

EFFECT OF MUSIC THERAPY INTERVENTION ON PHYSICAL FUNCTIONS AND MENTAL HEALTH OF PATIENTS WITH ANKYLOSING SPONDYLITIS

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received: 17.4.2020;

revised: 21.8.2020;

accepted: 31.8.2020

SUMMARY

Background: This study aims to investigate the influence of traditional Chinese music on the physical and psychological functions of hospitalized patients with ankylosing spondylitis (AS).

Subjects and methods: A total of 120 patients with AS admitted to the People's Hospital of Anhui Province between March 2018 and March 2019 were randomly divided into experiment and control groups. The experiment group was a traditional music group composed of 56 patients, namely, 50 males and 6 females. The control group was further divided into a painting group and a routine treatment group with a total of 64 patients, namely, 48 males and 16 females. The physical and psychological functions of each group of patients before and after the intervention were assessed in terms of physical and psychological function dimensions obtained before and after the intervention.

Results: After 8 weeks of treatment, the score in terms of physical functions is the highest in the music group ($P < 0.05$), and the difference in eating functions is statistically significant ($P < 0.001$). This finding suggests that the music group is better than the painting group and the routine treatment group ($P < 0.05$). In terms of the score in sexual functions, the following trend is observed: music group > painting group > routine treatment group. The difference in their psychological functions is statistically significant ($P < 0.001$). In terms of the score in psychological functions, the following trend is obtained: music group > painting group > routine treatment group. The three groups significantly differ in their scores in mental tension, negative emotion, positive emotion, cognitive functions, and self-esteem. All of these dimensions show the following pattern: music group > painting group > routine treatment group. Cross-group comparisons between the three groups are also statistically significant ($P < 0.05$).

Conclusions: Traditional Chinese music therapy and painting therapy can promote the recovery of patients' physical and psychological functions. Traditional Chinese music intervention therapy is better than painting therapy and routine hospitalization in promoting the recovery of physical and psychological functions of hospitalized patients.

Key words: mental health - music therapy - ankylosing spondylitis - physical functions

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INTRODUCTION

Ankylosing spondylitis (AS) is a chronic and progressive rheumatic disease characterized by inflammation, especially sacroiliitis (Kjeken et al. 2013). The main clinical features of AS are inflammatory back pain, joint stiffness, and fatigue, which are not easily relieved. These symptoms often lead to structural and functional impairment in the general health and physical functions of an individual (Dundar et al. 2014, Zagar et al. 2019). Hakkou et al. (2013) determined that this disease occurs mostly in young males aged 20–30 years. For males in adolescence, the decline and loss of physical functions cause various health problems, such as insomnia and anxiety. Yılmaz et al. (2013) considered that AS also affects the mental health of patients and reduce their sense of well-being. Wu et al. (2017) revealed that the decline in the mental health level negatively affects the physical health and recovery of patients with AS. Therefore, to improve the physical functions and mental health of patients with AS, clinical psychologists proposed different intervention methods from various theoretical perspectives. In general, medication intervention, psychological counseling interven-

tion, and other approaches have been developed. Medication intervention often improves a patient's mental health through a particular treatment. For psychotherapy intervention, O'Dwyer et al. (2017) increased the motivation and frequency of the participation of patients with AS in physical exercise through a one-to-one semi-structured consultation, thereby reducing their anxiety and depression levels. From the perspective of intervention implementation, a family-based intervention and another intervention that focuses on patients' self-management have been established (Spencer et al. 2015).

Music intervention has been used extensively in clinical applications, and related studies have shown that music intervention works efficiently in reducing the degree of pain (Bradt et al. 2016), trait anxiety (Lee et al. 2017), and depression in patients (Fancourt et al. 2016). Garza-Villarreal et al. (2017) emphasized that music is a non-aggressive and low-cost intervention easily accepted by patients. They conducted a meta-analysis on 768 articles on the relationship of music with the physical and mental health of patients with chronic pain. Their results show that music can alleviate chronic pain and depression, especially those observed in patients who actively choose music intervention.

