 1 (3w) | 1.34 (-0.21, 2.88) | 15 |
| 1 (6w) | 0.39 (-1.15, 1.93) | 14 |
| 3 (16w) | **-1.87 (-3.47, -0.27)** | **1** |
| PLA | reference | reference |

1 = *Lactobacillus* 2 = *Bifidobacterium* 3 = *Lactobacillus* + *Bifidobacterium* PLA = placebo

**Table S3.** The standardized mean difference (95% confidence interval) and the rank order (SUCRA ranks) of the intervention dosage compared to placebo (Anxiety).

|  |  |
| --- | --- |
| **Intervention** | Anxiety |
| SMD (95%CI)  | SUCRA rank |
| 1 (≥1011) | **-3.02 (-3.79, -2.26)** | **1** |
| 2 (≥1011) | **-2.96 (-3.72, -2.21)** | **2** |
| 1 (109~1010) | -0.09 (-0.31, 0.13) | 9 |
| 3 (109~1010) | -0.20 (-0.48, 0.08) | 8 |
| 3 (1010~1011) | **-0.41 (-0.76, -0.06)** | **5** |
| 3 (108~109) | -0.66 (-1.37, 0.06) | 3 |
| 1 (1010~1011) | **-0.51 (-0.79, -0.24)** | **4** |
| 2 (1010~1011) | -0.28 (-0.77, 0.20) | 6 |
| 3 (< 108) | -0.23 (-1.02, 0.56) | 7 |
| PLA | reference | reference |

1 = *Lactobacillus* 2 = *Bifidobacterium* 3 = *Lactobacillus* + *Bifidobacterium* PLA = placebo

**Appendix 4**

**Included reference list:**

Akhgarjand, C., Vahabi, Z., Shab-Bidar, S., Etesam, F., & Djafarian, K. (2022). Effects of probiotic supplements on cognition, anxiety, and physical activity in subjects with mild and moderate Alzheimer's disease: A randomized, double-blind, and placebo-controlled study. *Frontiers in Aging Neuroscience, 14*, 1032494. doi:10.3389/fnagi.2022.1032494

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