Huang, Xuewei, Liu, Qianyu, Li, Wendy Wen, Wu, Lanlan, and Yan, Anni (2020) ***Effects of magnanimous therapy on emotional, psychosomatic and immune functions of lung cancer patients.*** **Journal of Health Psychology, 26 (7) pp. 1096-1108.**

Effects of magnanimous therapy on emotional, psychosomatic and immune functions of lung cancer patients

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Abstract

This study was a randomised controlled study on the effects of the individual computer magnanimous therapy and group computer magnanimous therapy on emotional, psychosomatic and immune function among advanced lung cancer patients. Patients were examined at baseline and 2 weeks later using the Psychosomatic Status Scale for Cancer Patients, Hospital Anxiety Depression Scale and IgA, IgG, IgM and natural killer cell functions. The results showed that individual computer magnanimous therapy and group computer magnanimous therapy were beneficial for advanced lung cancer patients in improving depression, anxiety, psychosomatic status and immune functions. The improvements of immune functions may be related to the improvements of the participants' emotional and psychosocial status.

Keywords

Emotional effects, immune effects, lung cancer, magnanimous therapy, psychosomatic effects

Introduction

Lung cancer has the highest incidence and mortality among all cancers. As a result, in recent years there have been calls for an effective and efficient approach to treatment, which combines physical and psychological techniques (Chang et al., 2012; Ferlay et al., 2010). Although some research indicates that cognitive behavioural therapy (CBT) appears not to be clinically effective for treatment of depression in people with advanced cancer (Lepore and Coyne, 2006; Serfaty et al., 2019), it is believed that psychological input remains an important part of the combined approach to lung cancer treatments (Huang, 2018, 2019).

Psychological distress, caused by poor prognosis, the severity of symptoms and the side-effects of treatments, has been found to be persistent in lung cancer patients throughout the clinical course of illness (Ftanou et al., 2019). For example, research shows that emotional distress is significantly correlated with poorer prognosis of cancers, including lung cancer (GBD 2015 Risk Factors Collaborators, 2016; Pozo et al., 2014). Although it has not been universally recognised, some studies (including this research) have suggested that those who develop cancer may be more likely to suppress negative emotions than those who do not (Baltrusch, 1988; Huang et al., 2009). For instance, people with a Type-C or Type-T personality, namely the Cancer- or Tumour-prone personality, are characterised by their abnormal inhibition of emotions and inability to express anger. These psychological responses to emotions have been implicated as factors that may influence the development of cancer, and depression is linked to a significantly reduced chance of survival following diagnosis (Deimling et al., 2006; Watson et al., 1999). Moreover, psychologists specialising in psychoneuro-immunology (PNI) suggest that a patient's emotional state affects their immune system. In case of cancer, it is possible that positive emotional responses may help generate specialised 'killer' cells that help control the size and spread of cancerous tumours. Conversely, negative emotions may suppress the ability of those cells to fight against tumours (Boggero and Segerstrom, 2016; Evans et al., 2000; Schedlowski, 1999).

Thus, reducing levels of depression and encouraging expression of suppressed negative emotions (e.g. anger, worry, fear and anxiety) may improve immune function and increase chances of survival. Liu (2010) and Lu et al.'s (2012) studies on the psychological characteristics of long-term cancer survivors with sound psychological, physical and social quality of life found that these survivors had some common psychological characteristics. These characteristics included being or becoming magnanimous and open-minded; having a good mental health status and lower cancer- or tumour-prone personality level; being able to accept reality and to think positively and properly about the disease state; and being optimistic and peaceful. In their later studies on the cancer survivors, Huang (2019) employed magnanimous therapy (MT) to help the cancer survivors achieve high magnanimous mental status so as to more effectively cope with depressive symptoms and reduce suppressed negative emotions.

As a new and original psychotherapy, MT focuses on helping people develop insights into and understanding of life (Huang, 2018). It helps individuals restructure their cognitive habits and modify their behavioural mode to develop traits related to being magnanimous and open-

minded, enterprising and positive, and optimistic and harmonious. The development of these traits can lead to a peaceful and relaxed state: spiritually, psychologically and physically. Clients can then apply all of these new-found traits and skills to their problem-solving in daily life. Consequently, the magnanimous psycho-behavioural mode could be instilled as a part of the clients' life (for details of underlying theoretical frameworks of MT, see Huang, 2018). Research has shown that MT is effective in improving advanced lung cancer patients' coping, adjustment and living functions. For example, a group of Chinese researchers found that both individual computer magnanimous therapy (ICMT) and group computer magnanimous therapy (GCMT) reduced lung cancer patients' anxious and depressive symptoms, increased their psychological coping and adjustment, and thus improved the quality of life for patients with breast cancer, depression and hypertension (Huang, 2019; Li, 2012; Lu, 2013; Qian, 2011; Yang et al., 2013).

