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## The Influence Factors of Economic Development of Tourism Industry

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### Abstract

**Objectives:** This paper aims to conduct research on the factors that impact the advancement of the tourism economy in order to adapt to the rapidly changing demands of the tourism market. **Methods:** A case study was performed using a gray correlation model to analyze the tourism industry in Henan Province. **Findings:** Among the first-level indicators, tourism economic support had the highest correlation with tourism economic development, followed by tourism physical base, tourism transportation influence, tourism human resources, and tourism information service. Then, relevant suggestions were given according to the analysis results. **Novelty:** The novelty of this article lies in utilizing the gray correlation model to examine the factors that influence the tourism economy and analyzing the gray system with incomplete information.

**Keywords:** Tourism Industry; Gray Correlation; Influencing Factors; Economic Development.

### 1. Introduction

With the progress of the economy, there has been a gradual enhancement in the living standards of inhabitants, leading to an increasing number of individuals seeking spiritual contentment alongside their material desires [1]. The tourism industry can be considered one of the products that cater to this spiritual demand [2]. The growth and progress of the tourism sector are influenced by numerous factors, and if negative factors slow down or even regress tourism's economic growth, it will affect both local confidence in developing tourism [3] and people's standard of living, forming a vicious circle. Hence, it is imperative to conduct an analysis of the factors that impact the economic progress of the tourism sector during its development and establishment in order to provide more rational recommendations. Relevant studies are as follows. Zhang et al. [4] applied gray correlation analysis to panel data of Chinese provinces and assessed the connections between air quality and the volume of incoming tourists. They found that ambient air quality had a noteworthy and positive impact on inbound tourists.

Wu et al. [5] used gray correlation analysis to examine the impact of different financial expenditure programs on the local tourism industry based on relevant statistics of Huangshan City from 2008 to 2013. The results revealed the primary five categories of fiscal spending that impact the growth of regional tourism, encompassing overall public services, educational initiatives, public security measures, social welfare and employment programs, as well as urban and rural community affairs. Gan et al. [6] conducted a study on the tourism economic spatial network structure of an urban agglomeration located in the middle reaches of the Yangtze River. They employed both the tourism economic gravity model and social network analysis to analyze its relevant characteristics. The results of their study showed that Wuhan, Changsha, and Nanchang exhibited stronger connections in terms of tourism economic interactions with other cities, while also serving as pivotal intermediaries and connectors within the spatial network structure of the tourism economy.

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Zhou [7] first created a comprehensive evaluation index system for the regional ecological environment and economic activities. Then, they observed and analyzed the development trends of each indicator based on gray correlation analysis. The effectiveness of the proposed method for correlation analysis was confirmed by the experimental findings. Zhao et al. [8] conducted a study on the spatial relationship among the tourism sectors in 16 cities within Anhui, using spatial econometric analysis and a research perspective based on spatial econometrics. They found that there was significant positive spatial autocorrelation in per capita tourism income in Anhui, along with noticeable local spatial clustering characteristics. The studies mentioned above have examined the factors influencing the growth of the tourism industry in various ways, with some employing gray correlation analysis and others utilizing network structure models. Despite the different analytical approaches, all of these studies focused on a specific subject. This paper also adopted the gray correlation model to analyze Henan Province's tourism industry and validated the relevant factors that can influence local economic development in this sector. This paper briefly introduced the tourism economic influencing factors and the gray correlation model and analyzed the tourism industry in Henan Province. The contribution of this article lies in utilizing gray correlation analysis to examine the factors influencing Henan Province's tourism economy, thereby providing valuable insights for promoting local tourism industry development. The main challenge faced by this study pertains to the selection of indicators that impact the tourism economy during the construction of the gray correlation model. To address this issue, a comprehensive literature review and interviews with relevant professionals were conducted.

## 2. Factors Affecting Tourism Economy

Tourism encompasses a range of experiences and connections that result from the movement and temporary residence of individuals who are not permanent residents. People involved in tourism, known as tourists, do not permanently settle in the travel destination, nor do they engage in money-making activities there [9]. The tourism economy encompasses all economic activities and economic relations between travelers, tourism merchants, and the government in the travel destination related to the supply and demand of tourism goods [10]. The growth of the tourism economy heavily depends on the natural tourism resources available in the local area. Compared with other forms of economic development, the initial investment in the tourism economy is relatively small and yields quick results. Additionally, the development of the tourism industry can attract investments to the local area, stimulate related industries' growth, and rapidly enhance regional economic levels [11].

