*Journal of Infrastructure, Policy and Development* 2024, 8(15), 8936.
https://doi.org/10.24294/jipd8936

Article

# Patient safety culture and hospital performance: Patient safety outcomes in the traditional Chinese medicine public hospitals in Sichuan, China

**Na Zhang[1,2], Anees Janee Ali[1,*], Peiyang Gao[2,*]**

[1] School of Management, Universiti Sains Malaysia, Penang 11800, Malaysia
[2] Hospital of Chengdu University of Traditional Chinese Medicine, Chengdu 610072, China
*** Corresponding authors:** Anees Janee Ali, aneesali@usm.my; Peiyang Gao, gaopy930@126.com

**CITATION**

Zhang N, Ali AJ, Gao P. (2024). Patient safety culture and hospital performance: Patient safety outcomes in the traditional Chinese medicine public hospitals in Sichuan, China. Journal of Infrastructure, Policy and Development. 8(15): 8936. https://doi.org/10.24294/jipd8936

**ARTICLE INFO**

Received: 30 September 2024
Accepted: 26 November 2024
Available online: 12 December 2024



**Abstract:** Hospital performance possesses strategic significance in achieving an essential completive advantage for the public hospitals. This study aimed to examine the relationship between patient safety culture (PSC) and the performance of traditional Chinese medicine (TCM) public hospitals in Sichuan, China. To address the research purpose, this study analyses the hospital performance and Patient safety culture in traditional Chinese medicine public hospital in China. We examine the propose model by analyzing cross-sectional survey data from 194 clinical directors at 194 public traditional Chinese medicine hospitals using the Partial least squares structural equation model in Smart PLS 4.0. This study provides predictive evidence that PSC in unit management and management support can lead to better patient safety outcomes. The results revealed patient safety outcomes significantly and positively effects of patient safety related to unit management and management support on overall hospital performance (*p*-value: 0.000–0.003).

**Keywords:** patient safety culture; hospital performance; traditional Chinese medicine; public hospitals; China

## 1. Introduction

The improvement of hospital performance (HP) is a crucial endeavour in the healthcare industry worldwide. A significant portion of the health sector budget in many counties, ranging from 50% to 80%, is allocated specifically for hospitals (Imani et al., 2022). In China, total health expenditure represents a proportion of GDP, growing year by year.

One estimate by the China Health Statistics Yearbook (2024), On 4 June 2021, the General Office of the State Council issued opinions on the high-quality development of public hospitals (General Office of the State Council, 2021). As a result, hospital performance analysis is becoming a routine task for every hospital manager. In other words, not only hospital manger and government leader, but also researchers worldwide are facing with both difficult decisions regarding cost reduction, increasing service efficiency, and equity, and balance lower expense for patient satisfaction and high-quality care.

To this end, Patient safety culture has gained global attention partially due to the Institute of Medicine (IOM) landmark report in 1999 from the United States, which estimated that up to 40,000 preventable deaths occurred annually in the United States (David et al., 2024). The latest research by the World Health Organization (2023) statistics from 2023 stated that 1 in 10 patients are harmed in health care and over 3 million die annually from unsafe care. As many as 4 in 100 low-to middle-income

countries, patients die from unsafe health care (WHO, 2023). In sum, both WHO and Chinese Government are emphasis the significant of patient safety culture for hospital performance.

A strong patient safety culture (PSC) is thought to be an essential component of high-performing healthcare organizations, as it can contribution improved patient outcomes and overall healthcare quality (Huang et al., 2023). Mardon et al. (2022) found that hospitals with high PSC scores had lower rates of adverse events, such as hospital-acquired infections and medication errors. Similarly, Blegen et al. (2023) reported a significant relationship between a positive patient safety culture (PSC) and reduced patient complications, shorter lengths of stay, and lower mortality rates.

In China, traditional Chinese medicine (TCM) plays a significant role in the healthcare system, particularly in regions such as Sichuan, which is known for its rich cultural heritage and deep-rooted TCM practices. Holistic healing, preventive care, and individualised treatment are emphasised in TCM. Nevertheless, it operates in a healthcare context defined by modern safety standards and protocols. As public hospitals increasingly adopt patient safety initiatives, understanding how these initiatives align with TCM practices is crucial for enhancing healthcare quality. Data from 2015 to 2021 (Chines Health Statistic Yearbook, 2023) indicate that Chinese patients are increasingly favouring seeking medical care at TCM hospitals. The below **Figures 1–3** shown the different trends in TCM hospitals, the trends in number of receiving medical services in TCM hospitals from 2015 to 2021, in the number of TCM hospitals from 2015–2021, and trends in the number of discharged patients in the TCM hospitals respectively.

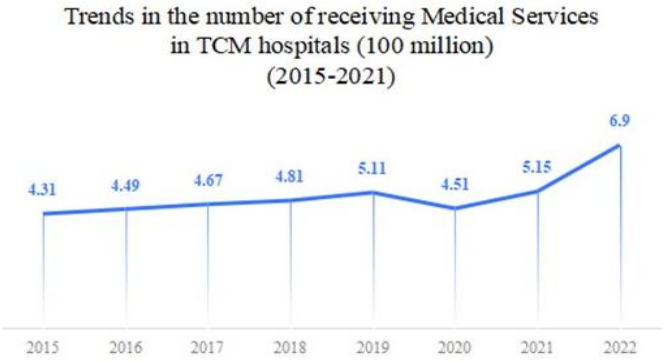


**Figure 1.** Trends in number of receiving medical services in TCM hospitals (100 million) from 2015–2022.

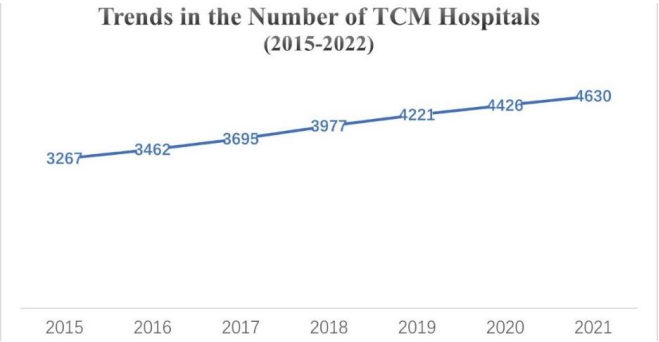


**Figure 2.** Trends in the number of TCM hospitals from 2015–2021.

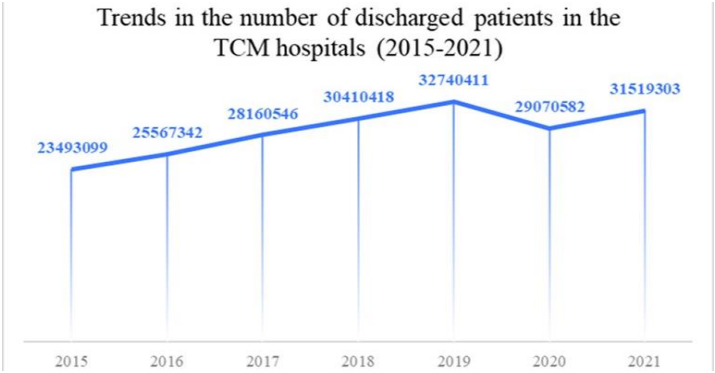


**Figure 3.** Trends in the number of discharged patients in the TCM hospitals.

Nevertheless, despite the intrinsic relationship between PSC and overall hospital performance, limited research has explored these dynamics within TCM public hospitals. The performance of these institutions can be assessed through various metrics, such as patient satisfaction, treatment efficacy, and operational efficiency. The unique characteristics of TCM, including its reliance on personalised treatments and traditional healing philosophies, pose distinct challenges and opportunities for cultivating a safety culture.

This study investigates the relationship between PSC and the performance of TCM public hospitals in Sichuan. The study aims to identify barriers and facilitators in fostering a safety culture tailored to the unique context of TCM, thereby providing insights that can inform policy and practice. The study endeavours to contribute to the ongoing discourse on improving healthcare delivery in China and beyond by bridging the gap between TCM practices and contemporary patient safety standards.

## 2. Literature review

### 2.1. Hospital performance

Performance in TCM public hospitals is measured using various metrics, including patient outcomes, efficiency, service quality, and compliance with healthcare standards (National Administration of Traditional Chinese Medicine, 2023). These metrics provide a comprehensive view of the hospital's effectiveness in delivering care services and managing resources. High performance is typically associated with better patient satisfaction, improved health outcomes, and financial sustainability (Rundall et al., 2021). Performance in healthcare can be evaluated using various metrics, including patient outcomes, operational efficiency, and patient satisfaction (Imani et al., 2022). Previous literature has demonstrated that organizations with strong safety cultures tend to perform better across these indicators (Calvache et al., 2021; Donabedian, 1988; Hao et al., 2020).

