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Competency Model for Emergency Rescue Volunteers in China: PAIP Model Based on a Mixed-Methods Study

YANG Jun

Doctor of Management

Supervisors:
PhD MA Shaozhuang, Associate Professor with Habilitation,
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Declaration

I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed: YANG jun Date: June 24, 2025

Name: YANG Jun

作者申明

本人郑重申明：除了论文致谢中明确说明并致以谢意的部分外，所呈交的论文不包含任何他人或作者本人已用于获得任何教育机构的学位和证书而使用过的材料。同时尽我所知，除了文中特别加以标注引用的内容外，本论文不包含任何其他个人或集体已经发表或撰写的成果作品。

作者签名：杨君 日期：2025年6月24日

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Abstract

China is a country frequently affected by natural disasters. Accordingly, China has a large number of public welfare emergency rescue volunteer teams. However, apart from the professional skill standards for emergency rescue personnel issued at the national level, there is a lack of a systematic competency model to guide the recruitment, training, and development of personnel in public welfare emergency rescue teams. To address this gap, this study aims to establish a comprehensive competency model for emergency rescue volunteers in China.

Using a mixed-methods approach, this study integrates qualitative and quantitative research methodologies. First, a literature review was conducted to identify key competency indicators. Then, behavioral event interviews (BEI) with superior performers (N=31) were used to develop a preliminary competency model. Finally, a questionnaire survey (N=206) was administered to validate the model statistically.

This study establishes a competency model for emergency rescue volunteers in China. The model includes four dimensions: Professional Knowledge and Learning Ability, Action and Operation Skills, Interpersonal Communication and Influence, and Personal Effectiveness and Values. This framework, termed the PAIP Four-Dimension Competency Model for Emergency Rescue Volunteers in China, consists of four primary dimensions, 27 secondary indicators, and 33 tertiary indicators. The model was empirically validated using data from diverse regions and rescue teams through exploratory feactor analysis (EFA), confirmatory factor analysis (CFA), and one-way analysis of variance (one-way ANOVA).

These findings provide emergency rescue volunteer organizations with valuable policy implications for talent selection, promotion, and development. By systematically defining and validating key competencies, this study contributes to the theoretical and practical advancement of emergency rescue volunteer management, enriching the broader research on competency modeling in disaster response contexts.

Keywords: emergency rescue, volunteers, vompetency model, Blue Sky Rescue team, public welfare

JEL: L31, M51

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Resumo

A China é um país frequentemente afetado por desastres naturais e conta com um elevado número de equipas de voluntários de resgate de emergência no âmbito da solidariedade social. No entanto, para além dos padrões nacionais relativos às competências técnicas do pessoal de resgate, verifica-se a ausência de um modelo de competências sistemático que oriente o recrutamento, a formação e o desenvolvimento dos voluntários envolvidos nestas equipas. Para preencher essa lacuna, este estudo tem como objetivo estabelecer um modelo de competências para voluntários de resgate de emergência na China.

Utilizando uma abordagem de métodos mistos, este estudo integra técnicas qualitativa e quantitativa. Foi realizada uma revisão da literatura com o objetivo de identificar os principais indicadores de competência. Posteriormente, conduziram-se entrevistas baseadas em eventos comportamentais (*behavioral event interviews*, BEI) com voluntários de desempenho superior (N=31), a fim de desenvolver um modelo de competências preliminar. Finalmente, procedeu-se à aplicação de um questionário (N=206) para validar estatisticamente o modelo.

Este estudo estabelece um modelo de competências destinado a voluntários de resgate de emergência na China. O modelo inclui quatro dimensões: "Conhecimento Profissional e Capacidade de Aprendizagem", "Competências de Ação e de Operação", "Comunicação Interpessoal e Influência" e "Efetividade Pessoal e Valores". Este modelo, designado por "Modelo de Competências PAIP de Quatro Dimensões para Voluntários de Resgate de Emergência na China", é composto por quatro dimensões principais, 27 indicadores secundários e 33 indicadores terciários. Além disso, o modelo foi validado empiricamente com dados provenientes de diversas regiões e equipas de resgate por meio da análise fatorial exploratória (*exploratory factor analysis*, EFA), análise fatorial confirmatória (*Confirmatory Factor Analysis*, CFA) e análise de variância unifatorial (*one-way* ANOVA).

Os resultados obtidos oferecem às organizações de voluntários de resgate de emergência valiosas implicações políticas para a seleção, promoção e desenvolvimento de talentos. Ao definir e validar sistematicamente as competências essenciais, este estudo contribui para o avanço teórico e prático da gestão de voluntários de resgate de emergência, enriquecendo a literatura sobre modelagem de competências no contexto da resposta a desastres.

Palavras-chave: resgate de emergência, voluntários, modelo de competência, equipa de resgate Blue Sky, solidariedade social
JEL: L31, M51

摘　要

中国是自然灾害频发的国家。相应的，中国拥有数量庞大的公益救援志愿者队伍。但是，除了国家层面发布的应急救援人员专业技能要求外，缺乏较为系统的胜任力指标系统指导公益队伍的人员招募、培训和发展。本研究旨在为中国应急救援志愿者建立胜任力模型。

本文根据胜任力模型相关研究，采用定性与定量结合的研究方法。首先，我们通过文献研究统计胜任力指标清单，再通过优秀志愿者行为事件访谈（BEI访谈法）（N=31）初步建立胜任力模型，最后通过问卷调查法（N=206）进行统计验证。

研究建立了中国应急救援志愿者胜任力模型。该模型包括四个维度：”专业知识与学习力（Professional Knowledge and Learning Ability）”、”操作技能与行动力（Action and Operation Skills）”、”人际沟通与影响力（Interpersonal Communication and Influence ）”和 “个人效能与价值观（Personal Effectiveness and Values）”。基于以上结果，本研究提出了”中国应急救援志愿者PAIP四因子胜任力模型”。具体而言，此胜任力模型包括4个一级指标，27个二级指标和33个三级指标。该模型通过探索性因子分析(EFA)、验证性因子分析(CFA)和单因素方差分析(One-way ANOVA)，对来自不同地区和救援队的数据进行了实证验证。

这些发现为应急救援志愿者组织的人才选拔、晋升和发展提供了宝贵的政策建议。通过系统地定义和验证关键能力，本研究有助于应急救援志愿者管理的理论和实践进步，丰富了灾害响应背景下胜任力建模的研究。

关键词：应急救援；志愿者；胜任力模型；蓝天救援队；公益

JEL: L31, M51

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I completed both my undergraduate and graduate studies at Sichuan University, where the university motto, “The sea embraces all rivers; the greatness lies in its inclusiveness” imparted to me the wisdom of pursuing knowledge through objective inquiry. After years of working, I resumed my academic journey. At the University of Electronic Science and Technology of China, the motto “Seeking truth and practicality; embracing and achieving greatness” taught me the value of applying knowledge to practice. The motto of ISCTE-IUL, “Per Sapientiam, Lux” (Through wisdom, light), inspired me to care for the world with a broad vision. The five-year doctoral journey from 2020 to 2025 has been both wonderful and unforgettable. As I flip through the handwritten research logs from my thesis writing process, each page vividly brings back memories. The repeated reflection and refinement of RQ and RB—“research questions” and “research background,” the constant struggle and decisions between qualitative and quantitative methods, the exhaustion and renewal of both physical and mental energy, the intertwining of theory and practice, the setbacks and breakthroughs marked by tears and joy... In those moments, I would always ask myself: “Have you lost the confidence in pursuing your doctoral degree? Have you abandoned your professional belief in management research? Have you wavered in your commitment to the field of public emergency rescue?” After calming down, I would return to my desk to continue reading and researching.

I am deeply grateful for the precious people I encountered over these five years who made this journey so memorable.

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Learning is a lifelong journey. This is not an end, but the beginning of a new chapter of the “thesis of life”. Here comes the next five years—let’s go!

致　谢

我大学本科和研究生就读于四川大学，川大的校训“海纳百川，有容乃大”给我了格物致知的教诲。工作数年后继续深造，电子科技大学的校训“求实求真，大气大为”给了我学以致用的教诲，ISCTE-IUL的校训“以智慧至光明（Per Sapientiam, Lux）给我了心怀天下的教诲。2020-2025这五年博士求学时光，是美好曼妙的，是刻骨铭心的。翻看自己手写的数册论文撰写日志，过往历历在目。RQ与RB“研究问题”的反复界定与琢磨，定性与定量研究方法的纠结与选择，体力与脑力的耗尽与重燃，理论与应用的交织与延展，受阻与攻克的眼泪与喜悦…… 凡是种种，每每此时，回望初心，扪心自问“你攻读博士学位的信心丧失了吗？你聚焦管理研究的专业理念放弃了吗？你致力公益救援领域的信仰动摇了吗？”冷静之后，继续俯身就读，伏案研究。

感谢生命中这宝贵的五年让我遇到“美好曼妙”的人，他们让我“刻骨铭心”。

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学无止境，这不是结束，这是新的“人生论文”的开篇！下一个五年，出发！

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Contents

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List of Abbreviations

ACH = Achievement Orientation/Tendency

ALT = Altruism

AOS = Action and Operation Skills

ASA = Accurate Self-Assessment

ASB = Arbeiter-Samariter-Bund

AT = Analytical Thinking

BEI = Behavioral event interview

BSR = Blue Sky Rescue Team

CFA = Confirmatory factor analysis

CFAR = China Fire and Rescue

CISAR = China International Search and Rescue

CIT = Critical incident technique

CO = Concern for Order, Quality, and Accuracy

CSO = Customer Service Orientation/Tendency

CT = Conceptual Thinking

DEV = Developing Others

DFV = German Fire Brigades Association

DIR = Directiveness: Assertiveness and Use of Positional Power

EFA = Exploratory factor analysis

EXP = Expertise

FG = Focus group

FLX = Flexibility

ICI = Interpersonal Communication and Influence

IMP = Impact and Influence

INFO = Information Seeking

INSARAG = International Search and Rescue Advisory Group

INT = Initiative

IU = Interpersonal Understanding

JUH = Johanniter-Unfall-Hilfe

KSA = Knowledge, skills, and abilities

KSAO = Knowledge, skills, abilities, and other characteristics

LEA = Learning Effectiveness

LOW = Low Profile

LSO = Life Saving Orientation

MHD = Malteser Hilfsdienst

OA = Organizational Awareness

OBE = Obedience

OC = Organizational Commitment

ORC = Organization and Coordination

OS = Operational Skills

PEV = Personal Effectiveness and Values

PKL = Professional Knowledge and Learning Ability

PS = Practical Skills

RB = Relationship Building

RC = Rescue Cognition

RM = Risk Management

RNLI = Royal National Lifeboat Institution

RRB = Ramunion Rescue Brigade

SCF = Self-Confidence

SCT = Self-Control

SES = New South Wales State Emergency Service

TAT = Thematic apperception test

THW = Technisches Hilfswerk (German Federal Agency for Technical Relief)

TL = Team Leadership

TW = Teamwork and Cooperation

UC = Upward Communications

USAR = Urban Search and Rescue

VISTA = Volunteers in Service to America

WoW = World of Work

Chapter 1: Introduction

This chapter primarily discusses the rescue environment and development challenges faced by emergency rescue volunteer organizations in China. Specifically, it elaborates on the practical problems encountered in talent selection. By reviewing the current research on the competency model, this chapter identifies the research objectives and key problems to be addressed. It also outlines the research methods to be employed and the structure of this thesis, and points out the practical and theoretical significance of this study.

1.1 Research background

1.1.1 Practical background

China is frequently affected by natural disasters, often resulting in severe damage. On May 12, 2008, the Wenchuan earthquake struck China with a magnitude of 8.0 on the Richter scale, causing 69,227 fatalities and 17,923 missing individuals, affecting a total population of over 40 million, resulting in direct economic losses exceeding 800 billion RMB. In addition to earthquakes, China is also prone to other natural disasters such as landslides, collapses, debris flows, droughts, floods, forest fires, extreme cold, and snow disasters. According to data from the National Disaster Reduction Center (NDRCC) of the Ministry of Emergency Management of China (NDRCC, 2024), over the decade between 2015–2024, the cumulative number of people affected by natural disasters in China exceeded 1.3 billion. More than 19 million houses collapsed or been damaged, agricultural losses affected over 160 million hectares, and direct economic losses surpassed 3 trillion RMB. Detailed statistics over this ten-year period can be found in Figure 1.1.

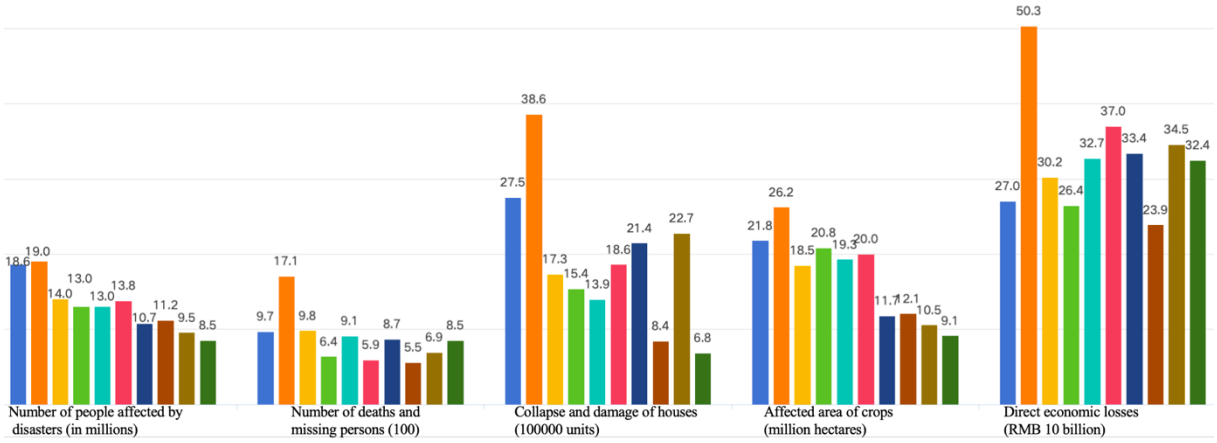

Figure 1.1 Statistics on natural disasters in China (2015–2024)

Source: NDRCC (2024)

According to statistics and research from the Ministry of Emergency Management of China (Central People's Government of China, 2019), more than 30 provinces and municipalities in China are affected by natural disasters, with over 70% of cities and more than 50% of the population located in high-risk areas for meteorological, seismic, geological, or marine disasters. As a result, China continues to face significant challenges posed by natural disasters in the future.

To address these challenges, the Chinese government has established a new emergency management department and issued the *National Occupational Skill Standards for Emergency Rescuers*, marking the formal recognition of emergency rescuers as an important social work position at the national level (MEMPRC, 2019). Emergency rescuers are classified into two categories: employees of governmental organizations and volunteers of non-governmental organizations (NGOs). Among them, volunteers constitute an indispensable force. For instance, in the German Federal Agency for Technical Relief (*Technisches Hilfswerk*, THW), more than 98% of emergency rescuers (approximately 80,000 individuals) are volunteers. According to some scholars, developed countries, through painful lessons, have generally realized that the effective operation of emergency response mechanisms ultimately depends on the active participation of the public, making volunteers an essential component in assisting the government with disaster relief and mitigation plans (Gong, 2008). Some scholars have conducted quantitative studies on the value of volunteers in emergency services, such as the research on the social contributions of Australian volunteers (Ganewatta & Handmer, 2009). The Chinese government has explicitly proposed accelerating the formulation of policies to enhance social emergency rescue forces, including professional skill training for social emergency forces and encouraging their participation in emergency response, as well as disaster prevention and mitigation (CNDRC, 2022).

The number of volunteers in China has grown rapidly, increasing by 36.7% in 2020 compared to 2019, with the total number of registered volunteers reaching 231 million (T. Yang & Zhu, 2022). The number of social emergency rescue teams in China has exceeded 1,200 (Central People's Government of China, 2019). However, despite the high number of emergency rescue volunteers, they generally lack professional competence. As a result, they can only perform auxiliary tasks such as setting up tents and distributing food and water during emergency rescues, rather than participating in professional rescue operations in water, mountainous, urban, or aerial environments. This limitation not only hinders the development of volunteers but also presents challenges for the personnel management of volunteer teams. Taking a regional branch of the Blue Sky Rescue Team in China as an example, the number of applicants seeking to join in 2021 increased by nearly 50% compared to 2020. However, the initial screening elimination rate was 40%, and the attendance rate among those who passed the screening (as a proportion of total applicants) was less than 26%. Over the years between 2017–2020, only 6.5% of volunteers who passed the selection process were eventually promoted to formal team members. This presents a challenge for rescue teams that lack full-time staff and professional human resource management teams. On the one hand, faced with enthusiastic and highly motivated applicants, rescue teams cannot simply reject them outright, nor can they indiscriminately accept all applicants. On the other hand, relying solely on applicants' educational backgrounds and other basic "competency" criteria for selection presents significant challenges.

Therefore, the rapid increase in the number of applicants and the lack of a scientific method for talent identification create a major contradiction in emergency rescue teams. If it is not addressed, problems will arise in the selection, training, and development of talents in emergency rescue teams, ultimately undermining the efficiency and effectiveness of rescue operations.

1.1.2 Theoretical background

- Research on the relationship between volunteers' competence and performance

White (1959), in his article *Motivation Reconsidered: The Concept of Competence*, introduced the concept of competence, providing a direction for competency identification. McClelland (1973) proposed the competency model, establishing a methodological foundation for competency identification. In the following years, along with other scholars and consultants, he further developed this method into a widely used tool by organizations.

An increase in the number of volunteers does not necessarily lead to an increase in their performance. However, an improvement in volunteers' competence directly enhances their volunteering behavior (Kazdin & Bryan, 1971). This research has shown that an increase in volunteers' competence, particularly task-related competence, enhances their intention to engage in volunteer service and their actual volunteer behavior. The increase in volunteer behavior is a necessary condition for improved volunteer performance. In 1973, McClelland published the article *Testing for Competence Rather Than for "Intelligence"* (McClelland, 1973). His research team evaluated the job performance of participants and confirmed that individuals' competencies significantly impact their performance.

The study of job performance, particularly individual job performance within organizations, has continued for over six decades. While no unified conclusion has been reached regarding the structural model of job performance in research or practice, there is a growing consensus on the factors influencing performance. Research generally identifies competence and motivation as the primary factors affecting performance. Some scholars have further incorporated personality as an additional factor (Lawler, 1994). Song (2012) concluded that scholars dedicated to competency theory view job performance as the result of an interaction between knowledge, skills, competencies, and personality.

- The proposal and widespread application of the competency model

Following the introduction of the concept of competency, the competency model was formally proposed in 1993, including frameworks such as the Iceberg model, the Onion model, and the Competency Dictionary. Over the past few decades, the competency model has been widely applied worldwide. Spencer and other colleagues were among the first to use the competency model to conduct competency modeling research for professionals and managers. In 1998, McClelland studied the competency model within multinational corporations. Between 1980 and 2000, over 100 researchers explored various interpretations of the competency concept (Spencer & Spencer, 2003). To establish standardization, Spencer and his colleague Charlie initiated research on the application standards of the competency model. They collected and analyzed over 200 job samples worldwide, including 187 samples from the US (66%) and 98 samples from more than 20 other countries or multinational corporations (34%) (Spencer & Spencer, 2003).

- Limited research on the competency model for emergency rescue volunteer organizations

Although existing research covers technical, professional, human resources, entrepreneurial, sales, marketing, trade, and management roles within organizations, most

studies focus on enterprises, government agencies, religious organizations, and the military. Research on volunteer service organizations remains relatively scarce. Studies specifically targeting emergency rescue volunteer organizations emerged in a later stage, generally after 2000, and research in China is particularly limited. Most relevant studies are concentrated in Western countries such as the US, Australia, and the UK. For example, *A Review of Competencies Developed for Disaster Healthcare Providers: Limitations of Current Processes and Applicability* (Daily et al., 2010) examined the processes and methods of competency development for disaster healthcare providers in the US.

However, competency research specifically targeting emergency rescue volunteers remains limited in both Western countries and China. The lack of guidance on applying competency frameworks to emergency rescue volunteers has become a pressing issue.

Despite the rapidly growing number of emergency rescue volunteers, the volunteers' "quality" has not significantly improved, and they still fail to meet the requirements for undertaking professional rescue tasks. There is a discrepancy between the rapid increase in volunteer numbers and the slow development of volunteer quality. The mere expansion of volunteer numbers does not necessarily enhance the performance of rescue operations. Instead, improved rescue performance relies more on the enhanced quality (competence) of volunteers. Research on the relationship between organizational members' competence and job performance has found a strong causal relationship between the two (Spencer & Spencer, 1993). For emergency rescue teams, as organizational entities, their organization performance depends on individual performance, which, in turn, depends on the competencies of the members. Thus, identifying the competencies of organizational members becomes crucial. While competency identification tools and methods are widely applied in business organizations, their application to emergency rescue volunteer teams remains underexplored.

McClelland (1973) suggested that high-performing organizations consist of individuals with superior performance, who share common characteristics that define job-related competencies. Therefore, this study attempts to identify the characteristics of superior volunteers in emergency rescue organizations and evaluate whether these characteristics are effective in volunteer recruitment.

Currently, no established competency assessment system exists for emergency rescue volunteers. Although the United Nations introduced the *INSARAG Guidelines* in December 2002 (OCHA, 2017, 2020), outlining competency requirements for urban search and rescue personnel, and the Chinese government released the *National Occupational Skill Standards for Emergency Rescuers* in February 2019, defining professional and technical requirements for

emergency rescuers in China, these official standards primarily serve as occupational regulations. They focus on knowledge-based criteria without addressing competencies below the surface level of the Iceberg model. As a result, rescue organizations find it difficult to use these official standards for volunteer selection and training, leaving the discrepancy between the number and quality of emergency rescue volunteers unresolved.