With the increase in market competition and changes in market demand, the tourism industry needs to adjust its industrial structure to adapt to the changes in the tourism market and thus maintain growth within the tourism economy [12]. Thus, the analysis of the determinants influencing the advancement of the tourism sector's economy is necessary. Figure 1 shows the five major influencing aspects selected, considering the correlation between the factors and the accessibility of the relevant data [13]. First of all, the economic development of the tourism sector is reflected by the total local tourism revenue, and the factor indicators that can influence the total tourism revenue include the tourism physical base, tourism economic support, tourism transportation impact, tourism human resources, and tourism information services [14]. Among them, the tourism physical base refers to tourism-related goods that the tourist site can provide to tourists [15], including the number of star hotels, travel agencies, and scenic spots above A level; the tourism economic support refers to the level of local economic development, including local gross domestic product (GDP), local tertiary industry GDP, and disposable income of residents; the tourism transportation impact refers to the impact of local transportation conditions on tourism, including the volume of railroad and highway passengers, as well as the length of transportation routes; tourism human resources refers to the local manpower that can serve the tourism sector [16], including the number of people employed in the tertiary sector and people to be employed in the tourism industry; tourism information services refers to services that provide tourism-related information, including the number of Internet broadband users and mobile network users.

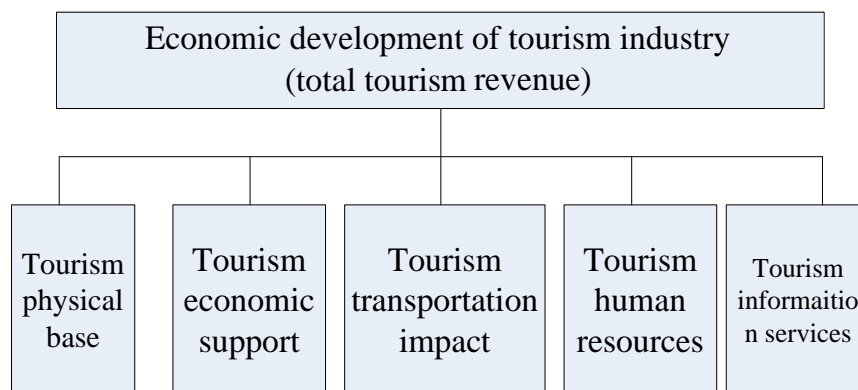


Figure 1. Factor indicators affecting the economy of the tourism industry

### 3. Gray Correlation Model

The previous section lists the five major factor indicators that can influence the economic growth of the tourism sector and the secondary indicators under every factor indicator, but it is only known that the above indicators will have an impact on the tourism economy, but it is not clear what impact it is, i.e., it is a gray system with incomplete information, so this paper used the gray correlation degree model [17] to analyze the influence factors of the economic growth of the tourism sector. The steps to establish the gray correlation model are illustrated in Figure 2.

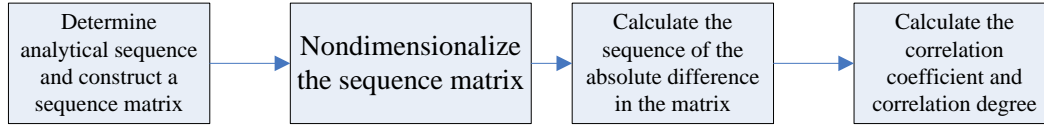


Figure 2. The analysis flow of the gray correlation model

① The analytical sequence was determined, and a sequence matrix was constructed. This paper aims to analyze the impact of factor indicators on the tourism sector, so the total tourism revenue of the sequence years was used as the reference sequence, i.e.,  $\{X_0(n)\}$ , and the factor indicators of every sequence year constituted a comparison sequence [18]. The reference sequence and the comparison sequences form a sequence matrix in a specification of  $m + 1$  rows and  $n$  columns:

$$\begin{bmatrix} X_0(1) & X_0(2) & \cdots & X_0(n) \\ X_1(1) & X_1(2) & \cdots & X_1(n) \\ \cdots & \cdots & \cdots & \cdots \\ X_m(1) & X_m(2) & \cdots & X_m(n) \end{bmatrix} \quad (1)$$

where  $X_0(n)$  indicates total tourism revenue in the  $n$ -th year and  $X_m(n)$  indicates the value of the  $m$ -th indicator in  $n$ -th year.