### 2.2. Patient safety culture

Patient safety culture, or PSC, is often defined as the shared values, beliefs, and norms influencing how patients' safety is managed within a healthcare organization (Kakeman et al., 2021; Tear et al., 2020). Studies have shown that a robust PSC reduces adverse events, improves staff morale, and enhances patient satisfaction (Lee

et al., 2021; Mitchell, 2008). In TCM hospitals, understanding and promoting a safety culture can be particularly challenging due to historical practices and the holistic nature of treatments. Key components of PSC include leadership support, staff training, reporting and learning systems, and a non-punitive approach to error management (Nielsen et al., 2010; Palmier et al., 2020). Research indicates that leadership commitment to safety directly correlates with improvements in safety practices at the frontline (Mearns et al., 2013). In TCM hospitals, where traditional beliefs potentially clash with contemporary safety protocols, fostering this leadership support is essential.

## 2.3. Theoretical background

The research's theoretical framework that underpins the constructs of PSC, hospital performance, and patient safety outcomes (PSO) are vital components in framing the analysis and understanding of their interconnected relationships, particularly within the context of TCM hospitals in China. The high-reliability organization (HRO) theory, a model that emphasises error prevention and promotes robust organizational resilience, is elucidated in this study (Enya, 2019). Subsequently, the resource-based view (RBV) theory, a strategic tool highlighting the significance of unique internal resources in achieving competitive advantage, is also gauged (Acosta-Prado et al., 2020). Additionally, hospital performance measurement (HPM) approaches are appraised in this study, underscoring the prominence of the balanced scorecard in providing a comprehensive assessment of hospital performance across multiple dimensions.

By exploring these theoretical frameworks, the research is better equipped to investigate and comprehend the intricate relationships and effects between PSC and hospital performance within TCM hospitals in China. This thorough understanding forms a solid theoretical foundation for this research, enabling a robust examination of the impacts of these constructs on hospital performance.

## 2.4. Hypotheses development

Cantu et al. (2020) and Rotteau et al. (2022) described high-reliability organizations as those operating in complex and high-risk environments while maintaining a high level of safety and efficiency. This study proposes and empirically validates the impact of PSC on hospital performance, with PSO mediating this relationship. Partial least squares structural equation modelling (PLS-SEM) was applied to estimate the model. Norton (1996) introduced the Balanced Scorecard as a strategic management tool that enables organizations to translate their vision and strategy into actionable objectives. Research model was shown in **Figure 4**.

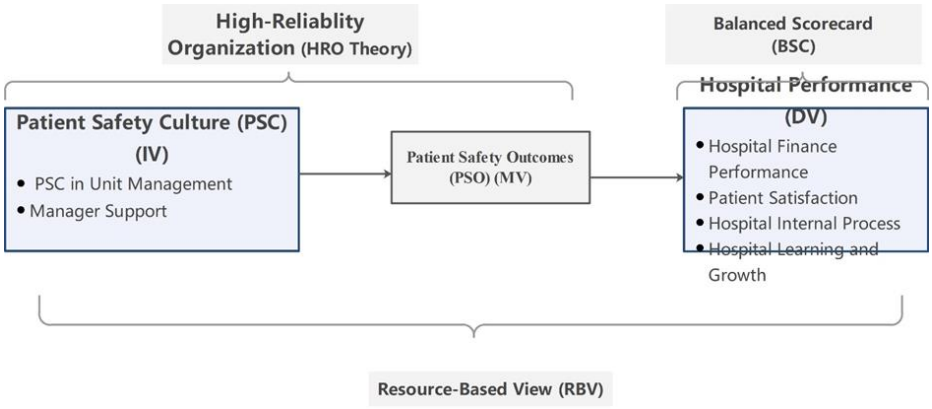


**Figure 4.** Research model.

### 2.4.1. Patient safety culture in unit management to hospital performance and PSO

The present study found that PSC in unit management has a significant positive relationship with hospital performance. The study covers procedures, measures and the culture of managing and ensuring the safety of patients at the unit level. This notion is further delineated by Zhou et al. (2018), who stated that units with a positive attitude towards patient safety are likely to experience fewer adverse occurrences and medical mistakes, thus incurring fewer liability claims, financial damages, medical errors, and resource use for hospitals and healthcare facilities. Similarly, PSC in unit management is claimed to be vital for promoting hospital financial performance. When the staff in one unit work together, share and support each other, they can better identify and prevent potential errors (Badr et al., 2017; Ree and Wiig, 2020). Patients are likely to feel more assured and satisfied with their treatment when they see their providers embracing strict safety practices (Li et al., 2020; Smith et al., 2021). Better clinical conditions also lead to positive patient satisfaction, as patients who have achieved better health status and experienced fewer complications will also rate their experience positively (Sun et al., 2019; Wang et al., 2021). Therefore, PSC in unit management is hypothesised to have a positive relationship with hospital performance, as listed below:

H1a: Patient safety culture (PSC) in unit management significantly and positively impacts hospital finance performance (HFP).

H1b: Patient safety culture (PSC) in unit management significantly and positively impacts patient satisfaction (PS).

H1c: Patient safety culture (PSC) in unit management significantly and positively impacts patient international performance (HIP).

H1d: Patient safety culture (PSC) in unit management significantly and positively impacts hospital learning growth (HLG).

H1e: Patient safety culture (PSC) in unit management significantly and positively impacts patient safety outcomes (PSO).

### 2.4.2. Management support and PSO to hospital performance

The HRO theory found that organizations developed unique strategies and practices to minimise the risk of accidents and failures (Damschroder et al., 2019; Weinger and Gaba, 2014). Additionally, research indicates that managerial

commitment has been found to be positively associated with the return on investment (Li et al., 2021). Thus, this research enhances the existing literature by evaluating the subsequent hypotheses.

H2a: Management support has a significantly and positively impacts on hospital finance performance (HFP).

H2b: Management support has a significantly and positively impacts on patient satisfaction (PS).

H2c: Management support has a significantly and positively impacts on hospital internal performance (HIP).

H2d: Management support has a significantly and positively impacts on hospital learning growth (HLG).

H2e: Management support has a significantly and positively impacts on patient safety outcomes (PSO).

### 2.4.3. PSO has a positive effect on hospital performance

The relationship between patient safety outcomes and hospital performance is primarily characterized by the communication of information that can be utilized in studies to improve healthcare based on its feedback. The thorough information exchange of patient safety grades interior the hospital benefits the internal operation efficiency, to establish more in-depth understanding towards target patients (Alabdaly et al., 2021). Thus, this research hypothesis as below:

H3a: Management support has a significantly and positively impacts on hospital finance performance (HFP).

H3b: Management support has a significantly and positively impacts on patient satisfaction (PS).

H3c: Management support has a significantly and positively impacts on hospital internal performance (HIP).

H3d: Management support has a significantly and positively impacts on hospital learning growth (HLG).

### 2.4.4. Mediating effects

Since the improvement of the PSO holds significant potential, the implementation of PSC in unit management has a critical role in influencing hospital performance. Therefore, the research anticipates that PSO will mediate the relationship between the following constructs.

H4a: The relationship between patient safety culture (PSC) in unit management and hospital finance performance (HFP) is mediated by patient safety outcomes (PSO).

H4b: The relationship between patient safety culture (PSC) in unit management and patient satisfaction (PS) is mediated by patient safety outcomes (PSO).

H4c: The relationship between patient safety culture (PSC) in unit management and hospital internal performance (HIP) is mediated by patient safety outcomes (PSO).

H4d: The relationship between patient safety culture (PSC) in unit management and hospital learning and growth (HLG) is mediated by patient safety outcomes (PSO).

H4e: The relationship between management support (MS) and hospital finance performance (HFP) is mediated by patient safety outcomes (PSO).

H4f: The relationship between management support (MS) and patient satisfaction

(PS) is mediated by patient safety outcomes (PSO).

H4g: The relationship between management support (MS) and hospital internal performance (HIP) is mediated by patient safety outcomes (PSO).

H4h: The relationship between management support (MS) and hospital learning and growth (HLG) is mediated by patient safety outcomes (PSO).

## 3. Research methodology

### 3.1. Survey instrument development

The measuring models for the constructs in this investigation were derived from other recognized past studies. Specifically, the measurement of PSC in unit management, manager support, and PSO was adapted from a five-item scale described by the Famolaro et al. (2021). Subsequently, hospital financial performance, patient satisfaction, internal process and learning and growth were adapted from the five-item scale of Administration of Traditional Chinese Medicines (2023). The instruments exhibited substantial internal consistency in the pilot test, with reliability coefficients between 0.875 and 0.719. The current study employed a cross-sectional survey and incorporated a marker variable comprising three items (e.g., legal bonds), previously utilized in Shou et al. (2014) and originally devised by Cannon and Perreault (1999), to mitigate the influence of common method variance (CMV) (Podsakoff et al., 2003; Simmering et al., 2015).

Before data collection, the survey instrument underwent rigorous pretesting via expert evaluation and cognitive interview methods to determine its face validity and clarity. Two academics and three industry experts were selected to evaluate the survey in terms of clarity, understandability, and content validity of the questionnaire, with the aim of improving the clarity of individual item questions. Cognitive interviews were subsequently conducted with 196 organizations from the sampling frame, data collection procedures shown in **Figure 5**.