Although the effect of music intervention on chronic pain diseases has been confirmed, related intervention studies have not included AS, a typical chronic pain disease. In China, although many discussions and studies on the effect of music therapy on alleviating the physiological pain of patients with cancer or other patient groups (Xue et al. 2017, Zeng et al. 2015), cases in which music therapy is applied to patients with AS have yet to be presented. Based on previous studies, music intervention therapy for the physical functions and mental health of patients with AS is innovatively used in the present study to expand the application of music intervention. The combination of music intervention and other psychological behavioral interventions can further enrich the intervention for patients with AS, providing reference methods and detailed criteria for other researchers and clinical psychologists.

SUBJECTS AND METHODS

Participants

A total of 120 patients with AS admitted to the People's Hospital of Anhui Province between March 2018 and March 2019 were randomly divided into two groups. The experiment group (music intervention) comprised 56 patients, namely, 50 males and 6 females, aged 18–42 years with an average age of 26.6±4.5 years. Their disease duration ranged from 3 months to 15 years with an average of 4.6±0.7 years. The control group included 64 patients, namely, 48 males and 16 females, aged 17–41 years with an average age of 25.3±5.2 years. Their disease duration ranged from 3 months to 16 years with an average of 4.7±0.2 years. The control group was further divided into a routine treatment group and a painting group. The two groups did not significantly differ in the following clinical data: gender, age, and disease duration ($P>0.05$). This observation suggested that they were comparable. The details are shown in Table 1.

One-way ANOVA shows no significant difference in age between the groups ($F=0.606$, $P=0.547>0.05$). Chi-square test indicates no statistically significant difference in gender distribution between the three groups ($2=4.888$, $P=0.106>0.05$). Kruskal–Wallis H test reveals no significant difference in the distribution of disease duration between the three groups ($2=0.539$, $P=0.764$). The general information of the three groups is comparable.

Methods

The routine treatment group was given 15 mg of oral meloxicam tablets twice daily before bedtime. Meloxicam was supplemented by routine psychological intervention and counseling in the hospital. After the patients were discharged, the patients followed routine discharge instructions and were tracked weekly to know their recovery.

The painting group started painting practice within the 1st week in accordance with routine treatment in the hospital and continued to receive routine treatment in the hospital. The patients who participated in painting therapy were grouped with no more than 10 members in each group and received painting therapy four times a week. The treatment lasted 60 minutes in each time. Group treatment and individual guidance were combined. Painting activities were conducted in a clean, quiet, and bright painting room. The patients learned painting and calligraphy in accordance with copybooks and painting tutorials. The investigators first observed, guided, and inspired the patients to innovate. They then displayed the patients' finished works in the painting room. Then, the investigators and the patients participated in the evaluation of outstanding works and gave rewards. A telephone follow-up was conducted once a week after discharge to trace the patients' insistence on painting intervention.

Traditional Chinese music intervention was conducted in the experiment group based on the control group. A number of traditional Chinese music songs, namely, "Spring is coming," "Beaming with joy," "Ah, no worries," and "Making progress," were selected to develop personalized music packages suitable for the patients in accordance with the patients' physical and psychological symptoms. Personalized music packages are developed in accordance with the categories of traditional Chinese music. According to 4 categories of traditional Chinese music, they are divided into 4 types of music packages, that is, court music package, poet music package, religious music package and folk music package respectively. The selection criterion of music is recommended by www.9ku.com, a relatively authoritative platform in China. The music package was placed in the patient's phone. The music therapy was provided to the patients throughout the whole hospitalization process. The nurse-in-charge guided the patient to listen for 30 minutes in the morning and before going to bed.

Table 1. Cross-group comparison of general data

Factor	Control group		Music group	F/ χ^2	P
	Routine treatment group	Painting group			
Gender				4.888	0.106
Male	23 (71.88%)	25 (78.13%)	50 (89.29%)		
Female	9 (28.13%)	7 (21.88%)	6 (10.71%)		
Age	25.16±5.66	26.28±5.34	26.36±4.77	0.606	0.547
Disease duration	4.81±3.4	4.5±3.23	5.06±3.57		
Median duration	3.5 (2-7)	3.5 (2-5.5)	4 (3-7)	0.539	0.764

Depending on personal preference, the patient could also listen at any time, and the course of treatment lasted 10 days. The treatment volume is 20–40 dB. Similarly, the connotation and background of the music were introduced during the treatment process, and the patient was guided into the artistic conception to increase the effect. Every week, the nurse communicated with the patient once, encouraged the patient to express inner feelings, positively evaluated each practice result, focused on the practice of collective positive psychology, and conducted a telephone follow-up every week after discharge to check whether the patient adhered to music intervention. The patients were tested through GQO-LI-74 before and after eight courses of treatment to evaluate the intervention effect on their physical and psychological functions.

