https://doi.org/10.1016/j.eujim.2017.12.007

Title: When east meets west: understanding the traditional Chinese medicine diagnoses on insomnia by Western medicine symptomatology

Running title TCM diagnoses on insomnia

Name of authors: Ka-Fai CHUNG, MBBS, MRCPsych*,[1]

Wing-Fai YEUNG, BCM, PhD[2]

Feona Chung-Yin LEUNG, BCM[1]

Branda Yee-Man YU, BA[2]

Name of department: [1]Department of Psychiatry, University of Hong Kong, Hong Kong SAR, China; [2]School of Nursing, Polytechnic University of Hong Kong, Hong Kong SAR, China.

***Correspondence**: Dr. K.F. Chung, Clinical Associate Professor, Department of Psychiatry, University of Hong Kong, 102 Pokfulam Road, Hong Kong SAR, China. Telephone: 852-22554487, Fax: 852-28551345, E-mail: kfchung@hku.hk

Institution(s) in which the work was performed: The University of Hong Kong

Number of words: 2902 (including Introduction, Methods, Results, and Discussion)

243 (Abstract)

38 References

6 Tables

1 Supplementary file

Conflict of interest: There is no conflict of interest

ABSTRACT

Introduction: Insomnia sub-classification by the Western diagnostic systems has unsatisfactory validity and reliability. On the contrary, traditional Chinese medicine (TCM) diagnosis is sometimes used to guide TCM therapies, including acupuncture. This study investigated the difference in Western medicine symptomatology between subjects with insomnia disorder who were diagnosed with different TCM diagnoses.

Methods: Data was derived from two randomized controlled trials. Subjects were recruited from the community and regional psychiatric clinics. A 92-item symptom checklist was specially designed for TCM diagnosis. Sleep diary and actigraphy variables, insomnia symptoms, general sleep disturbances, comorbid medical and psychiatric disorders, physical and psychiatric symptoms, and sleep-related dysfunctional cognitions and behaviors were included as Western medicine symptomatology.

Results: 365 subjects with DSM-IV or DSM-5 insomnia disorder (mean age 51.7 years; 77.3% females) were analyzed. The four commonest TCM diagnoses were *dual deficiency of the heart-spleen*, *non-interaction between the heart and kidney*, *depressed liver qi transforming into fire*, and *yin deficiency with effulgent fire*, with prevalence 31.8%, 25.8%, 18.4%, and 10.1%, respectively. There were minimal inter-relationships between the TCM and Western medicine systems on insomnia. Among various Western medicine symptomology we examined, only mean Hamilton Depression Rating Scale score was significantly lower in n*on-interaction between the heart and kidney* compared to *dual deficiency of the heart-spleen* and *yin deficiency with effulgent fire*.

Conclusion: Although the TCM and Western diagnostic systems of insomnia are largely different, an integrative TCM-Western approach may provide new insights for the understanding and treatment of insomnia.

Keywords: Insomnia, Classification, Diagnosis, Pattern, TCM, Traditional Chinese Medicine

INTRODUCTION

Insomnia is a prevalent disorder. Nearly one-third of the adult population experience insomnia symptoms and approximately 9-15% have insomnia symptoms accompanied by daytime consequences [1]. The recognition of insomnia as a health problem can be traced back to more than 2000 years ago in ancient Chinese medical texts [2]. Different theories of traditional Chinese medicine (TCM) have been developed to explain patterns of body disharmony and the most accepted categorization is a description in terms of eight major parameters: *yin* and *yang*, *external* and *internal*, *hot* and *cold*, and *excess* and *deficiency*, in addition to body systems such as *qi*, *blood*, and *body-fluid* differentiation and *zangfu* differentiation. A recent systematic review showed that *dual deficiency of the heart-spleen, yin deficiency with effulgent fire, depressed liver qi transforming into fire, and non-interaction between the heart and kidney* are the four commonest TCM diagnoses in subjects with insomnia [3]. The disharmony of the organs eventually disturbs the function of *shen* (or spirit) which is responsible for mental activities including mentality, consciousness, thinking and feeling; and hence the treatment principle of TCM for insomnia is to restore the function of *shen* or nourish *shen* [2]. These theory-based diagnoses are sometimes used to guide TCM treatment for insomnia; however, empirical data is fairly scarce. A systematic review found that Gui Pi Tang, An Shen Ding Zhi Wan, and Wen Dan Tang were more commonly used for *dual deficiency of the heart-spleen*, *internal disturbance of phlegm-heat,* and *qi deficiency of the heart and gallbladder*, respectively, but the treatment for other TCM diagnoses was inconsistent [4].