Currently, well-developed competency models that encompass knowledge and skill assessments are primarily applied to job positions in business organizations and government agencies. However, competency model development for volunteers—particularly emergency rescue volunteers—remains a research gap. Addressing this gap is crucial to helping emergency rescue volunteer organizations enhance both the quantity and quality of their members, thereby fostering the professionalization of these organizations.

Therefore, establishing a targeted, clear, and comprehensive competency model is of both practical significance for professional emergency rescue volunteer teams and theoretical importance for advancing competency model research.

1.2 Research problem

According to the research background described above, China's disaster prevention and mitigation efforts require a large number of "high-quality" emergency rescue volunteers. This necessitates a scientific approach for identifying and systematically training volunteers. Therefore, it is imperative to establish a competency model specifically designed for emergency rescue volunteers, rather than companies' employees, to guide the development and implementation of these efforts.

1.3 Purpose and research objectives

The purpose of this study is to construct and validate a competency model for emergency rescue volunteers and to develop a scale for measuring these competencies. Specifically, this study aims to achieve the following objectives:

1) Constructing a competency model for emergency rescue volunteers.
2) Validating this competency model for emergency rescue volunteers.
3) Developing a competency scale for emergency rescue volunteers.
4) Comparing different competency models.

1.4 Research questions

In general business organizations or organizations with well-established management practices, it is sufficient to develop a competency model following conventional methods. The human resources management departments of these organizations can effectively understand this process and provide guidance on how to use the model. However, in China's unofficial emergency rescue teams, this is obviously not a realistic expectation. Therefore, based on the research objectives established earlier, considering both theoretical modeling requirements and practical application, this study aims to address the following two specific research questions (RQ):

RQ1. What are the key competencies of emergency rescue volunteers?

From the perspective of competency models such as the Iceberg model, this study seeks to determine the competency characteristics of superior volunteers underlying the "Iceberg". From the perspective of aligning emergency rescue team development strategies with government regulatory requirements, it aims to identify the key competency characteristics of superior volunteers. Additionally, from the perspective of the practical application of the competency model within emergency rescue teams, the study aims to describe the behavioral descriptions of these competencies. Therefore, answering the question "What are the competency characteristics of emergency rescue volunteers?" requires addressing three sub-questions: What are the key competency characteristics? What are the behavioral descriptions of each key competency characteristic? Do these competency characteristics and behavioral descriptions align with the realities of public welfare emergency rescue teams?

RQ2. *To what extent is the competency model for emergency rescue volunteers valid, in distinguishing superior performance from average performance?*

Strictly speaking, the construction of a competency model is primarily an inductive process, influenced by factors such as the expertise of researchers, the expressive ability of research participants, and the availability of similar existing studies. Therefore, verification is necessary to determine the validity of the constructed model. This requires conducting a questionnaire survey based on the competency model and using statistical methods for data validation. The two sub-questions that need to be addressed include: Is the constructed competency model applicable in other regions of China? Can this model effectively distinguish between superior volunteers and average volunteers in terms of rescue performance?

1.5 Research methods

This study involves multiple disciplines, including management, sociology, organizational behavior, and psychology. Based on interviews, surveys, and statistical analysis, the research was conducted using both quantitative and qualitative methods. The construction of the competency model primarily adopts a qualitative approach, while the model validation mainly relies on quantitative methods. Specifically, this study employs the following two research methods:

1) Behavioral event interview (BEI)

This study employs the behavioral event interview (BEI) method, leveraging its open-ended nature to retrospectively explore the behaviors of superiorsuperior emergency rescue volunteers. Through one-on-one interviews with the interviewees, this study aims to collect key events in which the interviewees experienced a sense of accomplishment during their practical work. Following the STAR principle, the interviews focus on the context of the event, the individuals involved, the actions taken, personal feelings, and the outcomes. Each interviewee is expected to recall 3-6 relatively complete events.

2) Questionnaire survey

This study employs a questionnaire survey to investigate the performance and competencies of emergency rescue volunteers, with the aim of validating the competencies identified through the literature review and behavioral event interviews. Data processing is conducted using tools such as EXCEL and SPSS, including data entry, frequency analysis, data validation, exploratory factor analysis (EFA), and one-way analysis of variance (ANOVA).

1.6 Significance and contributions

1.6.1 Managerial significance

This study holds three key practical values:

1) Addressing the lack of relevance of existing corporate competency models for the public welfare rescue sector

Whitley (1989) argued that competency models (particularly those related to management roles) are highly industry-specific and context-specific. The construction of a model cannot be standardized across different industries or different organizational contexts (e.g., corporations). The rescue sector (or industry), especially the public welfare rescue sector, is fundamentally

different from the business sector. Likewise, public welfare rescue teams differ from corporate enterprises and cannot adopt the existing competency models developed for businesses.

2) Filling the gap of insufficient empirical validation of existing competency models

Laber and O'Connor (2000) pointed out a significant discrepancy: while many organizations have developed various competency models, there remains a significant lack of empirical research to support them. Thus, it is necessary to conduct model validation when constructing a competency model. This study addresses this gap by not only constructing a competency model for public welfare rescue volunteers but also validating it within a defined scope and timeframe.

3) Advancing the development and application of competency models in China's public welfare rescue sector

Currently, the development and application of the competency model in China's rescue sector remain limited. Literature reviews indicate that existing relevant studies primarily focus on medical and firefighting rescue fields, whereas the competency models for the public welfare emergency rescue sector are underexplored. This results in a lack of systematic criteria for the selection and training of emergency rescue volunteers. This study specifically targets the public welfare rescue sector, with a focus on the Sichuan Blue Sky Rescue Team, considering its unique organizational characteristics and external environment. The findings have strong practical implications not only for this team but also for similar public welfare emergency rescue organizations in China.

1.6.2 Theoretical significance

On one hand, the existing competency model development lacks a systematic and rigorous methodology. Currently, most competency model studies adopt the KSA (knowledge, skills, and attitudes) framework, which is merely a simple combination of these elements, leading to conceptual ambiguity and a lack of logical structure (Sackett & Laczo, 2003). Many corporate competency models are either self-developed by organizations or created with the help of consultants, often relying on experience-based summaries rather than development and validation using rigorous methodology. In addition, developing and implementing such models is costly and time-consuming, making them unfeasible for public welfare rescue organizations that lack the financial and structural resources of corporate enterprises. This study provides a relatively systematic and rigorous approach tailored to public welfare organizations, along with practical application recommendations.

By employing a mixed-methods approach, including qualitative research (behavioral event

interviews) and quantitative research (factor analysis), this study balances theoretical and practical research perspectives. The methodology serves as a reference for systematic research on competency and validation efforts in similar sectors.

On the other hand, this study incorporates an international perspective into the research on emergency rescue volunteers in China. Through a comparative analysis with Germany, Japan, and Australia, it identifies China's shortcomings in this field. In addition, by collecting and analyzing data from the Sichuan Blue Sky Rescue Team, this study contributes to the theoretical research and literature by providing China-specific samples and findings. The results provide valuable insights for international emergency rescue research and contribute to the development of international Urban Search and Rescue (USAR) teams.

1.7 Thesis structure

Based on the research objectives and methods described above, this thesis consists of five chapters, each covering the following content:

Chapter 1: Introduction

This chapter introduces the practical and theoretical background, research questions, research purpose and objectives, research methods, and the practical and theoretical significance of this study.

Chapter 2: Literature Review

This chapter provides a comprehensive review of relevant literature, covering the concepts of emergency rescue and competency, emergency rescue organizations, the status quo of competency model research, and methods for constructing and validating competency models.

Chapter 3: Research Methods

This chapter defines the key research terms, describes the research methods, introduces the research sample and data collection process, and outlines the overall research procedures.

Chapter 4: Results

This chapter presents the results of the competency model construction and validation, detailing the naming, definition, and behavioral descriptions of competency, as well as the application of the model's scale.

Chapter 5: Discussion and Conclusions

This chapter provides a review of the research process, discusses the four-dimension competency model, points out this study's limitations, and proposes directions for future research.

Chapter 2: Literature Review

This chapter introduces the terms of emergency management, emergency rescue, and emergency rescue organizations. It then introduces the concepts of competence and competency, with a focus on their differences and interrelations. Finally, this chapter provides a literature review, covering the status quo of competency model research and the model construction methods.

2.1 Emergency rescue organizations and emergency rescue volunteers

The current literature on emergency rescue in China, particularly emergency rescue volunteers, remains relatively limited. To better understand this sector and the characteristics of this specific population, this section provides an overview of emergency management, emergency rescue, and emergency rescue organizations.

2.1.1 Emergency management and emergency rescue

Emergency rescue organizations primarily involve two key concepts: emergency management and emergency rescue. Both concepts encompass rescue teams/organizations and individual rescuers (e.g., firefighters and volunteers).

- Emergency management

The English term “emergency management” is widely used in European countries, as well as the US. East Asian countries such as Japan primarily use the term “危機管理” or “緊急管理” (“emergency management”). South Asian countries like India and Pakistan generally refer to it as “disaster management.” Before 2018, the Chinese government predominantly used the term “灾害管理” (“disaster management”), but after 2018, it primarily adopted the term “应急管理” (“emergency management”). The United Nations also used “emergency management” before 2017 but switched to “disaster management” after redefining the concept in 2017.

The United Nations International Strategy for Disaster Reduction (UNISDR) defined emergency management as a combination of various stages, stating that emergency management is the “organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response, and rehabilitation.” The US Federal Emergency Management Agency (FEMA) provided a more function-oriented

definition: emergency management is the "organized analysis, planning, decision-making, and assignment of available resources to mitigate, prepare for, respond to, and recover from the effects of all hazards." The National Fire Protection Association (NFPA) in the US views emergency management as a continuous process, defining it as "an ongoing process to prevent, mitigate, prepare for, respond to, and recover from an incident that threatens life, property, operations, or the environment." The Emergency Rescue Promotion Center of the Ministry of Emergency Management of China defines emergency management as "a continuous process of mitigation, preparedness, response, and recovery aimed at achieving organizational goals and reducing harm to life, property, and the environment." This definition emphasizes the overall interests and goals of the organization rather than individuals. The protected subjects include life, property, and the environment, while the emergency management process consists of four interconnected and "continuous" phases: mitigation, preparedness, response, and recovery.

In addition, the International Organization for Standardization (ISO) adopts the term "risk management," emphasizing that the core principle of risk management is the creation and protection of value. Risk management efforts should focus on an organization's value-creation activities, supporting or assisting the organization in better value creation and protection. This definition suggests that risk management not only safeguards value but also "creates" value.

- Emergency rescue

Emergency Rescue generally refers to the activities and plans implemented to prevent, prepare for, respond to, and recover from sudden and destructive emergencies. Depending on the type of emergency, emergency rescue efforts can be classified into different domains, such as public health emergencies, transportation emergencies, fire emergencies, earthquake emergencies, industrial and mining emergencies, and household emergencies. In a broad sense, emergency rescue includes aspects of emergency management. In a narrower sense, emergency rescue generally refers to search and rescue operations as described by the International Search and Rescue Advisory Group (INSARAG).

2.1.2 Development of emergency rescue organizations in China

China's emergency rescue organizations fall into two categories: government emergency rescue organizations and social emergency rescue organizations.

Government emergency rescue organizations are directly managed by the government and are generally part of government bodies. Based on administrative jurisdiction, government emergency rescue organizations can be further divided into two types: professional emergency

rescue teams and grassroots emergency rescue teams. The former includes teams under the direct supervision of the central government, such as the China International Search and Rescue (CISAR) and the China Fire and Rescue (CFAR). The latter consists of teams managed by local governments across China, such as township and subdistrict emergency rescue teams (MEMPRC, 2022c).

Social emergency rescue organizations are managed directly by companies or volunteer organizations. Based on the entity responsible for direct management, social emergency rescue organizations can be classified into three types: company-affiliated organizations, public institution-affiliated organizations, and volunteer organizations. Examples of company-affiliated social emergency rescue organizations include the China Aneng Construction Group Rescue Team and the Chengdu Emergency Sichuan Petrochemical Rescue Team. Public institution-affiliated rescue organizations include teams such as the Pengzhou Squad of Chengdu Work Safety Emergency Rescue. Volunteer emergency rescue organizations include the China Blue Sky Rescue Team, Zhejiang Ramunion Rescue Brigade (RRB) Public Welfare Rescue Promotion Association, and the Luzhou Red Cross Mountain Rescue Team of Sichuan Province, among others.

2.1.2.1 Government emergency rescue organizations

China has established a relatively comprehensive system of government emergency rescue forces.

In terms of professional government emergency rescue forces, China has established the Emergency Rescue Center for Natural Disaster Engineering and rescue bases under the Ministry of Emergency Management. At the national level, there are more than 90 emergency rescue teams, totaling over 20,000 members, specializing in areas such as earthquake rescue, mine rescue, hazardous chemical rescue, tunnel construction rescue, engineering emergency rescue, and aerial rescue. At the provincial level, there are 34,000 emergency rescue teams, comprising a total of 1.3 million members, specializing in flood rescue, forest (and grassland) fire rescue, earthquake and geological disaster rescue, and industrial safety accident rescue, among others. At the township level, there are over 36,000 rescue teams, with a total of 1.051 million members, primarily undertaking tasks such as daily risk prevention and immediate response.

China’s national-level government emergency rescue organizations include the China International Search and Rescue (CISAR) and the China Fire and Rescue (CFAR).

Representative Team 1: China International Search and Rescue (CISAR)

China International Search and Rescue (CISAR), also known as the China National

Earthquake Disaster Emergency Rescue Team, was established on April 27, 2001. Its primary mission is to conduct emergency search and rescue operations for individuals trapped under collapsed constructions (or structures) due to earthquakes or other sudden incidents. CISAR is a specialized earthquake disaster emergency rescue team that meets the UN standards of a heavy search and rescue team. It has the capability to participate in global rescue missions, conduct rescue operations in three separate complex urban environments simultaneously, and carry out search and rescue activities at nine general urban operational sites simultaneously.

As of April 26, 2015, CISAR had completed 10 rescue missions in China and 10 international humanitarian rescue missions across 13 deployments. The missions in China included responses to the Wenchuan Earthquake in Sichuan, the Yushu Earthquake in Qinghai, the Zhouqu Mudslide in Gansu, the Lushan Earthquake in Sichuan, and the Jiuzhaigou Earthquake. Internationally, CISAR participated in humanitarian emergency rescue efforts following the 2003 earthquake in Algeria, the 2022 Kerman earthquake in Iran, the 2004 earthquake in Indonesia, the 2005 earthquake in Pakistan, the 2006 earthquake in Indonesia, the 2010 earthquake in Haiti, the 2010 catastrophic floods in Pakistan, the 2011 earthquake in New Zealand, and the 2011 earthquake and tsunami in Japan. Accumulatively, CISAR has rescued nearly 100 survivors and provided medical treatment to tens of thousands of injured individuals.

CISAR consists of personnel from an engineering unit of the People's Liberation Army, seismic technology experts from government research institutions, emergency medical specialists, and search dog handlers. At its inception, the team comprised 230 members, and by 2010, it had expanded to 480 members. CISAR is equipped with over 6,000 sets of rescue equipment of more than 300 types across eight categories, along with 20 search dogs. In 2009, CISAR passed the UN International Heavy Urban Search and Rescue (USAR) Classification Assessment, obtaining certification as an international heavy USAR team, becoming the 12th globally and the 2nd in Asia to receive this designation. In addition, under UN authorization, CISAR is qualified to establish on-site coordination centers and operational reception centers during international rescue operations. In 2014, CISAR successfully passed the UN re-evaluation for capacity classification, reaffirming its status as a certified international heavy USAR team.

The organizational structure of CISAR includes one Chief, three Deputy Chiefs, a Headquarters and a Direct Detachment comprising 20–30 members, and three rescue detachments. Each rescue detachment oversees five specialized units: the Search Unit, the Rescue Unit, the Medical Unit, the Technical Unit, and the Support Unit. The organizational

structure of CISAR is illustrated in Figure 2.1.

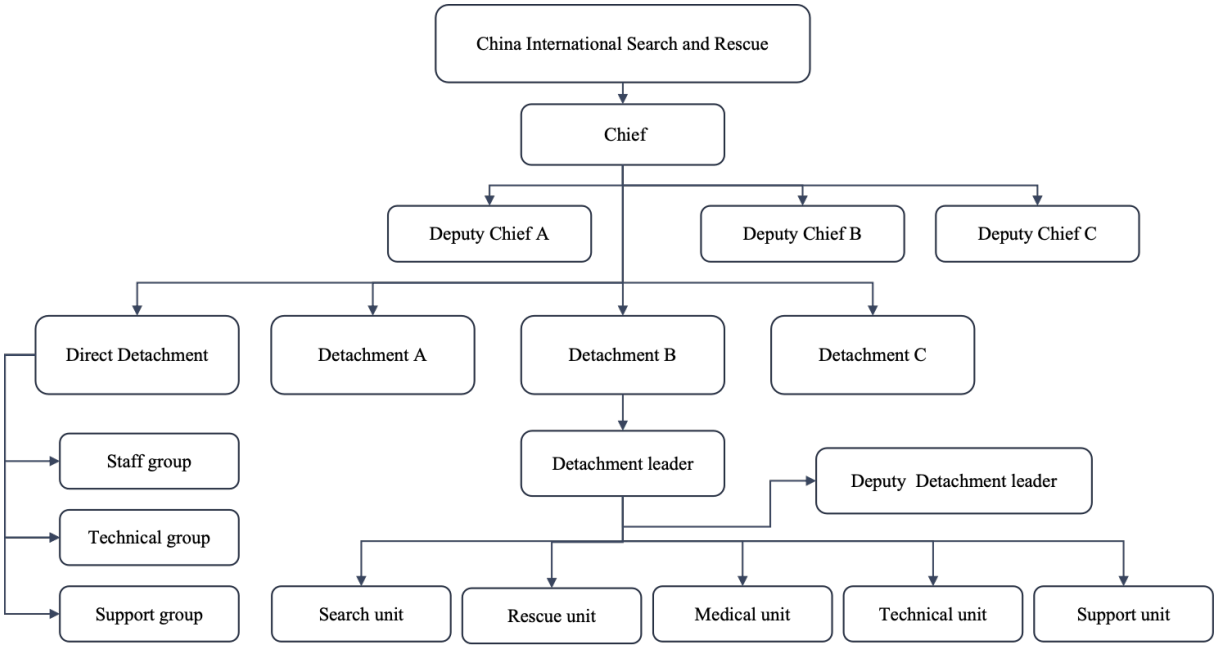

Figure 2.1 Organization chart of China International Search and Rescue (CISAR)

Source: CEA (2012)

Representative Team 2: The China Fire and Rescue (CFAR)

The China Fire and Rescue (CFAR) was established in Beijing, China, on November 9, 2018. CFAR is directly managed by the Ministry of Emergency Management of China. It was formed after the withdrawal of the China Public Security Fire Force (a division of the Chinese People's Armed Police Force) and the Forest Force of the Chinese People's Armed Police Force from military service. These units were then transferred in their entirety to the Ministry of Emergency Management to establish CFAR. Before 2018, CFAR primarily focused on fire rescue. After its reorganization, it was positioned as the main force and national team for emergency rescue in China, undertaking rescue missions for "all disaster types" and "major emergency". Since 2018, CFAR has undergone transformation and upgrades in terms of rescue concepts, team capabilities, responsibilities, equipment and facilities, rescue methods, and organizational structure. CFAR has undertaken a vast number of fire and comprehensive rescue missions within China. In just one year between 2018–2019, CFAR completed more than 1.2 million emergency rescue missions, over 100,000 incidents per month on average, and rescued or evacuated over 660,000 affected people.

Regarding its organizational structure, CFAR consists of two main divisions: the Forest Fire Bureau and the Fire Rescue Bureau.

The Forest Fire Bureau primarily undertakes forest and grassland firefighting and rescue missions. It currently has nine regional fire brigades in Inner Mongolia, Jilin, Heilongjiang,

Yunnan, Sichuan, Fujian, Gansu, Xinjiang, Tibet, and Beijing. These brigades oversee subordinate forest firefighting detachments or dispatched units.

The Fire Rescue Bureau is mainly responsible for urban and rural firefighting and comprehensive rescue operations. It currently has fire rescue corps in Beijing, Shanghai, Tianjin, Chongqing, Sichuan, Tibet, Xinjiang, Hebei, Henan, and 22 other provinces, totaling 31 provincial corps. These corps oversee municipal fire rescue detachments, which in turn oversee county-level fire rescue brigades. At the grassroots level, these brigades manage fire rescue stations in urban districts and townships.

The organizational structure of CFAR is illustrated in Figure 2.2.

