

# Effects of intentionally treated tea on mood

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**Objective:** This study explored whether drinking tea “treated” with good intentions would influence mood more than ordinary tea, under double-blind, randomized, placebo-controlled conditions.

**Design:** Each day for 7 days individuals recorded their mood in the evening using the Profile of Mood States. On days 3, 4 and 5 each person drank 600 cc of tea in the morning and afternoon. One group blindly received tea that was intentionally treated by three Buddhist monks; the other group received ordinary tea from the same source. On day 7 each person also indicated what type of tea they believed they had been drinking.

**Subjects:** Stratified random sampling assigned 189 participants into two groups matched by age, gender, the psychological trait of neuroticism, and the amount of tea ordinarily consumed per day. All participants lived in Kaohsiung, Taiwan, and the test was conducted over the course of one week to reduce mood fluctuations due to local weather and other common influences.

**Results:** A placebo-controlled hypothesis was supported ( $p = 0.02$ , two-tailed), as was a placebo-enhanced hypothesis ( $p = 0.00002$ , two-tailed).

**Conclusion:** Tea treated with good intentions improved mood more than ordinary tea derived from the same source. Belief that one was drinking treated tea further enhanced the effect.

**Key words:** Intention, tea, mood, mind-matter interaction

## INTRODUCTION

Why does mother's homemade chicken soup seem to taste better than the same type of soup spooned out of a tin can? Besides the use of fresher ingredients, homemade soup offers a special ingredient absent from commercial soups – mom's loving intention. Does this factor actually make a difference? In a previously reported study, we investigated this question by exposing samples of chocolate – a natural mood enhancer<sup>1,2</sup> – to the focused beneficial intentions of experienced meditators and then testing, under double-blind conditions, whether people eating intentionally treated chocolate would report greater mood enhancement as compared to people eating untreated chocolate from the same source.<sup>3</sup> The study showed significant mood improvement in alignment with the idea that intention does matter ( $p = 0.04$ , one-tailed).

The present study was designed to further study the mood enhancing effects of intention by exploring the role of expectation in potentially modulating this effect. The study was conducted in Taiwan, so to better conform to Chinese dietary habits tea rather than chocolate was used as the intentional target. Tea is the most consumed beverage in the world after water,<sup>4</sup> and it has been the principal beverage in China for thousands of years.<sup>5</sup> The effect of tea on health has been studied extensively, and beneficial outcomes have been claimed for a broad range of illnesses, from diabetes,<sup>6</sup> to cancer<sup>7</sup> and cardiovascular disease.<sup>8</sup> In particular, the moderate amounts of caffeine in tea, combined with the amino acid L-theanine, helps maintain alertness and focused attention, and like chocolate, it acts as a natural mood enhancer.<sup>4,9-11</sup>

The role of expectation was included as a key focus of the present study because expectation is known to modulate many aspects of food and beverage consumption, including mood. For example, labels like "low sodium" on commercial foods influence perception of saltiness,<sup>12</sup> and one's belief about having consumed caffeine affects cognitive performance and mood.<sup>13</sup>

We were especially interested in two ways that expectation might modulate mood. The first case examined the role of participants' beliefs about what they were drinking while some drank treated tea and others drank untreated tea, under double-blind conditions. We refer to this as a placebo-controlled comparison.<sup>14</sup> When they believed they were drinking untreated tea, we refer to this as a nocebo-controlled comparison.<sup>15</sup> While *placebo* and *nocebo* often refer to positive and negative expectations, respectively, we use these terms in a more genetic sense as holding a positive vs. a neutral belief.

The second case examined the effect of one's belief matching or mismatching the kind of tea one was actually drinking. In the case of actually drinking treated tea we compared mood for congruent vs. incongruent beliefs, and we refer to this as a placebo-enhanced comparison. In the case of actually drinking untreated tea we similarly compared mood for congruent vs. incongruent beliefs, and we refer to this as a nocebo-enhanced comparison.