② The sequence matrix was nondimensionalized [19]:

$$X'_i(k) = \frac{n \cdot X_i(k)}{\sum_{k=1}^n X_i(k)} \quad (2)$$

where  $X'_i(k)$  is the  $k$ -th data in the  $i$ -th sequence after dimensionless processing,  $X_i(k)$  is the  $k$ -th data in the  $i$ -th sequence, and  $n$  is the number of data in the sequence, i.e., the number of years.

③ The sequence of the absolute difference between the comparison sequence and the reference sequence is calculated:

$$\Delta X_i(k) = |X'_0(k) - X'_i(k)| \quad (3)$$

After obtaining the absolute difference sequence by the above formula, the absolute difference series matrix is obtained:

$$\begin{bmatrix} \Delta X'_1(1) & \Delta X'_1(2) & \cdots & \Delta X'_1(n) \\ \Delta X'_2(1) & \Delta X'_2(2) & \cdots & \Delta X'_2(n) \\ \cdots & \cdots & \cdots & \cdots \\ \Delta X'_m(1) & \Delta X'_m(2) & \cdots & \Delta X'_m(n) \end{bmatrix} \quad (4)$$

④ The correlation coefficient and the correlation degree between the indicator sequence and the reference series are calculated based on the absolute difference sequence [20]:

$$\begin{cases} \varepsilon_i(k) = \frac{\min\{\Delta X_i(k)\} + \rho \max\{\Delta X_i(k)\}}{\Delta X_i(k) + \rho \max\{\Delta X_i(k)\}} \\ R_i = \frac{\sum_{k=1}^n \varepsilon_i(k)}{n} \end{cases} \quad (5)$$

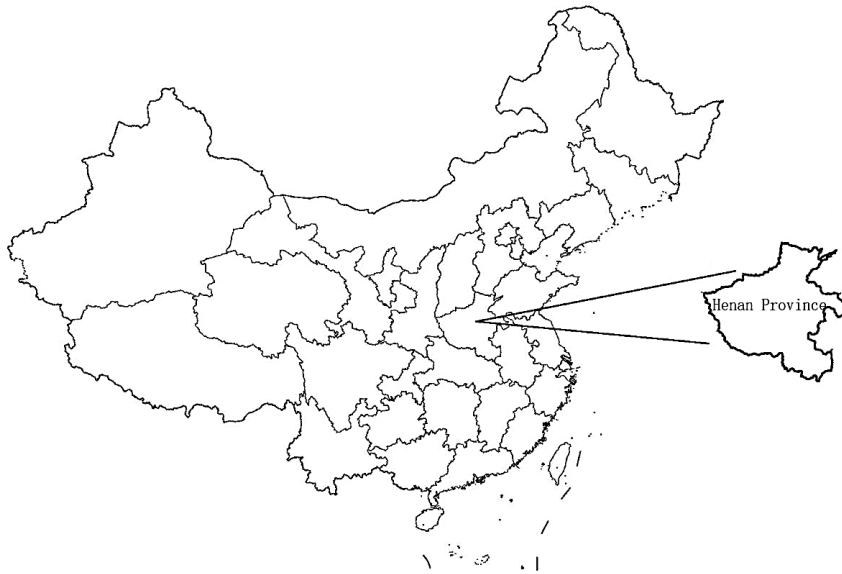
where  $\varepsilon_i(k)$  is the correlation coefficient of the  $k$ -th data in the  $i$ -th sequence,  $R_i$  is the correlation degree between the  $i$ -th sequence and the reference sequence,  $\min\{\Delta X_i(k)\}$  is the minimum value in the  $i$ -th sequence,  $\max\{\Delta X_i(k)\}$  is the maximum value in the  $i$ -th sequence, and  $\rho$  is the resolution coefficient of the gray correlation.

⑤ The indicator factors represented by every sequence were ranked according to the calculated correlation degree to assess the varying degrees of influence that different indicators have on the economic development of the tourism sector.