Diagnostic criteria

Our diagnostic criteria were based on Clinical Diagnosis and Treatment Guide proposed by the Chinese Medical Association for the diagnosis of AS.

Inclusion criteria and exclusion criteria

The following inclusion criteria were considered:

- patients with diagnosed AS;
- patients with clear consciousness and without disturbance to participate in the investigation;
- patients who were willing to participate in this study and given informed consent;
- patients with a certain level of education;
- patients who knew and understood the content of traditional Chinese music therapy (which originated from the long-standing traditional culture background of China, and the unique traditional Chinese culture gave birth to the unique traditional music.

It was handed down over time, rather than created contemporarily. The traditional Chinese music therapy in this study is to assist patients in selecting music packages that they are interested in and give music interventions by means of listening) and were willing to cooperate. The following exclusion criteria were considered:

- patients with severe hearing or mental retardation and were unwilling to receive treatment or observation;
- patients with mental disorder or were unable to cooperate with the researcher.

Measures

Generic Quality of Life Inventory (GQO-LI-74) (Chen et al. 2007) was used in this study. This inventory consists of 20 factors with 74 items, and each item is quantified from very poor (1 point) to very good (5 points). Each factor is scored a maximum of 20 points and a minimum of 4 points. In particular, the physical and psychological functions in the inventory consist of sleep and energy, physical discomfort, and sensory functions; the higher the scores in eating functions, psychological functions, physical functions, sexual functions or

exercise, and sensory functions are, the better the recovery of physical and psychological functions is. The test–retest reliability of the inventory is 0.84–0.93, and the internal consistency reliability is 0.66–0.69. The inventory has good content validity, construct validity, and criterion validity.

Statistical Analysis

Data were statistically analyzed using SPSS 24.0. Mean \pm standard deviation was used to describe the distribution of normal distribution quantitative data. One-way ANOVA was performed to compare differences between groups. LSD-t was conducted to compare the two groups when the overall difference was significant. Median and quartile were used to describe the distribution of non-normal distribution quantitative data. Kruskal–Wallis H test was carried out to compare the differences between the groups. Frequency and composition ratio were determined to describe the distribution of qualitative data. Chi-square test was employed to compare the differences between the groups. All of the tests in this study were two sided, and results were considered statistically significant at $P < 0.05$.

RESULTS

Comparison of physical and psychological functions between groups before enrollment

In Table 2, no statistically significant differences in physical and psychological functions are observed between the three groups before enrollment ($P > 0.05$). No statistically significant differences in physical functions are found between the three groups ($F = 0.874$, $P = 0.420$). Similarly, the groups do not significantly differ in terms of sleep and energy, physical discomfort, eating functions, sexual functions, exercise, and sensory functions (the corresponding F is 0.072, 1.010, 0.031, 1.242, and 0.058, respectively. Their corresponding P values are 0.931, 0.367, 0.970, 0.293, and 0.944, respectively, which are > 0.05). The psychological functions between the three groups do not significantly differ ($F = 0.755$, $P = 0.472$). The groups do not also significantly vary in terms of mental tension, negative emotion, positive emotion, cognitive functions, and self-esteem (their corresponding F values are 0.436, 0.503, 0.272, 1.645, and 0.302, respectively; their corresponding P values are 0.648, 0.606, 0.762, 0.197, and 0.740, respectively, which are > 0.05). Hence, the physical and psychological functions of the three groups are comparable before enrollment.

Comparison of physical and psychological functions between groups after 8 weeks of treatment

Tables 3 and 4 show that the difference in physical functions between the three groups is statistically significant after 8 weeks of treatment ($F = 164.071$, $P < 0.001$).