However, the effects of ICMT and GCMT on the emotional, psychosomatic and immune efficacy of patients with advanced lung cancer have not yet been tested. To address the research gap, this study aims to (1) assess the emotional, psychosomatic and immune functions of ICMT and GCMT in advanced lung cancer patients; (2) compare the effects of ICMT and GCMT on the emotional, psychosomatic and immune efficacy and (3) explore the possible mechanism that produces the effect. To the authors' knowledge, this study is the first of its kind that explores the relationships.

Method

Study design

The study was approved by the Ethical Committee of Guangdong Pharmaceutical University for Clinical Medicine (Approval No.: 2013 Clinical Medicine (06)). The study was a randomised controlled study on the effects of ICMT and GCMT for depression and anxiety symptoms, psychosomatic and immune function among lung cancer patients. Patients with advanced lung cancer matched by demographics, diagnosis and types of oncotherapy were randomly assigned to either an ICMT group, a GCMT group or a control group. The ICMT and GCMT groups received ICMT or GCMT, respectively, in addition to routine oncotherapy and care, while the control group only received routine oncotherapy and care. Patients were assessed at baseline and 2 weeks later using the Psychosomatic Status Scale for Cancer Patients (PSSCP) (Chen, 2014), the Hospital Anxiety Depression Scale (HADS) (Wang, 1999a; Zigmond and Snaith, 1983) and the immune functions of IgA, IgG, IgM, natural killer (NK) cells were measured. The efficacy of ICMT and GCMT was analysed. The relationship among the changes

of immune function and the changes of PSSCP and HADS were analysed to probe the possible mechanism.

Participants

Participants were recruited from the oncology inpatient department of two teaching hospitals in Guangzhou, China, during the period from September 2014 to 2017. In total, 116 patients participated in the study.

The inclusion criteria were (1) diagnosed with advanced lung cancer (stage III or IV, with confirmed pathological diagnosis); (2) aged between 18 and 80 years; (3) personal ability to complete a questionnaire and to receive psychotherapy; (4) personal awareness of their cancer diagnosis; (5) no apparent serious intellectual impairment and mental diseases; (6) a score greater than 8 on the HADS and (7) consent to participate in the study and signed written informed consent.

Exclusion criteria were (1) pregnant or lactating women; (2) current psychosis or history of a psychotic disorder; (3) substance dependence other than nicotine; (4) other acute, severe or unstable medical illness; (5) cognition impairment (as assessed using a Mini-Mental State Examination (MMSE) score of greater than 27) and (6) currently accepting immune treatments. The MMSE test is a 30-item questionnaire that is used extensively in clinical and research settings to measure cognitive impairment (Folstein et al., 1975; Wang, 1999b). It examines functions including registration, attention and calculation, recall, language, ability to follow simple commands and orientation.

Drop-out criteria were (1) absence from the therapy sessions twice or more and (2) deterioration of health condition.

The intervention

Participants allocated to the ICMT or the GCMT groups received eight 40-minute sessions of ICMT or GCMT in 2 weeks, which is the typical duration of hospitalisation for lung cancer patients in China. Treatment was conducted by one of two trained research students using ICMT or GCMT software. For the patients, each session consisted of pre- and post-intervention assessments employing the outcome measurements and the intervention (watching a computer-based therapy presentation and receiving interpretations of the presentation from the therapist). The final component of the session consisted of the patient reviewing what had been learned from the therapy, and as homework, identifying how that learning could be applied to problem-solving in daily life. At the beginning of the next session, the therapist asked patients what they had achieved from the treatment and their personal inspirations since the previous session. Each set of CMT presentations consisted of eight short, philosophical stories depicted as an animation,

accompanied by appropriate inspirations and enlightenments that help patients to achieve a magnanimous, enterprising, optimistic, relaxing, harmonious and peaceful state. In the ICMT group, the therapist used the presentation to treat one patient at a time and focused on the patient's individual traits and problems. In the GCMT group, the presentation focused on inspiring a positive interaction effect in a group of participants facilitated by the therapist. As previously mentioned, the control group did not partake in any CMT presentations, but continued with routine oncotherapy and care.