## 4. Case Study

### 4.1. Overview of the Study Area

This article analyzes the tourism sector in Henan Province. As depicted in Figure 3, the geographical location of Henan Province is situated within the southern region of the North China Plain, specifically in the middle and lower sections of the Yellow River. The province has a terrain that slopes from west to east, with plains, basins, mountains, and hills. Most areas have a warm temperate climate with abundant flora and fauna resources as well as rich tourism resources [21]. The relevant data from 2011 to 2020 was sourced from the Statistical Yearbook of Henan. Table 1 shows the relevant indicators affecting the economic growth of the tourism sector and their corresponding secondary indicators. The corresponding data were collected based on secondary indicators.



**Figure 3. The geographical location of Henan Province**

**Table 1. Relevant indicators affecting the economic growth of tourism**

General objective	Primary indicator	Secondary indicator
Total tourism revenue	Tourism physical base	Number of star hotels ( $X_1$ )
		Number of travel agencies ( $X_2$ )
		Number of scenic spots above A level ( $X_3$ )
	Tourism economic support	Local GDP ( $X_4$ )
		Local tertiary industry GDP ( $X_5$ )
		Disposable income of residents ( $X_6$ )
	Tourism traffic impact	Railroad passenger volume ( $X_7$ )
		Highway passenger volume ( $X_8$ )
		Length of transportation routes ( $X_9$ )
	Tourism human resources	Number of employees in the tertiary industry ( $X_{10}$ )
		Number of people to be employed in the tourism industry ( $X_{11}$ )
	Tourism information service	Number of Internet broadband users ( $X_{12}$ )
		Number of mobile network users ( $X_{13}$ )

### 4.2. Preliminary Analysis of Data Reliability and Relevance

The reliability of the data was assessed using the Cronbach's alpha method [22]. A higher coefficient indicates greater reliability. Usually, a value above 0.7 indicates high reliability. As shown in Table 2, the selected indicators in this study demonstrated good overall reliability.

**Table 2. Reliability test results of variables**

Variable	Cronbach's alpha	Variable	Cronbach's alpha
Number of star hotels ( $X_1$ )	0.869	Highway passenger volume ( $X_8$ )	0.749
Number of travel agencies ( $X_2$ )	0.852	Length of transportation routes ( $X_9$ )	0.763
Number of scenic spots above A level ( $X_3$ )	0.789	Number of employees in the tertiary sector ( $X_{10}$ )	0.852
Local GDP ( $X_4$ )	0.768	Number of people to be employed in the tourism sector ( $X_{11}$ )	0.878
Local tertiary industry GDP ( $X_5$ )	0.865	Number of Internet broadband users ( $X_{12}$ )	0.783
Disposable income of residents ( $X_6$ )	0.784	Number of mobile network users ( $X_{13}$ )	0.845
Railroad passenger volume ( $X_7$ )	0.877		

After confirming the reliability of the data, a preliminary analysis was conducted on the correlation between variables, as shown in Table 3. All thirteen selected indicators had significant correlations with the local tourism economy. However, this correlation was only a preliminary analysis result and could only indicate that the selected indicators can affect the tourism economy without revealing the extent of their impact. Therefore, this study further utilized a gray correlation model to examine the influence of these indicators on the tourism economy.

**Table 3. Initial analysis results of variable correlation**

Variable	Correlation coefficient	P value	Variable	Correlation coefficient	P value
Number of star hotels ( $X_1$ )	0.236	0.001	Highway passenger volume ( $X_8$ )	0.357	0.002
Number of travel agencies ( $X_2$ )	0.325	0.001	Length of transportation routes ( $X_9$ )	0.111	0.001
Number of scenic spots above A level ( $X_3$ )	0.367	0.000	Number of employees in the tertiary sector ( $X_{10}$ )	0.326	0.002
Local GDP ( $X_4$ )	0.474	0.002	Number of people to be employed in the tourism sector ( $X_{11}$ )	0.359	0.001
Local tertiary industry GDP ( $X_5$ )	0.348	0.001	Number of Internet broadband users ( $X_{12}$ )	0.236	0.003
Disposable income of residents ( $X_6$ )	0.321	0.003	Number of mobile network users ( $X_{13}$ )	0.258	0.003
Railroad passenger volume ( $X_7$ )	0.456	0.001			

### 4.3. Results of Gray Correlation Analysis

The collected data were calculated using the procedures outlined in the preceding section for constructing the gray correlation model. Table 4 shows the correlation coefficients between secondary indicators and total tourism revenue. Table 5 presents the correlation degrees between secondary indicators and total tourism revenue in descending order. Table 6 shows the degree of correlation between primary indicators and total tourism revenue.