## **METHOD**

### ***Participants***

Two hundred twenty-one members of a Buddhist book club of the Bliss Wisdom Foundation in the city of Kaohsiung, Taiwan, were recruited. All lived in Kaohsiung and were prepared to participate in the experiment at the same time to reduce potential effects of mood fluctuation due to changes in weather and other environmental factors. These volunteers were informed that the study was approved by the Chung-Ho Memorial Hospital Institutional Review Board of the Kaohsiung Medical University, and all participants gave their informed consent.

### ***Questionnaires***

Four questionnaires were employed to measure personality, mental health disturbances, well-being, and mood. The first was the Chinese Health Questionnaire (CHQ), a self-administered screening instrument commonly used to identify minor psychiatric disorders in non-psychiatric contexts. The CHQ was modified for use with a Chinese population from the General Health Questionnaire (GHQ) developed by Goldberg.<sup>16</sup> Cheng

and Williams<sup>17</sup> used the structure and concept of the GHQ and modified it into a brief psychiatric screening test appropriate to Chinese culture. Cheng and colleagues demonstrated an internal consistency of the CHQ of 0.79.<sup>18</sup> Higher scores on this scale refer to greater mental health disturbances.

The Profile of Mood States (POMS) measured mood.<sup>19</sup> The Chinese version of POMS was modified by Chang and Lu.<sup>20</sup> The Chinese POMS Brief Form is a 37-item questionnaire measuring seven factors of mood, including tension, depression, anger, vigor, fatigue, confusion, and self-esteem;<sup>20</sup> this test has shown good reliability and validity.<sup>21</sup> This scale is usually scored in terms of high scores indicating higher mood disturbance, but to avoid the confusion of double-negatives, we reversed the scale so a higher score indicates better mood.

The Eysenck Personality Questionnaire (EPQ) measured personality.<sup>22</sup> The EPQ is a 25 item inventory measuring personality characteristics of extraversion and neuroticism. A Chinese version of the EPQ was developed by Lu.<sup>23</sup> There are 25 items in the EPQ – 4 neuroticism items and 11 extraversion items. The Chinese version has demonstrated high internal consistency ( $\alpha = 0.90$ ) and good validity.<sup>23</sup> A higher score on the item of interest, neuroticism, indicates higher neuroticism.

Finally, Lu<sup>24</sup> selected items from a 48-item Chinese Happiness Inventory<sup>25</sup> to form a 10-item Subjective Well-Being (SWB) subscale. The internal consistency reliability of SWB is good ( $\alpha = 0.87$ ). A higher score indicates better well-being.

### ***Procedure***

Before the experiment began, each volunteer filled out the EPQ questionnaire and answered questions about gender, age, and amount of tea consumed on average per day. The second author, who was not involved in the data collection aspects of the study, used stratified random sampling to distribute the participants into two groups matched according to the demographic variables and the EPQ's neuroticism score. The latter variable was included because neuroticism is a known correlate of mood.<sup>26</sup>

One group was assigned to drink intentionally enhanced tea and the other to drink ordinary tea from the same source, under double-blind conditions (the treatment method is described below). Each person volunteering for the test received a package containing seven copies of the CHQ, SWB and POMS questionnaires and six bottles of tea, each 600 cc in volume. Participants were asked not to drink any other tea during the week-long experiment.

In the evening of each day, participants were asked to fill out the three questionnaires. On days 3, 4 and 5 they were instructed to drink one bottle of tea at 10AM and a second bottle at 3PM. On day 7 they also indicated whether they believed they were drinking the intentionally treated or untreated tea.

Tea was consumed three days in a row because previous studies have indicated that intentional effects are generally small in magnitude,<sup>27</sup> and as such repeated applications may be useful to provide detectable outcomes. The effect of interest was predicted to specifically appear on the third day of drinking tea based on results of the previous study involving intentionally enhanced chocolate.<sup>3</sup>

### ***Intentional Treatment Method***

The tea was an organic variety of oolong (*Camellia sinensis*). To ensure that the same tea was provided to the two groups, a single batch of tea was first prepared in a large container. It was then poured into separate bottles, each 600 cc in volume. The tea manufacturer provided assurance that the brewed tea was safe to maintain in room temperature for the one-week duration of the study. The bottles of tea were then distributed to the two groups according to the stratified random sampling scheme described above – the *treated* group receiving intentionally enhanced tea and the *untreated* group receiving ordinary tea.