Our previous study has shown that the response to acupuncture is different for different TCM diagnoses for insomnia [5]. Using an improvement by eight points or more on Insomnia Severity Index (ISI) [6], a self-report questionnaire, to denote treatment response, subjects with *depressed liver qi transforming into fire* had the highest response rate of 36.6%,

while the lowest response rate occurred in *yin deficiency with effulgent fire* at 13.0%, however the difference was not statistically significant. In another analysis, we further explored whether an integrative Chinese-Western diagnostic approach could be useful for predicting treatment response. We found that the presence of comorbid depression in subjects with *non-interaction between the heart and kidney* was associated with a significantly higher response rate than those of the same TCM diagnosis but without comorbid depression (39.0% vs. 17.9%) [7]. For other TCM diagnoses, comorbid depression did not significantly influence the response rate to acupuncture for insomnia.

The Western nosology in the diagnosis and classification of insomnia is based on frequency and duration of insomnia, functional impairment, and relationship with medical, psychiatric, and specific sleep disorders, while the widely accepted etiological models of insomnia include cognitive, behavioral and hyperarousal models. Insomnia can be classified into acute or chronic, primary or comorbid, or based on etiological factors, such as pathophysiological insomnia, sleep state misperception, and inadequate sleep hygiene. The rationale for classifying insomnia into subtypes is to develop personalized treatment with better outcomes. There have been attempts to identify insomnia subtypes using cluster analysis, but the findings are inconsistent [8,9]. In addition, the reliability and validity of insomnia subtypes is not satisfactory. A previous study found that psychophysiological insomnia and inadequate sleep hygiene had variable diagnostic accuracy across study sites, while the diagnosis of sleep state misperception was poorly supported [10]. The use of specific treatments for insomnia subtypes has not been proven in randomized controlled trials [11]. In view of the deficiencies of both theory-based TCM diagnoses and Western medicine concepts of insomnia, it may be worthwhile to explore an integrative Chinese-Western diagnostic approach. A better understanding of the connection between the Chinese and Western systems may be the first step.

The aim of the study was to compare the Western medicine symptomatology between subjects with different TCM diagnoses for insomnia. Symptoms relevant to the diagnosis, classification and understanding of insomnia according to the Western system were examined, including sleep diary and actigraphy variables, insomnia symptoms, general sleep disturbances, the presence of comorbid medical and psychiatric disorders, physical and psychiatric symptoms, and sleep-related dysfunctional cognitions and maladaptive behaviors. The findings may help practitioners better understand the meaning of TCM diagnoses in terms of the Western concept of insomnia.

METHODS

Subjects

We pooled data of two randomized controlled trials of acupuncture for insomnia (ClinicalTrials.gov #NCT01707706 and #NCT01891097). Primary analysis of the studies has been published [12,13]. There are minor differences in inclusion criteria, but participants from both studies had to be: (1) ethnic Chinese; (2) aged ≥18 years; (3) having insomnia at least three nights per week for at least three months; and (4) fulfilling criteria A and B of the DSM-IV diagnosis of primary insomnia [14] or criteria A to E of the DSM-5 diagnosis of insomnia disorder [15]. Other inclusion criteria of Study #NCT01707706 were the presence of past major depressive episodes and an ISI score ≥15 at baseline; for Study #NCT01891097, participants had to have sleep onset latency or wake after sleep onset >30 minutes and sleep efficiency <85% for at least three nights based on 1-week sleep diary. The major exclusion criteria were (1) a 17-item Hamilton Depression Rating Scale ($HDRS_{17}$) [16] score >18; (2) a significant suicidal risk according to the $HDRS_{17}$ item on suicide (score ≥3); (3) previous diagnosis of schizophrenia or other psychotic disorders or current alcohol or substance use disorder; (4) any unstable psychiatric conditions or serious physical illnesses;

(5) any sleep disorders, including sleep phase disorders, parasomnia, obstructive sleep apnea (apnea-hypopnea index ≥10), or periodic limb movement disorder (periodic limb movement disorder index ≥15) detected during screening or by in-laboratory overnight polysomnography; and (6) currently pregnant or breast-feeding. Study #NCT01707706 had 975 subjects assessed by telephone, 439 in person, and 150 randomized, while Study #NCT01891097 screened 841 subjects, 413 in person, and 224 randomized. Of the 374 participants who were randomized, 365 subjects (97.6%) had TCM diagnosis available and was the sample of this secondary analysis.