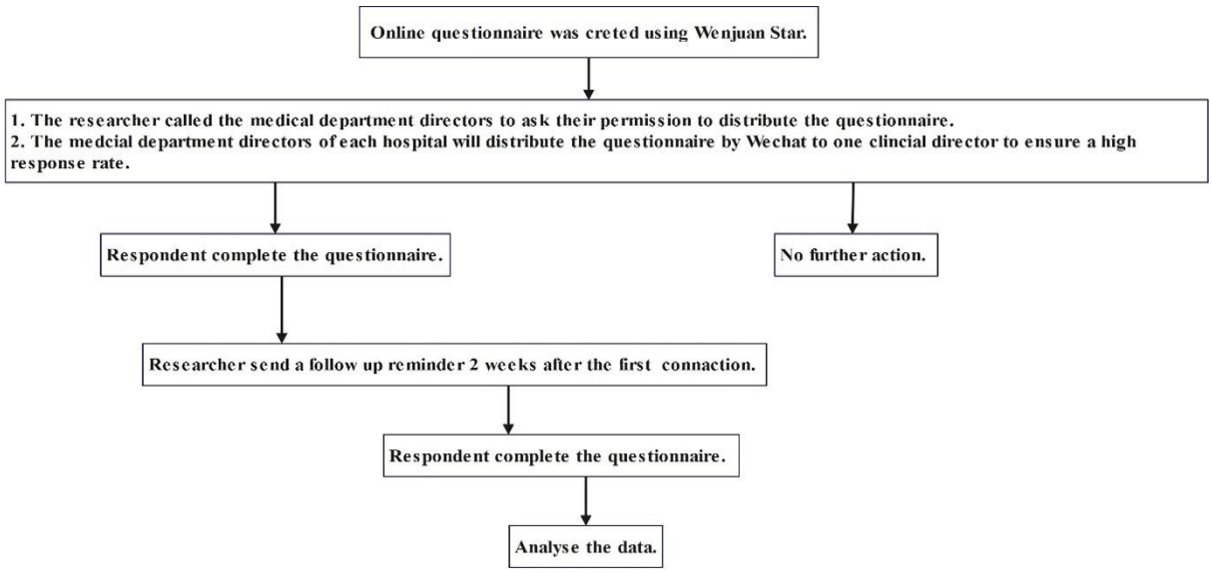


**Figure 5.** Data collection procedures.

## 3.2. Sampling method

To ascertain the sample size necessary for adequate data to perform inferential testing via PLS-SEM in this investigation, the recommendations of Hair et al. (2022) were adhered to, emphasising a spectrum of effect sizes rather than a singular criterion. By referring to Hair, Hult et al. (2021), the square root method was used to indicate the upper bound of sample sizes (Kock and Hadaya, 2018). For this study, G-power indicates a lower bound sample size of 194. The sample size of 196 strikes a balance between the expenses of data gathering and the advantages of a substantial sample size.

The focal context of this research is the Sichuan Public TCM hospitals in China. The research project is supported by the Sichuan Provincial Administration of Traditional Chinese Medicine (2023MS482) and the Chengdu Science and Technology Bureau (2024SCWA018), allowing the distribution of the questionnaire to all public TCM hospitals in Sichuan. The sampling frame was further refined to include all public TCM hospitals, which ensured that the final sampling frame was 196.

The sampling frame included the phone numbers of hospitals' medical directors, who were contacted by telephone or WeChat. Medical directors from all 196 public TCM hospitals agreed to distribute the questionnaire online. Each medical director distributed the questionnaire to one clinical department director per hospital.

## 3.3. Sample profile

**Table 1** discusses the respondents' demographic profiles, including their gender, age, education level, and tenure as director of this hospital. According to the sample, most respondents were female (68.1%), followed by male (31.9%). The majority of respondents were aged between 41 and 45 (33.7%), followed by those aged between 45 and 50 (24.5%), 36 to 40 (18.4%), 51 to 55 (15.3%), 30 to 35 (4.9%), and 56 to 60 (3.1%). In terms of education level, the majority of them possessed bachelor's degrees (79.9% In terms of the tenure of being a director in this hospital, 44.8 % of the respondents had 1 to 5 years of management experience. Approximately 24.7% had 6 to 10 years of management experience, 18.0 % had 11 to 15 years of management experience, and 12.4% had 16 to 20 years of management experience.), followed by master's degrees (11.8%), diplomas (7.2%), and doctorate or above (1.0%).

**Table 1.** Demographic profiles of the respondents.

| Demographic | Data | Frequency | Percentage (%) |
|---|---|---|---|
| Age (in years) | 30–35 | 8 | 4.9 |
| | 36–40 | 30 | 18.4 |
| | 41–45 | 55 | 33.7 |
| | 45–50 | 40 | 24.5 |
| | 51–55 | 25 | 15.3 |
| | 56–60 | 5 | 3.1 |
| Gender | Male | 111 | 68.1 |
| | Female | 52 | 31.9 |

**Table 1.** (*Continued*).

| Demographic | Data | Frequency | Percentage (%) |
|---|---|---|---|
| Education Level | Certificate/Diploma | 12 | 7.2 |
| | Bachelor's Degree | 130 | 79.9 |
| | Master's Degree | 19 | 11.8 |
| | Doctorate or above | 2 | 1.1 |
| Tenure of being the director in this hospital (in years) | 1–5 years | 73 | 44.8 |
| | 6–10 years | 40 | 24.7 |
| | 11–15 years | 30 | 18.1 |
| | 16–20 years | 20 | 12.4 |

## 4. Analysis and results

### 4.1. Data preparation

Cook's (1977) distance was estimated for the structural model as part of an outlier assessment to make sure there were no significant outliers in the data. Mardia's (1970) test for multivariate skewness and kurtosis and the Cramer-von Mises test demonstrated that the data deviates from a normal distribution at both the multivariate and individual variable levels (Kline, 2016; Lasker, 2024; Ringle et al., 2023). Appendix presents the comprehensive results of the skewness and kurtosis for both multivariate and individual variables. The bootstrapped PLS-SEM method, which does not necessitate assumptions about data distribution and lacks model parameters, is appropriate for model estimation and hypothesis testing in this instance (Hair et al., 2019). Moreover, PLS-SEM does not encounter the problem of undetermined concept scores. Consequently, it is appropriately designed to perform a prediction evaluation to enhance the model's generalisability and practical applicability (Hair et al., 2019). Despite the developing literature on the utilisation of prediction approaches in covariance-based SEM (de Rooij et al., 2023), there is hope regarding the deployment and thorough evaluation of these novel techniques.

### 4.2. Model evaluation

The model is estimated and analyzed using PLS-SEM to validate the measurement and structural models, conduct hypothesis testing, and analyze results (Sarstedt et al., 2022). the full collinearity test was assessed through PLS modelling using Smart-PLS 4 as the statistical tool to examine the measurement and structural models (Ringle et al., 2024). This method was chosen since it does not require the assumption of normality, which is often not met in survey research (Chin et al., 2003). Newsom et al. (2022) and Kock (2015) recommended that all variables are regressed against a common variable, and if the VIF $\leq 3.3$, there is no bias from the single source data. Subsequently, the linear regression analysis was conducted through SPSS Statistic 27, where the dummy variable was the dependent variable, while other latent variables were the independent variable. Lastly, the collinearity option was selected in the statistics menu, and the VIF values for each latent variable are presented in **Table 2**. Kline (2016), as cited in Kock (2012), introduced a critical VIF value of 5.0. Therefore, the VIF value below 3.3 or 5.0 indicates no bias from the single source

data.

**Table 2.** Full collinearity testing.

| Variable | MS | PSCUM | PSO | HFP | HIP | HLG | PS |
|---|---|---|---|---|---|---|---|
| VIF | 1.455 | 1.596 | 1.671 | 1.705 | 1.761 | 1.838 | 1.678 |

Note: HFP—hospital financial performance; PS—patient satisfaction; HIP—hospital internal process; HLG—hospital learning and growth; PSCUM—PSC in unit management; MS—management support; PSO—patient safety outcomes.

## 4.3. Common method variance

In studies driven by quantitative surveys, the data is collected from a single respondent through a self-reported questionnaire. Thus, common method bias (CMV) may present a problem, especially due to single source data and common scale properties (Podsakoff et al., 2003).

Following the PLS-predict evaluation, an inspection was conducted to assess the bias introduced by common method variance (Lindell and Whitney, 2001; Podsakoff et al., 2003). According to Malhotra et al. (2017), an increase in $R^2$ by more than 10% indicates the presence of CMV. Nevertheless, Lindell and Whitney (2011) extended this threshold to 30%. CMV is not a concern in this investigation (Lindell and Whitney, 2001; Podsakoff et al., 2003).

## 4.4. Results

### 4.4.1. Measurement model validation

All constructs in this model are composites assessed using Model A and evaluated based on construct internal consistency, size of indicator loadings, construct convergent validity, and construct discriminant validity (Hair, Hult et al., 2021). Based on the magnitude of indicator loadings for eight indicators (PCCUM2, PSCUMS3, PSCUM5, PSCUM6, PSCUM11, PSCUM13, PSCUM14, and PSO2 (loading < 0.6)), were removed from the model. Subsequent to the elimination of the indicators, the composite reliability (CR), Cronbach's alpha (CA), and average variance extracted (AVE), including the remaining indicators, exceeded thresholds (Refer to **Table 3**). Therefore, the structure is confirmed to be good.