The treated tea was produced via focused intention by Master Lu Cheng, a well respected monk in Taiwan and Director of the Bliss Wisdom Buddhist Foundation, along with two other senior monks from the same Foundation. All three were accomplished meditators with experience in maintaining prolonged concentration. The intention they

were asked to use was as follows: “An individual who consumes this tea will manifest optimal health and functioning at physical, emotional and mental levels, and in particular they will enjoy an increased sense of energy, vigor and well-being.” The monks mentally directed these beneficial intentions towards the tea for 22 minutes. To avoid including the untreated tea in the intentional process, the untreated bottles were placed in a distant room, and an additional, closing intention was added to the monks’ instructions: “This enhancement is only to this batch of tea,” referring to the treated bottles.

### ***Blinding and Data Recording Procedure***

After the treated bottles of tea had been prepared, a research assistant with no affiliation to the monks or the participants arranged the bottles of tea and sets of questionnaires into packages appropriate for the treated and the untreated group. The assistant then sent the prepared packages, labeled A or B, to the first author (YJS), who was unaware which labels corresponded to which group. YJS distributed the packages to the participants according to the stratified random sampling scheme. After the week-long study was complete, a second assistant, also blinded to the condition assignments, entered the data from the participants’ daily questionnaires into a database. Those entries were double-checked by a third assistant. At this point YJS contacted the first research assistant to break the blinding code, and the unblinded data were analyzed by the second author.

## **RESULTS**

Of the 221 people who volunteered for the experiment 3 dropped out before the experiment began. Of the remaining people, 15 did not fill in any of the daily questionnaire data and 14 filled in fewer than 60 of 63 required daily values (i.e. 9 questionnaire scales x 7 days). One person’s group assignment was not indicated on the datasheet. All of these individuals were dropped from further analysis. Of the remaining 189 participants, 95 had been assigned to the treated group and 94 to the untreated group.

Participants were asked to fill out a total of 11,907 items in the various questionnaires (189 people × 63 items each). Of these items, 29 values were missing; each missing value

was estimated by taking the average of the participant's responses to the same questionnaire item from adjacent days, or if the missing value came from the first or last day of the experiment then the second day or sixth day value was used.

Because 32 people had been dropped from the initial 221 volunteers, the first step of the analysis was to recheck the group assignments to see if they remained adequately matched on neuroticism, age, gender and tea consumed on average. As shown in Table 1, no significant differences were observed.

Table 1. Means (and standard errors) comparing demographic and personality variables between the two randomly stratified groups; p-values are two-tailed.

	Treated group (N = 95)	Untreated group (N = 94)	F(1,183)	p-value
Neuroticism	3.34 (0.27)	3.18 (0.28)	0.57	0.45
Age	44.8 (1.32)	45.5 (1.28)	0.15	0.77
Gender	1.68 (0.06)	1.63 (0.05)	0.46	0.50
Tea consumed	457.1 (62.8)	551.1 (60.8)	1.16	0.28

The two groups of 189 participants were then partitioned into six subgroups: 2 groups (treated and untreated tea) × 3 types of belief (treated, untreated, unknown). The number of participants in each group is shown in Table 2.

Table 2. Number of participants in each experimental subgroup.

	Placebo control	Nocebo control	
Group assignment	Belief: Treated tea	Belief: Untreated tea	Guess: Unknown
Tea type: Treated	25	16	54
Tea type: Untreated	30	17	47

Examination of the baseline mood values recorded on days 1 and 2 indicated that within the placebo-controlled comparison – those who believed they were receiving treated tea and in fact were vs. were not – had significantly different averages (see Table 3).