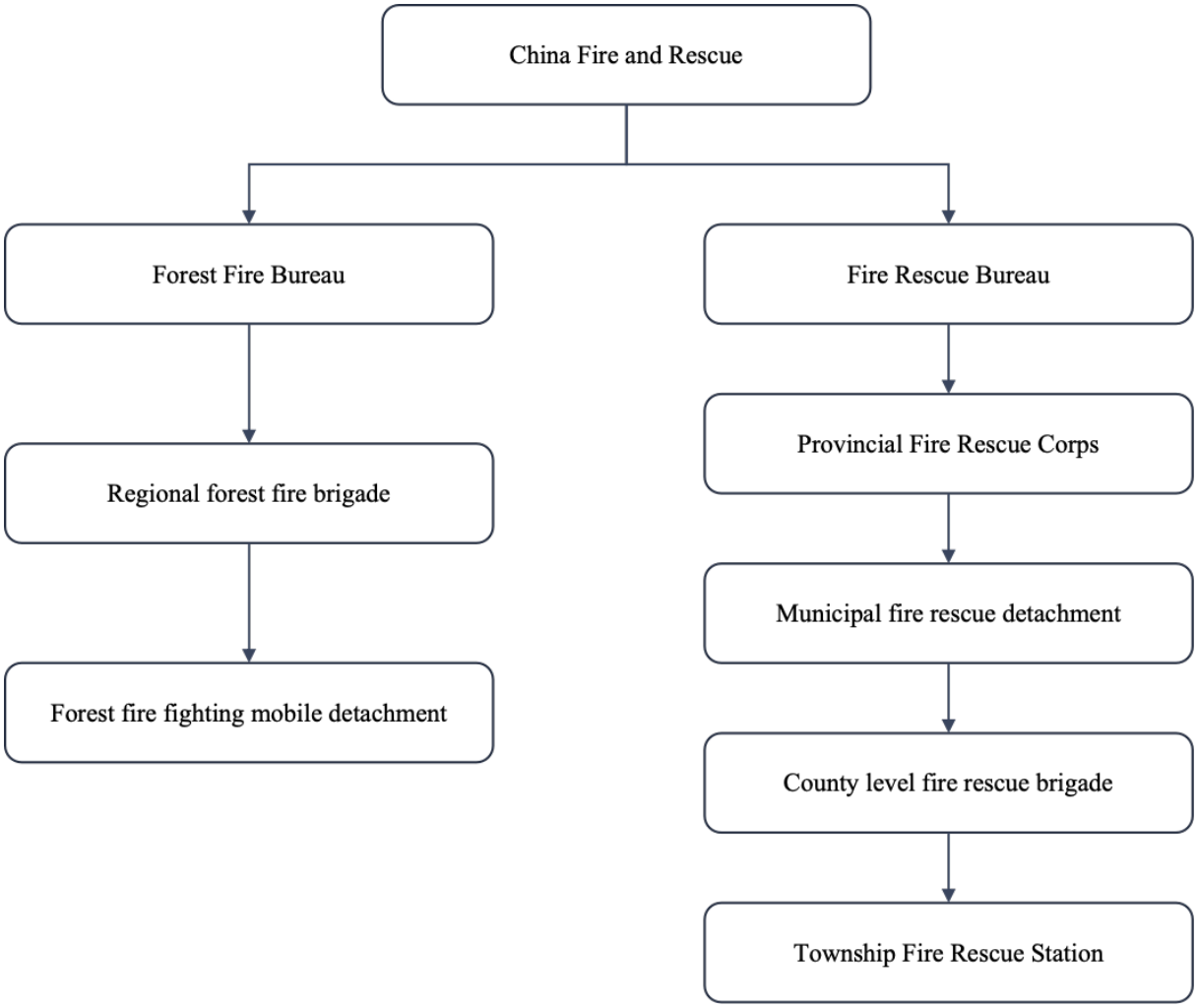

Figure 2.2 Organization chart of China Fire and Rescue (CFAR)

2.1.2.2 Social emergency rescue organizations

In China, more than 1,700 social emergency rescue organizations are legally registered with institutions such as the Ministry of Civil Affairs, comprising a total of over 40,000 members. Their primary tasks include participating in mountain rescue, water rescue, aerial rescue, diving

rescue, medical assistance, and other emergency response operations. Social emergency rescue organizations possess advantages such as volunteer-based public welfare, proximity to the public, and rapid responses, playing a crucial role in life-saving missions and disaster relief. According to statistics from the Ministry of Emergency Management of China, from 2018 to 2020, social emergency rescue organizations in China have participated in emergency rescue operations a total of 300,000 person-times and engaged in emergency volunteer services 1.8 million person-times.

Taking Chengdu, Sichuan Province, as an example, according to the data from Chengdu Emergency Management Bureau (2023), there are currently 54 registered social emergency rescue teams in Chengdu (see Annex A).

Representative Team 1: China Anneng Rescue Team (Corporate)

The China Anneng Rescue Team is affiliated with China Anneng Construction Group Co., Ltd. The predecessor of the Anneng Group was the Hydropower Unit of the Infrastructure Engineering Corps of the People's Liberation Army, established in 1966. In 1985, this unit was incorporated into the People's Armed Police Force, becoming the Hydropower Unit of the Force. In 2009, it was integrated into China's national emergency rescue system. In 2018, the Hydropower Unit of the People's Armed Police Force collectively withdrew from military service and was restructured into a non-military professional rescue force, forming the Anneng Group, which is under the administration of the State-owned Assets Supervision and Administration Commission of the State Council of China (SASAC).

The Anneng Group specializes in emergency engineering rescue for natural disasters. It possesses cutting-edge equipment such as remotely controlled intelligent excavators, underwater robots, power pontoon bridges, and multifunctional search-and-rescue vehicles. It leads in China and is globally recognized for its advanced rescue technologies, such as barrier lake management, rapid power grid construction, and one-time embankment closure. Over the years, the Anneng Group has successively completed over 270 major emergency rescue operations, including Tangshan Earthquake relief efforts, 1998 Yangtze River flood response, 2008 Wenchuan Earthquake disaster relief, Southern China ice storm power restoration, Jiangxi Changkai dike breach closure, Gansu Zhouqu mudslide rescue, Eastern Star shipwreck rescue, Jinsha River barrier lake emergency response, Poyang Lake dike breach closure, and Henan flood disaster rescue.

Representative Team 2: Pengzhou Squad of Chengdu Work Safety Emergency Rescue (Public Institution)

The Pengzhou Squad of Chengdu Work Safety Emergency Rescue is a public institution,

registered in 2020 with the Pengzhou Municipal Public Institution Registration and Management Bureau. Its primary task is to undertake emergency rescue operations for occupational safety incidents at non-coal mining enterprises and other production enterprises within Pengzhou. The team is managed by the Rescue Center of Pengzhou Emergency Management Bureau. It is equipped with a total of 142 sets of disaster relief and detection equipment across nine categories, including transport, demolition, search and rescue, communications, firefighting, explosion protection, gas detection, respiratory protection, and rescue support.

Representative Team 3: Ramunion Rescue Brigade (RRB) (Volunteer-based)

The Ramunion Rescue Brigade (RRB) is an international professional rescue team specialized in disaster and accident responses. Its was established in 2008 under the Zhejiang Province Ramunion Public Welfare Rescue Promotion Association. As of February 28, 2022, the team had 2,701 registered volunteers and over 500 rescue team members, had undertaken 2,102 volunteer services and 274 rescue missions, including 16 cross-border missions. Accumulatively, it had successfully rescued 7,792 lives. The team is capable of water rescue, mountain rescue, aerial rescue, and health epidemic prevention. It operates four specialized rescue training bases in China, focusing on high-altitude rescue, air special forces, water rescue, demolition, and search dogs. The team participated in over 250 rescue missions, including the rescue operations following the 2022 Henan floods, the Chongqing Wanzhou bus crash into the river, the Wenling tank truck explosion, and the Phuket Island shipwreck in Thailand. During the Henan floods, the team airlifted 38 critically ill patients. It has been awarded honors such as 5A-level Social Organization and China's 119 Firefighting Advanced Collective.

Representative Team 4: Blue Sky Rescue (BSR) (Volunteer-based)

The Blue Sky Rescue Team (BSR) is owned by Beijing Blue Sky Rescue Team. It was founded by outdoor enthusiasts in 2003 under the name "Green Field Rescue" for outdoor self-rescue and was renamed "Blue Sky Rescue" in 2007. In 2008, BSR collaborated with the Beijing Red Cross Society and integrated into the Red Cross system. In 2019, BSR registered with the Beijing Civil Affairs Bureau, becoming the first officially registered social rescue team in China.

BSR operates under a brand authorization model. The Beijing Blue Sky Rescue Team has 12 sub-teams in Beijing (including preparatory teams) and licensed teams across 31 provinces, municipalities, and autonomous regions in China, as well as a branch in Thailand. As of August 30, 2022, according to BSR's public data, it had 431 official teams with 69,940 members and 18,242 certified members, having accumulated over 2.58 million hours of service (BSR, 2022).

BSR conducts rescue missions both in China and internationally, including disaster rescues for the Sichuan Wenchuan earthquake, Yushu earthquake, Ya'an earthquake, Gansu Zhouqu mudslide, Henan Zhengzhou floods, Hainan Typhoon Wipha, and Hubei Jianli shipwreck, as well as international operations such as the Nepal earthquake rescue, Philippine typhoon rescue, Myanmar mountain rescue, and Sri Lanka flood rescue. BSR has conducted over 30,000 missions annually, including 5,889 missions of disaster rescue and missing persons search, 14,500 social activities and public training events, and 4,932 rescue drills and training sessions (BSR, 2022).

The team members of BSR primarily consist of volunteers from various industries. According to Y. Li (2019), the team members are mainly corporate employees (50%), followed by private business owners (26%) and university students (16%).

2.1.3 Development of international emergency rescue organizations

International emergency rescue organizations can be categorized into three types: United Nations and other global rescue organizations, as well as national emergency rescue teams and national emergency rescue volunteer organizations across countries.

The United Nations and other global rescue organizations encompass multinational or global organizations engaged in broad-spectrum rescue efforts across economic, cultural, medical, and disaster relief sectors. Some examples include the United Nations High Commissioner for Refugees (UNHCR), the United Nations Children's Fund (UNICEF), and the International Federation of Red Cross and Red Crescent Societies (IFRC). Among these organizations, the International Search and Rescue Advisory Group (INSARAG) is the most closely related to emergency rescue. Established in 1991, INSARAG is an intergovernmental humanitarian rescue body operating under the United Nations framework. It comprises disaster management personnel, government officials, non-governmental organizations (NGOs), and USAR teams.

National emergency rescue teams primarily refer to those that have passed the United Nations assessment under the INSARAG framework and are capable of conducting cross-border emergency rescue operations. The major teams representing different regions of the globe are listed in Annex B.

National emergency rescue volunteer organizations are non-governmental teams or associations primarily composed of volunteers. In history, emergency volunteer services have evolved through four stages: the nascent stage (19th century), formation stage (early 19th century to mid-20th century), maturity stage (mid-20th century to late 20th century), and

expansion stage (early 21st century to the present). Representative organizations include the Royal National Lifeboat Institution (RNLI) in the UK, New South Wales State Emergency Service (SES) in Australia, Arbeiter-Samariter-Bund (ASB) in Germany, Volunteers in Service to America (VISTA) in the US, the German Federal Agency for Technical Relief (THW), the German Fire Brigades Association (DFV), the Malteser Hilfsdienst (MHD) in Germany, and the Johanniter-Unfall-Hilfe (JUH) in Germany, among other specialized emergency volunteer organizations (Howard, 1999; X. Liang, 2013).

Representative Team 1: Royal National Lifeboat Institution (RNLI), UK

RNLI is an independent charity and volunteer organization for maritime search and rescue, established in 1824. It is a key social force in the UK's maritime rescue operations. In the UK, 90% of maritime search and rescue missions are completed by social forces, with RNLI being primarily responsible for saving lives at sea. RNLI has established over 230 lifeboat stations across the UK, with more than 4,600 volunteer crew members and over 3,000 shore-based support volunteers, covering coastal waters throughout the UK. The operational costs of RNLI come from public donations.

Organizational management: RNLI is supervised by an advisory council and a foundation, with its daily operations managed centrally by its headquarters. Its lifeboat stations operate under the leadership and command of the headquarters. The lifeboat stations are strategically located rather than distributed based on administrative divisions. While they coordinate with local governments, they do not fall under government command. RNLI headquarters is responsible for volunteer recruitment and training, establishing service standards, communication and coordination, and media response.

Equipment management: RNLI provides personal equipment for maritime search and rescue volunteers, including life-saving gear for the rescuers themselves. Currently, RNLI is equipped with five classes of all-weather lifeboats, five classes of inshore lifeboats, and one class of hovercraft to meet the needs of different locations and missions. In addition to search and rescue personnel, RNLI also has its own equipment designers who collaborate with manufacturers to produce rescue equipment.

Personnel management: The volunteers of RNLI come from various industries. Once recruited, they undergo a 12-month probation period, during which they receive training and carry out adaptive tasks. The training includes 46 specialized subjects, covering responsibilities in search and rescue, equipment use and maintenance, personal survival, and firefighting skills. At the end of the probation period, the volunteers will undergo an assessment.

Representative Team 2: New South Wales State Emergency Service (SES), Australia

SES is an emergency rescue service team established in 1955 in New South Wales, Australia. It primarily conducts flood and storm rescues in rural areas and also handles road traffic accident rescues, search and rescue operations, and vertical rescues.

SES is a government-managed volunteer organization with 18 regional headquarters and 243 subordinate units. It has 9,000 volunteers, of whom 6,700 are active members. SES does not have a long-term workforce and mainly relies on volunteers. The state headquarters of SES has 31 staff members, while the 18 regional headquarters collectively have 38 staff members, with over 6,700 active volunteer members. Local government councils provide accommodation, assistance with vehicle procurement, and daily operational funding support for SES.

Representative Team 3: Federal Agency for Technical Relief (THW), Germany

THW is a volunteer-based disaster relief organization in Germany that provides international humanitarian aid for disaster incidents on behalf of the German government. Established in 1950, THW became a federal agency in 1953 under the jurisdiction of the German Federal Ministry of the Interior. It was originally founded to serve civil protection functions during wartime, but began participating in emergency rescue operations in the 1960s.

Organizational management: The headquarters of THW is located in Bonn and consists of administrative staff, volunteer representatives, and two offices. It has several operational departments, including Standards and Regulations (E1), International Operations (E2), Capacity Development (E3), Logistics (E4), and Technical and Branch Support (E5). In particular, the Technical and Branch Support (E5) department is further divided into personnel, organization, finance, information, and communication divisions. The THW headquarters is responsible for coordinating forces on both national and international levels. Beneath the headquarters are 16 regional offices (LV), which later merged into eight regional offices, responsible for the coordination and deployment of THW rescue forces within their jurisdictions. These regional offices manage 66 branch offices (GSt), which coordinate local rescue forces. The branch offices oversee 668 local sections (OV), which carry out emergency rescue operations at the request of local governments.

Personnel management: THW is neither a government agency nor a typical volunteer organization. It has over 80,000 members, of whom only 1% are full-time employees, with the majority being volunteers. THW mobilizes its members for emergency rescue operations in response to accidents and natural disasters. It accepts applications from all interested volunteers and provides them with free training in basic skills, which is conducted by the volunteers' respective local sections. The basic training includes a total of 100 hours, and the training content covers knowledge and operation of equipment and devices, as well as basic medical

first aid skills. At the end of the training, the applicants must undergo an assessment. The qualified ones will become THW rescuers.

2.1.4 Emergency rescuers and emergency rescue volunteers

China's *National Occupational Skill Standards* defines an emergency rescuer as "a person engaged in disaster prevention and emergency preparedness, rescue of affected individuals and public or private property, organization of self-rescue and mutual aid, as well as post-rescue relief efforts in response to emergencies." In this definition, the person engaged in such work refers to individuals performing these tasks and is not limited to employed workers or civil servants; it also includes volunteers and social workers. The national unified training materials for occupational skills *Emergency Rescuer (Level 5)* classifies emergency rescuers into two categories: a) professional rescuers, such as emergency management personnel, firefighters, medical personnel, and search and rescue personnel; and b) social rescuers, such as emergency rescue volunteers and social workers (EMDERPC, 2020).

The role of an emergency rescuer is multifaceted, encompassing responsibilities as a disaster stakeholder coordinator, medical responder, media spokesperson, on-site disaster assessor, safety guarantor, psychological counselor, and emergency manager. These roles require emergency rescuers to perform various duties, including rapidly assessing the scene, identifying injured individuals, making and initiating action plans, providing companionship and comfort, and collecting remaining materials and data from the site. These roles and responsibilities require emergency rescuers to possess four competencies: help-seeking ability, communication ability, organizational ability, and medical rescue ability. The occupational standards specify that emergency rescuers must possess part or all of the following knowledge:

1) Fundamentals of emergency rescue work;
2) Prevention and emergency preparedness;
3) Monitoring and early warning;
4) Community emergency rescue;
5) Structural collapse search and rescue;
6) Mountain (rope) rescue;
7) Hazardous chemical emergency rescue;
8) Mine (tunnel) rescue;
9) Water search and rescue;
10) Execution of rescue operations;
11) Emergency medical treatment of injured people;

12) Post-rescue relief efforts.

2.2 The concept of competency and its relationship with performance

In the literature, both terms “competence” and “competency” have been used, with distinct definitions. The following sections will review and analyze relevant literature on their concepts, as well as the relationship between competency and performance.

2.2.1 Competence

The term “competence” was first introduced by McClelland et al. (1953) in reference to human traits. Following that, McClelland initiated the competency modeling movement in the US, leading to the emergence of various descriptions and definitions of competence.

There are multiple definitions of competence. According to the *Oxford Advanced Learner's Dictionary*, “competence” is the noun form of “competent”, meaning “being competent.” In academia, there are three perspectives on the definition of competence:

The first perspective defines competence in terms of performance. For instance, McClelland (1973) defined competence as “a personal trait or set of habits that leads to more effective or superior job performance.” In his paper *Testing for Competence Rather Than for “Intelligence”*, McClelland argued that while academic performance can be measured through knowledge, on-the-job performance should be measured through competence. Chouhan and Srivastava (2014) viewed competence as a method for linking business strategy to individual performance. Ulrich et al. (1995) defined competence as an ability that enhances business value, primarily referring to organizational performance. Similarly, Spencer and Spencer (1993) suggested that competence has a strong causal relationship with performance.

The second perspective considers competence as a set of human traits or personal potential, distinguishing it from organizational core competencies. For example, when McClelland et al. (1953) first introduced the concept of competence, they described it as a human trait. Likewise, Spencer and Spencer (1993) defined competence as an individual trait with a strong causal relationship to performance.

The third perspective sees competence as a manifestation of motivation, believing that it is a motivational outcome resulting from humans’ and mammals’ survival competition in their natural environment. This competence develops after birth; it is not acquired merely through physiological maturation but must be learned from the environment (White, 1959). Spencer and Spencer (1993) further found in their research on performance causality that competence,

encompassing motivation, traits, and self-concept, can predict behavior, which in turn influences job performance. If a behavior does not have an underlying motivation, it cannot be defined as competence.

2.2.2 Competency

Between 1953 and 1958, McClelland primarily used the term "competence", emphasizing human abilities.

From 1959 onward, scholars introduced the concept of "competency" (or competencies) from the perspective of organizational survival and sustained competition (Boyatzis, 1982; McLagan, 1980; Schoonover, 2003; Spencer & Spencer, 1993; Ulrich et al., 1995; White, 1959). Many dictionaries and current studies have treated "competence" and "competency" as synonymous.

Since 2001, Chinese scholars have begun to introduce and study the concept of competency. For instance, M Feng (2001) translated "competence" as 胜任力 ("competency"), while Shi et al. (2002) translated "competency" as 胜任力特征 (competency characteristic).

Although "competence" and "competency" (or "competencies") are often used interchangeably, through a review and analysis of the literature, we found some differences between them:

First, "competency" (or "competencies") is more closely associated with behaviors, while "competence" is more related to performance. In addition, "competency" (or "competencies") is more linked to professional qualifications, whereas "competence" pertains to human traits and talent potential. Moreover, "competency" (or "competencies") is often used in the organizational context, while "competence" is primarily related to individuals. Lastly, "competency" (or "competencies") refers to observable aspects, while "competence" is mainly related to latent qualities.

Despite these differences, the emergence of "competency" (or "competencies") led to the competency modeling movement, bringing greater consistency to the terminology, and standardized definitions began to emerge, as shown in Table 2.1.

Table 2.1 Definitions of competence/competency by different scholars

No.	Term used	Authors	Definition and description
1	Competence	McClelland et al. (1953)	Competence refers to a person's ability, encompassing personality and motivation.
2	Competence	White (1959)	Competence is a form of motivation that enables an organism to interact effectively with its environment, which can be acquired through learning.

No.	Term used	Authors	Definition and description
3	Competence	McClelland (1973)	Unlike intelligence tests, competence is a distinct metric for assessing talent. While high intelligence may provide access to better education and career opportunities, it does not necessarily indicate high competence. In addition to cognitive ability, competence should also include personality variables, life outcomes, and occupational outcomes, such as leadership and social skills.
4	Competence	Yukl (1982)	Competence is a set of skills, including technical skills, interpersonal skills, and conceptual skills.
5	Competence	Gilbert (1978)	Competence is a state of being competent, referring to the ability to continuously produce results (valuable outcomes of behavior), which is essential for achieving greater organizational goals in the most efficient and effective way.
6	Competency	Boyatzis (1982)	Competency is a fundamental personal characteristic associated with superior performance in the workplace (where a change in one variable leads to a change in another). Boyatzis (1982) suggested that exceptional managers typically possess 19 general competencies. He categorized these 19 competencies into five distinct groups: goal and action management, leadership, human resource management, coaching subordinates, and concern for others.
7	Competency	Hornby and Thomas (1989)	Competency refers to the ability to effectively perform management-related functions in a work environment.
8	Competency	Spencer and Spencer (1993)	Competency encompasses abilities in intelligence, management, social interaction, and emotional domains. Individuals are rewarded based on their competencies.
9	Competency	Hoffmann (1999)	Competency is the input or fundamental characteristic required for an individual to achieve competent performance.
10	Competency	Kurz and Bartram (2002)	Broadly speaking, competency can be defined as an effective response to job demands, achieved through the integration of work, profession, goals, and roles. Competencies are “behavioral repertoires”, while competence is a “state” of attainment.
11	Competence	Lawler (1994); Lawler and McDermott (2003)	Competence implies ability, authority, and skill. Etymologically, competence signifies excellence, referring to behavioral skills possessed by an employee with sound knowledge, behavior, and skills. Competency characteristics gradually become part of an individual’s personality and behavior while performing job tasks.
12	Competencies	Teodorescu (2006)	Competencies are ranked based on importance and expected achievement levels.
13	Competence	Sedyastuti et al. (2020)	Competence refers to the ability to perform a job or task based on the skills and knowledge supported by work attitudes. It demonstrates specific knowledge, skills, and attitudes required for a particular profession.
14	Competency	Samarin et al. (2021)	Competency is job-related; it comprises a combination of knowledge, skills, behavior, and personal characteristics.