Outcome measurements

Psychosomatic state was assessed using the PSSCP, which is a Chinese 16-item self-rating scale. The PSSCP was developed in a previous study of 515 participants measuring the psychosomatic status of cancer patients (Chen, 2014). The PSSCP includes four sub-scales: psychological (five items), somatic (four items), social (four items) and psycho-behavioural and resilience (three items). The psychological sub-scale measures psychological states such as mental burden, fear, depression and anxiety. The somatic domain screens for somatic states such as pain, nausea and poor sleep. The social domain sub-scale detects social states such as interpersonal communication and ability to work. The psycho-behavioural resilience sub-scale detects the ease of a participant to accept others' suggestions and to change their mentality. Participants registered their responses on a 5-point Likert-type scale (ranging from 1 = 'never' to 5 = 'always'). For some items, the scale has been reversed so that a lower score indicates a 'better' psychosomatic state. The scale has been deemed to have relevant content and structure validity. The criterion validity with the Functional Living Index-Cancer (FLIC) was −0.626 ($p < 0.01$). The PSSCP is a reliable instrument; the test–retest coefficients for the four dimensions and the total scores were from 0.519 to 0.717. Alpha coefficients for the internal consistency of factor scores ranged from 0.527 to 0.780. The split-half reliability for the scale was 0.793 (Chen, 2014).

Anxious and depressive symptoms were measured using the HADS. The HADS is a 14-item self-rating scale that measures anxiety and depression, and is designed specifically for patients with physical illnesses. A score equal to or greater than 11 indicates 'probable' psychological morbidity while a score of 8–10 indicates 'possible' psychological morbidity. The scale has been validated in Chinese patients (Wang, 1999: 223–226; Zigmond and Snaith, 1983).

Immune functions were examined by testing the level of IgA, IgG, IgM and NK cells (CD16+CD56+) in the patients' peripheral blood. It is considered promising to see an increase in levels of the four cell types. The patients' peripheral blood was taken before and after the interventions. IgA, IgG and IgM were assessed by an enzyme-linked immunosorbent assay (ELISA)-based assay. NK cells (CD16+CD56+) were assessed by flow cytometry (FCM). Lab personnel were blinded for treatment assignment.

Statistical analysis

Analyses were performed using the IBM SPSS Statistics software application (version 23.0: IBM, Armonk, NY, USA). Quantitative data were described as mean and standard deviation and categorical data as absolute frequencies and percentages.

Baseline demographic and clinical characteristics were tested by the chi-square test and the analysis of variance (ANOVA) to assess comparability between the groups. The statistical analyses were considered bilateral and $p < 0.05$ was considered significant.

The outcome variables and the difference value of the outcome variables for each group were compared between baseline and 2 weeks later by the ANOVA, and mixed ANOVA (between three groups and two time points) for this data. The differences of the outcome variable between baseline and 2 weeks later of each group, and the differences of the outcome variables between ICMT group and the control group, GCMT group and the control group and ICMT and GCMT groups were compared by Student–Newman–Kueuls test. Pearson correlation was employed to probe the impact factors of the changes of immune function.

Results

Comparisons for baseline characteristics of ICMT group, GCMT group and control group

Table 1 presents characteristics of the participants. There were no significant differences among the three groups on baseline demographics. Within same stage cancer patients, there were also no differences between conditions on medical variables.

Psychosomatic status, anxious and depressive symptoms

There were no statistically significant differences among the ICMT group, GCMT group and the control group at baseline for all scores of PSSCP and HADS (Table 2).

Compared with the control group, both the ICMT group and GCMT group showed significantly lower scores on all four dimensions of the PSSCP after the interventions, while the control group had significantly higher scores of somatic and social dimensions and no significant changes on other dimensions after 2 weeks.

Anxiety and depression scores measured using the HADS were reduced significantly after the interventions in both treatment groups. No significant changes in anxiety and depression were observed in the control group.