To adjust for this difference, for each participant mood scores on day 1 and 2 were averaged and then the *change in mood* from that value was determined for days 3 through 7. All subsequent analyses were performed on these change values.

Table 3. Mean mood (and standard error) on days 1 and 2 for participants in the placebo-controlled condition and two-tailed p-value based on a t-test of the difference.

	Day 1	Day 2
Treated tea	-7.6 (4.6)	-9.5 (5.0)
Untreated tea	5.3 (4.2)	6.7 (4.5)
Difference p-value	0.03	0.006

Comparison of change in mood by belief, independent of the type of tea actually consumed, showed that those who believed they were drinking treated tea (N = 55) showed a strong positive improvement in mood, those who were unsure showed a modestly positive improvement (N = 101), and those who believed that they were drinking untreated tea (N = 33) showed no change in mood from baseline measures (see Figure 1, ANOVA  $F(2, 183) = 8.6, p = 0.0003$ ).

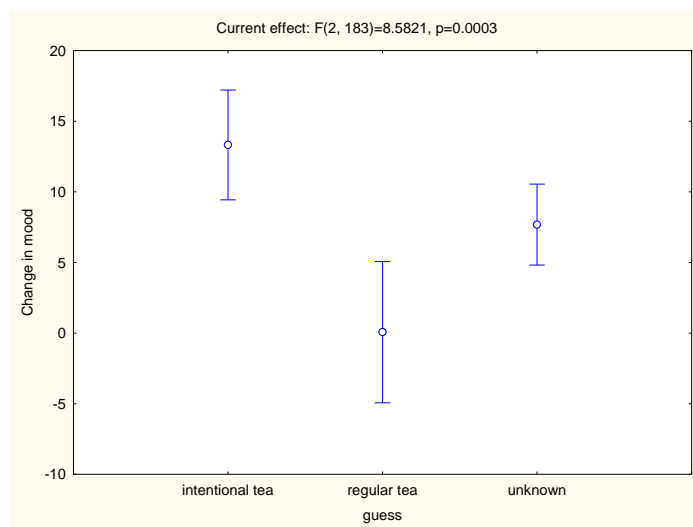


Figure 1. Mean change in mood by belief with 95% confidence intervals.

There were four comparisons of interest:

- 1) The *placebo-controlled* condition compared participants who believed that they were drinking treated tea and were in fact correct, versus those whose belief was mistaken. That is, the factor of belief is held constant while two treatments are compared.
- 2) The *nocebo-controlled* condition compared participants who believed that they were drinking untreated tea and were in fact correct, versus those whose belief was mistaken.
- 3) The *placebo-enhanced* condition compared participants who drank treated tea and who correctly believed they were drinking treated tea, versus those whose belief was incorrect. That is, the type of treatment is held constant while two types of beliefs are compared.
- 4) The *nocebo-enhanced* condition compared participants who drank untreated tea and correctly believed they were drinking untreated tea, versus those whose belief was incorrect.

Figure 2 shows daily means and 95% confidence intervals for change in mood among the six subgroups. To avoid complications associated with multiple comparisons, the third day of drinking tea (day 5 of the test) was predicted to show the maximal effect, so planned comparisons were conducted only for that day. Those comparisons revealed that (also see Table 4),

- 1) Placebo-control: Mood significantly improved ( $p = 0.02$ ).
- 2) Nocebo-control: mood showed no difference ( $p = 0.46$ ).
- 3) Placebo-enhanced: Mood substantially improved ( $p = 0.00002$ ).
- 4) Nocebo-enhanced: Mood showed no difference ( $p = 0.09$ ).