No.	Term used	Authors	Definition and description
15	Competency	Teng (2021)	Competency refers not only to knowledge and skills but also to the overall ability to mobilize knowledge and social resources in a specific context to meet the requirements of completing complex tasks.
16	Competency	B. Huang et al. (2022)	In the future, competency may no longer be centered around companies or employees in traditional employment relationships but rather on "mega individuals." The competency of "mega individuals" consists of three characteristic dimensions: compound ability, collaboration, and personal intellectual property. Compound ability does not only refer to an individual's knowledge, skills, and learning ability; it also reflects the individual's overall quality and the ability to respond to uncertainty in a timely manner. Collaboration among "mega individuals" is based on respect and equality, generating a synergistic effect that ultimately leads to goal achievement. Personal intellectual property requires time to accumulate but holds significant implicit value. This definition of competency extends beyond the framework of the Iceberg model, enabling competency to possess the ability to continuously evolve and self-develop.
17	胜任力 (competency)	P. Zhang and Zhang (2023)	Competency is a quality characteristic often used to measure job performance.

This study adopts the term "competency" or "competencies" in English and "胜任力" in Chinese. The Chinese term "能力" ("competence") will not be used. However, following the definition and translation of "competency" by Shi et al. (2002), we understand that "胜任力特征" ("competency characteristics") corresponds to "胜任力要项" ("competency elements"). In this study, when describing competency characteristics, the terms "胜任力要项" ("competency elements") or "胜任力指标" ("competency indicators") will be used.

This study follows the definition of competency provided by Spencer and Spencer (1993) in *Competence at Work: Models for Superior Performance*, which defines competency as a set of underlying personal traits that have a strong causal relationship with job performance in a criterion-referenced group. Here, "underlying personal traits" highlight the deep and enduring role that competency plays in personality and its ability to predict an individual's behavior in complex situations and critical roles. "Causal relationship" means that competency leads to performance or can be used to predict performance and behavioral outcomes. "Criterion reference" refers to the use of specific benchmarks or standards to measure competency, allowing for the practical assessment of an individual's job performance. Y. Li (2017) argued that Spencer's concept of competency is not merely a simple sum of dimensions such as knowledge, skills, self-concept, traits, and motives. Instead, it emphasizes three key

characteristics: 1) Competency is closely linked to job performance and can be used to predict an employee's future job performance; 2) competency is closely connected to task contexts and possesses dynamic characteristics; 3) competency serves as a tool for distinguishing superior performers from average performers.

2.2.3 Core competency

In the early 1970s, as the concept of competency expanded from describing individuals to describing organizations such as schools, terms such as "core competency", "core competencies", and "organizational core competency" began to emerge (Brent et al., 1972; McLane, 1975). For example, the Glassboro Teacher Education Program, established in 1972, defined the core competencies of teachers from a school perspective. The objective was to adapt to environmental changes and cultivate graduates into future teachers with superior performance. The core competencies developed in this program include a) competence in instructional skills, b) competence in learning theory, c) competence in materials and programs, and d) competence in establishing a positive school environment (Brent et al., 1972). Over the past decade, the concept of core competency has been widely applied and studied in business organizations such as corporations, mainly in relation to competitive environments and product development (Alexander & Martin, 2013; Bani-Hani, 2021; Barney & Hesterly, 2021; Wheelen et al., 2019; Whittington et al., 2020; C. Yang, 2015).

Hamel and Prahalad (1994) defined core competencies as the behavioral elements that all employees must possess, such as the core competency of "results/quality orientation". They also argued that core competencies form the foundation of an organization's strategic direction, representing what a company does best compared to its competitors.

Although the concept of core competency has some association with individuals, the primary research focus in the literature has been on organizations. Since this study focuses on individuals, this concept will not be further elaborated.

2.2.4 Competency and performance

McClelland (1973) first proposed the causal relationship between competence and performance in his article *Testing for Competence Rather Than for "Intelligence"*, published in *American Psychologist*. However, Barrett and Depinet (1991) argued that McClelland reached this conclusion without rigorous empirical research. In *American Psychologist*, Barrett and Depinet (1991) published an article titled *A Reconsideration of Testing for Competence Rather Than for*

Intelligence, which strongly criticized McClelland's conclusions and argumentation, pointing out that many of the cited data contradicted his viewpoint. However, the core of the debate mainly focused on the rigor of the argumentation rather than the validity of the causal relationship between competence and job performance. Additionally, these two authors noted that the intelligence tests McClelland opposed actually reflected cognitive ability tests and general aptitude tests, which measure abilities such as verbal comprehension, reasoning, thinking, and analytical skills. As intelligence influences competence, which in turn affects job performance, it indirectly supports the causal relationship between competence and performance (Barrett & Depinet, 1991).

Spencer and Spencer (1993) conducted a more rigorous empirical study to address McClelland's limitations by analyzing data from annual performance bonuses of sales personnel to explore the relationship between competency and performance. Later, McClelland (1998) conducted new research by collecting performance data to further examine the relationship between competency and performance.

The relationship between competency and performance is reflected in the World of Work (WoW) model (Kurz & Bartram, 2002). This model aimed to integrate research and application streams in occupational assessment, attempting to provide a structured taxonomy and conceptual framework to describe workplace behavior, competency, and performance. Kurz and Bartram (2002) categorized competencies into four types: job competency, occupation competency, goal competency, and role competency. Among these, job competency refers to a set of universal and fundamental abilities that contribute to achieving expected performance outcomes or results. Subsequently, Bartram (2005) conducted further research on competency and performance and proposed the Great Eight Competencies.

Song (2012) conducted an empirical study on government auditors in China, developing a 13-factor competency model. The study confirmed that different competency characteristics do not uniformly promote performance; instead, they contribute to job performance either holistically or partially. This research progressed from studying the relationship between competency as a whole and performance to examining the specific impact of various competency characteristics on performance using substantial data for validation.

Through research on emergency service volunteers in Australia, Silk et al. (2018) found that the physical and psychological competency characteristics of volunteers positively influenced task performance in rescue operations.

Meduri (2020) conducted a questionnaire survey in Indian emergency rescue organizations and confirmed a significant positive relationship between 34 competencies and emergency

rescue performance.

Whether examining the relationship between competency and performance holistically or focusing on specific aspects, researchers have consistently worked to validate McClelland's initial hypothesis regarding the causal relationship between the two (McClelland, 1973), which also serves as a foundation for this study (it is not a research question of this study; instead, this study will use this conclusion as an assumption).

This section has primarily reviewed the literature on the concepts of competence, competency, and core competency, highlighting their differences. Overall, since McClelland et al. (1953) took the perspective of individual psychology, competence is more closely associated with personal traits. Further, McClelland (1973) and subsequent scholars extended the research by studying competency and core competency at the observable behavior level and organizational level, as well as their application –the competency model.

2.3 Competency model

2.3.1 Definition of competency model

In the early 1970s, McClelland initiated the competency modeling movement. With the support of the consulting firm McBer (later part of Hay Group), McClelland conducted theoretical research and applications of competency modeling in educational organizations. As research progressed and the demand from businesses increased, the competency model was widely applied in business organizations (McClelland, 1973; Spencer & Spencer, 1993).

During the literature review, we observed that the concept of the competency model is often defined mainly from the perspective of how the models are constructed. Based on the modeling approach, competency models can be categorized into two main types. One type of competency models primarily originates from the job roles of the individuals being studied or the work-related competency requirements on them. The other type of competency models primarily stems from the individual competency requirements within the framework of an organization's capabilities. Representative definitions of these two types of competency models are presented in Table 2.2.

Table 2.2 Definitions of two types of competency models

Perspective	Authors	Description
Individual	Shippmann et al. (2000)	The competency model is the sum of the competency elements required for a particular job. It typically requires 7-9 total competencies. The competency model differs from job analysis. Job analysis focuses on the work or tasks and

Perspective	Authors	Description
		what has been accomplished, whereas the competency model focuses more on employees or individuals and how the tasks are accomplished.
	Cernusca and Dima (2007)	A competency model is a set of competencies that includes the key behaviors required for excellent performance in a particular role.
	Chouhan and Srivastava (2014)	The competency model is a list of effective, observable, and measurable knowledge, skills, and attributes. These characteristics are demonstrated through behaviors that produce outstanding performance in a specific work environment.
Organizational	M Feng (2001)	Competency is related to the work context, including industry specificity, company specificity, and task specificity. Therefore, the competency model includes four types of competencies: general industry competence, intra-organizational competence, standard technical competence, technical trade competence, and idiosyncratic technical competence.
	Chouhan and Srivastava (2014)	The competency model is an organizational framework that lists the competencies required for effective performance in a specific job, job family, or a group of related jobs within the organization. The competency model includes descriptions of activities and behaviors associated with each competency. Competency models are often highly customized for organizations, and thus, the elements of the model are expressed in a clear manner to reflect the environment and conditions necessary for performance achievement. Individual competencies are organized into a competency model to help individuals within the organization or profession understand, discuss, and apply them to workforce performance.
	L. Xu (2021)	The competency model is a practical application of competencies. Competency models are developed with different combinations depending on the industry, job roles, and specific needs. That means, competency elements vary across different contexts.

2.3.2 Research subjects of the competency model

Due to the existence of different concepts such as positions, job roles, and job families within organizations, the research subjects of the competency model may vary. Since the emergence of the competency model in the early 1970s, there have been different types of research subjects of the model. Some scholars have conducted a review in this regard (Chouhan & Srivastava, 2014; Mansfield, 1996). The research subjects generally fall into three types: the single-job, the "one-size-fits-all," and the multiple-job. The multiple-job approach was developed by Mansfield (1996) to address the limitations of the first two approaches, which cannot be applied to multiple positions or complex jobs.

Research Subject 1: The single-job (Targeting a single position or job role)

This approach is mainly suitable for constructing a simple competency model for a single job, such as customer service representatives. The research process for a single job approach involves three steps:

Step 1: Identifying critical jobs. On-the-job individuals are identified by direct managers or human resource managers.

Step 2: Data collection. It typically involves focus group interviews with on-the-job employees and their managers, as well as behavioral event interviews with on-the-job employees. Additional data sources might include interviews with customers and direct subordinates, surveys of employees, and direct observation of employees at work.

Step 3: Data analysis. The collected data is analyzed and integrated into a competency model. This model usually consists of 10 to 20 characteristics, each with a definition and a specific behavioral list that describes what effective performers do and how they achieve effective outcomes.

Research Subject 2: The "One-Size-Fits-All" (Targeting a family of jobs)

This research approach is primarily applicable to a broad range of jobs, such as all management positions. The broad range of jobs (i.e., a family of jobs) here means constructing a common competency model for an organization rather than focusing on a specific job. The steps involved are:

Step 1: Defining the target population, for example, all managers within the organization.

Step 2: Data screening. Unlike the single-job approach, this approach does not directly collect data from employees but instead screens secondary data, including previously developed competency models for specific positions, competency models found in the literature, and case databases from consulting firms.

Step 3: Model review. After choosing the model, senior management will review and revise it to ensure it aligns with the organization's mission and values. In addition to developing a common model, most organizations will also design supporting HR applications, such as a competency assessment questionnaire and a resource guide for developing the competencies.

Mansfield (1996) noted that the job-family approach provides a consistent framework for generic positions based on company-wide values and mission while being more cost-effective than the single-job approach. However, it also has significant disadvantages: 1) Limited specificity. For instance, a common management competency model cannot distinguish between international marketing managers and plant managers. 2) Implementation challenges. As this model designs competencies for multiple departments and roles, it necessitates extensive inter-department coordination and high-level approval.

Notably, Mansfield (1996) did not specify how the secondary data should be screened in the second step. It was later suggested that the Delphi method or peer review can be employed to address this issue (Cochran, 2009).

Research Subject 3: The multiple-job (Targeting multiple jobs)

This research approach is appropriate when both generality and specificity are needed for competency model construction, typically at the organizational level. This method offers a rapid, cost-effective way to develop competency models but is more complex than the previous two approaches and requires higher-level authorization (from company-level decision-makers). The research process includes three steps:

Step 1: Common competency model construction. This step primarily involves focus groups consisting of competency modeling experts, on-the-job employees, their supervisors, HR personnel, and subject matter experts, with an appropriate group size of 6-12 participants. The focus group discussion typically lasts one day. The discussion topics include:

1) Ongoing and anticipated changes in the organization, industry, market, and technology related to the target jobs;

2) A set of core responsibilities;

3) The most critical tasks or outcomes for employees;

4) Performance criteria for each key task;

5) The fundamental competencies and additional skills required for each job.

6) Job-specific behaviors through which competencies are demonstrated to contribute to key tasks or outputs.

7) Industrial trends and organizational strategy.

Step 2: Competency leveling. Based on the competency elements identified in the first step, competency levels are defined for different positions and different hierarchical levels within the same position. For consistency in rating, there are typically four or five standardized tiers (see Table 2.3).

Table 2.3 Levels for the competency: Customer orientation

Level	Description	Rating
Not demonstrated	Shows little awareness or concern for the needs of the customer; typically focuses on own needs.	
Developing	Inconsistent in showing awareness and responsiveness to customer needs.	
Capable	Consistently shows awareness of customers' needs; is responsive to concerns expressed by customers.	
Outstanding	Consistently shows awareness and responsiveness to customers' needs. In addition, actively seeks information about customers' needs and concerns and uses this information to modify work processes and behavior.	

Source: Mansfield (1996)

Step 3: Model review

The purpose and method of the model review of this approach are similar to those of the "one-size-fits-all" approach. The difference, however, lies in that the multiple-job approach requires the involvement of higher-level decision-makers at the company level.

Mansfield (1996) considered the multiple-job approach more effective due to the following trends: 1) Job and skill diversification. Future employees will experience more diversified work and skills. This approach develops a competency database (particularly a skills database) that facilitates the rapid combination and application of competencies for new positions or jobs. 2) Organizational flattening. As organizations become flatter, upward mobility is restricted due to a reduction in high-level positions. By using competency levels, however, this approach effectively expands career development opportunities, aiding in talent attraction and retention. 3) Development of skill-based compensation systems. Traditional compensation systems need to be supported by a graded skills evaluation framework.

In addition to these three types of research subjects, Spencer and Spencer (2003) suggested that competencies for future jobs could also be studied. However, the first step of the multiple-job approach proposed by Mansfield (1996) already addressed the discussion on competency requirements based on anticipated future trends.

2.3.3 Representative competency models

A competency model can be simply understood as a combination of several competency elements. Different combinations of these elements form different model structures. Representative competency models include the KSAs model, the KSAOs model, the iceberg model, the onion model, the Spencer model, the WoW model, and the Great Eight model. These representative competency models can be roughly divided into three categories: The first category is the three-dimension models, such as the KSAs model and the KSAOs model, both of which combine the three core factors: knowledge, skills, and attitudes. The second category is the two-layer models, such as the iceberg model and the onion model. In addition to knowledge, skills, and attitudes (the KSAs), these models include additional factors such as motives and traits. They are characterized by the distinction between surface-level factors and underlying factors. The third category is the multi-dimensional models, such as the Spencer model, the WoW model, and the Great Eight model. Building on the iceberg model, these multi-dimensional models further expanded the range of competency elements, and empirical data was used for factor analysis to recombine these competencies. An introduction to each model

is provided in the following.

- KSAs model

The KSAs model consists of three major factors: knowledge, skills, and attitudes. It represents an early and somewhat imprecise form of competency model. Sackett and Laczo (2003) argued that competency models are often a mixture of KSAs, which leads to unclear and imprecise definitions. Early competency models were often developed by consultants who lacked rigorous academic training. However, these consultants had certain advantages, such as a broader management perspective and good relationships with the senior management of the companies they studied (Chouhan & Srivastava, 2014).

- KSAOs model

The KSAOs model extends the KSA framework by adding other personal characteristics. It views competencies as a set of relevant knowledge, skills, abilities, and other personal characteristics that work together to produce superior performance (Cochran, 2009).

- Iceberg model

The iceberg model, proposed by McClelland (1973), is a framework composed of five factors: motives, traits, self-concept, knowledge, and skills. This model consists of two parts: the surface (visible) layer includes skills and knowledge, and the underlying (hidden) layer includes motives, traits, and self-concept (see Figure 2.3).

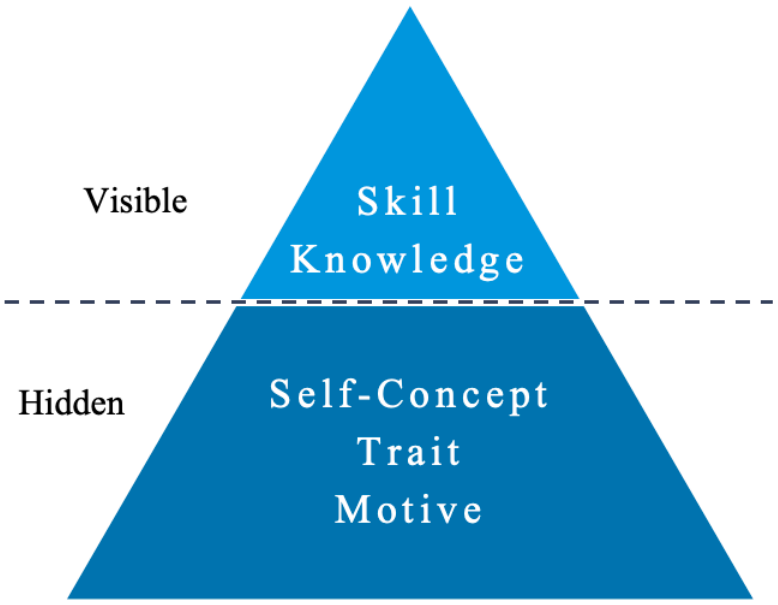

Figure 2.3 Iceberg model

Source: Spencer and Spencer (1993)

- Onion model

The onion model is similar to the iceberg model but differs from it in the following ways: 1) In addition to the five factors (motives, traits, self-concept, knowledge, and skills), the onion

model includes two additional ones: attitude and values; 2) the onion model positions traits and motives at the core, with self-concept, attitudes, and values in the middle layer, and skills and knowledge as the outer layer. Its structure provides an explicit illustration of the relationships between the factors (see Figure 2.4).

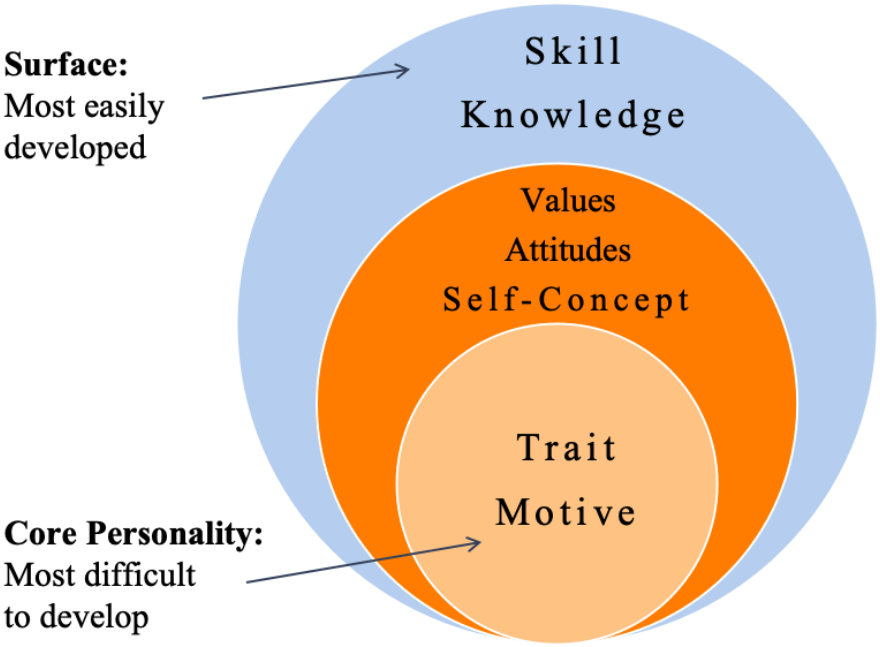

Figure 2.4 Onion model

Source: Spencer and Spencer (1993)

- Spencer model

Building upon the iceberg model and the onion model, Spencer and Spencer (1993) categorized and integrated common competencies into a model with six factors (primary indicators), each consisting of 2–5 elements (secondary indicators). For convenience, we refer to this model as the Spencer model (see Figure 2.5).