Compared with the control group, the ICMT group and GCMT group both scored significantly lower on all dimensions of PSSCP and HADS after the intervention. However, there were no significant differences between the two treatment groups by least significant difference (LSD)

pairwise comparison. The mean values of difference between baseline and 2 weeks later of PSSCP and HADS in both intervention groups were significantly greater than in the control group. However, there were no significant differences between the two treatment groups.

Immune functions: levels of IgA, IgG, IgM, NK cells

Immune function variables did not differ significantly between the study groups at baseline. The mean level of IgG cells was significantly increased in the GCMT group and significantly decreased in the control group. The mean level of NK cells (CD16+CD56+) significantly decreased in the control group. The control group had significantly lower mean levels of IgG and NK cells than the intervention groups after 2 weeks. However, there were no significant differences between the two treatment groups by LSD pairwise comparison. The mean level of IgA and IgM cells had no significant change across the three groups. The average difference between baseline and 2 weeks later of the mean level of IgG and NK cells of both intervention groups were significantly different to the control group. However, there were no significant differences between the two treatment groups (Table 3).

Immune functions and emotional, psychosomatic status

A Pearson correlation of the changes from baseline between immune functions and PSSCP and HADS scores was conducted to probe the possible mechanism behind the effect. The result showed that changes in the mean level of IgG cells was significantly correlated to the changes of psychological, somatic, social state, psycho-behavioural resilience and anxiety and depression symptoms (Table 4).

Discussion

Our study suggests that using both ICMT and GCMT for advanced lung cancer patients results in significant improvements in emotional and psychosomatic status, and also in immune functions as observed through an increase in the presence of IgG and NK cells. The analysis of all the functioning dimensions of PSSCP and HADS revealed a significant improvement in both the ICMT group and the GCMT group after the interventions, though the magnitude of the effect did not differ significantly between the two intervention conditions. IgG cell levels increased significantly 2 weeks after the intervention in the GCMT group and decreased in the control group. NK cell activity decreased significantly in the control group after 2 weeks, but there were no significant changes between the two intervention groups.

The results suggest that both ICMT and GCMT could be useful to regulate the emotional and psychosomatic adaptation process to the multiple challenges that the patients must face during cancer diagnosis and treatment. The treatments may improve patients' anxious and depressive symptoms and psychosomatic state directly, or work to trigger their understanding and insight to achieve such improvements. These results are supported by systematic reviews and meta-analyses that confirmed psychological interventions improved depression, anxiety, coping, adjustment, functional ability and quality of life (Badr et al., 2015; Graves, 2003; Osborn et al., 2006; Williams and Dale, 2006). This study advances the knowledge of a new psychotherapy, MT. MT was developed to absorb the essences of two religions, Zen and Dao in particular. It focuses on raising clients' insights into and understanding of life and restructuring their cognitive habits and modifying their behavioural mode towards becoming enterprising and optimistic, which appears to lead to a magnanimous and peaceful state of mind. It appears that MT can help patients to face and accept personal suffering (including death) peacefully, which demonstrates the advantages of MT compared with other psychotherapies.

The participants received MT every day or every other day for 2 weeks. It appears that the intensive input strengthened the effects of MT, and served as an immersive experience for the participants. The characteristics of the MT content have been designed to not only raise insights and enlightenments, but also to be entertaining, thought-provoking and interesting. For example, therapists used short stories showed in animation to make the patients to understand death as another form of life (or entering the paradise). This appeared to make participants being less scared and desperate, which led to increased emotional wellbeing. Receiving MT appeared to make patients peaceful and relaxed. Furthermore, the results of pre- and post-tests of blood pressure, heart rate and respiratory rate showed that all these physiological indexes decreased significantly after MT, which suggests that MT could help the patients become more physiologically relaxed. In their reviews at the end of each MT session, patients often reported that they learnt a great deal from MT and felt much better after receiving the therapy, and that above all the experience and effects were enjoyable. Considering this, it is not surprising that MT appears to improve depression, anxiety and psychosomatic state in a 2-week period. The statistically significant findings illustrated in this study were observed during an extensively challenging period of one's life, and after being diagnosed with one of the most severe and dangerous illnesses – advanced lung cancer. Clearly, bringing about changes in the patients' emotional state at this time when they are facing death is of immense value. This premise is supported by other studies (Badr et al., 2015; Gordon et al., 2011; Hulbert-Williams at al., 2015, Huang et al., 2019; Wahbeh et al., 2009).