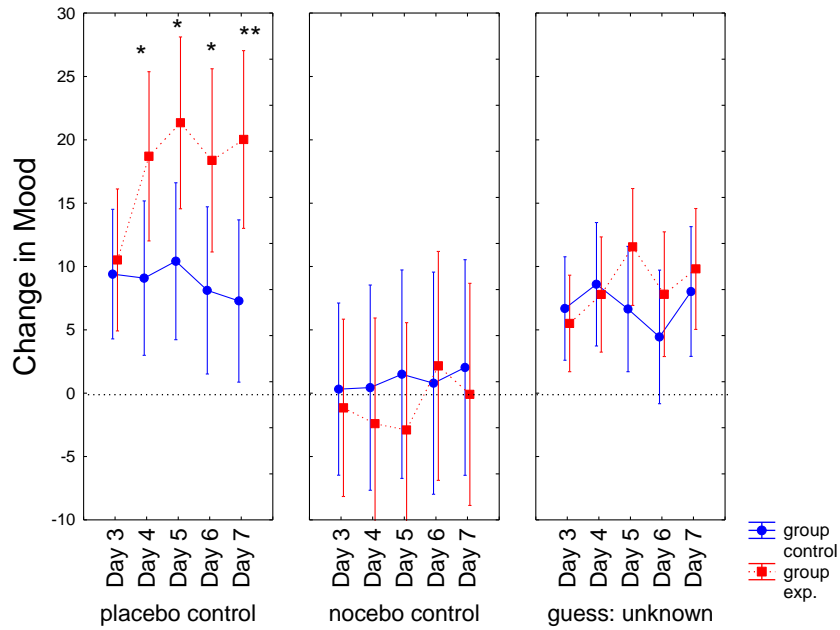


Figure 2. Means and 95% confidence intervals for tea type vs. belief.

Table 4. Mood (mean and standard error) and planned t-test comparisons on third day of drinking tea (day 5 of experiment), by assigned tea type and belief; p-values are two-tailed.

	Placebo Belief: treated	Nocebo Belief: untreated	t-test (p)
Tea type: Treated	21.3 (3.4) N = 25	-2.90 (4.3) N = 16	4.41 (0.00002)
Tea type: Untreated	10.4 (3.1) N = 30	1.50 (4.2) N = 17	1.71 (0.09)
t-test (p)	2.35 (0.02)	-0.74 (0.46)	

Similar comparisons were performed for the Chinese Health Questionnaire, Subjective Well Being scale, and the seven subscales of the Chinese version of POMS. These tests

indicated significant improvements in well being, and the POMS subscales of anger and confusion contributed the most to overall mood improvement (see Table 5) .

Table 5. Planned comparison p-values (two-tailed) on the third day of drinking tea for the Chinese Health Questionnaire (CHQ), Subjective Well Being (SWB), Profile of Mood States (POMS ), and seven subscales of POMS, for the four conditions of interest: placebo-controlled, nocebo-controlled, placebo-enhanced and nocebo-enhanced conditions.

	Placebo controlled	Nocebo controlled	Placebo enhanced	Nocebo Enhanced
<b>CHQ</b>	0.40	0.39	0.007	0.27
<b>SWB</b>	0.05	0.38	0.0002	0.22
<b>Mood</b>	0.02	0.46	0.00002	0.09
<b>Vigor</b>	0.14	0.67	0.07	0.27
<b>Fatigue</b>	0.12	0.71	0.002	0.16
<b>Anger</b>	0.04	0.26	0.00005	0.20
<b>Tension</b>	0.12	0.03	0.00001	0.45
<b>Depression</b>	0.06	0.32	0.0001	0.20
<b>Self Esteem</b>	0.20	0.26	0.52	0.40
<b>Confusion</b>	0.04	0.24	0.00001	0.11

## DISCUSSION

Under randomized, double-blind conditions, people who drank intentionally enhanced tea experienced improved mood and well-being as compared to people drinking untreated tea from the same source. This is consistent with the outcome of an earlier study using chocolate as the target of intentional enhancement.<sup>28</sup>

It should be noted that because there were four tests of interest, a conservative Bonferroni adjustment would require a p-value of  $p = 0.05/4 = 0.0125$  to be declared significant. In addition, mental health and well-being measures are not wholly independent of mood, so it is not surprising to find similar outcomes among those three measures. With

this in mind, the placebo-controlled outcome was modest ( $p = 0.02$ ) and did not quite reach the adjusted threshold for significance. A post-hoc comparison that included mood scores averaged over days 4 through 7 rather than just on day 5 resulted in a difference associated with  $p = 0.0118$ ; that comparison, had it been planned in advance, would have survived a Bonferroni correction.