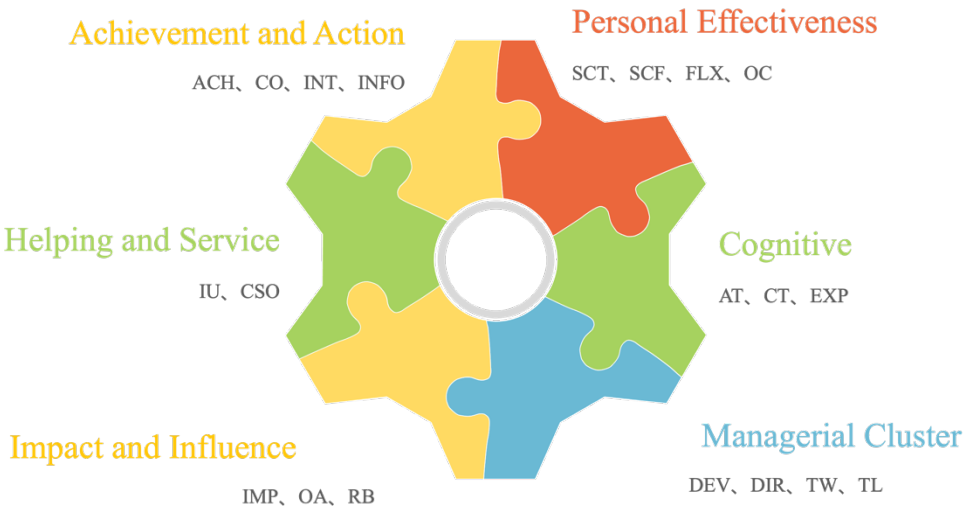

Figure 2.5 Spencer model

Source: Spencer and Spencer (1993)

Note: ACH = Achievement Orientation; AT = Analytical Thinking; CO = Concern for Order, Quality, and Accuracy; CSO = Customer Service Orientation; CT = Conceptual Thinking; DEV = Developing Others; DIR = Directiveness: Assertiveness and Use of Positional Power; EXP = Expertise; FLX = Flexibility; IMP = Impact and Influence; INFO = Information Seeking; INT = Initiative; IU = Interpersonal Understanding; OA = Organizational Awareness; OC = Organizational Commitment; RB = Relationship Building; SCF = Self-Confidence; SCT = Self-Control; TL = Team Leadership; TW = Teamwork and Cooperation.

- WoW model

The World of Work (WoW) model was developed by Kurz (1999) based on a decade of research on occupational assessment. This model provides a structured classification framework and identifies five competency domains, namely, the disposition domain, the attainment domain, the working life domain, the social relations domain, and the organization domain, which are used to describe work behaviors, competencies, and outcomes. Kurz and Bartram (2002) further conducted research on this model, suggesting that it essentially distinguishes between competency, competency potential, competence requirements, and outcomes. They also elaborated on the application of the four competencies within the working life domain in human resource management. See Figure 2.6 for the details of the model.

Figure 2.6 WoW model

Source: Kurz and Bartram (2002)

- The Great Eight model

Bartram (2005), in studying the relationship between competency and job performance, validated and proposed the model of Great Eight Competencies based on the research of Kurz and Bartram (2002). This model encompasses eight competency elements, including leading and deciding, supporting and cooperating, interacting and presenting, analyzing and interpreting, creating and conceptualizing, organizing and executing, adapting and coping, and enterprising and performing.

2.3.4 Classification of competencies in the models

In either the iceberg model or the onion model, the classification of competencies essentially adheres to a single standard: surface-level (visible) competencies and underlying (hidden) competencies. However, this classification fails to address whether the competency model identifies satisfactory performers (60/100) or superior performers (90/100). Spencer and Spencer (1993) addressed this issue by categorizing competencies based on the performance

criteria predicted by competencies. They classified competencies into two types: threshold competency and differentiating competency. Threshold competency refers to the minimum capabilities required to perform a job, typically including knowledge and basic skills. Differentiating competency refers to the key capabilities that distinguish average performers from superior performers, often including motives, attitudes, values, and self-concept. Building upon this, W. S. Chen (2004) proposed a third category of competency, namely development competency, which refers to the competencies that distinguish the future from the present. This study posits that the potential components in the iceberg model fall under this category.

This section primarily reviewed the concepts of competency models and compared the commonly used competency models. The literature review in this section revealed: 1) Competency models were first applied in educational organizations and later widely used in business organizations. 2) The different concepts in competency models mainly arise from individual and organizational perspectives. 3) Competency model structures vary in terms of component categorization. In general, competencies are classified into visible and hidden categories, namely the “surface-level” and “underlying” parts of the iceberg.

2.4 Competency models for emergency rescue volunteers

A review of the literature revealed that research on the competency model for emergency rescue volunteers is limited, with few valuable studies that can be directly referred to. Therefore, this study conducted a literature search using “volunteer competency” and “emergency rescue competency” as keywords and categorized the relevant studies for analysis.

2.4.1 Volunteer competency models

Research on volunteer competency models in China mainly focuses on areas such as Chinese language promotion in the world (21.8%), community service (20.0%), rural revitalization and rural education (12.7%), event support services (9.1%), medical care (9.1%), NGOs (9.1%), and public libraries (1.8%). Representative studies include the following:

- Volunteer competency in Chinese language promotion in the world

Through behavioral event interviews, L. Feng et al. (2015) studied the competency of 28 volunteers in teaching Chinese as a foreign language. The constructed competency model included four primary indicators and 17 secondary indicators. The primary indicators include Chinese language teaching knowledge and skills, Chinese cultural communication ability, cross-cultural communication and adaptation ability, and role awareness and personality traits.

The indicator of "role awareness and personality traits" includes six secondary indicators: volunteer awareness, professional reflection ability, responsibility, achievement orientation, teamwork spirit, and personality traits such as optimism, cheerfulness, self-confidence, patience, and harmonious interpersonal relationships.

- Volunteer competency in community service

Y. Li (2017) used behavioral event interviews and the analytic hierarchy process to construct a competency model for university student volunteers in community service, with 40 competency elements including respect for others, empathy, emotional management, optimism, adaptability, endurance, dedication, communication skills, analytical skills, resilience, self-awareness, and social responsibility.

- Volunteer competency in rural revitalization and rural education

Z. Huang et al. (2018) analyzed the competency of university students in China's rural revitalization volunteer services. Using the Iceberg model, they divided competencies into threshold and differentiating competencies. Threshold competencies (the surface-level competencies) include expertise and skills, while differentiating competencies (the underlying competencies) include self-role positioning, volunteer service spirit (e.g., endurance, dedication, friendship), innovation and entrepreneurship awareness, psychological cognition, and behavior patterns.

- Volunteer competency in event support services

C. Li (2022) studied university student volunteers in winter sports events by employing behavioral event interviews to extract competency elements, followed by a questionnaire survey to select indicators and factor analysis to extract common competency factors. The model includes five dimensions and 27 competency indicators. The dimensions are interpersonal communication skills, professional competence, comprehensive abilities, personal qualities, and basic knowledge. In particular, professional competence encompasses volunteer spirit, service awareness, summarizing ability, organization and management ability, winter sports service ability, and image representation awareness. Comprehensive abilities include judgment, observation, execution, agility, emergency response, computer skills, learning ability, adaptability, problem awareness, and cognitive ability. Personal qualities include responsibility, self-confidence, endurance, initiative, self-control, and physical fitness.

- Volunteer competency in medical care

M. Li et al. (2018) explored the competency model for medical volunteers. By analyzing and selecting from a common competency dictionary, based on the characteristics and

qualifications required for medical social work positions, they identified four competency elements and 18 basic elements. The four competency elements include knowledge, abilities, values and attitudes, and personal traits. In particular, knowledge encompasses medical knowledge, psychology knowledge, and management knowledge; abilities include both general and technical abilities, such as computer skills, foreign language proficiency, document writing, information seeking, synthetic analysis, organization and coordination, project management, professional services, emergency handling, volunteer supervision, and interpersonal communication; values and attitudes encompass professional ethics and teamwork awareness; and personal traits include dedication, sincerity, and care.

- Volunteer competency in NGOs

Based on the iceberg model, Hu (2020) employed interviews and questionnaire surveys to study community education volunteers in organization X, resulting in a competency model with five dimensions: knowledge and skills, values, motives, attitudes, and traits. The model involves 10 indicators, including cultural knowledge, influence, lifelong learning, planning, communication, execution, volunteer spirit, service awareness, positivity, and self-confidence.

- Volunteer competency in public libraries

Peng and Chuang (2020) conducted in-depth interviews with 15 volunteers in public library in Taiwan, resulting a competency model with 10 primary and 43 secondary indicators. The primary indicators include knowledge about readers, knowledge about story material, assisting in planning and organizing storytelling, expressing and interpreting story skills, children resource utilization instruction skills, information technology skills, oral and writing communication, volunteer team administration and management skills, professional literacy and development, and personal attitude and characteristics (enthusiasm, love for children/harmony with children, flexibility, continuous involvement, equality/neutrality, patience, friendliness, gregariousness).

Overall, volunteer competency model research in China often uses the iceberg or onion models, with behavioral event interviews and questionnaire surveys as primary research methods. Research samples are personnel in respective job positions, with a sample size of 20-30 participants. Competency indicators are generally structured into primary and secondary indicators. The knowledge and skills indicators are often associated with specific industries or service targets. Competency indicators typically include volunteer spirit and interpersonal communication skills. Other competencies have diverse definitions, which may have overlaps or redundancies.

2.4.2 Rescuer competency models

Research on rescuer competency models in China mainly focuses on fields such as medical rescue (66.7%), firefighting rescue (16.7%), urban search and rescue (7.4%), and flood disaster rescue (3.7%). In particular, the research on medical rescue competency targets three types of personnel: non-psychologist doctors (7.4%), psychologists (1.9%), and nurses (57.4%). Representative studies of each category are as follows:

- Competency of non-psychologist rescuers

Shuai et al. (2020) conducted a study on the competency of clinical physicians during the emergency rescue of COVID-19. Using a three-round Delphi method and analytic hierarchy process, the study established a competency evaluation system with three primary indicators, 12 secondary indicators, and 30 tertiary indicators. The primary indicators include theoretical knowledge, diagnostic and treatment skills, and humanistic practice. The top three secondary indicators in terms of weight are knowledge of COVID-19, interpersonal communication skills, and personal protective skills. Through a two-round Delphi method and sampling interviews, L. Liang et al. (2020) studied the competency of emergency medical rescuers and constructed a competency evaluation system with four primary indicators, 10 secondary indicators, and 54 tertiary indicators. The primary indicators include personal characteristics, knowledge, values, and skills. In particular, personal characteristics encompass personality traits, social adaptability, and basic capabilities; knowledge includes professional and basic knowledge; values include achievement orientation and emergency concepts; skills encompass prevention and detection skills, emergency treatment skills, and self-protection abilities.

- Competency of psychologist rescuers

Y. Nie et al. (2019) employed behavioral event interviews to study the competency of disaster psychological rescuers. The study indicated that the required competency characteristics for disaster psychological assistance should include three aspects: knowledge and skills for disaster psychological rescue, personal state, and personal traits. In particular, knowledge encompasses psychology, psychopathology, and medical knowledge; skills include stabilization techniques, grief counseling techniques, and group counseling; the personal state encompasses a strong willingness to help, stable and continuous participation, and the ability to handle personal issues (i.e., self-psychological protection for psychologist rescuers); personal traits include team awareness, sound personality, good physical fitness, ability to cope with emergencies, inclusiveness and affinity, and critical thinking.

- Competency of nurse rescuers

In addition to government emergency rescue teams and social rescue teams, China's rescue forces also include the military. Military nurses not only perform on-site medical tasks but also undertake rescue missions. Ma (2022) studied the educational training model of 382 military nurses and explored the competency model. The study first analyzed and summarized 21 textual materials, resulting in a preliminary competency model composed of four layers: motives, personality traits, social roles, knowledge and skills, and abilities. The model includes more than 30 specific competencies, such as mission commitment, self-control, adaptability, loyalty, team spirit, clinical nursing knowledge and skills, psychological nursing ability, professional learning, and organization and coordination. After the preliminary model construction, a two-round Delphi method was employed, ultimately resulting in a model with five primary indicators, 20 secondary indicators, and 76 tertiary indicators.

- Competency of firefighting rescuers

Y. C. Lin (2016) studied the competency of junior firefighting rescuers in Taiwan using methods such as direct interviews, the Delphi method, focus groups, and the analytic hierarchy process. The study identified seven primary indicators and 46 secondary indicators. The primary indicators include firefighting expertise, firefighting work skills, firefighting engine and equipment operation, self-management, firefighter basic physical fitness, firefighting practical experience, and interpersonal interaction. Using methods such as behavioral event interviews and the Delphi method, Liu (2020) constructed a competency model for firefighting rescuers in mainland China, which includes three primary indicators, 12 secondary indicators, and 40 tertiary indicators. The tertiary indicators include professional identification, dedication, holistic perspective, collective honor, physical fitness, psychological endurance, bravery, attention to detail, risk identification ability, rapid response ability, self-protection awareness, trust, analytical and judgment skills, teamwork ability, flexibility, willpower, and obedience to orders.

- Competency of urban search and rescue personnel

Urban search and rescue mainly deals with disasters caused by earthquakes and structure collapses. For instance, using 45 mid-level managers from Chinese urban search and rescue teams as samples, H. Li (2018) employed behavioral event interviews and literature analysis to establish a preliminary competency model. Subsequently, a questionnaire survey was conducted for indicator ranking and elimination, and SPSS was employed for factor analysis. The study identified four primary indicators and 17 secondary indicators. The primary indicators include basic knowledge and abilities, psychological quality, moral quality, and

professional and technical ability. The secondary indicators cover legal regulations, safety knowledge, medical rescue, stress tolerance, safety awareness, rapid response ability, responsibility, teamwork, communication ability, risk analysis ability, on-site handling ability, and information transmission ability.

- Competency of flood disaster rescuers

S. Xu et al. (2018) conducted behavioral event interviews with Chinese rescuers who participated in flood disaster rescue and, combined with literature data, proposed a competency indicator system for disaster rescue nurses. A two-round Delphi method was conducted with 32 experts, and the analytic hierarchy process was used to determine indicator weights. The study identified three primary indicators, 12 secondary indicators, and 77 tertiary indicators. The primary indicators include expertise, operational skills, and individual qualities. In particular, expertise encompasses four secondary indicators: basic flood disaster rescue knowledge, early identification and nursing of major injuries and diseases in flood disasters, hygiene and epidemic prevention knowledge, and psychological knowledge. Operational skills include water rescue techniques, shore rescue techniques, emergency handling techniques at disaster site, nursing techniques for flood disaster-related injuries, and medical equipment operation techniques, totaling nine secondary indicators. Individual qualities include three secondary indicators, namely, management ability, interpersonal communication ability, and physical and psychological fitness. Management ability covers adaptability, patient management ability, nursing decision-making ability, emergency supplies management ability, information management ability, and emergency handling ability, totaling six tertiary indicators. Physical and psychological fitness encompasses six tertiary indicators, including teamwork ability, healthy physique, wilderness survival skills, swimming rescue skills, self-psychological adjustment, and professional ethics.

- Competency of other emergency rescuers

Teng (2021) conducted a study on the competency of emergency language service volunteers and suggested that their competency consists of five components: moral quality, ethical quality, disciplinary quality, technological quality, and operational quality. These five components form the MEDTO competency framework, which includes 10 secondary indicators and 26 tertiary indicators. Shen (2017) studied the competency of crowdsourced participants in emergency information management. Through behavioral event interviews, he identified 29 competencies. Through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), he ultimately proposed a competency model comprising 20 personal traits across four dimensions: moral quality, knowledge and skills, motives and orientation, and personal

attributes.

In summary, most studies on competency models for emergency rescuers in China adopt the iceberg or onion models, classifying competencies into categories such as knowledge, skills, and values. The research methods generally include behavioral event interviews, the Delphi method, or questionnaire surveys. The research samples are personnel in respective positions, with great variations in sample sizes. Competency indicators are generally divided into two or three levels. Knowledge and skill indicators are often related to specific rescue targets and professions. The competency indicators generally include risk management, stress tolerance, and interpersonal communication.

2.5 Application of the competency model

After the competency model was proposed, it was primarily applied in government organizations, businesses, and nonprofit organizations. In the early 1970s, McBer Consulting assisted the Department of State of the US in selecting Foreign Service Information Officers (FSIOs), pioneering the application of the competency model in government organizations. Boyatzis (1982) was the first to introduce the competency model into business management. Around 2000, the concept of competency and competency model research was introduced in mainland China and Taiwan. For instance, Chinese scholar Wei Meijin translated Spencer's classic work *Competence at Work* (Spencer & Spencer, 2003). W. S. Chen (2004) studied the competency model for human resource management personnel in Chinese enterprises, while A. S. Chen et al. (2005) conducted research on the competency model for human resource directors in Taiwan.

In the field of human resource management, the role of competency has become increasingly prominent. A competency-based study of 217 companies found that competency has been widely applied to various aspects of business operations, including personnel allocation, employee training and development, performance management, and compensation management (Zhao, 2009). Y. Li (2017) conducted a literature review and found that the application of the competency model is primarily concentrated in the areas of talent recruitment, talent selection, talent training, performance evaluation, and compensation model design. We conducted a review of the literature on the competency of emergency rescue personnel and volunteers. The current areas of focus in the literature are as follows.

2.5.1 Recruitment and selection

Through the analytic hierarchy process and behavioral event interviews, Xie et al. (2022) constructed a competency model and applied it to the competency evaluation of provincial-level health emergency team members in Fujian Province, China. Specifically, the competency clusters of social role, self-image, traits, and motivates were used for member recruitment and selection, while the clusters of knowledge and skills were used for member training. Y. C. Lin (2016) applied the competency model to firefighter selection and evaluation. After the competency model was constructed, the competency indicators were quantified, and the assessment scores were visually displayed in radar charts. K. Nie (2021) applied a competency model for emergency management township civil servants to the personnel selection for emergency management in townships, using six competency indicators as selection criteria: preparedness, detection and early warning, damage control, recovery and assistance, summarizing and learning, and emergency traits. Shen (2017) developed a selection model for crowdsourced participants in emergency information management based on the competency model and applied it to the selection of emergency information management participants.

2.5.2 Training and program development

In 2013, the World Health Organization (WHO) launched a global project to standardize international emergency medical teams. In 2016, based on the competency model for international emergency medical teams, several experts in international disaster medicine developed the Global Operational Learning Framework, which has since been applied to the teaching and training for international emergency medical teams (Johnson et al., 2013). Upon request by the Australian National Training Authority (ANTA), the SES in Australia developed competency-based volunteer service skill standards (Howard, 1999). Wang et al. (2022) applied the competency model to the training and task deployment for emergency rescuers using a marginal utility function combined with a knowledge accumulation function. S. Li et al. (2019) conducted research on the training models based on competency at work, comparing training outcomes under different models and proposing recommendations for applying competency-based training models.

2.5.3 Competency evaluation and promotion

Hou (2016) applied the competency model to evaluate the command capability of fire rescue personnel. Xie et al. (2021) established a competency model comprising six primary factors

and 20 secondary factors and applied it to the three-level competency evaluation of public health emergency rescue team members. Ma (2022) applied the competency model to the development of a new progressive training model for military nurses. T. Zhang (2017) applied the competency model to construct an evaluation system for the emergency response capabilities of civilian airport firefighting personnel. In addition, the competency model has also been applied to the evaluation of emergency language service personnel. For instance, based on the competency model, Teng (2021) developed an talent evaluation system with 26 indicators.

2.5.4 Assessment and incentives

L. Liang et al. (2021) constructed a competency model for emergency medical rescue personnel and suggested its application in the selection and assessment of this type of personnel. Liu (2020) applied the competency model to fire rescue personnel management, arguing that traditional performance assessments often suffer from unclear evaluation criteria, inconsistent standards, and difficulties in quantifying indicators. He suggested that competency-based performance assessments can help alleviate these problems. However, some researchers believe that the application of the competency model in employee incentives is not ideal. It is not because the competency model itself cannot be applied in this area but due to differences in organizational culture. X. Lin (2013) pointed out that competency-based compensation incentives require differentiated broadband compensation, which may conflict with organizational cultures that prioritize stability.

In summary, current studies have applied the competency model in one or more areas of organizational human resource management or volunteer management. While some studies did not explicitly describe how to apply the competency model, they generally highlighted its practical value when elaborating on the research background. They mostly followed the iceberg model for competency classification: the visible components above the surface (e.g., knowledge and skills) are applied to training, while the underlying components (e.g., personal traits) are applied to personnel selection. Regardless of the specific application, these studies indicate that the competency model contributes to more targeted and efficient management.

2.6 Methods for constructing and validating the competency model

2.6.1 Critical incident technique (CIT)

Flanagan (1954) was the first to propose the critical incident technique (CIT). Before the emergence of the behavioral event interview, CIT was the primary method used in competency research. For example, Flanagan (1954) employed CIT to study and analyze the work of company managers. CIT is a set of procedures used to collect directly observed information about human behavior. Here, "incident" refers to any human activity that can be observed. In practical operation, it involves gathering as much information as possible about these activities, including written records of reported incidents. Once collected, these data are analyzed by researchers and may be further validated through additional observations.

2.6.2 Thematic apperception test (TAT)

The thematic apperception test (TAT) is a projective psychological assessment method originally proposed by Murray (1938). TAT was initially applied in the field of psychology, and in the 1960s, it began to be used in motive research. The traditional TAT involves 30 black-and-white pictures depicting people and scenes, through which participants are asked to perceive and imagine stories. Researchers then analyze these narratives to infer the individuals' psychological states. Boyatzis (1982) studied the application of TAT in describing competency behaviors. However, the method used is not the traditional TAT but a variant of TAT. The approach of Boyatzis (1982) requires respondents to tell stories that might arise from presented pictures, which will be recorded and coded by researchers to measure motives and other factors.