Study procedure

All study procedures were reviewed and approved by the local institutional review board. Subjects were recruited from the community and regional psychiatric clinics. Screening interviews were conducted by research assistants with undergraduate psychology background. An experienced clinician took a sleep history and administered a structured interview for psychiatric disorders. A Chinese medicine practitioner who had more than three years' clinical experience (FL) formulated the TCM diagnosis with the help of a standardized symptom checklist. A final TCM diagnosis was made after discussion with a senior Chinese medicine practitioner (WY). The 92-item standardized checklist consists of 13 sleep-related, 61 non-sleep-related, 11 tongue, and 7 pulse items (Supplementary file). The development of this checklist was based on the clinical features of the top 10 TCM diagnoses of insomnia, which covered roughly 80% of subjects with insomnia according to our systematic review [3]. If more TCM diagnoses were covered, the symptom checklist would be too lengthy. Symptoms included in the checklist had to be mentioned as clinical features of the TCM diagnoses in at least 10% of the reviewed studies; thus both common and less common features were listed. We also reviewed a standard TCM textbook, the *Traditional Chinese Internal Medicine* 1985, 1997, 2003 and 2007 versions [17-20] for additional symptoms. The

non-sleep-related items were subdivided under categories on eating, taste and appetite (12 items), emotions (11 items), chest and abdominal function (8 items), bladder and bowel function (6 items), headache, dizziness and tinnitus (6 items), coldness, hotness and sweating (5 items), menstruation and sexual function (4 items), complexion (4 items), limbs and back (3 items), and energy (3 items). The items were rated as 0 or 1, denoting absence or presence of the symptoms or signs.

Measures

Sociodemographic variables and medical and psychiatric history

Participants reported their age, gender, number of years in full-time education, marital status, occupation, duration of insomnia, and medical and psychiatric history.

ISI

The ISI is a 7-item self-rating scale that was used to assess the subjects' perceived severity of insomnia symptoms and the associated functional impairment [6]. The ISI is a 5-point Likert scale with higher scores indicating more severe insomnia. We used the Chinese version of ISI, known to be valid and reliable [21].

Pittsburgh sleep quality index (PSQI)

The PSQI is a 19-item, 7-component scale that are designed to assess subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medications, and daytime dysfunction. The coverage of PSQI is more comprehensive than the ISI and is regarded as a standard research assessment of general sleep disturbances. Higher score is indicative of greater sleep disturbances [22]. We used the Chinese version of PSQI, which is valid and reliable [23].

$HDRS_{17}$

The $HDRS_{17}$ is one of the most common clinician-administered scales to assess the severity of depression and the associated symptoms [16]. Higher scores indicate more severe depression.

Hospital anxiety and depression scale (HADS)

The HADS is a self-report scale that was used in this study to assess the severity of anxiety and depression in the past week [24]. It comprises of two subscales, each with seven items, measuring the severity of anxiety and depressive symptoms. The subscale score ranges from 0 to 21; higher scores indicate more severe symptoms. The HADS was chosen because it was well validated in the Chinese population [25].

Multidimensional fatigue invenstory-20 (MFI-20)

The MFI-20 comprises 20 statements that are used to assess the severity of fatigue in the recent few days on a 5-point Likert scale [26] The MFI-20 covers general fatigue, physical fatigue, mental fatigue, reduced activity, and reduced motivation and has a total score ranging from 20-100; higher score is indicative of greater fatigue. The Chinese version of the MFI-20 has been shown to have sufficient validity and reliability [27].

Epworth sleepiness scale (ESS)

The ESS is a self-administered 8-item questionnaire developed for the assessment of daytime sleepiness [28]. The ESS asks the respondents to rate on a scale of 0-3 the likelihood of dozing in 8 different situations, with higher scores indicating greater sleepiness. The Chinese version of ESS has been shown to be valid and reliable [29].

Dysfunctional beliefs and attitudes about sleep scale (DBAS)

The 30-item DBAS was used to assess participants' dysfunctional sleep-related cognitions [30]. A 10-point Likert scale, labeled "strongly disagree" at its far left extreme and "strongly agree" at its far right extreme, is used to evaluate the degree of endorsement. Higher scores represent stronger dysfunctional beliefs. The Chinese version of DBAS has been shown to be reliable and valid [31].

Sleep hygiene practice scale (SHPS)

The 30-item SHPS was used to assess sleep-wake schedule, pre-sleep arousal-related behaviors, eating and drinking before bedtime, and sleep environment. Participants indicated the frequency of which sleep hygiene practices were used, ranging from "never" to "always". The Chinese version of DBAS has been shown to be reliable and valid [32].

Expanded consensus sleep diary for morning (CSD-M)

Participants were asked to complete the CSD-M [33] everyday within 1 hour of getting out of bed for seven consecutive days. Sleep diary was used to examine sleep-wake pattern over an extended period of time and may be less sensitive to recall biases. We analyzed the average sleep onset latency, wake after sleep onset, sleep efficiency, and total sleep time.

Actigraphy

Actigraphs (Model Actiwatch-2; Respironics Inc; Murrysville, Pennsylvania) are watch-like devices that record physical movement by means of an accelerometer-microprocessor link. Because movement correlates with wakefulness and lack of movement with sleep, wrist actigraphy has been shown to be a valid and objective measure of sleep-wakefulness [34]. Actigraphs were worn 24 hours per day on the non-dominant wrist for one

week. Epoch length was set at one minute. Data were analyzed with Actiware software (Version 5, Respironics Inc).