**Table 4. Correlation coefficients between secondary indicators and total tourism revenue**

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Correlation degree
$X_1$	0.758	0.781	0.812	0.753	0.887	0.951	0.921	0.783	0.693	0.632	0.797
$X_2$	0.512	0.595	0.601	0.516	0.647	1.002	0.564	0.512	0.498	0.483	0.593
$X_3$	0.397	0.525	0.644	0.637	0.734	0.624	0.517	0.426	0.367	0.405	0.528
$X_4$	0.535	0.568	0.612	0.603	0.674	0.706	0.604	0.508	0.504	0.435	0.575
$X_5$	0.689	0.754	0.851	0.935	0.815	0.965	0.855	0.934	0.724	0.586	0.811
$X_6$	0.915	0.906	0.904	0.926	0.985	0.998	0.926	0.943	0.895	0.834	0.923
$X_7$	0.716	0.645	0.757	0.891	0.815	0.931	0.706	0.876	0.706	0.503	0.755
$X_8$	0.663	0.667	0.586	0.475	0.416	0.978	0.724	0.538	0.457	0.356	0.586
$X_9$	0.426	0.431	0.518	0.607	0.781	0.893	0.708	0.567	0.389	0.346	0.567
$X_{10}$	0.468	0.495	0.538	0.681	0.867	0.978	0.661	0.547	0.478	0.431	0.614
$X_{11}$	0.568	0.657	0.489	0.687	0.578	0.638	0.698	0.745	0.684	0.632	0.638
$X_{12}$	0.745	0.657	0.369	0.489	0.478	0.568	0.578	0.689	0.679	0.458	0.571
$X_{13}$	0.321	0.356	0.457	0.369	0.458	0.469	0.587	0.659	0.574	0.523	0.477

**Table 5. Correlation degree between secondary indicators and total tourism revenue in descending order**

Serial number	Indicator	Correlation degree
1	Disposable income of residents ( $X_6$ )	0.923
2	Local tertiary industry GDP ( $X_5$ )	0.811
3	Number of star hotels ( $X_1$ )	0.797
4	Railroad passenger volume ( $X_7$ )	0.755
5	Number of people to be employed in the tourism sector ( $X_{11}$ )	0.638
6	Number of employees in the tertiary sector ( $X_{10}$ )	0.614
7	Number of travel agencies ( $X_2$ )	0.593
8	Highway passenger volume ( $X_8$ )	0.586
9	Local GDP ( $X_4$ )	0.575
10	Number of Internet broadband users ( $X_{12}$ )	0.571
11	Length of transportation routes ( $X_9$ )	0.567
12	Number of scenic spots above A level ( $X_3$ )	0.528
13	Number of mobile network users ( $X_{13}$ )	0.477

**Table 6. Correlation degree between primary indicators and total tourism revenue**

Primary indicator	Tourism physical base	Tourism economic support	Tourism traffic impact	Tourism human resources	Tourism information service
Correlation degree	0.639	0.770	0.636	0.626	0.524

## 5. Discussion

Tourism is an industry that makes use of the natural tourism resources available in the local area. Compared to other types of economic industries, tourism requires low initial investment and yields quick results, while also stimulating the development of other local affiliated industries. However, as society progresses, people's demand for tourism is gradually diversifying. If the tourism industry fails to adjust accordingly, its economic development will be affected. This paper used gray correlation analysis to examine the influencing factors of tourism in Henan Province, and the final results are shown above. First of all, among the primary indicators affecting the economic growth of tourism in Henan Province, “tourism economic support” has the highest correlation degree due to its representation of both the level of local economic development and the income levels of residents in Henan Province. The degree of local economic growth directly reflects the potential scale of tourism development, so the indicator “tourism economic support” exhibits the strongest correlation with the economic development of tourism in Henan Province. Next is “tourism physical base”, which is the second most relevant indicator to the economic growth of tourism in Henan after “tourism economic support”.