Aside from the observed psychological benefits of MT, the authors were very encouraged by the observed improvement in immune functions. Although some changes between groups that emerged in the trials did not seem remarkable before analysis, they were shown to be statistically significant under the study's strict design and operation. For example, there were no observed changes in the levels of NK cells in the blood tests during a period of 2 weeks in the intervention groups, but there was a statistically significant reduction in the control group. This result implies that MT could help patients to avoid the reduction in the levels of NK cell

function. These findings are of clinical significance, and are supported by other studies (Barry et al., 2016; Takashi and Yoko, 2003). It can be speculated that psychotherapy takes effect on immune functions through psychoneuroimmune pathways (Boggero and Segerstrom, 2016; Evans et al., 2000; Schedlowski, 1999). It has been shown that psychotherapy improved mental state before it improved immune functions (Barry at al., 1988; Boggero and Segerstrom, 2016; Evans et al., 2000; Schedlowski, 1999). Our Pearson correlation analysis of the changes from baseline and 2 weeks later of the indicators for the study groups showed that the improvements of emotional and psychosomatic status may be the factors that drive the improvements of IgG and NK cell levels. In other words, positive changes of IgG and NK cell levels might be mediated by the efficacy on anxious and depressive symptoms and psychosocial status.

In their review on reviews on psychological interventions for distress in cancer patients, Lepore and Coyne (2006) suggested that the literature during the period between January 1995 and July 2005 do not provide conclusive support to the effectiveness of psychological interventions for cancer patients. However, this study makes a compelling case for the value of MT for advanced lung cancer patients. This is demonstrated in both physical and psychological outcomes of the significant improvements in the participating patients' emotional and psychosomatic status, and their immune functions resulting in an increase in the presence of IgG and NK cells.

Following the recommendations of Newell and the Revised Consort Statement (Moher et al., 2001; Newell et al., 2002), the authors have clearly detailed the procedure of this study in the 'Study design' section and have made significant efforts to control the impacts of the study, and have accounted for all patients' disposition and clinical characteristics. In addition, the authors have included up to 30 patients per treatment arm, with a follow-up period. The types of interventions and the number of sessions have been described above. The study design has passed the examinations of oncologists, statisticians, other psychologists and psychiatrists, and was considered to be scientifically rigorous.

Clinical implications

This study represents the first controlled clinical study to assess the effectiveness of ICMT and GCMT on measures of psychosomatic status, anxiety and depression symptomatology; and immune functions among advanced lung cancer patients. The study revealed that both interventions could modulate emotion arousal and mind–body–immune interactions, which is crucial in the field of oncology (Barry et al., 1988; Gordon et al., 2011; Wahbeh et al., 2009).

Study limitations

There are several limitations to this study. First, this study only showed the short-term effects of ICMT and GCMT. Further research is warranted to assess both long-term and short-term effects. Second, the mechanism of the improvements of IgG and NK cell functions for MT needs further investigation. It is unclear why MT appeared to improve the IgG and NK cell functions but not the IgA and IgM cell functions. Third, this study aimed to examine the differences between the effects of ICMT and GCMT to distinguish their applications, but no significant differences were found. It might be that there is in fact no difference, or the non-significance was caused by the small sample size of each GCMT group with three patients in each group. The effect differences between ICMT and GCMT warrant further exploration.

Conclusion

The authors have demonstrated that both ICMT and GCMT can have beneficial short-term effects on emotional, psychosomatic and immune function for advanced lung cancer patients. The improvements of immune functions may be correlated to the improvements of emotional and psychosocial status. Moreover, ICMT and GCMT seem to be equally beneficial. Following these promising results, further studies are being conducted with larger samples to better understand both the long-term and short-term biopsychosocial efficacy and mechanisms provided by ICMT and GCMT.

Acknowledgements

The author(s) thank the contribution of patients, oncologists and statisticians.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship and/or publication of this article: This research was supported by grants from the Natural Science Foundation of China (NSFC): grant no. 81372488.

Data accessibility statement

The data sets used and/or analysed during this study are available from the corresponding author upon reasonable request.