2.6.3 Behavioral event interview (BEI)

The behavioral event interview (BEI), first proposed by McClelland (1973), is a widely used method for competency model construction. McClelland (1998) provided a systematic methodological introduction regarding how to identify competencies through behavioral event interviews. This method mainly involves interviewing individuals with superior performance, requiring a structured interview guide beforehand. During the interviews, interviewees are asked to recall three exciting and successful experiences and three frustrating experiences. According to Spencer and Spencer (1993), the behavioral event interview integrates elements of both CIT and TAT. They argued that CIT is more focused on "task elements", while the behavioral event interview places greater emphasis on "behavioral traits."

2.6.4 Focus group (FG)

The focus group (FG) is a commonly used qualitative research method, along with other qualitative methods such as observation, in-depth interviews, grounded theory, and the Delphi method. Rosenthal (2016) noted that focus groups and interviews share structural similarities, as both consist of open-ended questions designed to capture the in-depth experiences of participants. However, the advantage of the focus group over individual interviews lies in its ability to capture diverse perspectives on the same issue from different individuals and the rich information generated through interactions among group members. Nevertheless, this method is time-consuming and operationally complex. Focus groups typically involve multiple groups, each consisting of 18 to 25 participants, with each session lasting an average of 45 minutes. Prifti et al. (2017) suggested that if multiple focus groups are involved in the same study, it is better to have the same moderator for all groups and to use the same semi-structured guide in each session to ensure comparability of results.

2.6.5 Delphi method

The Delphi method, also known as an expert evaluation method, was first introduced by the RAND Corporation in the 1960s. Initially, it was a qualitative forecasting method that allowed experts to communicate “anonymously” and leverage their experience and knowledge to make predictions on specific issues (He, 2007). Over time, various modified versions have been developed, including the modified Delphi, policy Delphi, and real-time Delphi methods (Hasson et al., 2000; Rayens & Hahn, 2000). In competency research, the modified Delphi method is primarily used (P. Lu et al., 2020; Schultz et al., 2012).

2.6.6 Content analysis

Content analysis is a research method in social sciences used to study the nature, implicit meanings, and dynamic processes of communication, as well as the behaviors of communicators. The content analyzed can include text, data, images, behaviors, and gestures, among others, with the primary focus being textual content analysis, namely, text analysis. In the early stages of competency model research, the collected data is subjected to both qualitative and quantitative analysis and rigorous management during the data analysis phase. Qualitative data can be analyzed using content analysis methods. Software such as MAXQDA, Nud*ist, Ethnograph, and ATLAS are commonly used for qualitative or mixed-method analysis (Archer et al., 2017; Pateman, 1998; Smit, 2021). Content analysis is characterized by systematicity,

objectivity, and replicability, and is widely applied in fields such as communication studies, sociology, and psychology. The basic procedure of this method includes identifying the research question, sampling, defining units of analysis, constructing a category system, coding, testing for reliability, and interpreting the results.

2.6.7 Grounded theory (GT)

Grounded theory (GT) is a qualitative research method developed by Anselm Strauss and Barney Glaser at Columbia University in 1987. It can be used for open coding and analysis of information obtained in competency research by decomposing, examining, comparing, conceptualizing, and categorizing competency characteristics (B. Huang et al., 2022). Grounded theory is typically employed in situations where no theoretical hypotheses have been proposed. Researchers directly induce theories from raw data to construct new theoretical frameworks that explain observed phenomena. This approach emphasizes that theories must be grounded in real-world data and rejects the traditional hypothesis-testing approach. Grounded theory research primarily relies on the constant comparative method, continuously revising the relationships between concepts. Typically, theoretical saturation is reached after 30 to 50 rounds of interview iterations.

2.6.8 Methods for validating the competency model

Spencer and Spencer (1993) summarized three methods for validating the competency model: concurrent cross-validation, concurrent construct validation, and predictive validity. They consider the third as the most robust method, as it allows for selecting and training personnel and comparing their current and future performance.

Kurz and Bartram (2002) proposed the Great Eight competencies, which have been used as a standard measurement framework by researchers. For example, Bartram (2005) applied this framework to validate 29 factors based on a dataset with a sample size of 4,861. The results showed moderate to strong correlations between the Great Eight competencies predicted by personality scales and line-manager ratings. The ability tests were correlated to four of the eight competencies, and the operational validities of the eight competencies derived from the combination of ability and personality data ranged from 0.20 to 0.44. The operational validities for aggregated predictors with aggregated criteria were estimated to be 0.53.

W. S. Chen (2004) conducted competency modeling for human resource management personnel in China, including human resource graduates from universities, junior human

resource managers, middle-level human resource managers, and senior human resource managers in enterprises. Using Spencer and Spencer's (1993) competency classification method, the study distinguished between superior and average human resource managers. The following hypotheses were set: 1) Null hypothesis (H_0): There is no difference in competency between superior and average human resource managers. 2) Alternative hypothesis (H_1): There is a difference in competency between superior and average human resource managers. The Mann-Whitney U Test was performed to compare the competencies of superior performers and average performers.

Zheng (2019) constructed and validated the model for the digital competence of primary and secondary school teachers in China. He examined the developmental trajectory from literacy to competence and then to digital competence. Based on existing digital competence frameworks in China and other countries, he conducted two rounds of anonymous consultations with 21 experts, ultimately identifying a competency model with five primary indicators and 25 secondary indicators. Then, a questionnaire survey was conducted with 10,054 teachers from two cities in China. Through the large-sample survey, the study empirically validated the rationality, objectivity, and reliability of the digital competence model for teachers.

Following the study titled *Exploratory Analysis of Competency Indicators for General Practitioners* (Z. Lu & Lu, 2019), P. Lu et al. (2020) further conducted the study *Construction of Family Doctors' Competency Indicator System Based on the Delphi Method*. After preliminarily identifying the competency indicators, the authros used the Delphi method to rank, weight, and refine the initially proposed indicators (of three levels). Data entry, analysis, and statistical validation were performed using Excel and SPSS 27.0.0. Ultimately, through two rounds of expert consultations, the study constructed and validated a competency model for general practitioners, including six primary indicators, 13 secondary indicators, and 63 tertiary indicators.

Chapter 3: Research Methods

This chapter primarily introduces the research methods, research process, reliability and validity, and research ethics. It also details the entire process of constructing and validating the competency model for emergency rescue volunteers, including literature review of competency model, behavioral event interviews (BEI), model construction, scale development, and model validation.

3.1 Research samples

The emergency rescue teams involved in this study are non-governmental organizations (NGOs) and non-profit organizations (NPOs), which are different from companies. Their members are volunteers, different from government or corporate employees. In addition, considering that some organizations' names may be confusing and that some names are mentioned for the first time, we need to make the following clarifications:

1) The emergency rescue teams mentioned in this study refer specifically to registered social emergency rescue teams in mainland China, excluding the China International Search and Rescue (CISAR), China Fire and Rescue (CFAR), and other non-emergency rescue volunteer organizations.

2) The volunteers mentioned in this study specifically refer to emergency rescue volunteers. The competency model is specific to this role, and this study does not cover all volunteer-related competency models, nor does it refine its scope to volunteers in specific job positions.

3) Existing competency models of similar types can serve as references for constructing the competency model for emergency rescue volunteers. "Similar types" here refer to those involving emergency rescue or related fields, for example, fire rescue in China, Chinese volunteers, and international emergency rescue.

4) The research subjects were primarily selected based on performance data obtained from supervisor evaluations and internal team records, rather than the popularity of the individuals within the team or other factors. Although the performance data may be incomplete, we attempted to use authentic and valid original data and employed appropriate data collection methods.

5) Participants in the study, including rescue team leaders, department heads, and team

members, are capable of clearly understanding and articulating the competencies required by the rescue team both at present and in the future.

6) The volunteers in this study specifically refer to those currently participating or who have previously participated in frontline rescue missions, excluding management personnel and other individuals who have never participated in frontline rescue tasks.

7) The research subjects include superior performers and effective performers.

3.2 Overview of methods

Based on the nature of analytical approaches, research methods generally fall into three types: qualitative research, quantitative research, and mixed research. Both qualitative and quantitative research are scientific research methods (Rubin & Rubin, 2020). This study adopts a mixed research approach that integrates both qualitative and quantitative methods. The primary methods used in this study include literature review, behavioral event interviews, content analysis, questionnaire survey, and factor analysis. These methods are employed to address two key research questions: 1) What are the competency characteristics of emergency rescue volunteers? 2) How effective is the competency model for emergency rescue volunteers? See Figure 3.1 for an overview of the research methods.

RQ1.1	What are the competency characteristics of emergency rescue volunteers (literature research)?
Samples	Literature on the Competence of Emergency Rescue Volunteers (n=113)
Data collection	Literature Collection
Data analysis	Frequency statistics
Result	Competency List (10 Indicators)

RQ1.2	What are the competency characteristics of emergency rescue volunteers (discovered through interviews)?
Samples	Excellent Volunteer of Sichuan Blue Sky Rescue Team (n=31)
Data collection	Behavioral event interviews
Data analysis	Content analysis
Result	Competency List (10 validated indicators, 9 new indicators added)

RQ2	How effective is the competency model for emergency rescue volunteers?
Samples	Chinese emergency rescue volunteers (n=206)
Data collection	Questionnaire
Data analysis	Factor analysis and ANOVA
Result	Competency model (four dimensions, a total of 27 secondary indicators)

Figure 3.1 Research stages and methods

3.2.1 Literature review

Literature review is a research method that primarily uses scientific texts as the research subject. It includes various techniques, such as literature quantity analysis, author analysis, word frequency analysis, citation analysis, and content analysis. In this study, we primarily analyzed the frequency of competency-related terms and selected the most frequently occurring ones.

3.2.2 Behavioral event interviews and text analysis

Qualitative interviews can be applied to "concept clarification" and "action research" within social sciences. Rubin and Rubin (2020) identified four advantages of qualitative interviews: 1) Through qualitative interviews, researchers can understand and reconstruct events in which they did not participate themselves; 2) qualitative interviews allow researchers to deeply explore important personal issues; 3) decision-makers can use qualitative interviews to understand historical issues; 4) research based on in-depth interviews can help people better understand their work. In this study, we employed qualitative interviews to extract competency elements and collect information on competency-related behaviors.

Qualitative interviews can be used in competency model construction. This method includes two main techniques: critical incident technique (CIT) and behavioral event interview (BEI). CIT was the first to be applied in research, but it was later integrated with the thematic apperception test (TAT), developing into behavioral event interviews. The behavioral event interview has been validated as an effective technique by Spencer (McClelland, 1998; Spencer & Spencer, 1993).

Moreover, over the past half-century (from 1973 to 2023), behavioral event interviews have been widely applied in research related to competency models (Boyatzis, 1982; McClelland, 1973; Qiu & Ai, 2013; Schoonover, 2003; Spencer & Spencer, 1993; P. Zhang & Zhang, 2023).

For those reasons, this study adopts behavioral event interviews rather than CIT.

The literature on competency models contains a vast and complex array of competency characteristics. Additionally, considering that interviews with superior volunteers provide a large amount of information, this study utilized MAXQDA2020 to analyze and statistically process the textual content derived from transcribed interview recordings.

3.2.3 Questionnaire survey, factor analysis, and one-way ANOVA

Based on literature review and behavioral event interviews, we can preliminarily construct a competency model for emergency rescue volunteers in China. The next step is to validate this

model. A literature review indicated that both the Delphi method and questionnaire surveys can be employed for model validation. However, considering the inconsistency in expert selection criteria, the difficulty in inviting experts, and the limited validation sample size in the Delphi method, we adopted the questionnaire survey instead. The survey was conducted among over 200 volunteers from 70 emergency rescue teams in China. According to Spencer and Spencer (1993), validation across different groups and regions can enhance the reliability of the results. After collecting the questionnaires, we used IBM SPSS Statistics 27.0.0 to perform factor analysis and one-way analysis of variance (one-way ANOVA) on the data.

3.3 Research process

The research process of this study includes three phases: 1) competency model literature review; 2) behavioral event interviews and modeling; and 3) model validation. In particular, the phase of competency model literature review consists of three steps: competency indicator selection, indicator naming, and indicator definition. The phase of behavioral event interviews and modeling consists of four steps: pilot interviews, formal interviews, indicator coding, and indicator classification. The phase of scale development and model validation consists of five steps: scale development, pilot test, formal survey, exploratory factor analysis (EFA), and one-way ANOVA.

Throughout the process of constructing and validating the competency model, each step has influenced the number, connotation, and naming of competency indicators to varying degrees. The following sections will provide a detailed description of the work undertaken at each step. To facilitate comprehension and comparison, we will first offer an overview of this process. Through the literature review, we identified ten high-frequency indicators. The behavioral event interviews validated these ten indicators and generated nine additional indicators. Subsequently, using MAXQDA, the behavioral descriptions of these 19 indicators were coded, resulting in 94 tertiary indicators (behavioral descriptions). Based on the definition and naming conventions in the Competency Dictionary, we categorized them into six primary indicators, 27 secondary indicators, and 94 tertiary indicators. Considering the measurement dimensions in the competency scale, the 94 tertiary indicators were consolidated and reduced to 34 tertiary indicators. Finally, after EFA, one tertiary indicator was merged into another. The final validated four-dimension competency model comprises four primary indicators, 27 secondary indicators, and 33 tertiary indicators.

3.3.1 Competency model literature review

When we set “rescue volunteer competency” as the keyword for literature search, we found limited relevant literature. However, when we expanded the search by changing the keyword to “competency”, a vast amount of literature was returned, making it difficult to have an effective research focus. Therefore, we adjusted the keywords to two: “rescue competency” and “volunteer competency.”

During the collection of literature from both Chinese and English databases, we found that there was very limited research in the English database on this field. Considering that this study focuses on the Chinese context, we primarily conducted the literature search from the China Academic Journal Network Publishing Database, supplemented by the literature retrieved from databases outside mainland China. To expand the number of documents, we did not limit the year range for literature search.

Regarding the types of literature, we focused on academic journals, doctoral theses, master’s theses, and government reports.

Using the above strategy, we collected 54 studies on “rescue competency”, 56 studies on “volunteer competency”, and three government reports related to emergency rescue competency (EMDERPC, 2020; MEMPRC, 2019; OCHA, 2020). The total number of collected documents was 113.

3.3.1.1 Competency indicator selection

From the 113 documents mentioned above, we identified 47 competency indicators. Three indicators that did not match the definition of competency (“Board and Committee Development,” “Geographic Location,” and “Spare Time”) were deleted, and two indicators (“Decisiveness” and “Directiveness: Assertiveness and Use of Positional Power”) were merged, resulting in 43 indicators. Their frequency of mentions is shown in Figure 3.2. We further deleted 16 indicators that were mentioned less than 10 times, resulting in 27 indicators. These indicators were then arranged in descending order based on their frequency of mentions, as shown in Figure 3.3.

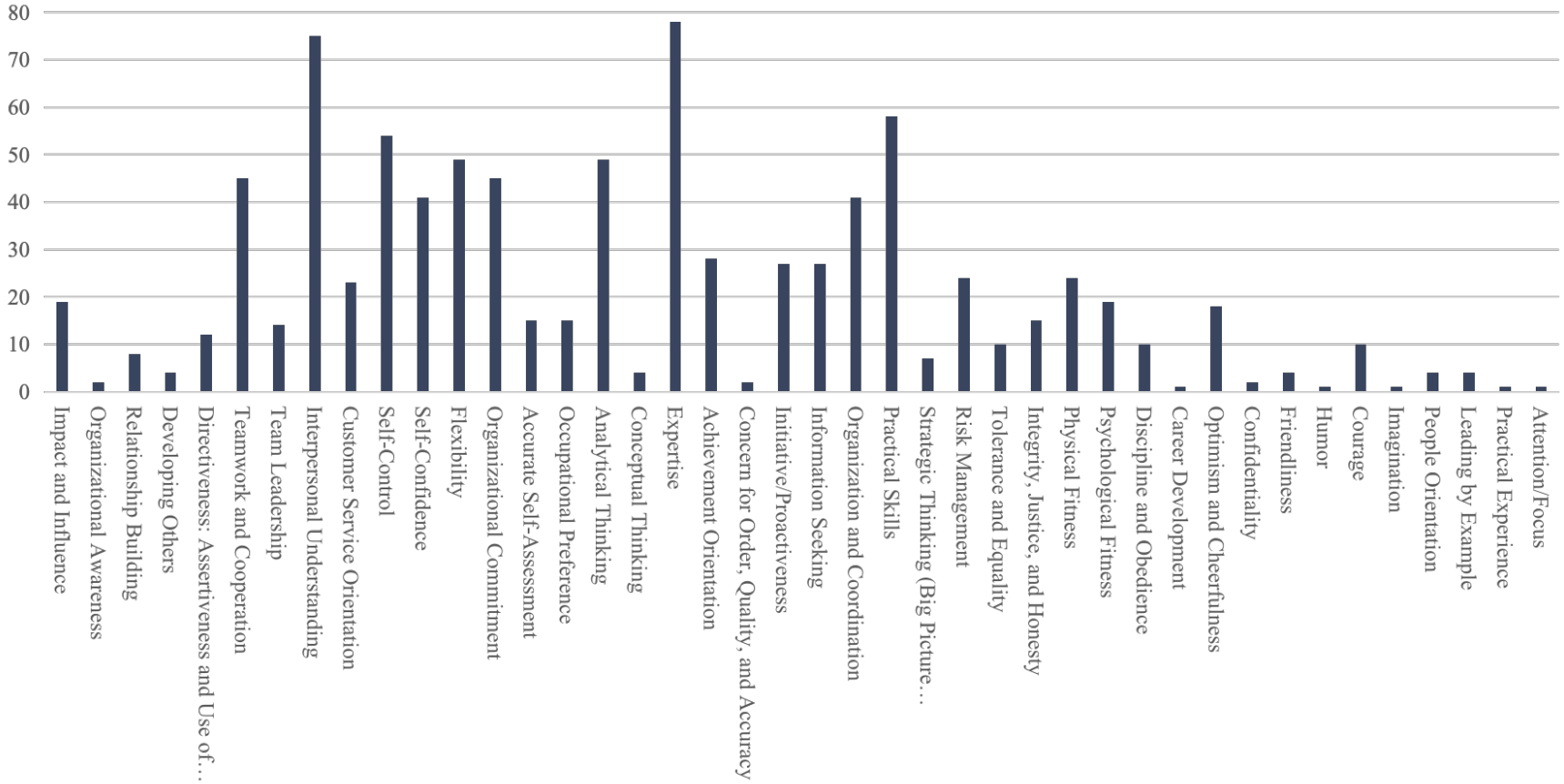

Figure 3.2 Frequency of rescue volunteer competency indicators in the literature (including those mentioned less than 10 times)

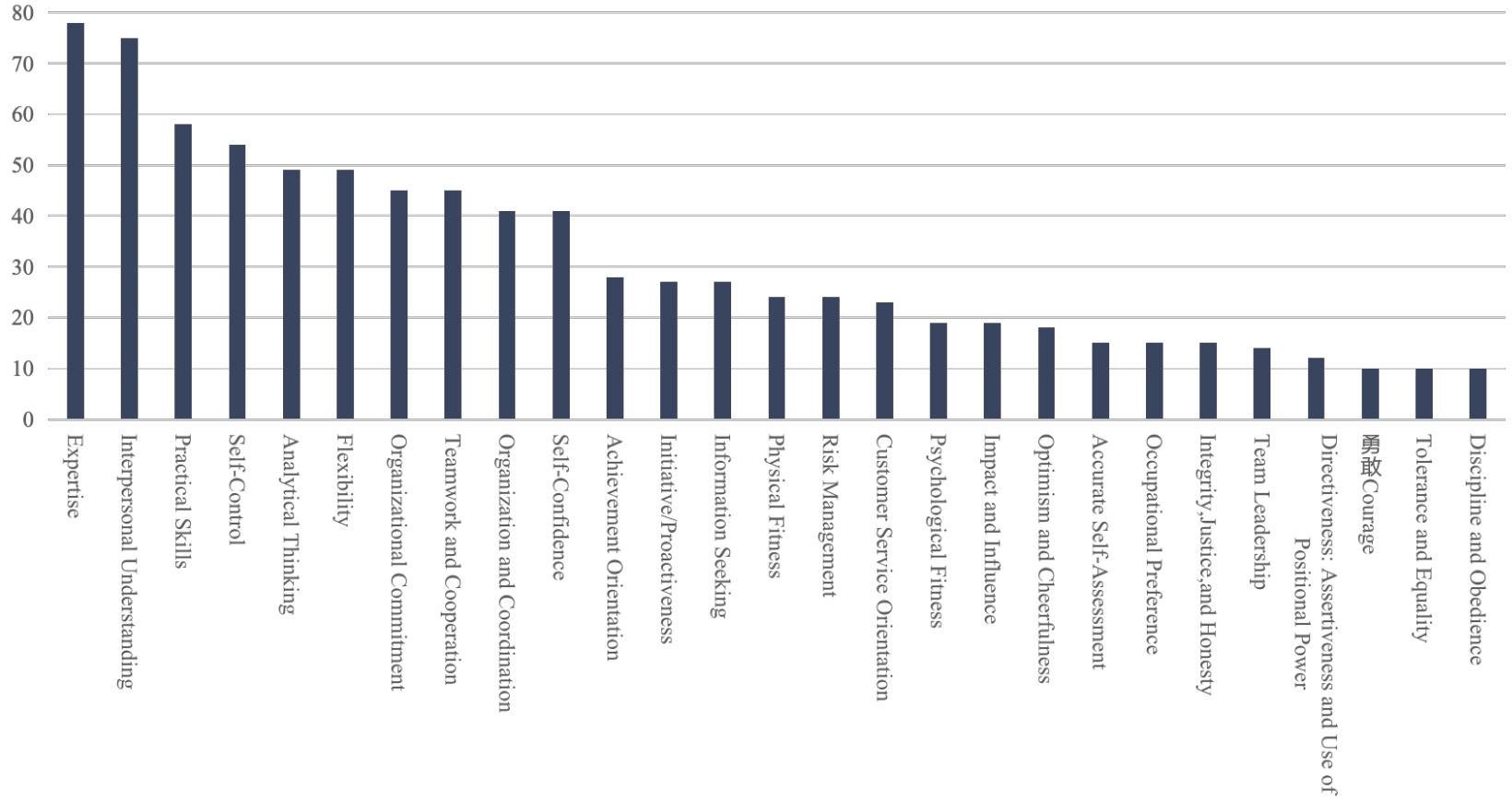

Figure 3.3 Frequency of rescue volunteer competency indicators in the literature (excluding those mentioned less than 10 times)

The top 10 competency indicators, ranked by frequency from high to low, are Expertise, Interpersonal Understanding, Practical Skills, Self-Control (Resistance to Stress), Analytical Thinking, Flexibility (Ability to Change), Organizational Commitment (volunteer spirit), Teamwork and Cooperation, Organization and Coordination, and Self-Confidence.

