

# The aesthetics of Gannan Hakka architecture in modern housing: A design psychology perspective



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The rapid acceleration of societal change has subjected contemporary individuals to prolonged periods of diverse pressures, leading to substantial psychological strain, resulting in anxiety, depression, and compromised mental well-being. Within this context, the home has evolved into a vital refuge for modern individuals, offering both physical and psychological respite. Through experimental intervention, this study examines two distinct residential groups: those adhering to traditional housing and those residing in characteristic folk houses, specifically Gannan Hakka architecture. Analysing the psychological state of contemporary individuals and integrating Gannan Hakka architectural elements into folk house design through a psychologically informed approach, this research aims to enhance residents' aesthetic experiences and alleviate psychological distress. The study involved 120 volunteers with varying psychological stress levels, categorised into characteristic and traditional folk house groups. Psychological assessments evaluated stress, self-efficacy, and quality of life. Findings reveal significantly improved psychological well-being, self-efficacy, and quality of life among the characteristic residential group, affirming the benefits of Gannan Hakka architecture integration. This research underscores the importance of addressing modern individuals' environmental needs and proposes the integration of Gannan Hakka cultural elements into residential design to enhance well-being.

**Contribution:** This study demonstrates the application of Hakka culture in contemporary housing profoundly influences residents' lives, enabling both relaxation and a deeper cultural connection. This integration facilitates a comprehensive understanding of Hakka culture, promoting its preservation. Notably recognised for hospitality and diligence, Hakka culture enhances individuals' appreciation of tradition, fostering physical and mental rejuvenation. These findings offer valuable insights for practical theology scholars and practitioners exploring the impact of religious aspects on modern residential design from a psychological perspective.

**Keywords:** design psychology; resident; residential design; Gannan Hakka; architectural aesthetics.

## Introduction

The overall pace of society is accelerating, resulting in modern people being under various pressures for a long time, with great psychological pressure, resulting in anxiety and depression and worrying mental health. The study analysed the psychological stress of modern people and obtained six factors that led to modern people suffering from psychological diseases, including work pressure, emotional and family pressure, network dependence psychology, learning pressure, social development adaptation pressure and economic pressure (Yang & Department 2019). Among them, work pressure refers to that the pace of life and work of modern people are constantly accelerating, which is very obvious in urban white-collar groups (Schandert et al. 2021). Most white-collar groups are in a high-tension working state for a long time and lack of practice to adjust their body, spirit and psychology. In this case, many white-collar workers have negative symptoms such as anxiety, irritability and depression (Roberts et al. 2021). Maintaining a high-tension mental state for a long time will lead to physical dysfunction and various physical and mental diseases, which is also one of the important reasons for the frequent occurrence of mental diseases and psychological disorders in modern people (King et al. 2022). Emotional and family stress refer to the increasing frequency of emotional problems, marriage problems and family problems in contemporary society, and the resulting psychological problems also increase dramatically (Malyshev et al. 2020).

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Take love as an example. When you encounter love, you will experience an extremely painful emotional experience. You will feel sad because of your nostalgia, and there will be a serious psychological imbalance. As a result, many people suffer from psychological disorders and a series of psychological diseases, which have a very negative impact on their own health (Sindermann et al. 2020). Marriage is the foundation of a family. However, in modern society, because of the change of ideas, the divorce rate in China has increased year by year. In a survey, more than 70% of the people believed that the breakdown of marriage would cause psychological stress to themselves and harm their mental health (Cengiz et al. 2019). This can fully explain that marriage changes will bring greater psychological pressure to modern people. Network dependence psychology refers to: for teenagers, their mental intelligence is not mature, their self-control is low and their dependence on the network is extremely serious. A considerable number of teenagers show strong interest in the Internet and regard it as a necessity in their life (Kneer et al. 2019). Proper and correct access to the Internet is beneficial to relaxing the mood and consulting learning materials, but excessive access to the Internet will damage the physical and mental health of teenagers, especially the large amount of junk information on the Internet, which will cause teenagers to suffer from various psychological diseases. However, spending a lot of time in games, online love and chatting every day will affect teenagers' self-awareness and environmental cognition and even cause teenagers to suffer from split personality disorder (Hernández-Moreno et al. 2021). Learning pressure mainly appears in students, especially high school students. Because of the pressure of the college entrance examination, high school students live a repetitive life every day, with endless books and learning materials, and exams are also emerging in endlessly. However, students' families, teachers and schools all have high expectations of them, which leads to high school students bearing greater psychological pressure (Gorman et al. 2021). When the test results are not ideal, the psychological pressure from families, schools, classmates, teachers and students themselves will rise sharply. When this pressure exists for a long time, it will lead to various psychological problems of students. Learning pressure often leads to students' bad psychology, such as slow reaction, irritability, anxiety, fear and weariness, so it needs to be paid attention to. The adaptation pressure of social development refers to the fact that in the process of rapid social development, the society is constantly changing and some modern people do not adapt to social changes for various reasons. The maladjustment to society is reflected in various aspects. In modern society, new things, new technologies, new concepts and new words emerge in an endless stream. When social development deviates from people's inherent cognition of society, people will have a sense of difference. When this sense of difference is too large, it will lead to a feeling of being abandoned by the society, resulting in loneliness and anxiety (Micoulaud-Franchi et al. 2021). In addition, because of the rapid development of society, there are some people who cannot adapt their skills to modern society, resulting in anxiety and helplessness. All the above