**Table 3.** Model validation.

| Construct | Items | Loadings | Item Deleted | CA | CR | AVE | Cronbach |
|---|---|---|---|---|---|---|---|
| HFP | HFP1 | 0.779 | 0.876 | 0.891 | 0.915 | 0.606 | 0.891 |
| | HFP2 | 0.765 | 0.878 | | | | |
| | HFP3 | 0.765 | 0.879 | | | | |
| | HFP4 | 0.763 | 0.877 | | | | |
| | HFP5 | 0.772 | 0.876 | | | | |
| | HFP6 | 0.757 | 0.877 | | | | |
| | HFP7 | 0.845 | 0.864 | | | | |
| PS | PS8 | 0.817 | 0.768 | 0.818 | 0.88 | 0.646 | 0.818 |
| | PS9 | 0.811 | 0.77 | | | | |
| | PS10 | 0.775 | 0.781 | | | | |
| | PS11 | 0.812 | 0.764 | | | | |

**Table 3.** (*Continued*).

| Construct | Items | Loadings | Item Deleted | CA | CR | AVE | Cronbach |
|---|---|---|---|---|---|---|---|
| HIP | HIP12 | 0.805 | 0.85 | 0.875 | 0.906 | 0.616 | 0.875 |
| | HIP13 | 0.803 | 0.849 | | | | |
| | HIP14 | 0.778 | 0.855 | | | | |
| | HIP15 | 0.775 | 0.856 | | | | |
| | HIP16 | 0.767 | 0.857 | | | | |
| | HIP17 | 0.78 | 0.856 | | | | |
| HLG | HLG18 | 0.786 | 0.843 | 0.868 | 0.901 | 0.602 | 0.868 |
| | HLG19 | 0.795 | 0.841 | | | | |
| | HLG20 | 0.777 | 0.844 | | | | |
| | HLG21 | 0.793 | 0.842 | | | | |
| | HLG22 | 0.745 | 0.851 | | | | |
| | HLG23 | 0.758 | 0.851 | | | | |
| PSO | PSO1 | 0.823 | 0.701 | 0.756 | 0.86 | 0.671 | 0.756 |
| | **PSO2** | **0.177** | deleted | | | | |
| | PSO3 | 0.813 | 0.667 | | | | |
| | PSO4 | 0.823 | 0.652 | | | | |
| PS | PR1 | 0.817 | 0.818 | 0.818 | 0.880 | 0.646 | 0.818 |
| | PR2 | 0.810 | 0.810 | | | | |
| | PR3 | 0.777 | 0.7776 | | | | |
| | PS4 | 0.812 | 0.812 | | | | |
| PSCUM | PSCUM1 | 0.793 | 0.795 | 0.904 | 0.924 | 0.635 | 0.904 |
| | PSCUM2 | 0.019 | | | | | |
| | PSCUM3 | 0.092 | | | | | |
| | PSCUM4 | 0.785 | | | | | |
| | PSCUM5 | 0.152 | | | | | |
| | PSCUM6 | 0.092 | | | | | |
| | PSCUM7 | 0.806 | 0.808 | | | | |
| | PSCUM8 | 0.803 | 0.803 | | | | |
| | PSCUM9 | 0.803 | 0.806 | | | | |
| | PSCUM10 | 0.763 | 0.764 | | | | |
| | PSCUM11 | 0.039 | | | | | |
| | PSCUM12 | 0.813 | 0.815 | | | | |
| | PSCUM13 | 0.102 | | | | | |
| | PSCUM14 | 0.089 | | | | | |
| MS | MS15 | 0.839 | 0.838 | 0.772 | 0.868 | 0.687 | 0.772 |
| | MS16 | 0.815 | 0.815 | | | | |
| | MS17 | 0.832 | 0.832 | | | | |

Note: PSCUM = Patient safety culture in unit management, MS = Management support, PS = Patient satisfaction, HFP = Hospital finance performance, HIP = Hospital internal process, HLG = Hospital learning and growth, and PSO = Patient safety outcomes.

### 4.4.2. Assessment internal consistency reliability

Subsequently, the discriminant validity of the constructs was analyzed by applying the HTMT statistical test and Fornell-Larcker to investigate whether the constructs in the model are empirically distinct from each other. Firstly, the Fornell-Larcker criterion was used to assess the discriminant validity between latent variables. The square root of the average variance extracted (AVE) must be greater than inter-construct correlations (Hair et al., 2014). The Fornell-Larcker method suggests that the AVE root score should be higher than another latent variable. Similarly, indicator loading should be higher than all of its cross-loading (Hair et al., 2016, 2019).

The heterotrait-monotrait (HTMT) test provided evidence that two sets of constructs might face discriminant validity issues and thus warrant a deeper investigation. The test indicated that HTMT between HFP, HIP, HLG, MS, PS, PSCUM, and PSO were less than 0.85 or 0.9 as recommended (Henseler et al., 2015; Yang et al., 2021). The findings of the discriminant validity study are displayed in **Table 4**. All conditions for the measurement models were satisfied, with AVE above 0.5 and CR surpassing 0.7. The results met the criterion for discriminant validity (Franke et al., 2021; Hair, Hult et al., 2020, 2021; Henseler et al., 2016).

**Table 4.** Discriminant validity.

| | **HFP** | **HIP** | **HLG** | **MS** | **PS** | **PSCUM** | **PSO** |
|---|---|---|---|---|---|---|---|
| HFP | | | | | | | |
| HIP | 0.575 | | | | | | |
| HLG | 0.602 | 0.619 | | | | | |
| MS | 0.482 | 0.521 | 0.559 | | | | |
| PS | 0.547 | 0.548 | 0.561 | 0.531 | | | |
| PSCUM | 0.518 | 0.532 | 0.546 | 0.454 | 0.544 | | |
| PSO | 0.55 | 0.595 | 0.589 | 0.554 | 0.648 | 0.544 | |

Note: PSCUM = Patient safety culture in unit management, MS = Management support, PS = Patient satisfaction, HFP = Hospital finance performance, HIP = Hospital internal process, HLG = Hospital learning and growth, PSO = Patient safety outcomes.

## 4.5. Structural model validation

The validation requirements for the structural model, as specified by Hair, Hult et al. (2021), were adhered to. Initially, multi-collinearity was evaluated by calculating the Variance Inflation Factor (VIF) for the exogenous variables within the structural model. All VIF values ranged from 1.492 to 1.704. Consequently, no significant collinearity problems can negatively impact the estimations of standard errors and confidence intervals in the model (Hair et al., 2022).

Subsequently, each of the focal hypotheses was evaluated. The study revealed that MS, PSCUM, and PSO have a moderate positive relationship with HFP, HIP, HLG, and PS. This relationship is statistically substantial at an elevated confidence level (95% confidence interval does not include 0). Nevertheless, MS and PSCUM significantly affect PSO (Refer to **Table 5**).

**Table 5.** Structural model estimate (direct model).

| Hypothesis | Relationship | *β* | *T*-value | *P*-value | PCI-LL | PCI-UL | VIF | Decision |
|---|---|---|---|---|---|---|---|---|
| H1a | MS > HFP | 0.192 | 4.879 | 0.000 | 0.129 | 0.259 | 1.513 | Supported |
| H1b | MS > HIP | 0.208 | 5.255 | 0.000 | 0.146 | 0.277 | 1.513 | Supported |
| H1c | MS > HLG | 0.247 | 6.601 | 0.000 | 0.188 | 0.311 | 1.513 | Supported |
| H1d | MS > PS | 0.194 | 4.041 | 0.000 | 0.116 | 0.276 | 1.513 | Supported |
| H1e | MS > PSO | 0.294 | 6.79 | 0.000 | 0.223 | 0.367 | 1.26 | Supported |
| H2a | PSCUM > HFP | 0.282 | 6.334 | 0.000 | 0.211 | 0.358 | 1.492 | Supported |
| H2b | PSCUM > HIP | 0.27 | 6.225 | 0.000 | 0.203 | 0.345 | 1.492 | Supported |
| H2c | PSCUM > HLG | 0.278 | 6.543 | 0.000 | 0.211 | 0.351 | 1.492 | Supported |
| H2d | PSCUM > PS | 0.253 | 5.019 | 0.000 | 0.176 | 0.342 | 1.492 | Supported |
| H2e | PSCUM > PSO | 0.338 | 7.946 | 0.000 | 0.269 | 0.408 | 1.26 | Supported |
| H2f | PSO > HFP | 0.248 | 5.72 | 0.000 | 0.181 | 0.324 | 1.704 | Supported |
| H3a | PSO > HIP | 0.277 | 6.383 | 0.000 | 0.208 | 0.351 | 1.704 | Supported |
| H3b | PSO > HLG | 0.25 | 5.714 | 0.000 | 0.18 | 0.324 | 1.704 | Supported |
| H3c | PSO > PS | 0.318 | 6.601 | 0.000 | 0.241 | 0.399 | 1.704 | Supported |

The $R^2$ values for the exogenous constructs (PSO, HIP, HLG, PS, HFP) were 0.200, 0.235, 0.230, and 0.208, respectively, exceeding the acceptable threshold of 0.10 (Hair, Hult et al., 2021). **Table 6** presents the method outlined by Hair, Hult et al. (2021) was applied to test the indirect relationships. **Table 6** shows the significant mediating effects of patient safety outcomes between the management support and patient satisfaction ($\beta = 0.094$, $t = 4.570$, $p < 0.001$), hospital finance performance ($\beta = 0.074$, $t = 3.884$, $p < 0.01$), hospital internal performance ($\beta = 0.082$, $t = 4.098$, $p < 0.01$) and hospital learning growth ($\beta = 0.074$, $t = 3.919$, $p < 0.01$), therefore, the study supports H4a, H4d, H4e, H4f. Meanwhile, the significant medicating effects of patient safety outcomes between patient safety culture in unit management and hospital learning growth (H4b, $\beta = 0.085$, $t = 4.189$, $p < 0.05$), patient satisfaction (H4c, $\beta = 0.108$, $t = 4.727$, $p < 0.01$), hospital finance performance (H4g, $\beta = 0.085$, $t = 4.196$, $p < 0.01$), Hospital internal performance (H4f, $\beta = 0.095$, $t = 4.362$, $p < 0.01$).