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Table 1. Baseline characteristics of study participants

Characteristic	ICMTG (n=40)	GCMTG (n=36)	CTRLG (n=40)	F/X^2	*P*
Age -yr. Mean(SD)	59.0(9.80)	57.4(11.5)	59.7(10.7)	0.433	0.649
Male Sex, n(%)	26(65.0)	24(66.7)	26(65.0)	0.031	0.985
Marital status, N (%)					
Married	35(87.5)	30(83.3)	35(87.5)	0.440	0.979
Divorced	2(5.0)	2(5.6)	2(5.0)		
Separated/Widowed	3(7.5)	4(11.1)	3(7.5)		
Education, N (%)					
Primary school	12(30.0)	6(16.7)	7(17.5)	4.998	0.544
Secondary school	11(27.5)	8(22.2)	7(17.5)		
High school/Technical school	12(30.0)	16(44.4)	19(47.5)		
University degree or higher	5(12.5)	6(16.7)	7(17.5)		
Occupation, N (%)					
Peasant	9(22.5)	10(27.8)	8(20.0)	3.290	0.915
Workers	6(15.0)	6(16.7)	7(17.5)		
Staff	9(22.5)	6(16.7)	7(17.5)		
Self-employed	6(15.0)	2(5.6)	6(15.0)		
Others	10(25.0)	12(33.3)	12(30.0)		
Pathological diagnosis, N (%)					
Squamous cell carcinoma	10(25.0)	8(22.2)	9(22.5)	3.764	0.709
Adenocarcinoma	22(55.0)	19(52.8)	21(52.5)		
Adenosquamous cell carcinoma	4(10.0)	1(2.8)	2(5.0)		
Small cell carcinoma	4(10.0)	8(22.2)	8(20.0)		
Stage of cancer, N (%)					
III	14(35.0)	12(33.3)	14(35.0)	0.031	0.985

IV	26(65.0)	24(66.7)	26(65.0)		
Type of treatment					
Chemotherapy	12(30.0)	16(44.4)	18(45.0)	8.841	0.065
Radiotherapy	10(25.0)	3(8.3)	4(10.0)		
Combined therapy	18(45.0)	17(47.2)	18(45.0)		

Table 2 Means and standard deviations of PSSCP and HADS at baseline and post-intervention compared with the 3 groups

			ICMTG(n=40)	GCMTG(n=36)	CTRLG(n=40)	F	*P*
PSSCP	Psycho-logical	Baseline	9.55(2.26)	9.61(2.02)	9.55(1.65)	0.012	0.988
		2 Weeks later	8.20(1.59)	8.06(1.47)	9.68(1.73)	12.195	**<0.001**
		t	3.857	3.877	-0.392	-	-
		P	**<0.001**	**<0.001**	0.697	-	-
		$\overline{d}$ ±s (Change from baseline)	1.35(2.21)	1.56(2.41)	-0.13(2.02)	6.709	**0.002**
	Somatic	Baseline	8.48(1.96)	8.53(2.02)	8.48(1.69)	0.010	0.990
		2 Weeks later	7.68(1.35)	7.81(1.12)	9.05(1.26)	14.585	**<0.001**
		t	2.667	2.032	-2.129	-	-
		P	**0.011**	**0.049**	**0.040**	-	-
		$\overline{d}$ ±s (Change from baseline)	0.80(1.90)	0.72(2.13)	-0.58(1.71)	6.429	**0.002**
	Social	Baseline	9.93(2.32)	10.64(2.47)	10.63(2.08)	1.244	0.292
		2 Weeks later	9.23(2.01)	9.08(1.87)	11.33(2.00)	15.980	**<0.001**
		t	2.070	2.991	-2.585	-	-
		P	**0.045**	**0.005**	**0.014**	-	-
		$\overline{d}$ ±s (Change from baseline)	0.70 (2.14)	1.56(3.12)	-0.70(1.71)	8.852	**<0.001**
	Psycho-beha-vioral resi-lience	Baseline	8.90(2.06)	9.33(1.94)	9.30(2.07)	0.554	0.576
		2 Weeks later	8.10(2.38)	8.03(2.44)	9.55(1.96)	5.629	**0.005**
		t	2.210	2.366	-0.855	-	-
		P	**0.033**	**0.024**	0.398	-	-
		$\overline{d}$ ±s (Change from baseline)	0.80(2.29)	1.31(3.31)	-0.25(1.85)	3.791	**0.025**
HADS	A Score	Baseline	6.65(2.50)	6.69(2.12)	6.75(2.31)	0.019	0.982
		2 Weeks later	5.20(1.84)	5.19(1.47)	6.90(2.13)	11.131	**<0.001**
		t	7.164	3.631	-0.488	-	-