will lead to various psychological problems. Economic pressure means that in today's highly developed economy, people's desire for money is also increasing day by day. In addition, because of the existence of various financial products and services, most modern people are burdened with various loans, such as housing loans and car loans. In big cities, the cost of living is very high, coupled with entertainment costs, transportation costs, among others. Modern people have a lot of expenses and economic pressure. However, some people's salary cannot bear these expenses, and they will have anxiety, depression and mental illness. Home is a person's shelter and an important place for modern people to relax physically and mentally. A good residential design, where residents live, can alleviate psychological stress, thus releasing the negative emotions of residents. The Hakka ethnic group, one of the seven major ethnic groups of the Han nationality in China, mainly living in southern China, and its distribution areas include Jiangxi, Guangdong and Fujian. The Hakka family is an important part of the Han nationality. Although the Hakka people have roughly the same life customs and cultural characteristics, through in-depth research, we can find that the Hakka buildings in various regions have their own characteristics of development according to the environment. The origin of the Hakka family is Gannan, so the Hakka architecture in Gannan is the most representative and traditional. Gannan Hakka architecture mainly includes two forms, which are divided into hall and house combination and enclosure.

The most mainstream residential building of Gannan Hakka people has high cultural value and historical practical value. Among them, the most mainstream residential building form in Gannan is the combination of halls and houses, which is widely distributed in the northeast of Gannan. The enclosed houses in southern Jiangxi are different from the enclosed round earth buildings in Fujian and the semi-enclosed dragon houses in northern Guangdong. Most of the enclosed houses in southern Jiangxi are square enclosed spaces, which have strong defensive and certain anti-encirclement and suppression capabilities during the years of social unrest. The residence combines the regional history of Gannan and the living habits of surrounding residents, reflecting the ideological and cultural, social outlook, and lifestyle of Gannan region. Therefore, the Hakka architecture in Gannan area contains rich ideological, cultural and historical information, which has a certain impact on the spiritual thoughts of the residents. The research analyses the existing relevant documents, news and reports to understand the historical and cultural background and construction methods of Gannan residential buildings and explore the important elements of Gannan residential buildings. With the development trend of modern urban culture, all regions are based on local customs and develop regional culture. The research analyses the psychological situation of modern people and then integrates the elements of Gannan Hakka architecture into the design of folk houses based on design psychology, so as to deepen the aesthetic feelings of residents

and alleviate the psychological pressure of residents. In the design of residential buildings based on Gannan Hakka architecture, the integration of Gannan Hakka elements greatly alleviates the psychological pressure of residents. Introducing ethnic elements into modern urban architectural clusters has a certain degree of innovation.