Statistical analysis

We used the SPSS version 20.0 (IBM Corp) for all statistical analysis. Sociodemographic variables, clinical characteristics, and sleep-wake variables at baseline were compared across TCM diagnoses using chi-square test for categorical variables and one-way analysis of variance (ANOVA) for continuous variables. In cases that ANOVA revealed significant differences between TCM diagnoses, post-hoc analyses using Bonferroni test, which can reduce the probability of false positive [35], were performed.

RESULTS

Subject characteristics

The mean age of the participants was 51.7 years; 77.3% were female, 66.3% were married or cohabiting, and 35.3% were in paid employment (Table 1). About 38.6% of the participants had insomnia disorder as the only psychiatric diagnosis, while 56.4% had previous depressive episodes. At baseline, the mean ISI and PSQI score was 19.6 and 13.8, respectively, while the mean sleep-diary and actigraphy-derived sleep efficiency was 61.2% and 77.5%, respectively, indicating moderate insomnia severity. The mean $HDRS_{17}$ score was 8.0, which was equivalent to mild severity of depression.

TCM diagnosis for insomnia

The commonest TCM diagnosis was *dual deficiency of the heart-spleen*, which occurred in 116 of the 365 participants (31.8%), followed by *non-interaction between the heart and kidney*, *depressed liver qi transforming into fire*, and *yin deficiency with effulgent fire* (Table 2). Only the four commonest TCM diagnoses had adequate number for between-

diagnosis comparison. Table 3 presents the symptoms and signs and tongue and pulse features which were used for TCM diagnosis in this study.

Differences between TCM diagnoses in sociodemographic and clinical variables

ANOVA revealed a significant difference in age, but not in gender ratio, marital status, educational attainment, insomnia duration, and the proportion with medical and psychiatric illnesses (Table 4); however, post-hoc analysis with Bonferroni correction could not detect any significant between-group difference.

Differences between TCM diagnoses in insomnia, physical and psychiatric symptoms

There were significant differences in $HDRS_{17}$ score, but not in ISI, PSQI, HADS, MFI, ESS, DBAS and SHPS scores between TCM diagnoses (Table 5). Post-hoc analyses with Bonferroni correction found that participants diagnosed with *dual deficiency of the heart-spleen* and those with *yin deficiency with effulgent fire* had significantly higher $HDRS_{17}$ scores compared to those with *non-interaction between the heart and kidney*.

Comparison between TCM diagnoses in sleep diary and actigraphy variables

There was no significant difference between TCM diagnoses in sleep-diary and actigraphy-derived sleep onset latency, wake after sleep onset, sleep efficiency and total sleep time (Table 6).

DISCUSSION

The study aimed to compare the Western medicine symptomatology between subjects with different TCM diagnoses for insomnia. We found that the relationship between TCM and Western medicine systems on insomnia was quite minimal. Only the severity of depression was different between TCM diagnoses. *Non-interaction between the heart and*

kidney was associated with significantly lower depression score than *dual deficiency of the heart-spleen* and *yin deficiency with effulgent fire*. Further studies are needed to examine the clinical relevance of symptoms and signs that are emphasized in the TCM diagnostic system, such as temperature regulation and complexion, but not in the Western nosology, and explore the meaning of these clinical features using modern technology and the well-established cognitive-behavioral and physiological models of insomnia.

Our previous studies have shown that the presence of comorbid depression in subjects with *non-interaction between the heart and kidney* was associated with a significantly higher response rate to acupuncture for insomnia than those of the same TCM diagnosis but without comorbid depression [7]. With reference to the finding of the current analysis, subjects with *non-interaction between the heart and kidney* should have low depression score, but in case that comorbid depression was present, the condition was predictive of a positive response to acupuncture for insomnia. It is possible that insomnia comorbid with depression responds better to our acupuncture regimen, which includes acupuncture points traditionally used for depression, e.g., HT7, *Yintang* and GV20 [37]. Our finding supports that an integrative TCM-Western diagnostic approach may bring new insights to the understanding of insomnia.

We replicated the findings of our systematic review [3] that *dual deficiency of the heart-spleen*, *non-interaction between the heart and kidney*, *depressed liver qi transforming into fire*, and *yin deficiency with effulgent fire* are common in subjects with insomnia. The four TCM diagnoses took up 86.1% of our sample, which is similar to the finding in a study of 913 clinic patients with insomnia, which showed that the four TCM diagnoses accounted for 80.4% of all patients [38]. Although the TCM classification system has not been tested using empirical data, the consistency in diagnosis suggests that it may have important clinical applications. Further randomized controlled studies should be performed to find out whether individualized treatment according to TCM diagnosis is more effective than standardized

treatment. In view of the frequent use of Chinese medicine therapies for insomnia [39], a TCM-Western integrative approach is likely to be acceptable to subjects with insomnia.