While the placebo-controlled outcome provides only modest support for the intentional hypothesis, in practical terms the treated tea resulted in a 200% improvement in mood as compared to the untreated tea. By contrast, the nocebo-controlled comparison showed virtually no difference in mood ( $p = 0.46$ ).

The placebo-enhanced result was clearer ( $p = 0.00002$ ) and easily survived the Bonferroni correction. The combination of believing that one was drinking treated tea and actually drinking it produced a 700% improvement in mood over those who drank the same treated tea but believed that they were drinking untreated tea. By contrast, believing that one was drinking untreated tea – the nocebo-enhanced condition – nullified any effect of the intentional treatment. This suggests that a key modulator in this type of intentional phenomenon is belief.

This outcome is reminiscent of studies begun in the 1940s by Schmeidler,<sup>29,30</sup> and later summarized in a meta-analysis by Lawrence.<sup>31</sup> Known informally as “sheep-goat” experiments, these studies examined the role of belief (sheep) vs. disbelief (goats) on performance on extrasensory perception (ESP) tasks. Lawrence found 73 publications reported by 37 different investigators, involving over 4,500 participants. The results of the meta-analysis showed that believers out-performed “disbelievers” with odds against chance greater than a trillion to one.

It should be noted that belief in the present study was not in the sense of an assigned or a primed expectation, but rather guesses or inferences based on each participant’s experiences while drinking the tea. Among the 95 people who received the treated tea, 31% believed they were drinking treated tea and 16% believed they were drinking untreated tea. Among the 94 people in the untreated tea group, 32% believed they were

drinking treated tea and 18% believed they were drinking untreated tea. The similarity in percentages suggests that these beliefs were guesses rather than reasoned inferences based on subjective perceptions.

In conclusion, this study suggests that if you believe you are drinking “blessed” tea, the belief alone will enhance your mood. If that tea is in fact blessed, your mood will improve even more. By contrast, if you do not believe you are drinking blessed tea, your mood will stay the same regardless of what you are actually drinking.

## REFERENCES

1. Macht M, Dettmer D. Everyday mood and emotions after eating a chocolate bar or an apple. *Appetite*. May 2006;46(3):332-336.
2. Scholey AB, French SJ, Morris PJ, Kennedy DO, Milne AL, Haskell CF. Consumption of cocoa flavanols results in acute improvements in mood and cognitive performance during sustained mental effort. *J Psychopharmacol*. Oct 2010;24(10):1505-1514.
3. Radin D, Hayssen G, Walsh J. Effects of intentionally enhanced chocolate on mood. *Explore (NY)*. 2007;3(5):485-492.
4. Gardner E, Ruxton C, Leeds A. Black tea – helpful or harmful? A review of the evidence. *European Journal of Clinical Nutrition*. 2006:1-16.
5. Chow K, Kramer I. *All the tea in China*. San Francisco, CA: China Books and Periodicals; 1990.

6. Panagiotakos D, Lionis C, Zeimbekis A, et al. Long-term tea intake is associated with reduced prevalence of (type 2) diabetes among elderly people from Mediterranean Islands: MEDIS epidemiological study. *Yonsei Med J.* 2009;50(1):31-38.
7. de Mejia EG, Ramirez-Mares MV, Puangpraphant S. Bioactive components of tea: Cancer, inflammation and behavior. *Brain Behav Immun.* 2009;In Press, Corrected Proof.
8. Sueoka N, Suganuma M, Sueoka E, et al. A new function of green tea: prevention of lifestyle-related diseases. *Ann Ny Acad Sci.* 2001;928:274-280.
9. Bryan J. Psychological effects of dietary components of tea: caffeine and L-theanine. *Nutr Rev.* Feb 2008;66(2):82-90.
10. Quinlana PT, Lanea J, Moorea KL, Aspenna J, Rycrofta JA, O'Briena DC. The Acute Physiological and Mood Effects of Tea and Coffee: The Role of Caffeine Level. *Pharmacology Biochemistry and Behavior.* 2000;66(1):19-28.
11. Scott D, Rycroft J, Aspen J, Chapman C, Brown B. The effect of drinking tea at high altitude on hydration status and mood. *Eur J Appl Physiol.* 2004;91(4):493-498.
12. Liem DG, Miremadi F, Zandstra EH, Keast RS. Health labelling can influence taste perception and use of table salt for reduced-sodium products. *Public Health Nutr.* Mar 8 2012:1-8.