## Subjects and methods

### Study setting

The psychological problems of modern people are becoming more and more serious and frequent, which has greatly hindered social progress and reduced the happiness of Chinese residents. In various surveys, more than half of modern people have varying degrees of psychological stress, and more than 26% of modern people suffer from various types of psychological diseases. There are seven common psychological problems in modern people, including depression, compulsion, anxiety, division, social fear, choice difficulty and habitual negation. Depressive psychology is mainly reflected in the fact that individuals lose interest in the things and people around them and think that life is boring. Compulsive psychology refers to the fact that an unimportant thing must be completed according to one's own requirements. Anxiety refers to feeling nervous and anxious about anything and problems, and sweating and trembling will occur. Split psychology refers to people who are extroverted, warm and cheerful when facing familiar people, but they are unwilling or afraid to communicate with strangers, and their emotions are capricious. Social phobia means that some people are afraid of people and things outside and refuse to communicate. Selection difficulty refers to that some people often feel that their choice is not the best choice when facing choices and show panic and anxiety in the scene where they must make choices. Habitual negative psychology refers to people who habitually deny themselves and others, who often only see the defects of things, so they often take a pessimistic attitude towards things. As the main place for modern people to relax, the social intercourse of folk houses is also very important. Good residential design can relax the mood of residents, give residents comfort from visual and other sensory experience and use experience and alleviate residents' negative emotions. Therefore, based on the design psychology, the research analyses the needs of modern people for the living environment and proposes to integrate the elements of Gannan Hakka architecture into the design of folk houses, so as to deepen the aesthetic feelings of residents and alleviate the psychological pressure of residents.

### Design

In order to verify the relieving effect of integrating the elements of Gannan Hakka architecture into the residential design on the psychological pressure of modern people, a control experiment was designed. Through Internet, group chat, offline leaflets and other ways, 120 volunteers were recruited for the experiment. All volunteers had different levels of psychological stress. All volunteers were numbered and then randomly grouped using Excel software. After

obtaining the grouping results, all volunteers were divided into two groups, namely, the characteristic folk house group and the traditional folk house group. For the members of the characteristic folk house group, let them live in the folk houses with the elements of Hakka architecture in southern Jiangxi for half a month; for members of the traditional residential group, they shall be allowed to live in the ordinary residential for half a month. Half a month later, the psychological stress, self-efficacy and quality of life of the two groups were evaluated by psychological test scale. The psychological stress, self-efficacy and quality of life of volunteers were evaluated by symptom checklist 90 (SCL-90), self-efficacy evaluation scale (SEES) and SF-36. Self-efficacy evaluation includes four aspects: stress self-management, anxiety self-management, depression self-management and emotional self-management. The total score of the SEES is calculated as shown in Equation 1:

$$F = S + A + D + E \quad [\text{Eqn 1}]$$

In Equation 1, *S*, *A*, *D*, and *E* respectively represent stress self-score, anxiety self-score, depression self-management score, and emotional self-management score.

## Results

Symptom checklist 90 was used to evaluate the psychological stress of the two groups of volunteers. The four dimensions of anxiety, depression, hostility and neuroticism in the scale were selected to evaluate the psychological situation of volunteers.

See Table 1 for relevant information of the two groups of volunteers. In Table 1, we can see that there are 10 members under the age of 20 in the characteristic residential group and eight members under the age of 20 in the traditional residential group. The difference between the two groups is very small, and the *P*-value of the difference is greater than 0.05; there are 29 members aged 20–30 years in the characteristic residential group, and 30 members aged 20–30 years in the traditional residential group. There is a very small difference between the two groups, and the *P*-value of the difference is greater than 0.05; there are 21 members aged over 31 years in the characteristic residential group, and 22 members aged over 31 years in the traditional residential group. There is a very small difference between the two groups, and the *P*-value of the difference is greater than 0.05. It can be seen that in terms of age, the difference between the characteristic residential group and the traditional residential group is very small, and the *p*-value of the difference is greater than 0.05. In addition, in terms of psychological stress, education level and occupational distribution, the difference between the characteristic residential group and the traditional residential group is also very small, with a *P*-value greater than 0.05. The above results show that the difference between the characteristic residential group and the traditional residential group is very small, which can be used as a comparative comparison of the experiment.

**TABLE 1:** Relevant information of two groups of volunteers ( $N = 60$ ).

Attribute	Category	Characteristic residential group ( $n$ )	Traditional residential group ( $n$ )
Age (years)*	< 20	10	8
	20–30	29	30
	> 31	21	22
Degree of psychological stress*	Nothing	0	0
	Light	20	18
	Moderate	30	31
	Severe	10	11
Education*	Master degree or above	5	7
	Undergraduate	25	26
	Speciality	16	15
	High school and below	14	12
Occupation*	White collar	28	26
	Teacher	20	18
	Worker	12	16

\*,  $p > 0.05$ .