3.3.1.2 Naming of competency indicators

Due to differences in the names, levels, and definitions of competency indicators across various literature, it is necessary to conduct an initial standardization. With the exception of two indicators, Practical Skills and Organization and Coordination, relatively clear definitions for most of the top 10 indicators can be found in the Competency Dictionary developed by Spencer and Spencer (1993). Therefore, we first used this dictionary to preliminarily name the top 10 indicators, as shown in Table 3.1.

Table 3.1 List of competency indicators (I) (after literature review and unified naming)

Sort	Indicator name	Abbreviation	Pagination
1	Expertise	EXP	73
2	Interpersonal Understanding	IU	37
3	Practical Skills	PS	-
4	Self-Control	SCT	78
5	Analytical Thinking	AT	68
6	Flexibility	FLX	83
7	Organizational Commitment	OC	86
8	Teamwork and Cooperation	TW	61
9	Organization and Coordination	ORC	-
10	Self-Confidence	SCF	80

Source: Spencer and Spencer (1993)

3.3.1.3 Definitions of competency indicators

The competency indicators mentioned in Table 3.1 have various names or designations in the literature. For convenience in subsequent research, and considering the actual emergency rescue scenarios, we provide definitions for these indicators as follows.

Technical/Professional/Managerial Expertise: In the Competency Dictionary, this includes two meanings: one related to job-relevant knowledge, such as technical, professional, or managerial knowledge, and the other referring to the motives to expand, use, and disseminate knowledge. In the literature, it is also referred to as “Legal Awareness,” “Product Knowledge,” “Expert-Helper Image,” “Diagnostic Skill,” and “Commitment to Learning”. We will use the term “Expertise” and define it as knowledge related to rescue work, including legal, technical, and managerial knowledge, as well as the ability to learn and impart knowledge.

Interpersonal Understanding: In the Competency Dictionary, it is defined as “the ability to hear accurately and understand the unspoken or partly expressed thoughts, feelings, and

concerns of others". Here, "others" can refer to individuals or classes of individuals. Additionally, Interpersonal Understanding also includes cross-cultural sensitivity. It is also referred to as "Empathy," "Listening," "Sensitivity to Others," "Awareness of Others' Feelings," and "Diagnostic Understanding." Considering that rescue operations often occur in diverse international settings, we will use "Interpersonal Understanding" and define it as the ability to understand others accurately and express oneself clearly with cross-cultural sensitivity.

Practical Skills: The Competency Dictionary does not provide a specific definition for this indicator. However, both the iceberg and onion models view skills as visible competence characteristics. In accordance with the *National Occupational Skill Standards for Emergency Rescuers*, we name this indicator "Practical Rescue Skills" and define it as the ability to be familiar with rescue procedures and proficient in operating rescue equipment or methods.

Self-Control: In the Competency Dictionary, it is defined as "the ability to keep emotions under control and to restrain negative actions when tempted, when faced with opposition or hostility from others, or when working under conditions of stress." It is also referred to as "Stamina", "Resistance to Stress", "Staying Calm", and "Being Not Easily Provoked". We will use the term "Resistance to Stress" and define it as the ability to keep emotions under control, stay calm, and exercise restraint when faced with extreme situations, challenges, and stress.

Analytical Thinking: The Competency Dictionary defines it as "understanding a situation by breaking it apart into smaller pieces, or tracing the implications of a situation in a step-by-step causal way". It is also referred to as "Thinking for Yourself", "Practical Intelligence", "Analyzing Problems", "Reasoning", and "Planning Skill". We will use the term "Analytical Thinking" and define it as the ability to break down complex issues, perform comparative analysis, causal analysis, and plan development.

Flexibility: In the Competency Dictionary, it is defined as "the ability to adapt to and work effectively with a variety of situations, individuals, or groups". It is also known as "Adaptability", "Ability to Change", "Perceptual Objectivity", "Staying Objective", and "Resilience". We will use the term "Ability to Change" and define it as the ability to understand differences in perspectives, environmental changes, and changing demands and proactively adapt to carry out tasks.

Organizational Commitment: In the Competency Dictionary, it refers to "individuals' ability and willingness of individuals to align his or her behavior with the needs, priorities, and goals of the organization, to act in ways that promote organizational goals or meet organizational needs". It is often found in organizations with a strong sense of mission. It is also referred to as "Businessmindedness", "Mission Orientation", "Vision", and "Commitment

to the Command's Mission". We will use the term "Volunteer Spirit" and define it as the ability to align personal preferences with the mission of a volunteer organization, demonstrating dedication, care, and altruism.

Teamwork and Cooperation: In the Competency Dictionary, it is defined as "a genuine intention to work cooperatively with others, to be part of a team, to work together as opposed to working separately or competitively". It is also referred to as "Group Management", "Group Facilitation", "Conflict Resolution", "Managing Branch Climate", and "Motivating Others". We use the term "Teamwork and Cooperation" and define it as possessing teamwork awareness and cooperation spirit, as well as the ability to foster team spirit, create a positive atmosphere, resolve conflicts, and motivate others.

Organization and Coordination: There is no specific corresponding concept in the Competency Dictionary, but a related concept is "Relationship Building", which can also be referred to as "Networking", "Use of Resources", "Develops Contacts", "Personal Contacts", "Concern for Customer Relationships", and "Ability to Establish Rapport". We will use the term "Organization and Coordination Ability" and define it as the ability to establish and leverage work relationships, allocate resources, assign tasks, manage plans, and resolve conflicts based on task requirements.

Self-Confidence: In the Competency Dictionary, it is defined as "a person's belief in his or her own capability to accomplish a task", including "the person's expressing confidence in dealing with increasingly challenging circumstances, in reaching decisions or forming opinions,, and in handling failures constructively". Other terms for Self-Confidence include "Decisiveness", "Ego Strength", "Independence", "Strong Self-Concept", and "Willingness to Take Responsibility". We use the term "Self-Confidence" and define it as the ability to objectively recognize oneself, having a sense of responsibility, and the belief in one's ability to complete tasks.

3.3.2 Behavioral event interviews and modeling

Based on the 10 competency indicators identified through literature review, we further conducted behavioral event interviews with emergency rescue volunteers to validate these 10 indicators and identify additional indicators. Afterward, we proceeded with naming, defining, and categorizing these indicators to form the competency model.

3.3.2.1 Participants in behavioral event interviews

The primary participants in behavioral event interviews are interviewees. In this study, they are

the volunteers from the Sichuan Blue Sky Rescue Team with superior performance.

3.3.2.2 Sampling

When selecting participants for the behavioral event interviews, we primarily considered the following three factors:

Factor 1: Excellence criteria. According to the principle of statistical normal distribution, superior performance refers to performance that is one standard deviation (SD) above the mean. In practical work scenarios, this proportion is about 10% (Spencer & Spencer, 2003). As early as in 1998, McClelland's study specifically proposed that the proportion of the superior group is 5%-10% (McClelland, 1998). As of December 31, 2022, the Sichuan Blue Sky Rescue Team had a total of 325 volunteers. Based on the aforementioned proportion, the number of superior volunteers is estimated to be between 16 and 33 individuals. There are two criteria for superior volunteer performance: 1) The volunteer has worked no less than 500 hours annually (Xiao, 2016). 2) The volunteer has ever received an annual excellence award through team performance evaluation. According to the *Sichuan Blue Sky Rescue Team 2022 Annual Superior Volunteer List*, 31 individuals were recognized as superior volunteers in that year.

Factor 2: Theoretical saturation. In qualitative research, as the number of interviewees increases, the amount of new information that can be added on the same topic decreases. When the interviewes begins to hear the same responses repeatedly, at this point, theoretical saturation is achieved, and the interview process can be concluded (Glaser & Strauss, 1967; Rubin & Rubin, 2020; Saunders et al., 2018). In the published literature on the construction of the competency model for Chinese firefighting rescuers, theoretical saturation was achieved when the number of interviewees reached 16 (Liu, 2020). In the literature on the competency of Iranian rescuers, theoretical saturation was reached with 20 interviewees (Samarin et al., 2021).

Factor 3: Practical experience. The literature research in the previous research phase indicated that in competency studies related to rescue fields, the number of interviewees typically ranges from 10 to 30 (Bai, 2022; G. Li et al., 2014; H. Li, 2018; L. Liang et al., 2020; Liu, 2020; Thielsch et al., 2021; R. Zhang et al., 2016). It is worth noting that some competency studies involved more than 30 interviewees. That is due to two reasons: one is that the competency models being studied targeted multiple types of personnel; the other is that no theoretical saturation test was conducted, and additional interviews with repetitive information were still conducted after saturation. In this study, we specifically focus on emergency rescue volunteers from the Sichuan Blue Sky Rescue Team, excluding management and other personnel.

3.3.2.3 Sample size

Considering the three factors mentioned above, this study determined that the number of interviewees would be 31 (superior volunteers from the Sichuan Blue Sky Rescue Team). If theoretical saturation is not reached, additional interviewees will be added. If theoretical saturation is reached ahead of time, interviews will be concluded.

3.3.2.4 Data collection

This study employed behavioral event interviews to collect core data—behavioral descriptions and competency elements. Prior to the formal interviews, the interviewer scheduled a time and location with the interviewees and obtained informed consent. The behavioral event interviews were conducted either in-person or online to collect relevant information, including the interviewee's role in the rescue team, years of service, profession, education level, successful rescue cases, and failed rescue cases. The behavioral event interview process includes the preparation of a pilot interview guide, pilot interviews, revision of the interview guide, and formal interviews. The data collection for the behavioral event interviews took place from November 6, 2023, to January 9, 2024. The demographic characteristics of the interviewees and interview details are shown in Table 3.2.

Table 3.2 Demographic characteristics of interviewees and interview details

ID	Gender	Age	Education level	Profession	Years of service	Rescue role	Interview date	Interview location	Interview duration (min)
1	Female	43	Associate degree	Company employee	5	Member	November 6, 2023	Meeting room	85
2	Male	37	Associate degree	Company employee	4	Group leader	November 7, 2023	Meeting room	103
3	Male	44	Associate degree	Freelancer	5	Group leader	November 7, 2023	Meeting room	114
4	Male	41	Bachelor's degree	Company employee	14	Group leader	November 9, 2023	Reception	93
5	Female	41	Bachelor's degree	Company employee	10	Deputy team leader	November 12, 2023	Stadium	91
6	Male	42	Bachelor's degree	Government employee	4	Group leader	November 25, 2023	Reception	102
7	Male	39	Bachelor's degree	Company employee	4	Group leader	November 25, 2023	Reception	88
8	Male	46	Bachelor's degree	Government employee	5	Group leader	December 2, 2023	Reception	102
9	Female	39	Associate degree	Freelancer	5	Group leader	December 5, 2023	Reception	100
10	Male	34	Bachelor's degree	Freelancer	5	Group leader	December 10, 2023	Living room	100
11	Female	41	Bachelor's degree	Company employee	3	Member	December 10, 2023	Living room	114
12	Male	41	Associate degree	Company employee	6	Member	December 13, 2023	Reception	100
13	Male	43	Bachelor's degree	Freelancer	2	Member	December 13, 2023	Reception	115
14	Male	38	Master's degree	Flight instructor	5	Group leader	December 13, 2023	Reception	143
15	Male	28	Associate degree	Outdoor instructor	7	Group leader	December 14, 2023	Meeting room	95
16	Male	35	Bachelor's degree	Company employee	6	Group leader	December 14, 2023	Teahouse	105
17	Male	35	Associate degree	Freelancer	3	Member	January 3, 2024	Reception	92
18	Male	28	Associate degree	Company employee	3	Member	January 3, 2024	Reception	92
19	Male	26	Bachelor's degree	Teacher	5	Member	January 3, 2024	Reception	105
20	Female	22	Master's degree	Student	2	Member	January 3, 2024	On-line	93
21	Male	37	High school	Company employee	2	Member	January 4, 2024	Reception	73
22	Male	41	Bachelor's degree	Company employee	4	Member	January 4, 2024	Reception	85
23	Female	31	Bachelor's degree	Company employee	3	Member	January 4, 2024	Reception	87
24	Male	41	High school	Freelancer	7	Member	January 5, 2024	On-line	89
25	Male	40	Bachelor's degree	Company employee	15	Team leader	January 5, 2024	Reception	118
26	Male	49	Middle school	Company employee	9	Group leader	January 6, 2024	Reception	151
27	Male	26	Associate degree	Company employee	3	Member	January 6, 2024	Reception	84
28	Female	53	Associate degree	Company employee	5	Member	January 7, 2024	Reception	65
29	Female	52	Bachelor's degree	Company employee	3	Member	January 7, 2024	Reception	96
30	Male	37	Bachelor's degree	Company employee	4	Member	January 7, 2024	Reception	80

ID	Gender	Age	Education level	Profession	Years of service	Rescue role	Interview date	Interview location	Interview duration (min)
31	Male	34	Bachelor’s degree	Company employee	13	Deputy team leader	January 9, 2024	Reception	146

The majority of the interviewees were male, accounting for 74.19% (23 individuals), reflecting the fact that emergency rescue volunteers differ from general volunteers, with men being more suited to this type of work. Regarding the age distribution, the interviewees were primarily between 30 and 50 years old, accounting for 77.42% (24 individuals), which reflects the physical demands of rescue work. The interviewees with an associate degree or above made up 90.32% (28 individuals), indicating that the professional nature of rescue work requires a certain level of education.

As the subjects of the study are engaged in public welfare service in a part-time format within the rescue team, the "profession" here refers to the primary occupation of the rescuers. As public welfare rescue work requires a certain level of personal financial capacity, the majority of the interviewees were company employees, making up 67.74% (21 individuals). That is followed by freelancers, accounting for 19.35% (6 individuals), as they have more flexible time, making them suitable for emergency rescue volunteer services.

Among the interviewees, senior management of the rescue team accounted for 9.68% (3 individuals), middle management accounted for 38.71% (12 individuals), and team members made up 51.61% (16 individuals). The average years in rescue volunteer service was 5.5 years, with 54.84% (17 individuals) having over 5 years of service.

The total interview duration was 3,119 minutes, with an average of 100 minutes per interviewee. The shortest interview lasted 65 minutes, while the longest lasted 151 minutes. A total of 164 cases were obtained through the interviews, covering various types of rescue, such as water, earthquake, and mountain rescue. The ratio of successful rescue cases to failed cases was 2:1. Theoretical saturation was achieved with the 23rd interview, after which no additional competencies were identified. From the 24th interview onwards, the competencies mentioned began to repeat those mentioned by the previous 23 interviewees.

3.3.2.5 Pilot and formal behavioral event interviews

- Main content of "competency"

If the behavioral event interview were to cover all aspects in detail, it would consume a large amount of time, and it would be challenging to identify the factors that distinguish superior performers. Spencer and Spencer (1993) pointed out that, based on the performance criteria predicted, competencies can be divided into "threshold competencies" and "differentiating competencies". Threshold competencies refer to necessary ability characteristics, typically the visible part of the "iceberg", such as knowledge and basic skills. Differentiating competencies refer to key ability characteristics that differentiate superior performers from average ones,

typically the underlying part of the "iceberg", such as self-concept, traits, and motives.

The view mentioned above is from Spencer and Spencer (1993). At the same time, considering the clear official standards already available for the knowledge and skills of rescue volunteers in China—the *National Occupational Skill Standards for Emergency Rescuers* (MEMPRC, 2019) and the *Emergency Rescuer* (EMDERPC, 2020)—this study focuses on whether rescue knowledge and skills are the competency elements for superior rescue volunteers, without delving into the specific content of the knowledge and skills. Instead, the resources derived from the behavioral event interviews are mainly used for researching "differentiating competencies."

- Interview duration

Spencer and Spencer (1993) suggested that the interview duration for a behavioral event interview should be between 90 and 120 minutes. However, McClelland's research indicated that the length of the interview would not affect the scores (evaluation) of competencies (McClelland, 1998). In addition, considering the interviewees' comfort, limited time, and the specific nature of emergency rescue work, we decided to appropriately shorten the interview duration (mainly for the description of personal background and job responsibilities, which could be obtained from interviewees' personnel files). Moreover, since this study mainly focuses on the "underlying part of the iceberg", we could shorten the interview duration by reducing discussion on specific knowledge and operational skills. Therefore, we estimated that the interview time for each interviewee would be between 60 and 100 minutes.

- Steps and methods

The book *Competence at Work* (Spencer & Spencer, 2003) provides a detailed analysis and explanation of the steps, purposes, and operational considerations for conducting behavioral event interviews. This method was adopted in this study, but considering the time, location, and other details of the interview, we decided to employ a variety of formats, such as face-to-face interviews and online video interviews. To ensure the quality of the interviews, we always tried to schedule face-to-face interviews when making appointments with the interviewees. If some interviewees could not attend face-to-face interviews due to business trips or other reasons, we would try to schedule online video interviews. In the literature, some studies conducted behavioral event interviews through phone interviews to improve efficiency (Thielsch et al., 2021). In cases where neither of the previous two interview formats was feasible, we conducted interviews via phone calls.

A comparison of the interview steps and methods from Spencer and Spencer (2003) and those used in this study can be found in Table 3.3.

Table 3.3 Comparison of behavioral event interview steps and methods

Steps	Purposes	Spencer's method	This study's method
1) Self-introduction and research introduction	Introduce the background and purpose of the interview, ask the interviewee about their personal background, such as educational background and relevant experience.	Face-to-face interview, 5-10 minutes	Face-to-face or online video interview, compressed to 5 minutes
2) Description of job responsibilities	Ask the interviewee to describe his or her key job duties and responsibilities.	Face-to-face interview, 10-15 minutes	Face-to-face or online video interview, compressed to 5 minutes
3) Behavioral event interview	Ask the interviewee to describe in detail 2-3 successful rescue experiences and 2-3 failed experiences.	Face-to-face interview	Face-to-face or online video interview
4) Competency characteristics summary	Ask the interviewee what characteristics they believe are necessary to perform the work well.	Face-to-face interview	Face-to-face or online video interview
5) Summary and conclusion	Thank the interviewee for his or her participation and extract key events and insights from the interview.	Express gratitude face-to-face; Post-interview summary	Express gratitude face-to-face or via phone; Post-interview summary

Following these steps and the STAR principle, this study designed the interview guide based on Spencer's behavioral event interview framework (Spencer & Spencer, 1993) while considering the specific work characteristics of emergency rescue volunteers (see Annex D). The interview guide in this study retains the five steps from Spencer's framework, incorporating key interview questions tailored to the primary work scenarios of the Sichuan Blue Sky Rescue Team. Moreover, the purpose of the interview and supplementary questions are explicitly defined in the interview guide. Before each interview, the interviewee's written consent was obtained, as they were asked to sign the *Informed Consent for Emergency Rescue Volunteer Interviews* (see Annex E).

The interviews in this study consist of five steps: 1) self-introduction and research introduction, 2) description of job responsibilities, 3) behavioral event interview, 4) competency characteristics supplementation and summary, and 5) interview summary and conclusion.

Step 1: Self-introduction and research introduction. This part includes questions about the interviewee's basic information. The main purpose is to explain the interview's purposes and key considerations while fostering a comfortable atmosphere for the interviewee.

Step 2: Description of job responsibilities. This step aims to understand the interviewee's main job responsibilities and work tasks, facilitating further discussion tailored to their specific work characteristics.

Step 3: Behavioral event interview. This part focuses on specific behavioral events to understand the details of the events and the interviewee's actions in those scenarios. Considering the work characteristics of the Sichuan Blue Sky Rescue Team's volunteers, the questions covered three types of events: rescue operations, support tasks, and other duties. The interview questions followed the STAR principle for each category. In particular, rescue operations include earthquake rescue, flood rescue, and emergency rescue drills. Support tasks include emergency duty assignments from the government and emergency support for events. Other duties include emergency rescue training and public awareness campaigns on emergency rescue.

Step 4: Competency characteristics summary. In this step, interviewees were asked to express their perspectives on the characteristics of superior emergency rescue volunteers, guilding them to summarize the competency characteristics.

Step 5: Summary and conclusion. This part mainly serves to conclude the interview, with expressions of gratitude. No substantive questions were asked in this step. After the interview, the interview team preserved the recordings, transcribed them, and summarized key findings. The interview team consisted of three individuals, all experienced in transcription and data extraction, who underwent standardized training before the formal interviews. Each person was responsible for transcribing ten interview recordings.

A pilot test of the behavioral event interview (pilot interviews) was conducted to assess the effectiveness of the interview design described above. For that purpose, we randomly selected two superior volunteers: one interviewee was a rescue volunteer with a managerial role, while the other was a rescue volunteer with a team member role. After completing the pilot interviews, adjustments were made to the interview steps, methods, and interview guide.