There are strengths as well as methodologic limitations of the study. We recruited our sample from the community and psychiatric clinics; hence the results are more likely to be generalizable. We used a well-documented screening process to recruit subjects with clinically significant insomnia disorder. The number of subjects in each group ranged from 37 to 116, which is equivalent to a statistical power of 80% to detect a small to medium effect size between groups by ANOVA at a significance level of .05. The major limitation is that the TCM symptom checklist has not been validated; however, we used a consensus approach in TCM diagnosis; hence was likely to be more accurate than that by a single rater. Lastly, we have not included some relevant psycho-behavioral characteristics, such as personality, which may be different between TCM diagnoses. Further studies on the clinical relevance of TCM diagnoses are needed.

In conclusion, we found that the Western and TCM diagnostic systems of insomnia are largely different. Among various Western medicine symptomology we used, only depression score was significantly lower in n*on-interaction between the heart and kidney* compared to *dual deficiency of the heart-spleen* and *yin deficiency with effulgent fire*. Our findings are in line with our recommendation that an integrative TCM-Western diagnostic approach may bring new insights to the understanding and treatment of insomnia.

FUNDING

ClinicalTrials.gov #NCT01707706 and #NCT01891097 were supported by the Health and Health Services Research Fund (HHSRF #08091101 and #10111301), Food and Health Bureau, Hong Kong SAR.

REFERENCES

1. M.M. Ohayon, Epidemiology of insomnia: what we know and what we still need to learn, Sleep Med. Rev., 6(2) (2002) 97-111.
2. B. Wang, Huang Di Nei Jing Su Wen [The Yellow Empreor's Classic of Internal Medicine - Simple Questions], Beijing, China: People's Health Publishing House, 1979.
3. M.M. Poon, K.F. Chung, W.F. Yeung, et al., Classification of insomnia using the traditional Chinese medicine system: a systematic review, Evid. Based Complement. Alternat. Med., 2012 (2012) 735078.
4. W.F. Yeung, K.F. Chung, M.M. Poon, et al., Prescription of Chinese herbal medicine and selection of acupoints in pattern-based traditional Chinese medicine treatments for insomnia: a systematic review, Evid. Based Complement. Alternat. Med., 2012 (2012) 902578.
5. K.F. Chung, W.F. Yeung, F.C. Leung, et al., Traditional Chinese medicine diagnosis and response to acupuncture for insomnia: an analysis of two randomized placebo-controlled trials, Eur. J. Integr. Med., 8 (2016) 797-801.
6. C.H. Bastien, A. Vallieres, C.M. Morin, Validation of the Insomnia Severity Index as an outcome measure for insomnia research, Sleep Med., 2 (2001) 297-307.
7. K.F. Chung, W.F. Yeung, F.C. Leung, B.Y. Yu, An integrative Chinese-Western diagnostic approach to predict a positive response to acupuncture, Acupunct Med., 35 (4) (2017) 306-308.
8. P.J. Hauri, A cluster analysis of insomnia, Sleep, 6 (4) (1983) 326-338.
9. J.D. Edinger, A.I. Fins, J.M. Goeke, et al., The empirical identification of insomnia subtypes: a cluster analytic approach, Sleep, 19 (5) (1996) 398-411.

10. J.D. Edinger, J.K. Wyatt, E.J. Stepanski, et al., Testing the reliability and validity of DSM-IV-TR and ICSD-2 insomnia diagnoses. Results of a multitrait-multimethod analysis, Arch. Gen. Psychiatry, 68 (10) (2011) 992-1002.
11. J.D. Edinger, A.D. Krystal. Subtyping primary insomnia: is sleep state mispereption a distinct clinical entity? Sleep Med. Rev., 7 (3) (2003) 203-214.
12. K.F. Chung, W.F. Yeung, Y.M. Yu, et al., Acupuncture for residual insomnia associated with major depressive disorder: a placebo- and sham-controlled, subject- and assessor-blind, randomized trial, J. Clin. Psychiatry, 76 (6) (2015) e752-760.
13. K.F. Chung, W.F. Yeung, Y.M. Yu, et al., Acupuncture and combined acupuncture and auricular acupuncture for insomnia: a randomized, waitlist-controlled trial, Acupunct Med., (in press).
14. American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders: DSM-IV, 4th ed, Washington: Washington, DC, 1994.
15. American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders (DSM-5), 5th ed, Arlington, VA: American Psychiatric Publishing, 2013.
16. M. Hamilton, A rating scale for depression, J. Neurol. Neurosurg. Psychiatry, 23 (1960) 56-62.
17. B. Y. Zhang, Traditional Chinese Internal Medicine, Shanghai Scientific and Technical Publishers, Shanghai, China, 1985.
18. Y. Y. Wang, Traditional Chinese Internal Medicine, Shanghai Scientific and Technical Publishers, Shanghai, China, 1997.
19. Z. Y. Zhou, Traditional Chinese Internal Medicine, China Press of Traditional Chinese Medicine, Beijing, China, 2003.
20. B. Peng, J. Xie, Traditional Chinese Internal Medicine, People's Medical Publishing House, Beijing, China, 2nd ed, 2007.