During the experiment, the changes of psychological pressure of the two groups of volunteers are shown in Table 2.

In Table 2, before the experiment, the scores of the two groups of volunteers in the four dimensions of anxiety, depression, hostility and neuroticism were basically the same; after the experiment, the scores of the members of the characteristic residential group in the four dimensions of anxiety, depression, hostility and neuroticism decreased significantly, while the scores of the members of the traditional residential group in the four dimensions of anxiety, depression, hostility and neuroticism changed little. It can be seen that before the experimental intervention, the members of the characteristic residential group scored  $1.74 \pm 0.44$  in the anxiety dimension, while the members of the traditional residential group scored  $1.75 \pm 0.47$  in the anxiety dimension. The score difference between the two groups was very small, and the significance was greater than 0.05. The score of the members of the characteristic residential group in the depression dimension was  $1.93 \pm 0.35$ , and the score of the members of the traditional residential group in the depression dimension was  $1.88 \pm 0.42$ . The score difference between the two groups was very small, and the significance was greater than 0.05. The score of the members of the characteristic residential group in the hostile dimension is  $1.96 \pm 0.62$ , while the score of the members of the traditional residential group in the hostile dimension is  $1.86 \pm 0.71$ . The score difference between the two groups is very small, and the significance is greater than 0.05.

The score of neuroticism dimension of the members of the characteristic residential group was  $1.62 \pm 0.49$ , and that of the traditional residential group was  $1.61 \pm 0.54$ . The difference between the two groups was very small, and the significance was greater than 0.05. After the experiment, the score of the members of the characteristic residential group in the depression dimension was  $1.35 \pm 0.26$ , which was significantly lower than that before the experiment, with a difference of less than 0.05. The score of the members of the

**TABLE 2:** Changes of psychological pressure in the two groups of volunteers ( $N = 60$ ).

Dimension	Experiment time	Group		$p$
		Characteristic residential group ( $n$ )	Traditional residential group ( $n$ )	
Anxiety	Before experiment	$1.74 \pm 0.44$	$1.75 \pm 0.47$	$> 0.05$
	After experiment	$1.35 \pm 0.26^*$	$1.68 \pm 0.51$	$< 0.05$
Depression	Before experiment	$1.93 \pm 0.35$	$1.88 \pm 0.42$	$> 0.05$
	After experiment	$1.39 \pm 0.42^*$	$1.91 \pm 0.38$	$< 0.05$
Hostility	Before experiment	$1.96 \pm 0.62$	$1.86 \pm 0.71$	$> 0.05$
	After experiment	$1.45 \pm 0.45^*$	$1.88 \pm 0.63$	$< 0.05$
Neuroticism	Before experiment	$1.62 \pm 0.49$	$1.61 \pm 0.54$	$> 0.05$
	After experiment	$1.40 \pm 0.33^*$	$1.58 \pm 0.43$	$< 0.05$

\*, Compared with 'Before experiment' ( $p < 0.05$ ).

traditional residential group in the depression dimension was  $1.91 \pm 0.38$ , which was not significantly different from that before the experiment, with a difference of more than 0.05. The score of the members of the characteristic residential group in the depression dimension was significantly lower than that of the traditional residential group, with a difference of less than 0.05. After the experiment, the score of the members of the characteristic residential group in the hostile dimension was  $1.45 \pm 0.45$ , which was significantly lower than that before the experiment, with a difference of less than 0.05. The score of the members of the traditional residential group in the hostile dimension was  $1.88 \pm 0.63$ , which was not significantly different from that before the experiment, with a difference of more than 0.05. The score of the characteristic residential group in the hostile dimension was significantly lower than that of the traditional residential group, with a difference of less than 0.05. After the experiment, the score of neuroticism dimension of the members of the characteristic residential group was  $1.40 \pm 0.33$ , which was significantly lower than that before the experiment, with a difference of less than 0.05. The score of neuroticism dimension of the members of the traditional residential group was  $1.58 \pm 0.43$ , which was not significantly different from that before the experiment, with a difference of more than 0.05. The score of neuroticism dimension of the members of the characteristic residential group was significantly lower than that of the traditional residential group, with a difference of less than 0.05. Table 3 shows the changes of SF-36 scores of the members of the characteristic residential group and the members of the traditional residential group.

