Supplemental Information 1. Probiotic/prebiotic containing food not to eat during intervention

Probiotic richly containing food:

Yogurt containing probiotics (eg. Dannon Activia, Yakult, or any other brands you know)

Goat's milk

Soy milk

Kefir

Sauerkraut

Pickles

Kimchi

Umeboshi plums

Tempeh

Dark chocolate

Microalgae

Natto

Poi (kind of mashing cooked taro plant)

Miso soup

Kombucha Tea

Prebiotic richly containing food:

Raw Chicory root

Raw Jerusalem artichoke

Raw Dandelion greens

Raw garlic

Raw leek

Raw onion

Supplemental Information 2. The Cyberball Game.

In the CBG, the participants were asked to play a ball tossing game with two other virtual players programmed by the experimenter. They were made believe that the two players were real and were playing the game. To minimize gender effects, male participants played with 2 female players, and female participants played with 2 male players. During the game, the other players were depicted as cartoon characters with their photos aside and names below. The volunteering participant was represented by a cartoon in the middle lower part of the screen and could throw the ball to either of the other two players on the left or right, by pressing the left or right button on the response box (**Figure 2**).

The CBG consisted of 4 blocks: inclusion - exclusion - inclusion – exclusion conditions; this order was maintained for all volunteers. In each inclusion block, there were 108 trials, during 1/3 (36 trials) of which the participant received the ball from the other players (for another 1/3 the ball was played to one of the other players, and for the other 1/3 between the other two players). The order of the ball throwing to the participant was pseudo-randomized. The 1/3 of trials in the inclusion block when the virtual players threw the ball to each other and not to the participant, were called "not my turn" events.

To equalize the numbers of analysed trials when the virtual players threw the ball to each other and not to the participant, we set 47 total trials in each exclusion block. The participants received the ball 3 times (trials 14, 25, or 26, and 39, 40, or 41 in block 2 and 4, respectively) to maintain their attention. The first 5 exclusion trials, the 3 trials the participant receiving the ball, and the 3 trials the participant was throwing the ball were not analysed but discarded. The remaining 36 so-called "rejection" events were used for comparison with the 36 "not my turn" events in the inclusion block. Visual stimuli of these trials did not differ in two conditions, so any difference of brain activities was supposed to be due to the participants' inner state. The trial began with the ball being presented in the cartoon for 500-2000 ms randomly to imitate a real life situation. Then the ball was moving for 2000 ms before reaching the target player (**Figure 2**). After each of the inclusion and exclusion blocks, participants completed the NTS, the MQ, and the SEP.

Supplemental Information 3: Assessment of Need Threat Scale, Mood Questionnaire and Exclusion Perception.

All items need to be rated on a scale from 1 ('not at all') to 5 ('very much'). (R) = reversed scored.

Need Threat Scale

Belonging:

1. I felt disconnected with one or more players.
2. I felt rejected by other players.
3. I felt like an outsider.
4. I felt belonged to the group. (R)
5. The other players interacted with me a lot. (R)

Self-esteem:

6. I felt good about myself. (R)
7. My self-esteem was high. (R)
8. I felt I was liked. (R)
9. I felt insecure.
10. I felt satisfied. (R)

Meaningful existence:

11. I felt invisible.
12. I felt meaningless.
13. I felt non-existent.
14. I felt important. (R)
15. I felt useful. (R)

Control:

16. I felt powerful. (R)
17. I felt I had control over the course of the game. (R)
18. I felt I had the ability to significantly alter events. (R)
19. I felt I was unable to influence the actions of others.
20. I felt the other players decided everything.

Mood Questionnaire

During the game I felt:

1. Good (R)
2. Bad
3. Happy (R)
4. Sad
5. Pleasant (R)
6. Angry
7. Friendly (R)

8. Unfriendly

Exclusion perception

1. I was ingored.
2. I was excluded.

Supplemental Information 4. MEG data analysis.

Preprocessing

Analysis of the MEG data was preformed using Matlab (Mathworks, Natick, USA) and the open-source toolboxes Fieldtrip (23). The resting state dataset were cut into time windows of 2s. Data in this time window were filtered using a 4 Hz high pass frequency filter. Non-physiological jumps in the MEG signal and trials with jump and muscle artifacts were excluded by an automatic rejection algorithm that excluded all trial in which the variance exceeded 10^{-25} in any channel.

The continuously recorded dataset during the CBG was segmented in epochs of 3 s with 1 s of pre-stimulus interval time-locked to the moment at which the players started to throw the ball. Trials in which one of the virtual players threw the ball towards the other virtual player during the inclusion blocks were defined as 'inclusion' condition, and those during exclusion blocks were defined as 'exclusion' condition.

Time-frequency analysis

The time-frequency analysis used the multitaper windowed fast fourier transform 'MTMFFT' implemented in Fieldtrip. The 'multitaper method' (MTM) is based on Slepian sequences as tapers. The frequency of interest ranged from 4 to 30Hz with step of 2 Hz. The frequency smoothing window is +/- 3 Hz:

Source analysis

Using the time-frequency determined by the analysis described above, oscillatory sources of theta, alpha, beta-1, beta-2 and beta-3 bands (6, 11, 16, 21, and 26 Hz) were localized using beamformer techniques. We applied the Dynamical Imaging of Coherent Sources (DICS) method (48). To estimate the individual source activity, each participant's brain recorded as T1-MR image was divided in a regular threedimensional grid with a 1 cm resolution. A spatial inverse filter was computed from both conditions and both visits, as common filter. The common filter was applied to each condition and each visit separately to obtain the respective source power. The MEG data in each condition were co-registered with the respective individual structural MR images respectively.

Source statistics

We performed source-level statistics to assess effects of intervention on the data obtained from the resting-state condition and the CBG, respectively. To check if there was any difference between groups at baseline prior to any intervention, resting-state at baseline source power was compared with an independent T-test with *Intervention* (*B. longum* 1714™ vs. placebo) as between factor. Then,

intervention-induced changes in source power were computed in each frequency band by subtracting the baseline from the post-intervention. The changes of the source power were entered into an independent T-test with *Intervention* (*B. longum* 1714^{TM} vs. placebo) as between factor. For the CBG, source power at baseline in each frequency band was also tested with an independent T-test with *Interventions* (*B. longum* 1714^{TM} vs. placebo) as between factor to check if brain activations showed differences between groups. Subsequently, changes in the source power after intervention were computed by subtracting the baseline values from the post-intervention for each condition in each frequency band. Changes of source power were entered in a two-way ANOVA of *interventions* (*B. longum* 1714^{TM} vs. placebo) x *conditions* (exclusion vs. inclusion). The statistical analysis was done separately for each frequency band. To localize significant activations, the cluster-based permutation method for multiple comparisons was used with a significance level of alpha of 0.05. A significant cluster is a group of one or multiple brain voxels with values the given threshold.