21. K.F. Chung, K.K. Kan, W.F. Yeung, Assessing insomnia in adolescents: comparison of Insomnia Severity Index, Athens Insomnia Scale and Sleep Quality Index, Sleep Med., 12 (5) (2011) 463-470.
22. D.J. Buysse, C.F. Reynolds, T.H. Monk, et al., The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research, Psychiatry Res., 28 (2) (1989) 193-213.
23. K.F. Chung, M.K. Tang, Subjective sleep disturbance and its correlates in middle-aged Hong Kong Chinese women, Maturitas, 53 (4) (2006) 396-404.
24. A.S. Zigmond, R.P. Snaith, The hospital anxiety and depression scale, Acta. Psychiatr. Scand., 67 (6) (1983) 361-370.
25. C.M. Leung, Y.K. Wing, P.K. Kwong, et al., Validation of the Chinese-Cantonese version of the hospital anxiety and depression scale and comparison with the Hamilton Rating Scale of Depression, Acta. Psychiatr. Scand., 100 (6) (1999) 456-461.
26. E.M. Smets, B. Garssen, B. Bonke, et al., The Multidimensional Fatigue Inventory (MFI) psychometric qualities of an instrument to assess fatigue, J. Psychosom. Res., 39 (3) (1995) 315-325.
27. K.F. Chung, B.Y. Yu, K.P. Yung, et al., Assessment of fatigue using the Multidimensional Fatigue Inventory in patients with major depressive disorder, Compr. Psychiatry, 55 (7) (2014) 1671-1678.
28. M.W. Johns, A new method for measuring daytime sleepiness: the Epworth sleepiness scale, Sleep, 14 (6) (1991) 540-545.
29. K.F. Chung, Use of the Epworth Sleepiness Scale in Chinese patients with obstructive sleep apnea and normal hospital employees, J. Psychosom. Res., 49 (5) (2000) 367-372.
30. C.M. Morin, J. Stone, D. Trinkle, et al., Dysfunctional beliefs and attitudes about sleep among older adults with and without insomnia complaints, Psychol. Aging, 8 (3) (1993) 463-467.

31. K.F. Chung, F.Y. Ho, W.F. Yeung, Psychometric comparison of the full and abbreviated versions of the Dysfunctional Beliefs and Attitudes about Sleep Scale, J. Clin. Sleep Med., 12 (6) (2016) 821-828.
32. S. Lin, C. Cheng, C. Yang, et al., Reliability and validity of the sleep hygiene practice scale, Arch. Clin. Psychol., 4 (2009) 105-115 [in Chinese].
33. C.E. Carney, D.J. Buysse, S. Ancoli-Israel, et al., The consensus sleep diary: standardizing prospective sleep self-monitoring, Sleep, 35 (2) (2012) 287-302.
34. K.L. Lichstein, K.C. Stone, J. Donaldson, et al., Actigraphy validation with insomnia, Sleep, 29 (2) (2006) 232-239.
35. V. Bewick, L. Cheek, J. Ball, Statistics review 9: one-way analysis of variance. Crit. Care, 8 (2) (2004) 130-136.
36. Z.J. Zhang, H.Y. Chen, K.C. Yip, et al., The effectiveness and safety of acupuncture therapy in depressive disorders: systematic review and meta-analysis, J. Affect. Disord., 124 (1-2) (2010) 9-21.
37. Z. Yuan, C. Dai, R. Ye, et al., Analysis on relative factors of TCM pattern identification of 913 insomnia cases, Chin. J. Tradit. Chin. Med. Pharm., 26 (2011) 1587-1590 [in Chinese].
38. W.F. Yeung, K.F. Chung, K.P. Yung, et al., The use of conventional and complementary therapies for insomnia among Hong Kong Chinese: a telephone survey, Complement. Ther. Med., 22 (5) (2014) 894-902.

Table 1.

Sample characteristics (n = 365)

Variables	Mean ± SD / n (%)
Age, y	51.7 ± 10.0
Sex, male/female	83/282
Education attainment, y	10.9 ± 3.6
Marital status	
Never married	50 (13.7)
Married/cohabiting	242 (66.3)
Divorced/widowed	73 (20)
Occupation	
Professional and associate professional	32 (8.8)
Skilled and semi-skilled worker	66 (18.1)
Unskilled worker	31 (8.5)
Retired	70(19.2)
Unemployed/housework	166 (45.5)
Insomnia duration, y	11.7 ± 10.2
Lifetime psychiatric disorder	
Primary insomnia	141 (38.6)
MDD	206 (56.4)
GAD/Panic disorder/PTSD	14 (3.8)
Bipolar disorder	2 (0.5)
Chronic medical illnesses [a]	100 (27.4)
ISI total score	19.6 ± 4.0
PSQI total score	13.8 ± 3.0
$HDRS_{17}$ total score	8.0 ± 4.0
Sleep-dairy parameters averaged over 1 week	
SOL, min	68.5 ± 59.7
WASO, min	65.1 ± 63.8
TST, min	302.3 ± 79.2
SE, %	61.2 ± 15.1
Actigraphy parameters averaged over 1 week	
SOL, min	30.8± 28.7
WASO, min	63.4 ± 30.3
TST, min	388.8 ± 71.4
SE, %	77.5 ± 9.7