In Table 3, after the experiment, the scores of physical function, social function, role function and emotional function of the members of the characteristic folk house group in the SF-36 scale are significantly higher than those of the members of the traditional folk house group. Using SEE to evaluate the self-efficacy of the members of the characteristic residential group and the traditional residential group. After the experimental intervention, the score of the members of the characteristic residential group in the physical function dimension was  $71.25 \pm 9.64$ , and the score of the members of the traditional residential group in the physical function dimension was  $66.84 \pm 9.02$ . The score of the members of the characteristic residential group in the physical function dimension was significantly lower than that of the traditional residential group, with a

**TABLE 3:** SF-36 scale scores of the two groups after the experiment.

Group	Somatic function	Social function	Role function	Emotional function
Characteristic residential group (N = 60)	71.25 ± 9.64	69.04 ± 8.02	79.53 ± 7.46	72.30 ± 8.48
Traditional residential group (N = 60)	66.84 ± 9.02	65.37 ± 9.18	71.25 ± 9.52	65.12 ± 9.03
Characteristic residential group (N = 80)	75.25 ± 11.45	72.08 ± 10.52	82.54 ± 9.47	74.39 ± 7.27
Traditional residential group (N = 80)	68.80 ± 10.73	68.73 ± 10.05	73.24 ± 12.27	68.52 ± 11.36
<i>p</i>	< 0.05	< 0.05	< 0.05	< 0.05

significance of less than 0.05. After the experimental intervention, the score of the members of the characteristic residential group in the social function dimension was  $69.04 \pm 8.02$ , and the score of the members of the traditional residential group in the social function dimension was  $65.37 \pm 9.18$ . The score of the members of the characteristic residential group in the social function dimension was significantly lower than that of the traditional residential group, with a significance of less than 0.05. After the experimental intervention, the score of the members of the characteristic residential group in the role function dimension was  $79.53 \pm 7.46$ , and the score of the members of the traditional residential group in the role function dimension was  $71.25 \pm 9.52$ . The score of the members of the characteristic residential group in the role function dimension was significantly lower than that of the traditional residential group, with a significance of less than 0.05. After the experimental intervention, using different parameters, the emotional function scores of members of the characteristic residential group were  $72.30 \pm 8.48$  and  $74.39 \pm 7.27$ , while the emotional function scores of members of the traditional residential group were  $65.12 \pm 9.03$  and  $68.52 \pm 11.36$ . The score of the role function dimension of members of characteristic residential groups is significantly lower than that of traditional residential groups, with a significance of less than 0.05. After the experiment, the SEES scores of the members of the characteristic folk house group and the members of the traditional folk house group are shown in Table 4.

In Table 4, after the experiment, the scores of the members of the characteristic residential group in the four dimensions of stress self-management, anxiety self-management, depression self-management and emotional self-management in the SEES scale are significantly higher than those of the members of the traditional residential group. To sum up, based on the design psychology, the integration of Gannan Hakka architectural elements into the residential design can effectively relieve the psychological pressure of residents.

## Discussion

The psychological problems of modern people are becoming more and more serious and frequent, which has greatly hindered social progress and reduced the happiness of Chinese residents (Trombello et al. 2022). In various surveys, more than half of modern people have varying degrees of psychological stress, and more than 26% of modern people suffer from various types of psychological diseases. Therefore, the psychological problems of modern people must be paid

**TABLE 4:** After the experiment, the SEES scores of members of the characteristic folk house group and members of the traditional folk house group (N = 60).

Group	Stress self-management	Anxiety self-management	Depression self-management	Emotional self-management
Characteristic residential group	71.25 ± 9.64	69.04 ± 8.02	79.53 ± 7.46	72.30 ± 8.48
Traditional residential group	66.84 ± 9.02	65.37 ± 9.18	71.25 ± 9.52	65.12 ± 9.03
<i>p</i>	< 0.05	< 0.05	< 0.05	< 0.05

SEES, self-efficacy evaluation scale.