Table 2. Comparison of physical and psychological functions between groups before enrollment

Dimension	Routine treatment group	Painting group	Music group	F	P
Physical functions	36.48±6.14	36.56±5.79	34.46±6.13	1.734	0.181
Sleep and energy	9.63±2.59	9.41±2.2	9.57±2.49	0.072	0.931
Physical discomfort	9.72±2.37	10.16±2.4	9.45±2.1	1.010	0.367
Eating functions	10.09±2.9	10.03±2.75	9.95±2.65	0.031	0.970
Sexual functions	8.81±1.89	8.88±2.3	7.75±2.25	3.787	0.025
Exercise and sensory functions	10.94±2.03	10.78±1.64	10.86±1.82	0.058	0.944
Psychological functions	31.88±5.33	31.33±4.88	30.56±4.81	0.755	0.472
Mental tension	8±1.63	8.28±1.73	7.95±1.63	0.436	0.648
Negative emotion	8.19±1.73	7.81±1.67	8.16±1.77	0.503	0.606
Positive emotion	8.81±2.19	8.44±1.29	8.61±2.28	0.272	0.762
Cognitive functions	10.38±1.96	10.09±2.08	9.63±1.83	1.645	0.197
Self-esteem	10.13±2.15	10.44±1.97	10.11±1.98	0.302	0.740

Table 3. Comparison of physical and psychological functions between groups after 8 weeks of treatment

Dimension	Routine treatment group	Painting group	Music group	F	P
Physical functions	45.66±5.01	58.87±6.04	68.82±6.04	164.071	<0.001
Sleep and energy	11.63±2.41	14.44±2.2	16.59±1.99	53.979	<0.001
Physical discomfort	10.5±2.05	12.34±1.84	14.61±2.42	37.567	<0.001
Eating functions	13.78±2.43	14.88±2.32	16.21±2.46	10.718	<0.001
Sexual functions	8.66±1.66	10.16±2.03	11.21±1.59	22.155	<0.001
Exercise and sensory functions	11.97±1.79	15.28±1.63	16.43±1.57	75.684	<0.001
Psychological functions	41.29±7.13	60.98±6.39	69.02±4.62	229.535	<0.001
Mental tension	10.34±2.16	13.53±1.68	14.89±1.84	59.182	<0.001
Negative emotion	10.75±1.92	13.81±1.86	14.79±1.52	56.668	<0.001
Positive emotion	10.06±2.2	14.28±2.54	15.39±1.79	66.170	<0.001
Cognitive functions	11.31±2.05	14.56±2.03	15.63±1.7	53.858	<0.001
Self-esteem	10.56±1.9	12.59±2.42	14.52±1.94	37.955	<0.001

Table 4. Comparison of physical and psychological functions between the two groups after 8 weeks of treatment

Dimension	P of comparison between two groups		
	Routine treatment group vs painting group	Routine treatment group vs music group	Painting group vs music group
Physical functions	<0.001	<0.001	<0.001
Sleep and energy	<0.001	<0.001	<0.001
Physical discomfort	0.001	<0.001	<0.001
Eating functions	0.073	<0.001	0.014
Sexual functions	0.001	<0.001	0.007
Exercise and sensory functions	<0.001	<0.001	0.002
Psychological functions	<0.001	<0.001	<0.001
Mental tension	<0.001	<0.001	0.002
Negative emotion	<0.001	<0.001	0.012
Positive emotion	<0.001	<0.001	0.020
Cognitive functions	<0.001	<0.001	0.012
Self-esteem	<0.001	<0.001	<0.001

In terms of the score in physical functions, the following trend is observed: music group > painting group > routine treatment group. No statistically significant difference is found between the two groups (P<0.05). The difference in sleep and energy between the three groups is statistically significant (F=53.979, P<0.001). In terms of

the score in sleep and energy, the following trend is observed: music group > painting group > routine treatment group (P<0.05 in the comparison between the two groups). The difference in physical discomfort between the three groups is statistically significant (F=37.567, P<0.001).