	P	**<0.001**	**<0.001**	0.628	-	-
	$\overline{d}$ ±s (Change from baseline)	1.45(1.28)	1.50(2.48)	-0.15(1.94)	9.170	**<0.001**
D Score	Baseline	9.13(2.53)	9.50(2.49)	10.08(2.15)	1.595	0.207
	2 Weeks later	6.93(2.30)	7.11(2.31)	10.53(2.20)	31.424	**<0.001**
	t	9.242	4.280 **<0.001**	-1.442	-	-
	P	**<0.001**		0.157	-	-
	$\overline{d}$ ±s (Change from baseline)	2.20(1.51)	2.39(3.35)	-0.45(1.97)	17.619	**<0.001**
Global Score	Baseline	15.78(4.14)	16.19(3.31)	16.83(3.37)	0.844	0.433
	2 Weeks later	12.13(3.39)	12.31(3.05)	17.43(3.01)	35.730	**<0.001**
	t	10.429	5.022	-1.257	-	-
	P	**<0.001**	**<0.001**	0.216	-	-
	$\overline{d}$ ±s (Change from baseline)	3.65(2.21)	3.89(4.65)	-0.60(3.02)	21.693	**<0.001**

$\overline{d}$ ±s (2wsL-B): the means of difference between baseline and 2 weeks later and deviations.

Table 3. Means and standard deviations of the level of immune functions at baseline and post-intervention compared with the 3 groups

		ICMTG(n=40)	GCMTG(n=36)	CTRLG(n=40)	F	*P*
IgA	Baseline	2.84(1.13)	2.63(1.16)	2.57(0.95)	0.717	0.491
	2 Weeks later	2.79 (1.16)	3.02(1.49)	2.58(1.20)	1.068	0.347
	t	0.613	-1.232	-0.180	-	-
	P	0.543	0.226	0.858	-	-
	$\overline{d}$ ±s (Change from baseline)	-	-	-	-	-
IgG	Baseline	11.58(3.63)	11.35(2.21)	12.86(3.49)	2.502	0.086
	2 Weeks later	11.12(4.32)	13.59(4.23)	11.73(3.54)	3.762	**0.026**
	t	0.336	2.877	3.071	-	-
	P	0.739	**0.007**	**0.004**	-	-
	$\overline{d}$ ±s (Change from baseline)	0.13(2.38)	-2.23(4.66)	1.12(2.32)	10.595	**<0.001**
IgM	Baseline	0.99(0.66)	1.24(0.63)	1.05(0.63)	1.561	0.214
	2 Weeks later	0.97(0.67)	1.27(0.92)	0.94(0.54)	2.294	0.106
	t	0.346	-0.137	1.428	-	-
	P	0.731	0.892	0.161	-	-
	$\overline{d}$ ±s (Change from baseline)	-	-	-	-	-
NK cell	Baseline	16.78(10.44)	13.71(7.74)	17.96(7.83)	2.333	0.102
	2 Weeks later	19.21(10.73)	15.04(6.80)	15.06(7.18)	3.149	**0.047**
	t	-1.900	-0.993	2.395	-	-
	P	0.065	0.327	**0.022**	-	-
	$\overline{d}$ ±s (Change from baseline)	-2.43(8.09)	-1.33(8.06)	2.90(7.67)	5.004	**0.008**

Table 4 Pearson correlation between the changes of immune functions and emotional, psychosomatic status

			IgA	IgG	IgM	NK
PSSCP	Psychological	Pearson correlation	0.006	0.307	-0.173	0.014
		P	0.929	**0.007**	0.080	0.827
	Somatic	Pearson correlation	-0.061	-0.168	-0.040	0.084
		P	0.356	**0.010**	0.546	0.203
	Social	Pearson correlation	0.031	0.327	-0.003	-0.007
		P	0.642	**0.004**	0.961	0.920
	Psycho-behavioral resilience	Pearson correlation	-0.013	-0.132	-0.013	0.049
		P	0.845	**0.044**	0.841	0.462
HADS	A Score	Pearson correlation	-0.100	0.276	-0.071	0.146
		P	0.128	**0.016**	0.282	**0.026**
	D Score	Pearson correlation	0.015	0.270	-0.056	0.036
		P	0.825	**0.018**	0.393	0.586