Abbreviations: GAD, generalized anxiety disorder; $HDRS_{17}$, 17-item Hamilton depression rating scale; ISI, Insomnia severity index; MDD, major depressive disorder; PSQI, Pittsburgh sleep quality index; PTSD, posttraumatic stress disorder; SE, sleep efficiency; SOL, sleep onset latency; TST, total sleep time; WASO, wake time after sleep onset.

[a] Participants were on regular medications for the medical illnesses.

Table 2.

TCM diagnoses in 365 adults with insomnia disorder

	Chinese name	Number of subjects (%)
Dual deficiency of the heart-spleen	心脾兩虛	116 (31.8)
Non-interaction between the heart and kidney	心腎不交	94 (25.8)
Depressed liver qi transforming into fire	肝鬱化火	67 (18.4)
Yin deficiency with effulgent fire	陰虛火旺	37 (10.1)
Qi deficiency of the heart and gallbladder	心膽氣虛	15 (4.1)
Internal disturbance of phlegm-heat	痰熱內擾	13 (3.6)
Heart deficiency with timidity	心虛膽怯	6 (1.6)
Liver fire flaming upward	肝火上擾	6 (1.6)
Stomach qi disharmony	胃氣失和	9 (2.5)
Stomach disharmony	胃腑不和	2 (0.5)

Table 3.

Symptoms and signs of the four commonest TCM diagnoses for insomnia

	Sleep-related symptoms	Non-sleep related symptoms and signs	Tongue features	Pulse features
Dual deficiency of the heart-spleen	Excessive dreaming, difficulty staying asleep, difficulty falling asleep, insomnia, half asleep	Palpitation, lassitude, reduction in luster complexion, poor memory, dizziness, fatigue, tasteless, weary limbs, poor appetite, sloppy stool	Pale tongue with thin coating, white thin coating	Fine and weak pulse
Non-interaction between the heart and kidney	Insomnia, excessive dreaming, difficulty falling asleep, difficulty falling asleep with vexation, insomnia with vexation, difficulty staying asleep, restless sleep	Backache, dizziness, tinnitus, palpitation, vexation, feverish sensations in the palms, soles and chest, seminal emission, night sweating, sore knees, dry mouth, susceptibility to fright, aphthous stomatitis, cold extremities, fright palpitation, irritability, reddened complexion, reddish eyes, poor memory, dry throat, hot flashes, impatience, nocturnal emission	Red tongue, scanty coating, thin coating, pale tongue, yellow coating, red in the tip of the tongue	Fine and rapid pulse, string-like pulse, sunken pulse, weak pulse
Depressed liver qi transforming into fire	Insomnia, difficulty falling asleep, excessive dreaming	Vexation, irritability, bitter taste, constipation, reddish eyes, yellow urine, headache, dizziness, hypochondriac pain, impatience, reddened complexion, thirst, poor appetite, oppression in the chest, tinnitus, hypochondriac distension, favour of drinking, reddish urine, pain in the chest and hypochondrium, frequent sighing	Red tongue with yellow coating	Rapid and string-like pulse, fine pulse
Yin deficiency with effulgent fire	Insomnia, difficulty staying asleep, insomnia with vexation, excessive dreaming, difficulty falling asleep	Tinnitus, palpitation, poor memory, dizziness, feverish sensations in the palms, soles and chest, dry mouth, backache, vexation, nocturnal emission, acid regurgitation, sore knees, sweating, dry throat, seminal emission, poor appetite, bitter taste, hot flashes, reddened cheeks	Red tongue, scanty coating, slimy coating, white coating, yellow coating	Fine and rapid pulse, slippery pulse

Table 4.