The best scores are detected in the music group, followed by the painting group and then the routine treatment group ($P < 0.05$ in comparison between the two groups). The difference in eating functions between the three groups is statistically significant ($F = 10.718$, $P < 0.001$). In terms of the score in eating function, the following trend is observed: music group > painting group > routine treatment group. The comparison between the two groups shows no statistically significant difference between the routine treatment group and the painting group ($P = 0.073$), whereas the music group is better than the painting group and the routine treatment group ($P < 0.05$). The difference in sexual functions between the three groups is statistically significant ($F = 22.155$, $P < 0.05$). In terms of the score in sexual functions, the following trend is observed: music group > painting group > routine treatment group ($P < 0.05$ in the comparison between the two groups). The difference in exercise and sensory functions between the three groups is statistically significant ($F = 75.684$, $P < 0.001$). In terms of the score in exercise and sensory functions, the following trend is observed: music group > painting group > routine treatment group ($P < 0.05$ in the comparison between the two groups). The difference in psychological functions between the three groups is statistically significant ($F = 229.535$, $P < 0.001$). In terms of the score in psychological functions, the following trend is obtained: music group > painting group > routine treatment group. The two groups significantly differ ($P < 0.05$). The three groups significantly vary in terms of the factors, such as mental tension, negative emotion, positive emotion, cognitive functions, and self-esteem. The corresponding F values are 59.182, 56.668, 66.170, 53.858 and 37.955, respectively ($P < 0.001$ in all cases). In all of the factors, the following trend is detected: music group > painting group > routine treatment group. The two groups significantly differ ($P < 0.05$).

DISCUSSION

The experiment group and the control group do not significantly vary before intervention in terms of the recovery effect or the mental health level. After 8 weeks of intervention, the recovery and quality of life are significantly improved in the painting group and the music group based on routine treatment therapy compared with the pre-intervention level and the routine treatment group. Thus, music therapy and painting therapy have a good effect on promoting the recovery and quality of life of patients with AS.

First, music therapy can promote the recovery and quality of life of patients AS. The result is consistent with the finding of Zhang et al. (2018), who used the Chinese five-element music therapy to improve the mental health of patients with advanced malignant tumors. Therefore, music therapy improves the mental health level of patients to a certain extent. Music therapy can improve the physical and mental health of

patients possibly because of the following paths. First, music therapy can affect patients' emotions (Koelsch 2015). Musical melody can influence people's emotions, which are key factors influencing individuals' cognition, decision-making, and actions (Koelsch 2018). Music can influence individuals' cognitive evaluation process. Those who are exposed to positive music are more positive about things. For patients, listening to positive music can increase their attention to the positive aspects of things, thus improving their confidence in recovery (Hou 2017). Similarly, positive and enjoyable music can also help reduce individuals' negative experiences of diseases, such as fear, worry, and fear (Carlson et al. 2015). Second, music therapy can influence patients' psychology (Gallego & Garcia 2017). Positive music may create an emotional infection that improves patients' ability to work and remember, and studies have shown that emotion-related memory has a long-lasting effect on individuals (Tumuluri et al. 2017). Third, music therapy can also directly promote individuals' behaviors. According to the Heath Action Process Approach (HAPA) model, positive music enhances the individual's self-efficacy in implementing healthy behaviors, whereas self-efficacy increases and directly affects the internal impetus that produces healthy behaviors (Ghetti 2011).

Second, painting therapy can promote the physical and mental health level of patients to some extent. The result is consistent with those obtained by Zhao et al. (2011), who used painting therapy and yoga therapy for patients with schizophrenia. Painting therapy is better than routine treatment in improving the patients' quality of life. The present result is consistent with previous studies on art therapy (Van Lith 2016). Freud's catharsis theory believes that individuals can only maintain their mental health by excreting negative emotions, such as internal pain and dissatisfaction, whereas painting is the way people express themselves. People use painting to express inner feelings and cognition, thereby venting negative feelings and improving mental health; correspondingly, mental health also positively affects physical health. Thus, painting therapy can also improve the physical and mental health levels of patients to some extent (Yang et al. 2017, Li & Ren 2019).

According to the results of this study, after 8 weeks of intervention, the physical functions of the objects in the music group and the painting group are improved compared with those of the routine treatment group. However, the comparison results show that the physical functions of the music group are significantly higher than those of the painting group. Hence, music therapy has the best intervention effect on the recovery of the physical functions of patients with AS. Specifically, first, music therapy has the best effect on the intervention for the sleep and energy of patients with AS. The result is consistent with the conclusion drawn by Wang et al. (2014), who stated that music therapy positively affects patients with severe and