**Table 6.** Structural model estimate (indirect model estimation).

| H | Relationship | β value | CI-LL | CI-UL | *t*-value | *P*-value | $f^2$ | Decision |
|---|---|---|---|---|---|---|---|---|
| H4a | MS > PSO > PS | 0.094 | 0.059 | 0.139 | 4.57 | 0.000 | 0.0154 | Supported |
| H4b | PSCUM > PSO > HLG | 0.085 | 0.051 | 0.13 | 4.189 | 0.004 | 0.0144 | Supported |
| H4c | PSCUM > PSO > PS | 0.108 | 0.068 | 0.158 | 4.727 | 0.001 | 0.0169 | Supported |
| H4d | MS > PSO > HFP | 0.074 | 0.042 | 0.117 | 3.884 | 0.003 | 0.119 | Supported |
| H4e | MS > PSO > HIP | 0.082 | 0.049 | 0.128 | 4.098 | 0.002 | 0.137 | Supported |
| H4f | MS > PSO > HLG | 0.074 | 0.042 | 0.116 | 3.919 | 0.002 | 0.130 | Supported |
| H4g | PSCUM > PSO > HFP | 0.085 | 0.051 | 0.13 | 4.196 | 0.003 | 0.130 | Supported |
| H4f | PSCUM > PSO > HIP | 0.095 | 0.058 | 0.142 | 4.362 | 0.002 | 0.151 | Supported |

Note: A 95% confidence interval with a bootstrapping of 10000 was used. CILL: confidence interval lower level; CIUL: confidence interval upper limit.

The results indicated that PSO positively mediates the relationships between

PSCUM, MS, HIP, HFP, PS, and HLG. Therefore, robust evidence exists to substantiate hypotheses H1a, H1b, H1c, H1d, H2a, H2b, H2c, H2d, H3a, H3b, H3c, H3d, H3e, H3f, H3g, and H3h.

In the following **Figure 6** represents the diagrammatic analysis of the structural model of hypotheses testing results:

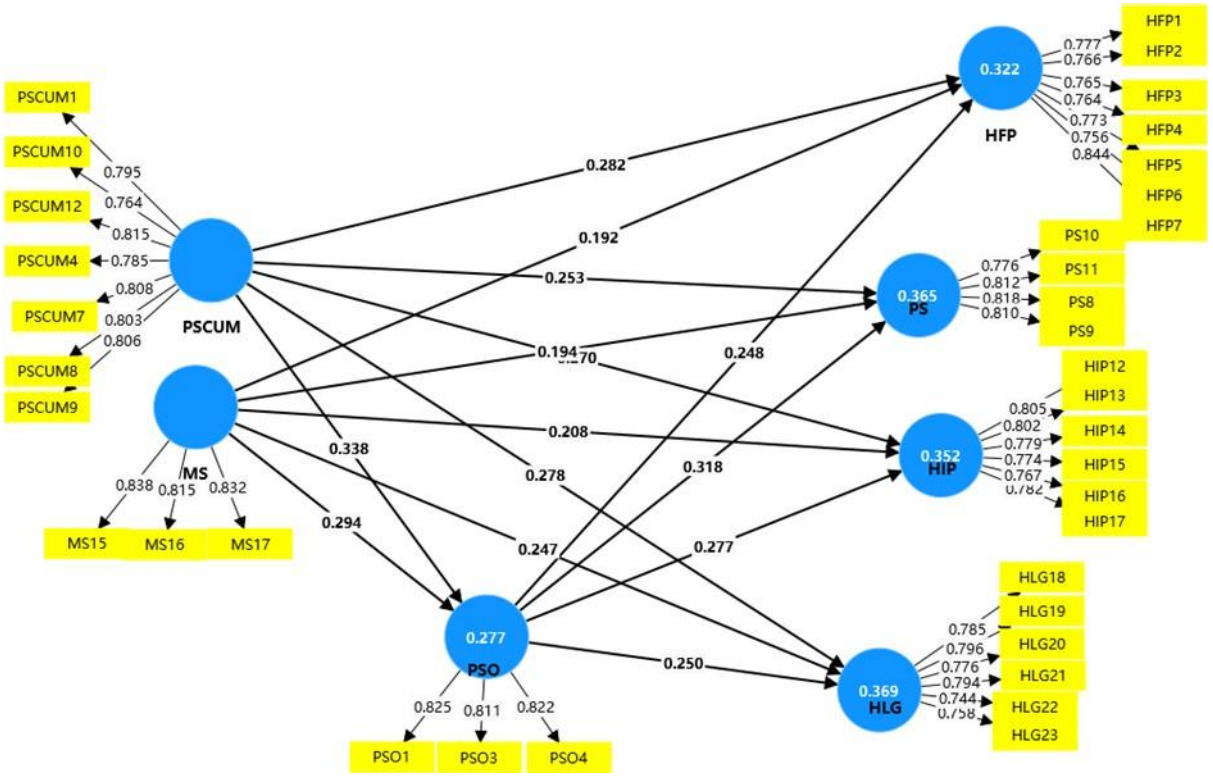


**Figure 6.** Structural measurement model.

## 5. Discussion

This study proposes and empirically validates the relationship between PSC and hospital performance, with PSO mediating the relationship between PSC and hospital performance.

In testing the direct effect relationship between the independent variables (PSC in unit management and management support) and hospital performance (hospital finance performance, patient satisfaction, hospital internal process performance, hospital learning, and growth performance), all relationship were supported and positive (*p*-value 0.000–0.004).

In the relationship between the independent variables (PSC in unit management and management support) and patient safety outcomes, and the dependent variables (hospital finance performance, patient satisfaction, hospital internal process performance, hospital learning and growth performance), all relationship were significantly positive.

In the testing the mediating roles of patient safety outcomes, it was found that all relationships were significantly positive (*p*-value: 0.000–0.004).

## 5.1. Theoretical implications

The results of this research present several theoretical contributions. Firstly, findings elucidate the critical of the hospital management (consisting of operating, nursing, medical quality, education and management) in the healthcare context. Besides, this study contributed to the literature by examining and empirically validating the function of PSC competence as a micro-foundation of hospital performance. This study enhances the micro-foundation literature in strategic management by empirically elucidating the mediating impacts of PSO capability on the relationships within hospital performance micro-foundations. This integral role of PSC as an HRO and sustaining hospital performance provides a fresh contribution to the existing body of knowledge on hospital performance.

Furthermore, by testing these relationships, **Table 4** showed that PSCUM and MA have significant with four dimensions of HP and PSO. Besides, the path of PSCUM to four dimension of HP and PSO has more affection than MS, compared primary research PSC has been found to be a significant driver of the hospital performance capability, therefore addressing the longstanding calls by prior studies (Huang, 2021; Lee et al., 2023; Wang, 2021; Zhou, 2018).

Thus, this study is one of the first to employ HRO, BMC and RBV theory to analysis the relationship between patient safety culture in unit management and manager support and hospital performance. Patient safety outcomes as the mediator have positive effect of the relationship between patient safety culture and hospital performance.

## 5.2. Managerial implications

In addition to theoretical contributions, this study offers practical and managerial insights for hospital administrators through a more refined model of patient safety culture (PSC). Managers aiming to enhance PSC may follow these findings to optimally implement tailored actions required for the effective utilisation of their resources and talents.

First, findings point toward how diverse how patient safety culture and patient safety outcomes can improve hospital performance. Patient safety culture in unit management is the most important factor for improving hospital performance, especially for hospital learning and growth and patient safety outcomes. In another word, the novel contribution offered to managers arises from the findings that PSC in unit management and management support contributes to hospital performance in two ways: initially, as a competency at the micro-foundation level within public hospitals, and subsequently, as a conduit that integrates other micro-foundation resources and skills to enhance hospital performance. Consequently, it is advisable for hospitals to implement PSC practices as an essential initial measure to enhance resilience.

As this concept requires change in both cognitive and behavioral aspects among hospital employees, hospital managers should begin efforts by establishing hospital policies that embed PSC in their work culture.