attention to (Adikari, Appukutty & Kuan 2020). As the main place for modern people to relax, the social intercourse of folk houses is also very important. Good residential design can relax the mood of residents, give residents comfort from visual and other sensory experience and use experience and alleviate residents' negative emotions (Gelaye et al. 2020). A poor residential design will, to a certain extent, aggravate the psychological anxiety and irritability of residents, not only failing to relieve their psychological pressure but also aggravating their psychological pressure. For example, the insufficient space design leads to the limited range of residents' activities, the small computer table leads to only one computer, inconvenient dining, inconvenient clothes drying and other details (Menear et al. 2020; Sharifian et al. 2021). Therefore, based on the design psychology, the study analyses the psychological needs of residents for modern folk. Limited, modern people instinctively pursue freedom and unconstrained, so they have a certain demand for large space. During the design, it is necessary to remove some unnecessary objects and decorations so that residents can have a certain activity space. Then, the space design in the residential buildings should be as reasonable as possible, so that the residents can feel comfortable and relax their mood. For example, we should pay attention to the sense of privacy and security of residents. Finally, to meet the needs of residents for harmonious mitigation. Modern people have an inseparable connection with nature and instinctively want to get close to nature and embrace nature. Therefore, in the design of residential buildings, it is necessary to make the environment around the residential buildings and the residential buildings coexist and integrate harmoniously, so that the residents can approach the nature to the greatest extent, so that the residents' mood can be relaxed and the psychological pressure can be released. Based on the above analysis, it is proposed to integrate the elements of Gannan Hakka architecture into the design of folk houses. Gannan Hakka architecture emphasises the integration of multiculturalism, the harmonious coexistence between humans and nature, the combination of spiritual belief and architecture and the people-oriented architectural concept. Integrating these elements into modern residential design can not only meet the psychological needs of residents but also provide them with a new sensory experience. After the experimental intervention, members of the characteristic residential group scored  $72.30 \pm 8.48$  in the emotional function dimension, while members of the traditional residential group scored  $65.12 \pm 9.03$  in the emotional function dimension. The members of the characteristic residential group scored significantly lower in the role function dimension than the traditional residential group, with a significance of less than 0.05. The self-

management ability of traditional residential group emotions is  $65.12 \pm 9.03$ , while the self-management ability of characteristic residential group emotions is  $72.30 \pm 8.48$ . It is obvious that the emotional fluctuations of users in traditional residential groups are much greater than those in characteristic residential groups. Based on the above contents, the residents can relax their minds in the residential buildings, thus relieving their psychological pressure. In order to verify the effect of the design method proposed in the study, the results of the research and design experiments show that integrating the elements of Gannan Hakka architecture into the residential design can effectively relieve the psychological pressure of residents.

## Conclusion

The integration of Gannan Hakka architectural elements into modern residential areas is to better alleviate the psychological pressure of modern people. Starting from design psychology, this study integrates Gannan Hakka architectural elements into the residential design to meet the psychological needs of residents and alleviate their psychological pressure. The experimental results show that after the experiment, the scores of the members of the characteristic residential group in each dimension of the SEES and SF-36 scale are significantly higher than those of the members of the traditional residential group. In the SF-36 scale, after the experimental intervention, the social and role functions of the characteristic residential group and the traditional residential group were  $69.04 \pm 8.02$ ,  $79.53 \pm 7.46$  and  $65.37 \pm 9.18$ ,  $71.25 \pm 9.52$ , respectively. After the experiment, the melancholic dimension score of the characteristic residential group was  $1.35 \pm 0.26$ , which was significantly lower than before the experiment, with differences within 0.05. The depression scale score of the participants in the traditional residence test was  $1.91 \pm 0.38$ , and there was no significant difference compared to the participants before the traditional residence test, with a difference of over 0.05. The scores of college students in characteristic residential areas on various dimensions of depression are significantly lower than those in traditionally residential areas, with differences within 0.05. After the experiment, the score of the specificity in the hostile dimension was  $1.45 \pm 0.45$ , which was significantly different from before the experiment, with a difference of within 0.05. To sum up, based on the design psychology, integrating the Hakka architectural elements of Gannan into the residential design can effectively relieve the psychological pressure of residents. In the future, the evaluation index system will be enriched and improved based on the development of the industry, while taking into account more factors that affect the comfort of residential areas.

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### Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

## Authors' contributions

X.L. developed the idea for the study, X.L., H.C. and L.G. did the analyses and X.L., H.C. and L.G. wrote the article.

## Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

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## Data availability

All data generated or analysed during this study are included in this published article.

## Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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