Demographic and clinical features by TCM diagnoses

	Dual deficiency of the heart-spleen (n = 116)	*Non-interaction between the heart and kidney* (n = 94)	*Depressed liver qi transforming into fire* (n = 67)	*Yin deficiency with effulgent fire* (n = 37)	ANOVA/ chi-square	P-value
Age, y	51.6 ± 9.7	53.9 ± 9.6	50.2 ± 10.5	49.1 ± 9.3	2.99	0.03
Females	92 (79.3)	75 (79.8)	47 (70.1)	29 (78.4)	2.58	0.46
Marital status					7.15	0.31
Never married	19 (16.3)	7 (10.4)	11 (11.7)	8 (21.6)		
Married/cohabiting	76 (65.5)	46 (68.7)	69 (73.4)	19 (51.4)		
Divorced/widowed	21 (18.1)	14 (20.9)	14 (14.9)	10 (27.0)		
Educational attainment, y	10.9 ± 3.4	10.3 ± 4.0	11.6 ± 3.5	11.7 ± 3.5	2.30	0.08
Insomnia duration, y	13.0 ± 10.4	11.3 ± 10.3	10.5 ± 9.9	9.1 ± 7.1	1.81	0.15
Had chronic medical illnesses	29 (25.0)	26 (27.7)	24 (35.8)	8 (21.6)	3.31	0.35
Had past psychiatric illnesses	74 (63.8)	47 (50.0)	47 (70.1)	24 (64.9)	7.76	0.051

Values are expressed in mean ± SD or n (%).

Table 5.

Insomnia, depressive and anxiety symptoms, fatigue, sleepiness and sleep-related dysfunctional cognitions and behaviors

	Dual deficiency of the heart-spleen (n = 116)	*Non-interaction between the heart and kidney* (n = 94)	*Depressed liver qi transforming into fire* (n = 67)	*Yin deficiency with effulgent fire* (n = 37)	ANOVA	P-value
ISI	19.4 ± 3.6	19.1 ± 4.3	20.0 ± 3.9	20.0 ± 4.0	0.84	0.48
PSQI	13.9 ± 3.2	13.1 ± 2.8	14.0 ± 2.9	14.2 ± 2.9	2.05	0.11
$HDRS_{17}$	8.6 ± 4.2 [a]	6.8 ± 2.8 [b]	8.1 ± 4.4	9.1 ± 4.5 [a]	4.64	0.003
HADS-depression	7.3 ± 4.8	7.5 ± 4.3	8.7 ± 4.1	6.8 ± 3.8	1.85	0.14
HADS-anxiety	8.5 ± 4.7	8.0 ± 4.3	8.9 ± 3.9	8.4 ± 4.1	0.51	0.68
MFI	66.8 ± 13.4	65.7 ± 11.8	67.3 ± 14.3	65.4 ± 13.5	0.30	0.82
ESS	9.8 ± 5.6	9.3 ± 5.7	9.6 ± 5.1	7.3 ± 5.8	1.68	0.17
DBAS	6.5 ± 1.5	6.6 ± 1.5	6.6 ± 1.8	6.9 ± 1.4	0.41	0.74
SHPS	72.9 ± 16.5	72.8 ± 16.0	75.9 ± 12.3	81.2 ± 13.7	1.74	0.16

Abbreviations: DBAS, Dysfunctional beliefs and attitudes about sleep scale; ESS, Epworth sleepiness scale; HADS, Hospital anxiety and depression scale, $HDRS_{17}$, 17-item Hamilton depression rating scale; ISI, Insomnia severity index; MFI, Multidimensional fatigue inventory; PSQI, Pittsburgh sleep quality index; SHPS, Sleep hygiene practice scale.

Values are expressed in mean ± SD.

Table 6.

Sleep diary and actigraphy results by TCM diagnoses

	Deficiency of both the heart and spleen (n = 116)	*Heart-kidney non-interaction* (n = 94)	*Liver-qi stagnation transforming into fire* (n =67)	*Hyperactivity of fire due to yin deficiency* (n =37)	ANOVA	P-value
Sleep diary						
SOL	62.9 ± 44.4	72.8 ± 97.5	65.5 ± 43.5	82.5 ± 63.2	1.14	0.33
WASO	64.6 ± 55.2	68.0 ± 99.7	62.2 ± 50.0	65.2 ± 60.7	0.10	0.96
TST	305.7 ± 91.4	315.6 ± 77.4	291.6 ± 73.4	303.5 ± 65.0	1.20	0.31
SE	61.9 ± 16.9	62.0 ± 14.5	60.7 ± 14.3	60.1 ± 14.0	0.23	0.87
Actigraphy						
SOL	28.5 ± 28.9	32.1 ± 26.8	29.7 ± 24.7	32.8 ± 25.0	0.39	0.76
WASO	60.7 ± 30.6	65.9 ± 29.6	60.9 ± 29.1	70.3 ± 35.2	1.25	0.29
TST	383.4 ± 70.9	394.9 ± 66.8	388.4 ± 66.3	392.7 ± 61.4	0.45	0.72
SE	77.8 ± 10.9	77.6 ± 8.8	77.9 ± 8.9	77.4 ± 8.6	0.03	0.99

Abbreviations: SE, sleep efficiency; SOL, sleep onset latency; TST, total sleep time; WASO, wake after sleep onset
Values are expressed in mean ± SD.