The reason is that “tourism physical base” represents the tourism materials that Henan Province can provide to tourists, including scenic spot resources, star hotels, and travel agencies. These factors do not directly reflect on tourism's economic development but indirectly affect local tourism's economic development. For example, tourism scenic resources that are developed more sufficiently can attract more tourists, and more star hotels and travel agencies can accommodate a larger tourist influx, thus increasing tourism revenue and indirectly enhancing tourism economic development. The correlation of “tourism traffic impact” ranks third. This primary indicator reflects the local traffic condition in Henan Province. The more convenient the traffic is, the more inclined tourists will be to visit Henan Province. The convenient traffic can also guarantee a stable, large passenger flow and facilitate the maintenance of order among tourists in the scenic spot. A good order can also enhance tourists' interest in tourism. The rise in tourist numbers will indirectly boost the economic income of local tourism industries associated with tourism, thereby facilitating the growth and expansion of the tourism sector. Next is “tourism human resources”, which reflects the number of local people involved in the tourism sector in Henan. The higher the number of people, the more traffic the local tourism industry can bear, but when the number of people exceeds a certain range, the traffic will be saturated. The extra human resources will not only fail to create tourism value but also drag down the economic development of tourism because of the extra expenses. Thus, this indicator will have an impact on tourism economic development, but the degree of correlation will not be very large. “Tourism information service” has the lowest correlation degree, which reflects the degree of local promotion of tourism in Henan Province. Since the local attractions are relatively well known, the impact of this indicator on the economic advance of tourism is relatively not very significant, so the degree of correlation is the lowest.

Among the subdivided secondary indicators, “disposable income of residents” has the highest correlation degree, followed by “local tertiary industry GDP”, both of which are part of the primary indicator “tourism economic support”. This further validates the impact of local economic advancement and disposable income on the economic development of the tourism industry.



According to the results of the gray correlation analysis, the following recommendations are made for the economic development of tourism:

- The tourism industry should increase the level of per capita consumption and expand job opportunities in the service sector. Increasing the consumption level of tourists in the tourism process can effectively increase the disposable income of local residents, thus enhancing the growth of the tourism economy. As the relatively low correlation degree of “tourism human resources” weakens the role of human resources in the growth of the tourism economy, expanding job opportunities can strengthen this correlation.
- The tourism industry should increase the construction of star hotels and travel agencies and the development of scenic spots to improve the correlation degree.
- Tourist attractions should strengthen their marketing strategies. “Tourist information service” is the primary indicator with the lowest correlation degree. It aims to promote tourist areas and attract tourists to consume, thus boosting economic development. To enhance tourism economic development by improving the correlation degree of this indicator, it is necessary to strengthen the promotion of local attractions on the Internet and mobile networks.

## 6. Conclusion

The present paper provides a concise overview of the influencing factors in tourism economics and introduces the gray correlation model, followed by an analysis of the tourism sector in Henan. The degree of correlation between the secondary indicators and total tourism income, from the highest to the lowest, were disposable income of residents, local tertiary industry GDP, number of star hotels, railroad passenger volume, number of people to be employed in the tourism sector, number of people employed in the tertiary sector, number of travel agencies, highway passenger volume, local GDP, number of Internet broadband users, length of transportation routes, number of scenic spots above A level, and number of mobile network users. The degree of correlation between the primary indicator and total tourism revenue, from the highest to the lowest, was as follows: tourism economic support, tourism material base, tourism transportation impact, tourism human resources, and tourism information services. Based on the outcomes of gray correlation analysis, relevant suggestions were put forward, including improving and enhancing individual consumption rates, expanding the scale of service jobs, strengthening the attractiveness of local tourism resources, and developing marketing strategies for tourism regions.

## 7. Declarations

### 7.1. Data Availability Statement

The data presented in this study are available in the article.

### 7.2. Funding

The author received no financial support for the research, authorship, and/or publication of this article.

### 7.3. Institutional Review Board Statement

Not applicable.

### 7.4. Informed Consent Statement

Not applicable.

### 7.5. Declaration of Competing Interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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