Secondly, patient safety outcomes as the mediator have the positive effect between patient safety culture in unit management and management support and hospital performance. Especially PSCUM has the strongest effect on patient

satisfaction. In another words, if employees of the unit submitted more patient safety outcomes, patient satisfaction will be higher.

Such policies will enable hospital staff from various teams and divisions to collaboratively adopt, comprehend, and execute the practices of PSC efficiently. However, this strategy necessitates the dean of the hospital's dedication to investing resources in PSC to enable the effective execution of the policy through suitable strategies and action plans. Another method to enhance the adoption of PSC is by fostering an environment that enables employees to debate emergent disruptions and gather evidence to validate their ideas regarding the healthcare system.

In this regard, the theory model adopted in the study comprises two theories that help explain the connections between PSC and hospital performance of TCM hospitals in Sichuan Province, China. These theoretical implications offer a convenient paradigm for the connection between the formation of PSC, changes to PSO, and hospital performance.

Moreover, the primary implications of this study are vital to healthcare policies and practices, especially connecting hospitals. First, policymakers in the healthcare sector need to understand the correlation between patient safety and a hospital's overall performance. Thus, by identifying the influence of the PSC on different areas of hospital performance, it is possible to formulate policies to increase the understanding of safety culture among TCM hospitals.

## 6. Conclusion

The present study found that patient safety culture in unit management has a significant positive relationship with hospital performance (finance performance: *P*-value = 0.000; $\beta$ = 0.282, *t*-value=6.334; internal performance: *P*-value = 0.000, $\beta$ = 0.208, *t*-value = 5,255; learning growth: *p*-value = 0.000, $\beta$ = 0.270, *t*-value = 6.225; patient satisfaction: *p*-value = 0.000, $\beta$ = 0.253, *t*-value = 5.091). Zhou et al. (2018) delineated that units with a positive attitude to patient safety are likely to sustain few adverse occurrences and medical mistakes, thus incurring less on hospitals and healthcare facilities, liability claims, financial damages, medical errors, and resources. Managers tend to experience a higher level of hospital financial performance when their support is high in public TCM hospitals. This situation perfectly matches the ideas of HRO theory, which states that organizations develop unique strategies and practices to minimise the risk of accidents and failures (Damschroder et al., 2009; Weinger and Gaba, 2014). Huang et al. (2021) also claimed that patient safety culture in unit management can support hospital internal process performance. For example, positive staff compliance with safety management practices is achieved when unit managers recognize it as a key focus and ensure that safety standards are upheld. This finding also indicates that when unit management places greater emphasis on patient safety, such as encouraging open communication, effective teamwork, and ensuring sufficient staffing, the environment is more likely to promote professional growth and lead to the adoption of best practices (Lee et al., 2023). This conclusion highlights the significance of unit-level administration in fostering employee satisfaction, social responsibility, and related outcomes. Patients are likely to be more assured and satisfied with their treatment since they should expect their providers to embrace strict

safety practices (Li et al., 2020; Smith et al., 2021).

Moreover, the research results indicated that management support has a significant positive relationship with hospital performance (finance performance: *P*-value = 0.000; $\beta$ = 0.192, *t*-value = 4.879; internal performance: *P*-value = 0.000, $\beta$ = 0.208, *t*-value = 5,255; learning growth: *p*-value = 0.000, $\beta$ = 0.247, *t*-value = 6.601; patient satisfaction: *p*-value = 0.000, $\beta$ = 0.194, *t*-value = 4.041). The result perfectly matches the ideas of HRO theory, which states that organizations develop unique strategies and practices to minimize the risk of accidents and failures (Damschroder et al., 2009; Weinger and Gaba, 2014). Additionally, managerial commitment has been found to influence return on investment significantly (Li et al., 2021). This finding aligns with the study by Huang et al. (2024), which proposed that positive internal processes in healthcare organizations can result from management support. For instance, patients adhering to the same principles, methods, and medications have gradually increased, while turnover days have steadily decreased. The finding aligns with literature, which suggested that the hospital management's support for patient safety would foster healthcare employee engagement in contributing to patient safety initiatives, such as continuous organizational learning (Caldas et al., 2022; Hall et al., 2018; Vogus et al., 2010).

Lastly, the research results indicated that mediating role of patient safety outcomes (PSO) on the relationship between patient safety culture (PSC) in unit management and hospital performance (HP) (finance performance: *P*-value = 0.003; $\beta$ = 0.085, *t*-value = 4.196; internal performance: *P*-value = 0.002, $\beta$ = 0.082, *t*-value = 4.098; learning growth: *p*-value = 0.004, $\beta$ = 0.085, *t*-value = 4.189; patient satisfaction: *p*-value = 0.001, $\beta$ = 0.108, *t*-value = 4.727). Moreover, the current study supports the hypothesis that patient safety outcomes interact with management support to influence hospital Performance (finance performance: *P*-value = 0.003; $\beta$ = 0.074, *t*-value = 3.884; internal performance: *P*-value = 0.002, $\beta$ = 0.082, *t*-value = 4.098; learning growth: *p*-value = 0.002, $\beta$ = 0.074, *t*-value = 3.919; patient satisfaction: *p*-value = 0.000, $\beta$ = 0.094, *t*-value = 4.570). The results highly evidenced that previous study revealed that patient safety outcome is a significant mediating variable between patient safety culture and hospital performance (Huang et al., 2023). Patients are more likely to be satisfied, particularly if they feel safe within a healthcare facility and achieve positive outcomes, which is effectively explained by patient safety outcomes. Additionally, Sun et al. (2019) and Wang et al. (2021) also revealed that commitments to safety culture at the unit level also enhance compliance with clinical protocols as well as recognition of plausible safety concerns that might lead to adverse occurrences. Research shows that when patient safety outcomes improve, operations have to be enhanced within the hospital. For example, procedures must be done in a shorter period of time without reinforcement of safety incidents, which interrupts the process.

**Author contributions:** Conceptualization, NZ; data curation, NZ; formal analysis, NZ; funding acquisition, NZ; investigation, NZ; methodology, NZ; resources, NZ; software, NZ; original draft, NZ; project administration, AJA; supervision, AJA and PG; validation, AJA and PG; visualization, AJA and PG; review and editing, AJA and PG. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the Sichuan Health Economics Association grant number [2024SCWA018]; Hospital of Chengdu University of Traditional Chinese Medicine grant number [22XG04]; Sichuan Provincial Administration of Traditional Chinese Medicine grant number [2023MS482].

**Conflict of interest:** The authors declare no conflict of interest.

## Abbreviations

| | |
|---|---|
| TCM | Traditional Chinese Medicine |
| PSC | Patient Safety Culture |
| PSO | Patient Safety Outcomes |
| MS | Management Support |
| PSCUM | Patient Safety culture in unit management |

## References

Acosta-Prado, J. C., López-Montoya, O. H., Sanchís-Pedregosa, C., & Zárate-Torres, R. A. (2020). Human resource management and innovative performance in non-profit hospitals: the mediating effect of organizational culture. Frontiers in Psychology, 11, 1422. https://doi.org/10.3389/fpsyg.2020.01422.

AHRQ (Agency for Healthcare Research and Quality). (2020). Second User Comparative Database Report on Hospital Survey on Patient Safety Culture (HSOPS) 2.0. Patient Safety Network. Retrieved from https://www.ahrq.gov/sops/events/news/hsops2-release.html.

Badr, H. E., AlFadalah, T., & El-Jardali, F. (2017). Towards promoting patient safety practices: Baseline assessment of patient safety culture in three private hospitals. International Journal of Healthcare Management, 13(3), 207–214. https://doi.org/10.1080/20479700.2017.1390958

Caldas, B. D. N., Portela, M. C., Singer, S. J., & Aveling, E. L. (2022). How can implementation of a large-scale patient safety program strengthen hospital safety culture? Lessons from a qualitative study of national patient safety program implementation in two public hospitals in Brazil. Medical Care Research and Review, 79(4), 562-575.

Calvache, J. A., Benavides, E., Echeverry, S., Agredo, F., Stolker, R. J., & Klimek, M. (2021). Psychometric properties of the Latin American Spanish version of the hospital survey on patient safety culture questionnaire in the surgical setting. Journal of Patient Safety, 17(8), e1806-e1813. Https://doi: 10.1097/PTS.0000000000000644.

Cantu, J., Tolk, J., Fritts, S., & Gharehyakheh, A. (2020). High Reliability Organization (HRO) systematic literature review: Discovery of culture as a foundational hallmark. Journal of Contingencies and Crisis Management, 28(4), 399-410. Https:// doi: 10.1056/CAT.21.0314.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). Routledge. https://doi.org/10.4324/978020377158.

Cook, R. D. (2000). Detection of Influential Observation in Linear Regression. Technometrics, 42(1), 65–68. https://doi.org/10.1080/00401706.2000.10485981.