chronic insomnia. Our finding is also consistent with the meta-analysis results obtained by De Niet et al. (2009), who determined that music-related relaxation activities can improve sleep quality. Relaxing music can activate the processing in the corresponding areas of the brain, thereby changing individuals' cognitive and emotional experiences, whereas positive emotions are good medicines that help patients fall asleep quickly (Thompson 2015). Second, music therapy reduces the physical discomfort of patients with AS to the greatest degree. This result is consistent with the finding of Wu (2017). Wu (2017) also divided 27 college students into two groups: routine intervention and music therapy intervention. Their results show that the relaxation of the group subjected to music therapy intervention is significantly improved, and pain is significantly reduced. Kekecs et al. (2013) proposed in their meta-analysis that music therapy is a positive way to reduce physical discomfort possibly because individuals immersed in music pay less attention to physical discomfort. Third, music therapy has the best intervention effect on the feeding functions of patients with AS. This result is consistent with the findings of Loewy et al. (2013), who used music to treat a patient with anorexia nervosa, effectively reducing the patient's clinical symptoms. Music therapy can promote the satisfaction of patients' basic psychological needs. In particular, patients improve the satisfaction of their needs for independence, belonging, and competence during music therapy process, thus reducing psychological stress and alleviating eating difficulties (Bibb et al. 2015). Fourth, music therapy has the best effect on improving the sexual functions of patients with AS. Robarts (2003) used music therapy as intervention for a child who is a survivor of early trauma and sexual abuse, and the effect is quite clear, confirming the result of the present study to some extent. Finally, music therapy has a better effect than the two other interventions on the exercise and sensory functions of patients with AS. Schneider et al. (2010) conducted a recovery training for patients with stroke and found that the recovery training effect of music therapy is better than that of functional exercise training.

After 8 weeks of intervention, the music group has a better effect on the recovery of psychological functions than the painting group, although the effect on the recovery of psychological functions in the music and painting groups is significantly better than the routine treatment group. In particular, music therapy has the best effect on the relief of mental tension and negative emotions caused by AS. This result is consistent with the finding of Tseng et al. (2016), who conducted a meta-analysis of related studies on the use of music therapy to treat patients with schizophrenia. They identified that supporting music therapy is more effective than routine treatment for patients with schizophrenia, especially in reducing patients' negative emotions. Garrido (2015) revealed that even listening to sad music can significantly reduce tension. This

finding may be associated with the ability of music to stimulate individuals' adjustment strategy on non-adaptive emotions. Under the influence of negative music, an individual initiates a strategy of enhancing positive emotions to reduce the perception of negative emotions, thereby achieving the purpose of self-protection. Pérez Lloret et al. (2014) explored the relationship between different music types and automated nervous systems and found that individuals who listen to classical music and romantic music have no significant difference in heart rate variability, whereas listening to the music of the new era leads to a significant reduction in heart rate variability. Hence, the impact of music on tension can be achieved by reducing heart rate variability. Second, music therapy has the best effect on improving the positive emotion, cognitive functions, and self-esteem of patients with AS. This result is consistent with the finding of Costa-Giomi (2015), who found that childhood music intervention training has a long-term effect on individuals' intelligence and general cognitive ability. Chen (2016) used the random intervention group (music group) and the control group (routine treatment group) to perform three measurements before, during, and after the intervention. The results show that during the intervention and after the intervention, the self-efficacy of the participants in the music group is significantly improved. Some studies have found that the combination of reasonable emotional therapy and music therapy has a better intervention effect on improving college students' self-esteem and psychological flexibility.

CONCLUSION

A total of 120 patients with AS were randomly divided into the routine treatment group, the painting group, and the music group for 8 weeks of intervention. The intervention effect of music therapy and painting is better than that of routine treatment on patients with AS, and music therapy has the best effect on patients' physical and psychological functions. This finding suggests that music therapy can be applied to provide intervention for patients with AS and to enhance the clinical effect on physical functions and psychological functions. It can also be used as an important auxiliary treatment. The results of this study provide a basis for promoting the clinical application of music therapy. First, music therapy can be used to improve intervention for the physical and mental health of patients with AS. However, its internal mechanism has yet to be explored. Therefore, the clinical application of music therapy can be further enhanced to develop targeted intervention. Second, music therapy is an operative and convenient way that can be combined with other therapies to enhance clinical applications. Third, the correct understanding of music therapy should be enhanced, especially among clinical medical staff, to improve the clinical application of music therapy.

Acknowledgements:

This work was supported by Higher Education Quality Project of Anhui Province (2018jyxm0606) and 2019 Quality Engineering Project of Suzhou University (AHSKLW2014D01).

Conflict of interest: None to declare.

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