Table S1. The time of sleep onset and waking up after extended light exposure for 1 week and 3 weeks.

| Items               | T-Bas       | T-S1wk      | T-S3wk      |
|---------------------|-------------|-------------|-------------|
| Sleep onset time    | 20:06±0:02  | 21:50±0:18  | 21:43±0:14  |
| Wake up time        | 7:44±0:03   | 7:56±0:01   | 7:54±0:02   |
| Total sleep time    | 11:18±0:07  | 9:45±0:16   | 9:45±0:13   |
Table S2. Correlation analysis between changes of gut microbiota and alterations of physiological responses in tree shrews.

| Level  | Microbiota         | 95% CI     | r   | P     |
|--------|--------------------|------------|-----|-------|
| Weight |                    |            |     |       |
| Phylum | *Tenericutes*      | 0.078 to 0.846 | 0.579 | 0.026* |
|        | *Lautropia*        | -0.877 to -0.194 | -0.652 | 0.010* |
|        | *Leptotrichia*     | -0.831 to -0.026 | -0.543 | 0.039* |
|        | *Haemophilus*      | -0.825 to -0.006 | -0.529 | 0.045* |
| Genus  | *Bergeyella*       | -0.842 to -0.061 | -0.568 | 0.030* |
|        | *Aggregatibacter*  | -0.885 to -0.228 | -0.672 | 0.007** |
|        | *Lysinibacillus*   | 0.007 to 0.825 | 0.529 | 0.043* |
|        | *Anaerovibrio*     | 0.004 to 0.824 | 0.527 | 0.044* |
| Distance|                    |            |     |       |
| Genus  | *Kurthia*          | 0.267 to 0.894 | 0.694 | 0.002** |
|        | *Atopostipes*      | 0.120 to 0.858 | 0.6061 | 0.018* |
|        | *Moraxella*        | 0.088 to 0.849 | 0.586 | 0.019* |
|        | *Finegoldia*       | 0.097 to 0.852 | 0.592 | 0.0095** |
|        | *Methylobacterium* | -0.826 to -0.009 | -0.531 | 0.044* |
| Urinary cortisol |               |            |     |       |
| Phylum | *Deferribacteres*  | 0.221 to 0.883 | 0.668 | 0.006** |
|        | *Senegalimassilia* | 0.134 to 0.862 | 0.615 | 0.015* |
|        | *Shuttleworthia*   | 0.006 to 0.825 | 0.529 | 0.045* |
| Genus  | *Ureaplasma*       | 0.004 to 0.824 | 0.527 | 0.045* |
|        | *Mucispirillum*    | 0.221 to 0.883 | 0.668 | 0.006** |
|        | *Anaerofustis*     | -0.015 to 0.818 | 0.514 | 0.0498* |
|        | *Olsenella*        | -0.850 to -0.089 | -0.586 | 0.019* |
The alterations of relative abundance in phylum Tenericutes and genera Lysinibacillus and Anaerovibrio were positively associated with the changes in body weight before and three weeks after stress. Further analysis revealed a negative correlation between the changes of relative abundance and body weight, including genera Lautropia, Leptotrichia, Haemophilus, Bergeyella and Aggregatibacter.

There was a significantly positive correlation between the changes of gut microbiota relative abundance and activities before and three weeks after stress, including the genera Kurthia, Atopostipes, Moraxella and Finegoldia. However, the changes relative abundance of Methylobacterium were negatively related to the changes in activities.

A positive correlation was observed between the alterations of relative abundance in phylum Deferribacteres and genera Senegalimassilia, Shuttleworthia, Ureaplasma, Mucispirillum and Anaerofustis and the changes of urinary cortisol before and after stress. A significantly negative correlation was found between the alterations of relative abundance in genera Olsenalla and the changes of urinary cortisol.

The most important is that an apparent correlation was discovered between the changes of gut microbiota relative abundance and the total sleep time before and three weeks after stress. The positive correlation was observed in genera Phascolarctobacterium, Parabacteroides, Trichococcus, Alistipes, Holdemania and Anaerofustis and the negative correlation was observed in genera Streptococcus, Lachnoclostridium, Johnsonella, Tannerella and Propionivibrio. * p < 0.05, ** p < 0.01.
Table S3. The time of sleep onset and waking up under extended light exposure after different treatments.

| Items                | Groups | T-R24h   | T-R72h   | T-R10d  |
|----------------------|--------|----------|----------|---------|
| Sleep onset time     | Saline | 22:07±0:37 | 22:37±0:35 | 22:25±0:28 |
|                      | Ketamine | 21:31±0:27 | 22:03±0:23 | 22:32±0:26 |
|                      | WMT    | 21:36±0:24 | 22:06±0:18 | 21:21±0:09 |
|                      | Saline | 7:50±0:03  | 7:58±0:00  | 7:54±0:07  |
| Wake up time         | Ketamine | 8:08±0:06  | 7:57±0:01  | 8:02±0:02  |
|                      | WMT    | 8:06±0:07  | 7:59±0:06  | 7:56±0:04  |
|                      | Saline | 9:26±0:33  | 9:09±0:32  | 9:08±0:23  |
| Total sleep time     | Ketamine | 10:10±0:23 | 9:32±0:20  | 9:09±0:24  |
|                      | WMT    | 10:25±0:27 | 9:44±0:20  | 9:41±0:14  |