Danks, N. P., Ray, S., & Shmueli, G. (2024). The composite overfit analysis framework: assessing the out-of-sample generalizability of construct-based models using predictive deviance, deviance trees, and unstable paths. Management Science, 70(1), 647-669. https://doi.org/10.1287/mnsc.2023.4705

David Blumenthal et al., Mirror, Mirror 2024: A Portrait of the Failing U.S. Health System — Comparing Performance in 10 Nations (Commonwealth Fund, Sept. 2024). https://doi.org/10.26099/ta0g-zp66

De Rooij, M., Karch, J. D., Fokkema, M., Bakk, Z., Pratiwi, B. C., & Kelderman, H. (2022). SEM-based out-of-sample predictions. Structural Equation Modeling: A Multidisciplinary Journal, 30(1), 132–148. https://doi.org/10.1080/ 10705511.2022.2061494.

Donabedian, A. (1988). The quality of care: How can it be assessed? JAMA, 260(12), 1743-1748. https://doi.org/10.1001/jama.1988.0341012008903.

Enya, A., Dempsey, S., Pillay, M. (2019). High Reliability Organisation (HRO) Principles of Collective Mindfulness: An

Opportunity to Improve Construction Safety Management. In: Arezes, P. (eds) Advances in Safety Management and Human Factors. AHFE 2018. Advances in Intelligent Systems and Computing, vol 791. Springer, Cham. https://doi.org/10.1007/978-3-319-94589-7_1.

Essuman, D., Ataburo, H., Boso, N., Anin, E. K., & Appiah, L. O. (2023). In search of operational resilience: How and when improvisation matters. Journal of Business Logistics, 44(3), 300-322. https://doi.org/10.1111/jbl.12343.

Famolaro T, Hare R, Yount ND, Fan L, Liu H, Sorra J. Surveys on Patient Safety Culture(SOPS®) Hospital Survey 2.0: 2021 User Database Report. (Prepared by Westat, Rockville, MD, under Contract No. HHSP233201500026I/HHSP23337004T). Rockville, MD: Agency for Healthcare Research and Quality; March 2021. AHRQ Publication No. 21-0017.

Franke, G. R., Sarstedt, M., & Danks, N. P. (2021). Assessing measure congruence in nomological networks. Journal of Business Research, 130, 318–334. https://doi.org/ 10.1016/j.jbusres.2021.03.003.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modelling (PLS-SEM) using R: A workbook (p. 197). https://doi.org/10.15480/882.4101.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) 3rd Edition. Thousand Oaks: Sage.

Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019), "When to use and how to report the results of PLS-SEM", European Business Review, Vol. 31 No. 1, pp. 2-24. https://doi.org/10.1108/EBR-11-2018-0203.

Hall, N., Klein, V., Betts, K., & DeRanieri, J. (2018). Speaking up: Fostering "silence breaking" through leadership. Nursing management, 49(6), 51-53.

Hao, H. S., Gao, H., Li, T., & Zhang, D. (2020). Assessment and Comparison of Patient Safety Culture Among Health-Care Providers in Shenzhen Hospitals. Risk Management and Healthcare Policy, 13, 1543–1552. https://doi.org/10.2147/RMHP.S266813.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8.

Huang, H., Bach, J. R., Sharma, H. S., Chen, L., Wu, P., Sarnowska, A., ... & Sanberg, P. R. (2024). The 2023 yearbook of Neurorestoratology. Journal of Neurorestoratology, 100136. https://www.sciencedirect.com/science/article/pii/S2324242624000433

Imani, A., Alibabayee, R., Golestani, M., & Dalal, K. (2022). Key Indicators Affecting Hospital Efficiency: A Systematic Review. Frontiers in public health, 10, 830102. https://doi.org/10.3389/fpubh.2022.830102.

Institute of Medicine (US) Committee on Quality of Health Care in America, Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (Eds.). (2000). To Err is Human: Building a Safer Health System. National Academies Press (US).

Kakemam, E., Gharaee, H., Rajabi, M. R., Nadernejad, M., Khakdel, Z., Raeissi, P., & Kalhor, R. (2021). Nurses' perception of patient safety culture and its relationship with adverse events: a national questionnaire survey in Iran. BMC nursing, 20, 1-10. https://doi.org/10.1186/s12912-021-00571-w.

Kline, R. B. (2016). Principles and practice of structural equation modeling (4th ed.). Guilford Press.

Kock, N., & Lynn, G. S. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. Journal of the Association for information Systems, 13(7), 2. Available at SSRN: https://ssrn.com/abstract=2152644

Lasker, J. (2024). Measurement Invariance Testing Works. Applied Psychological Measurement. https://doi.org/10.1177_01466216241261708.

Lee, J. Y., McFadden, K. L., Lee, M. K., & Gowen III, C. R. (2021). US hospital culture profiles for better performance in patient safety, patient satisfaction, Six Sigma, and lean implementation. International Journal of Production Economics, 234, 108047.https://doi.org/10.1016/j.ijpe.2021.108047.

Lee, S. E., Dahinten, V. S., Seo, J. K., Park, I. Y., Lee, M. Y., & Han, H. S. (2023). Patient Safety Culture and Speaking Up Among Health Care Workers. Asian Nursing Research, 17(1), 30–36. https://doi.org/10.1016/j.anr.2023.01.001

Leguina, A. (2015). A primer on partial least squares structural equation modeling (PLS-SEM). International Journal of Research & Method in Education, 38(2), 220–221. https://doi.org/10.1080/1743727X.2015.1005806.

Li, Y., Cheng, Y., Hu, X., & Zhang, L. (2021). Transcultural adaptation and psychometric evaluation of the mainland China version of Nursing Home Survey on Patient Safety Culture Questionnaire: a cross-sectional survey based on 50 nursing homes in China. BMJ open, 11(6), e043994. https://bmjopen.bmj.com/content/11/6/e043994.abstract

Li, Z., Yang, L., Tang, S., & Bian, Y. (2020). Equity and efficiency of health resource allocation of Chinese medicine in Mainland China: 2013–2017. Frontiers in Public Health, 8, 579269. https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2020.579269/full

Mardia, K. V. (1970). Measures of multivariate skewness and kurtosis with applications. Biometrika, 57(3), 519–530.https://doi:org/10.1093/biomet/57.3.519.

National Administration of Traditional Chinese Medicine. (2023, April 17). Notice on the issuance of the operation manual for the performance assessment of national secondary public TCM hospitals (2023 version). Retrieved from http://www.natcm.gov.cn/yizhengsi/gongzuodongtai/2023-04-17/30135.html.

National Administration of Traditional Chinese Medicine. (2023, February 28). Notice on the issuance of the operation manual for the performance assessment of national secondary public TCM hospitals (2023 version). Retrieved from http://www.natcm.gov.cn/yizhengsi/gongzuodongtai/2023-02-28/29344.html

National Health Commission of the People's Republic of China. (2019, December 29). Law of the People's Republic of China on Basic Medical and Health Care and the Promotion of Health. Retrieved from https://www.gov.cn/xinwen/2019-12/29/content_5464861.htm nomological networks.

Newsom, J. T., Hachem, Z. A., Granger, A. M., & Denning, E. C. (2022). Where Did I Go Wrong with My Model? Ten Tips for Getting Results in SEM. Structural Equation Modeling: A Multidisciplinary Journal, 30(3), 491–500. https://doi.org/10.1080/10705511.2022.2101113.

Palmieri, P.A., Leyva-Moral, J.M., Camacho-Rodriguez, D.E. et al. Hospital survey on patient safety culture (HSOPSC): a multi-method approach for target-language instrument translation, adaptation, and validation to improve the equivalence of meaning for cross-cultural research. BMC Nurs 19, 23 (2020). https://doi.org/10.1186/s12912-020-00419-9.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Purwanto, A., & Sudargini, Y. (2021). Partial Least Squares Structural Squation Modeling (PLS-SEM) Analysis for Social and Management Research: A Literature Review. Journal of Industrial Engineering & Management Research, 2(4), 114 - 123. https://doi.org/10.7777/jiemar.v2i4.168.

Ree, E., & Wiig, S. (2020). Linking transformational leadership, patient safety culture and work engagement in home care services. Nursing Open, 7(1), 256-264. https://doi.org/10.1002/nop2.386.

Ringle, C. M., Sarstedt, M., Sinkovics, N., & Sinkovics, R. R. (2023). A perspective on using partial least squares structural equation modelling in data articles. Data in Brief, 48, 109074. https://doi.org/10.1016/j.dib.2023.109074.

Ringle, C. M., Wende, S., & Becker, J.-M. (2022). SmartPLS 4. SmartPLS.

Roemer, E., Schuberth, F., & Henseler, J. (2021). HTMT2–an improved criterion for assessing discriminant validity in structural equation modeling. Industrial management & data systems, 121(12), 2637-2650.https://doi.org/10.1108/IMDS02-2021-0082.

Rotteau, L., Goldman, J., Shojania, K. G., Vogus, T. J., Christianson, M., Baker, G. R., ... & Coffey, M. (2022). Striving for high reliability in healthcare: a qualitative study of the implementation of a hospital safety programme. BMJ Quality & Safety, 31(12), 867-877. https://doi.org/10.1136/bmjqs-2021-013938.