13. Dawkins L, Shahzad FZ, Ahmed SS, Edmonds CJ. Expectation of having consumed caffeine can improve performance and mood. *Appetite*. Dec 2011;57(3):597-600.
14. Benedetti F. Placebo-Induced Improvements: How Therapeutic Rituals Affect the Patient's Brain. *J Acupunct Meridian Stud*. Jun 2012;5(3):97-103.
15. Hahn RA. The nocebo phenomenon: concept, evidence, and implications for public health. *Prev Med*. Sep-Oct 1997;26(5 Pt 1):607-611.
16. Goldberg D, Williams P. *A User's Guide to the General Health Questionnaire*. Windsor, UK: NFER-Nelson; 1972.
17. Cheng TA, Williams P. The design and development of a screening questionnaire (CHQ) for use in community studies of mental disorders in Taiwan. *Psychological Medicine*. 1986;16:415-422.
18. Cheng TA, Wu JT, Chong MY, Williams P. Internal consistency and factor structure of the Chinese Health Questionnaire. *Acta Psychiatrica Scandinavica*. 1999;82:304-308.
19. McNair D, Lorr M, Droppleman L. *Profile of Mood States*. San Diego, CA: Multi-Health Systems Inc.; 1992.
20. Chang Y, Lu J. The revision of Profile Mood State questionnaire report. *Journal of Physical Education in Higher Education*. 2001;3(2):47-55 (in Chinese).

21. Hsu P, Chang Y, Lu J. The revision of profile of mood state questionnaire. *Journal of Physical Education in Higher Education*. 2003;5(1):85-95 (in Chinese).
22. Eysenck HJ, Eysenck SBG. *Manual for the Eysenck Personality Questionnaire*. London: Hodder and Stoughton; 1975.
23. Lu J. University transition: Major and minor life stressors, personality characteristics and mental health. *Psychological Medicine*. 1994;24(1):81-87
24. Lu L. "Cultural fit": Individual and societal discrepancies in values, beliefs, and subjective well-being. *J. Soc. Psychol.* Apr 2006;146(2):203-221.
25. Lu L. The meaning, measure, and correlates of happiness among Chinese people. *Proceedings of the National Science Council [Republic of China], part C*. 1998;8:115-137.
26. Roesch S, Aldridge A, Vickers RJ, Helvig L. Testing personality-coping diatheses for negative and positive affect: a longitudinal evaluation. *Anxiety Stress Copin*. 2009:Epub ahead of print.
27. Radin D. *Entangled Minds*. New York, NY: Paraview Pocket Books; 2006.
28. Radin D, Hayssen G, Walsh J. Effects of intentionally enhanced chocolate on mood. *Explore*. Sep-Oct 2007;3(5):485-492.
29. Schmeidler GR. Personal values and ESP scores. *J Abnorm Soc Psych*. 1952;47(4):757-761.

30. Schmeidler G, Murphy G. The influence of belief and disbelief in ESP upon individual scoring levels. *Journal of Experimental Psychology*. 1946;36(3):271-276.
31. Lawrence TR. Gathering in the sheep and goats: A meta-analysis of forced choice sheep-goat ESP studies, 1947-1993. In: Zingrone NL, Schiltz MJ, Alvarado CS, Milton J, eds. *Research in Parapsychology 1993* Lanham, MD: Scarecrow Press; 1998:27-31.