Sarstedt, M., Ringle, C.M., Hair, J.F. (2022). Partial Least Squares Structural Equation Modeling. In: Homburg, C., Klarmann, M., Vomberg, A. (eds) Handbook of Market Research. Springer, Cham. https://doi.org/10.1007/978-3-319-57413-4_15

Simmering, M. J., Fuller, C. M., Richardson, H. A., Ocal, Y., & Atinc, G. M. (2015). Marker Variable Choice, Reporting, and Interpretation in the Detection of Common Method Variance: A Review and Demonstration. Organizational Research Methods, 18(3), 473-511. https://doi:org/10.1177/1094428114560023.

Smith A, Vrbos D, Alabiso J, Healy A, Ramsay J and Gallani B, 2021. Editorial: Future directions for risk communications at EFSA. EFSA Journal 2021;19(2):e190201, 6 pp. https://doi.org/10.2903/j.efsa. 2021.e190201

Statistical Information Center. (2024). China Health Statistics Yearbook. Retrieved from http://www.nhc.gov.cn/mohwsbwstjxxzx/tjtjnj/202305/6ef68aac6bd14c1eb9375e01a0faa1fb.shtml.

Tear, M. J., Reader, T. W., Shorrock, S., & Kirwan, B. (2020). Safety culture and power: Interactions between perceptions of safety culture, organisational hierarchy, and national culture. Safety science, 121, 550-561. https://doi.org/10.1016/j.ssci.2018.10.014.

Vogus, T. J., Sutcliffe, K. M., & Weick, K. E. (2010). Doing no harm: enabling, enacting, and elaborating a culture of safety in health care. Academy of Management Perspectives, 24(4), 60-77.

Wang, J., Sun, T., Liu, B., Cao, Y., & Wang, D. (2021). Patient Outcome Predictions Improve Operations at a Large Hospital Network. Retrieved from http.//arxiv.org/pdf/2305.15629v1.pdf.

Zhou, P., Bai, F., Tang, H. Q., Bai, J., Li, M. Q., & Xue, D. (2018). Patient safety climate in general public hospitals in China: differences associated with department and job type based on a cross-sectional survey. BMJ open, 8(4), e015604. https://bmjopen.bmj.com/content/8/4/e015604.abstract

# Appendix

## Section A: Demographic Profile

Please mark [✓] on the level of agreement that best applied to you for each of the statements below, using the given scale.

Have you been working as the clinical director at least one year in the Public Chinese Traditional Medicine Hospital?

☐ Yes ☐ No

If your answer is YES, kindly proceed to answer the rest of the questionnaire.
If your answer is NO, kindly stop from answering the questionnaire. Thank you very much.

### A. Respondent's Profile

1. Age (Years)

☐ 30–35 ☐ 35–40
☐ 40–45 ☐ 45–50
☐ 50–55 ☐ 55–60

2. Gender

☐ Male ☐ Female

3. Education Level

☐ Certificate/Diploma ☐ Bachelor's Degree
☐ Master's Degree ☐ Doctorate or above

4. Length of being the director in this hospital

☐ 1–5 years ☐ 6–10 years
☐ 11–15 years ☐ 16–20 years

### B. Hospital Profile

5. Hospital Level

☐ Tertiary Level ☐ Secondary level

6. Hospital Location

☐ Provincial ☐ City
☐ County

## Section B: Patient Safety Culture

Please mark [✓] on the level of agreement that best applied to you for each of the statements below, using the given scale.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |

| | **Patient Safety Culture in the Clinical Department in Our Hospital** | | | | | |
|---|---|---|---|---|---|---|
| 1 | We work together as an effective team. | 1 | 2 | 3 | 4 | 5 |
| 2 | We have enough staff to handle the workload. | 1 | 2 | 3 | 4 | 5 |
| 3 | Staff work longer hours than is best for patient care. | 1 | 2 | 3 | 4 | 5 |
| 4 | Our department regularly reviews work processes to determine if changes are needed to improve patient safety. | 1 | 2 | 3 | 4 | 5 |
| 5 | We appropriately make use of the temporary staff resources. | 1 | 2 | 3 | 4 | 5 |
| 6 | Staff feel empowered to learn from their mistakes and are encouraged to improve continuously. | 1 | 2 | 3 | 4 | 5 |
| 7 | When an event is reported, a just culture is promoted. We stress resolve the problem rather than blaming the person. | 1 | 2 | 3 | 4 | 5 |
| 8 | During busy times, staff help each other. | 1 | 2 | 3 | 4 | 5 |
| 9 | We respect each other in this clinical department. | 1 | 2 | 3 | 4 | 5 |
| 10 | When staff make errors, this clinic department focuses on learning rather than blaming individuals. | 1 | 2 | 3 | 4 | 5 |
| 11 | The work pace in this clinical department efficiently managed to prioritize patient safety. | 1 | 2 | 3 | 4 | 5 |
| 12 | Changes to improve patient safety are evaluated to see how well they work. | 1 | 2 | 3 | 4 | 5 |
| 13 | There is support for staff involved in patient safety errors. | 1 | 2 | 3 | 4 | 5 |
| 14 | This clinical department actively addresses patient safety issues. | 1 | 2 | 3 | 4 | 5 |
| Directors Support in Our Hospital | | | | | | |
| 15 | Our director seriously considers staff suggestions for improving patient safety. | 1 | 2 | 3 | 4 | 5 |
| 16 | Our director wants us to work faster during busy times while ensuring patient safety. | 1 | 2 | 3 | 4 | 5 |
| 17 | Our director takes action to solve patient safety concerns that are brought to their attention. | 1 | 2 | 3 | 4 | 5 |

## Section C: Patient Safety Outcomes

Please mark [✓] on the level of agreement that best applied to you for each of the statements below, using the given scale.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Never | Rarely | Sometimes | Most of the time | Always |

| **Frequency of Events Reported** | | | | | | |
|---|---|---|---|---|---|---|
| 1 | When a mistake is caught and corrected before reaching the patient, how often is this reported? | 1 | 2 | 3 | 4 | 5 |
| 2 | When a mistake is made but has no potential to harm the patient, how often is this reported? | 1 | 2 | 3 | 4 | 5 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Poor | Fair | Good | Very Good | Excellent |

| **Patient Safety Rating** | | | | | | |
|---|---|---|---|---|---|---|
| 3 | How would you rate your unit/work area on patient safety? | 1 | 2 | 3 | 4 | 5 |

4. In the past 12 months, how many patient safety events have you reported?

☐ None ☐ 1 to 2 ☐ 3 to 5

☐ 6 to 10 ☐ 11 or more

## Section D: Hospital Performance

To Compare the last 12 months, please mark [✓] on the level of agreement that best applied to you for each of the statements below, using the given scale.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hospital Finance Performance | | | | | | | |
| 1 | The proportion of medical service income (excluding drugs, consumables, and inspection and testing income) to medical income has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 2 | The proportion of traditional Chinese medicine revenue to drug revenue has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 3 | The proportion of revenue from traditional Chinese medicine slices to drug revenue has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 4 | The proportion of outpatient traditional Chinese medicine medical service projects revenue to medical revenue has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 5 | The proportion of inpatient traditional Chinese medicine medical service revenue to inpatient medical revenue has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 6 | The average length of stay for hospitalized patients has decreased. | 1 | 2 | 3 | 4 | 5 |
| Hospital Patient Satisfaction | | | | | | | |
| 7 | The satisfaction of outpatient has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 8 | The satisfaction of hospitalized patients has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 9 | The number of patient complaints has gradually decreased. | 1 | 2 | 3 | 4 | 5 |
| 11 | The average drug cost increase for hospitalized patients has gradually decreased. | 1 | 2 | 3 | 4 | 5 |
| Hospital Internal Process Performance | | | | | | | |
| 12 | The proportion of traditional Chinese medicine outpatient clinics has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 13 | The proportion of patients using traditional Chinese medicine non-drug therapies has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 14 | The proportion of discharged patients treated mainly with traditional Chinese medicine has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 15 | The proportion of discharged patients who used the same principles, methods and medicines has gradually increased | 1 | 2 | 3 | 4 | 5 |
| 16 | The turnover days of patients have gradually decreased | 1 | 2 | 3 | 4 | 5 |
| 17 | The application functions of hospital electronic cases have gradually increased. | 1 | 2 | 3 | 4 | 5 |
| Hospital Learning and Growth Performance | | | | | | | |
| 18 | The number of new medical technologies in hospitals has shown continuous growth. | 1 | 2 | 3 | 4 | 5 |
| 19 | Hospital employee satisfaction has gradually improved. | 1 | 2 | 3 | 4 | 5 |
| 20 | The research funding for hospital health technicians has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 21 | The frequency of hospital assistance at the grassroots level has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 22 | The number of health science popularization and education activities organised by hospitals has gradually increased. | 1 | 2 | 3 | 4 | 5 |
| 23 | The number of free consultations in hospitals has gradually increased. | 1 | 2 | 3 | 4 | 5 |

## Section E: Marker Variable

Please mark [✓] on the level of agreement that best applied to you for each of the statements below, using the given scale.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Once I have come to a conclusion, I am not likely to change my mind. | 1 | 2 | 3 | 4 | 5 |
| 2 | I don’t change my mind easily. | 1 | 2 | 3 | 4 | 5 |
| 3 | My views are very consistent over time. | 1 | 2 | 3 | 4 | 5 |

Thank you very much!