After the behavioral event interviews were completed, we carried out the following tasks: transcribing the interview recordings, conducting discussions within the interview team, extracting and analyzing the behavioral event interview data, and proposing a list of competency indicators.

Pilot interviews and adjustments. The results of the pilot interviews revealed differences with the interview plan in terms of interview duration, case selection, and questions. Acccordingly, we made the following adjustments.

1) Interview duration. The planned interview duration of 60 minutes proved insufficient, as the pilot interview reached or exceeded 60 minutes after the description three cases. Consequently, the interview duration for each interviewee needed to be extended.

2) Case numbers. The initial plan of three cases per interviewee was proved insufficient,

requiring an increase to eight cases of four categories. The four categories include earthquake rescue, water rescue, mountain rescue, and other tasks, with each category containing one successful case and one failed case.

3) Interview guide. The original question for identifying competencies proved difficult for interviewees to answer directly. However, valuable insights could be obtained through case descriptions and the description of the traits of individuals they admired.

4) Transcription and text processing. After the pilot interviews, we used a speech-to-text tool to transcribe the recordings, and the obtained text contained numerous redundant and meaningless words. Therefore, we performed AIGC-based text refinement, and the resulting text had an improved structured with precise and concise wording. While this method reduced character count by 36.91%, from 34897 to 22015 (with one interview recording as an example), a manual review revealed that similar words were often merged despite distinct contextual meanings. To ensure the accuracy and completeness of the information, the AI-based method was abandoned, and we decided to manually process all interview recordings (31 in total, including the pilot interview).

After revising the interview plan based on pilot interviews, we proceeded with formal interviews.

1) Interview locations: We interviewed a total of 31 individuals. Among them, 24 interviews were conducted one-on-one in the rescue team's meeting room, five were held in quiet, independent spaces such as private rooms in a tea house or living rooms in residence, and two were conducted via video calls because the interviewee was on a business trip or undertaking remote assignments.

2) Interview duration: The total duration of the interviews was 3,119 minutes, averaging 100 minutes per interviewee, with a minimum duration of 65 minutes and a maximum of 151 minutes.

3) Interview documents: Four types of primary data were collected through the interviews, including signed informed consent forms, handwritten interview notes, audio recordings, and recording transcripts (after manually reviewed).

4) Interview cases: A total of 164 cases were collected from the interviews, covering water, earthquake, and mountain rescues. The ratio of successful to failed cases was 2:1, deviating from the planned ratio of 1:1, showing that interviewees were more inclined to share successful experiences.

5) Theoretical saturation point: A total of 31 individuals were interviewed, with the theoretical saturation reached at the 23rd interview. From the 24th interview onward, no new

competency emerged, and the competencies mentioned began to repeat those identified by the previous 23 interviewees. To ensure the completeness and reliability of the information, we did not stop the interviews when theoretical saturation had been reached; instead, we continued to conclude the interviews with the remaining superior performers. While these additional interviews did not yield new competencies, they provided further insights into the competency connotations. For instance, Objectivity and Accuracy (standardized qualities and order) was supplemented with references to computational skills, while Learning Ability was further enriched with the concept of multi-scenario learning.

Through the interviews with superior volunteers, the behavioral event cases validated 10 competency indicators identified in the literature while identifying an additional nine indicators, including Objectivity and Accuracy, Learning Ability, Rescue Philosophy, Discipline and Obedience, Safety Handling, Achievement Orientation, Developing Others, Role Awareness, and Proactiveness.

3.3.2.6 Text coding

During text coding, we primarily imported the transcribed interview recordings into MAXQDA 2020 for coding behavioral events. The software's analysis functions were then utilized to generate a code list (see Annex G).

Based on the 19 competency indicators identified through literature review and behavioral event interviews, we further conducted textual analysis. For that purpose, the interview transcripts were imported into MAXQDA 2020 for coding analysis. The list of competency indicators and their frequencies are presented in Table 3.4.

Table 3.4 Competency indicator list for emergency rescue volunteers (II)

No.	Indicator name	Counts	Frequency (%)
1	Analytical Judgment	276	10.81%
2	Volunteer Spirit	256	10.02%
3	Objectivity and Accuracy	206	8.07%
4	Organization and Coordination	196	7.67%
5	Learning Ability	162	6.34%
6	Communication Skills	158	6.19%
7	Rescue Philosophy	141	5.52%
8	Discipline and Obedience	138	5.40%
9	Expertise	125	4.89%
10	Safety Handling	124	4.86%
11	Courage and Self-Confidence	114	4.46%
12	Achievement Orientation	109	4.27%
13	Teamwork and Cooperation	101	3.95%
14	Ability to Change	96	3.76%
15	Resistance to Stress	95	3.72%
16	Developing Others	84	3.29%
17	Practical Skills	81	3.17%

18	Role Awareness	50	1.96%
19	Proactiveness	42	1.64%
	Total	2554	100.00%

The concept of "Rescue Philosophy" includes scientific rescue, self-preservation before saving others, pursuit of efficiency, respect for life, and non-instrumentalization. Non-instrumentalization, as mentioned by superior volunteers during the interviews, refers to the idea that rescue is meant to solve problems by using tools rather than using tools for the sake of the tools. Rescuers should not be constrained by tools; instead, they should be able to develop rescue plans by reasonably choosing or even creatively using rescue tools.

"Role Awareness" includes rescuers' self-awareness and acting within one's capabilities.

"Practical Skills" encompass rescue equipment operation proficiency, as well as maintenance and even modification of equipment.

"Developing Others" involves willingness to share, instruction skills, guiding through questions, and providing motivation and feedback.

"Safety Handling" includes risk identification, prioritizing prevention, safety assessment, safety monitoring, and safety response measures.

"Analytical Judgment" involves logical analysis, systematic and comprehensive thinking, information seeking, plan formulation, and data computation.

"Achievement Orientation" includes perseverance, result orientation, pursuit of excellence, and leading by example.

"Discipline and Obedience" consists of confidentiality awareness, obedience to command, adherence to rules, and self-discipline.

"Resistance to Stress" includes blocking stress, desensitization protection, attention diversion, and psychological counseling.

"Expertise" encompasses knowledge in multiple disciplines related to rescue, local customs and traditions at rescue sites, equipment knowledge, and rescue procedures.

"Volunteer Spirit" includes selfless dedication, respect and tolerance, altruistic behavior, gratitude and reciprocity, a sense of mission, and low profile and pragmatism.

"Objectivity and Accuracy" involves being calm and rational, data sensitivity, information verification, and attention to detail.

"Communication Skills" include interpersonal communication, cross-cultural communication, conciseness and clarity, and organizational communication.

"Teamwork and Cooperation" consists of trusting others, external collaboration, technical coordination, and big picture awareness.

"Ability to Change" includes quick response, accepting challenges, and plan adjustment.

"Learning Ability" includes empty cup mentality, reflection and summary, emphasis on principles, and continuous learning.

"Proactiveness" includes taking the initiative to act and maintaining a positive and optimistic attitude.

"Organization and Coordination" involves planning ability, talent identification and utilization, clear division of labor, resource coordination, proper delegation, and command and control.

"Courage and Self-Confidence" include responsibility and accountability, willingness to challenge, and decisiveness.

Detailed information about these indicators can be found in Annex G.

3.3.2.7 Classification of competency indicators

The powerful analytical capabilities of MAXQDA2020 enables us to extract, label, and statistically analyze all behavioral events (behavior and actions in rescue cases) of all interviewees. This process generates a code list and reveals the preliminary relationships between the codes. However, the software cannot differentiate between behavior and competency indicators, nor can it standardize and classify these indicators. Therefore, we referred to Spencer's Competency Dictionary and conducted discussions to categorize, name, and define the indicators.

We first compared the competency indicators mentioned in the code list exported from MAXQDA2020 (see Appendix G) with those in the Competency Dictionary. Based on the meaning of the indicators derived from the interviews and the competency definitions provided in the dictionary, we reclassifed and redefined these indicators. Then, we used MAXQDA2020 to find out the frequency of these competency indicators in the interviews and followed the criteria below to remove indicators or merge them with similar indicators: 1) Indicators with a frequency of less than 1% are either removed or merged; 2) if a competency indicator category exceeds six items, some items are either removed or merged.

Through the classification and consolidation of the indicators, we obtained Competency Indicator List III (see Table 3.5), which includes primary indicators (competency clusters) and secondary indicators (competency elements), along with their preliminary definitions. This process resulted in six primary indicators and 27 secondary indicators (the 19 indicators obtained from behavioral event interviews were adjusted with Spencer's Competency Dictionary as a reference).

Table 3.5 Competency indicator list for emergency rescue volunteers (III)

Primary indicators (Clusters)	Secondary indicators
Cognitive	Analytical Thinking (AT) Learning Effectiveness (LEA) Technical/Professional/Managerial Expertise (EXP) Rescue Cognition (RC)
Personal Effectiveness	Self-Control (SCT) Flexibility (FLX) Self-Confidence (SCF) Organizational Commitment (OC) Accurate Self-Assessment (ASA) Low Profile (LOW)
Achievement and Action	Risk Management (RM) Concern for Order, Quality, and Accuracy (CO) Achievement Orientation (ACH) Operational skills (OS) Information Seeking (INFO) Initiative (INT)
The Impact and Influence	Relationship Building (RB) Impact and Influence (IMP) Organizational Awareness (OA) Upward Communications (UC)
Helping and Rescue Service	Obedience (OBE) Interpersonal Understanding (IU) Life Saving Orientation (LSO) Altruism (ALT)
Managerial	Teamwork and Cooperation (TW) Developing Others (DEV) Directiveness: assertiveness and use of positional power (DIR)

The process of categorizing and consolidating competency indicators is as follows:

After textual analysis, the competency list still exhibited problems such as overlapping content and excessive nomenclature. Further definition, naming, merging, and classification were needed. We first used the competency clusters and nomenclature from Spencer's Competency Dictionary to classify, name, and define the competencies. Subsequently, considering the description and frequency of the competency indicators, we eliminated those with low frequency and merged or reclassified indicators with similar meanings.

- **Naming and definitions of primary indicators**

Prior to EFA, there was no classification standard for the obtained 27 competency indicators (secondary indicators). Thus, we followed the definitions and classification standards for primary indicator in Spencer's Competency Dictionary, which categorizes competencies into six clusters (primary indicators): Cognitive, Personal Effectiveness, Achievement and Action, Impact and Influence, Helping and Human Service, and Managerial Clusters. Since public welfare emergency rescue organizations are not business entities, we replaced the term "human service" and renamed that cluster as "Helping and Rescue Service Cluster". The primary

indicators and their definitions are as follows:

1) Cognitive Cluster: The Cognitive competencies function as an intellectual version of Initiative: the individual's working to come to an understanding of a situation, task, problem, opportunity, or body of knowledge.

2) Personal Effectiveness Cluster: The Personal Effectiveness competencies control the effectiveness of the individual's performance when dealing with immediate environmental pressures and difficulties.

3) Achievement and Action Cluster: The Achievement and Action Cluster involves the competencies to take actions aimed at completing a task.

4) The Impact and Influence Cluster: Impact and Influence involves actively influencing others through means such as speeches and persuasion to gain their support.

5) Helping and Rescue Service Cluster: Helping and Rescue Service involves intending to meet someone else's needs; attuning oneself to the concerns, interest, and needs of the other (Interpersonal Understanding) and working to meet those needs (Customer Service Orientation).

6) Managerial Cluster: The Managerial Cluster encompasses a specialized subset of the Impact and Influence competencies, expressing the intention to have certain specific effects.

- **Naming and merging of secondary indicators**

After encoding the indicators, we obtained a competency model with 19 secondary indicators and 94 tertiary indicators (see Annex G for the detailed behavioral descriptions). At this stage, the names of the secondary indicators were inconsistent, and their connotations overlapped or were incomplete. In addition, it would be difficult to operationalize 94 tertiary indicators during scale development and questionnaire survey. Therefore, we deleted some indicators considering their frequency and reclassified and renamed the indicators using Spencer's Competency Dictionary as a reference.

First, we reviewed the code list derived from the textual analysis of the interviews (see Annex G) and removed the codes (tertiary indicators) with less than five counts. A total of seven items were deleted, including "Guiding Through Questions" under Developing Others, "Preventing Emotional Involvement" under Resistance to Stress, "Gratitude and Reciprocity" under Volunteer Spirit, "Focusing on Key Points" and "High-Frequency Progression" under Learning Ability, and "Time Management" and "Proper Delegation" under Organization and Coordination.

Then, we referred to Spencer's Competency Dictionary and made adjustments by splitting and merging certain secondary indicators, resulting in a total of 27 secondary indicators. The adjustments are as follows:

1) The indicator “Rescue Philosphy” was renamed “Rescue Cognition (RC)” to better express the behavioral nature of this competency;

2) A new indicator, “Life Saving Orientation (LSO)”, was added. The aspect of “Reverence for Life” under Rescue Philosphy, along with “Altruistic Behavior” under Volunteer Spirit, were merged into “Life Saving Orientation (LSO)”;

3) “Role Awareness” was renamed “Accurate Self-Assessment (ASA)”;

4) “Practical Skills” was renamed “Operational Skills (OS)”;

5) “Safety Handling” was renamed “Risk Management (RM)”;

6) “Analytical Judgment” was renamed “Analytical Thinking (AT)”, as judgment is a result of analytical thinking rather than an objective behavior;

7) “Information Seeking (INFO)” was separated from “Analytical Judgment”, becoming a new indicator;

8) “Discipline and Obedience” was renamed “Obedience (OBE)”;

9) “Resistance to Stress” was renamed “Self-Control (SCT)”;

10) The scope of “Communication Skills” was too broad, encompassing both “Interpersonal Communication” and “Organizational Communication”. “Interpersonal communication” was further divided into “Relationship Building (RB)” and “Interpersonal Understanding (IU)”, each established as separate secondary indicators. “Organizational Communication” was further divided into “Upward Communications (UC)” and “Organizational Commitment (OC)”, each established as separate secondary indicators. “Conciseness and Clarity”, previously under “Communication Skills”, was incorporated into the indicator “Impact and Influence (IMP)”;

11) “Big-Picture Awareness”, previously under “Teamwork and Cooperation (TW)”, was incorporated into the indicator “Organizational Commitment (OC)”;

12) “Ability to Change” was renamed “Flexibility (FLX)”;

13) “Learning Ability” was renamed “Learning Effectiveness (LEA)”;

14) “Proactiveness” was renamed “Initiative (INT)”;

15) “Organization and Coordination” was renamed “Directiveness: Assertiveness and Use of Positional Power (DIR)”;

16) The content under “Volunteer Spirit” was overly broad and complex, failing to align with the principle of behavioral description, and therefore, it was removed;

17) “Objectivity and Accuracy” was renamed “Concern for Order, Quality, and Accuracy (CO)”;

18) “Altruism (ALT)” was added as a new indicator, inccorporating the concept of “Selfless

Dedication" from "Volunteer Spirit" into its connotation;

19) "Courage and Self-Confidence" was renamed "Self-Confidence (SCF)", and "Decisiveness" under it was moved under "Directiveness: Assertiveness and Use of Positional Power (DIR)";

Through the renaming, connotation adjustments, additions, and deletions of indicators mentioned above, the number of secondary indicators changed from 19 to 27.

- **Classification of secondary indicators**

Based on the defined competencies, the secondary indicators were reclassified, as shown in the Competency Indicator List (III) in Table 3.5 above.

1) Cognitive Cluster

The Cognitive Cluster includes four secondary indicators: Analytical Thinking (AT), Learning Effectiveness (LEA), Technical/Professional/Managerial Expertise (EXP), and Rescue Cognition (RC). Learning Effectiveness was originally under the Personal Effectiveness Cluster. Spencer and Spencer (1993) used the longer term "Concrete Style of Learning and Communicating" in the original text, but in China, the term "Learning Ability" is more commonly used. After further reflections, we decided to adopt Bandura's term "Learning Effectiveness", which better aligns with its connotation. Based on its definition, it fits more appropriately within the Cognitive Cluster.

2) Personal Effectiveness Cluster

The Personal Effectiveness Cluster includes six secondary indicators: Self-Control (SCT), Flexibility (FLX), Self-Confidence (SCF), Organizational Commitment (OC), Accurate Self-Assessment (ASA), and Low Profile (LOW).

3) Achievement and Action Cluster

This cluster includes six secondary indicators: Risk Management (RM), Concern for Order, Quality, and Accuracy (CO), Achievement Orientation (ACH), Operational Skills (OS), Information Seeking (INFO), and Initiative (INT). Risk Management was previously named "Safety Handling" in the interviews; however, the term "Safety Handling" fails to encompass all behaviors related to risk assessment, risk monitoring, and the formulation and execution of risk prevention plans. Therefore, we decided to adopt the term "Risk Management". In addition, "Operational Skills" were previously named "Practical Skills" in the interviews. Chinese literature tends to use a broad term like "operational skills," while English literature prefers naming specific operational skills. For instance, the word "documentation", instead of a generic term like "operational skills" is used to refer to record-keeping operations (Meduri, 2021); alternatively, it can be referred to as a "skill" instead of "competency" (Y. C. Lin, 2016). In a

literature review on competencies, when explaining the relationship between "competency" and "skill", the term "operational skill" was used (Daily et al., 2010). The article *Psychological First Aid: A Consensus-Derived, Empirically Supported, Competency-Based Training Model* (McCabe et al., 2014) also employed the term "operational skill". Thus, we decided to name this indicator "Operational Skills".

4) The Impact and Influence Cluster

This cluster includes four secondary indicators: Relationship Building (RB), Impact and Influence (IMP), Organizational Awareness (OA), and Upward Communications (UC). Spencer and Spencer (1993) categorized "Upward Communications" under the Personal Effectiveness Cluster. However, based on its definition of proactive reporting, we posit that it aligns more closely with the Impact and Influence Cluster rather than the Personal Effectiveness Cluster.

5) Helping and Rescue Service Cluster

This cluster includes four secondary indicators: Obedience (OBE), Interpersonal Understanding (IU), Life Saving Orientation (LSO), and Altruism (ALT).

6) Managerial Cluster

The Managerial Cluster includes three secondary indicators: Teamwork and Cooperation (TW), Developing Others (DEV), and Directiveness: Assertiveness and Use of Positional Power (DIR).

- **Definitions of secondary indicators**

Each secondary indicator was defined based on Spencer's competency definitions and the key behavioral descriptions in the interviews. The definitions and descriptions of the secondary indicators are as follows.

1) Analytical Thinking (AT)

Analytical Thinking refers to the ability of rescue volunteers to break down large problems into smaller ones, or to explore the causes of problems step by step. Analytical Thinking involves systematically organizing the various parts of a problem or situation, comparing different features or dimensions in a systematic manner, sorting rationally, and identifying time sequences, causal relationships, or hypothetical relationships. It is often described using terms such thinking for yourself, analyzing problems, reasoning, and planning skills.

2) Learning Effectiveness (LEA)

Learning Effectiveness refers to the targeted acquisition of knowledge or experience by rescue volunteers to improve their rescue efficiency and skills. Learning Effectiveness is also known as learning ability or learning style.

3) Technical/Professional/Managerial Expertise (EXP)

Technical/Professional/Managerial Expertise refers to rescue volunteers' proficiency and understanding of a range of rescue-related knowledge, along with the motivation to extend, apply, and disseminate this knowledge to others. This knowledge encompasses technical, professional, procedural, and managerial aspects.

4) Rescue Cognition (RC)

Rescue Cognition refers to a set of conceptual understandings about the scientific and efficiency-related aspects of rescue operations that rescue volunteers hold when performing rescue tasks, handling rescue affairs, and managing rescue relationships. It is also referred to as rescue philosophy or rescue spirit.

5) Self-Control (SCT)

Self-Control refers to the ability of rescue volunteers to maintain calm, suppress negative emotions, and take actions when faced with temptations, resistance, hostility, or stress. It is also commonly expressed through terms like stamina, resilience to stress, staying calm, and being not easily provoked.

6) Flexibility (FLX)

Flexibility refers to an individual's ability to adapt when working in different environments or with different individuals or teams. It allows one to understand and appreciate different or opposing views and adjust one's ways of doing as needed according to changing situations. It also reflects the capacity to accept or make changes in accordance to organizational or work requirements. Flexibility is also expressed as adaptability, perceptual objectivity, resilience, and staying objective.

7) Self-Confidence (SCF)

Self-Confidence refers to a person's belief in his or her ability to complete a task. It includes the confidence expressed when dealing with challenging environments, making decisions, generating ideas, or proactively addressing setbacks. Self-Confidence is also referred to as decisiveness, ego strength, independence, strong self-concept, and willingness to take responsibility.

8) Organizational Commitment (OC)

Organizational Commitment refers to an individual's ability and willingness to align their personal behavior with the needs, key decisions, and goals of an organization, and to assist in achieving organizational objectives or meeting organizational demands. This means prioritizing organizational tasks over personal preferences or important professional responsibilities. Organizational Commitment is also known as mission orientation, vision, and commitment to the command's mission.

9) Accurate Self-Assessment (ASA)

Accurate Self-Assessment refers to the clear understanding of one's strengths and weaknesses, and effectively utilizing one's strengths to compensate for his or her weaknesses. It is also referred to as self-awareness, recognizing limits, and focusing on strengths while avoiding weaknesses.

10) Low Profile (LOW)

Low Profile refers to that one avoids boasting or exaggerating and focuses on practical, modest action. Such individuals decide whether to act or display their achievements based on whether it contributes to the completion of rescue tasks or the development of the rescue team. It is also known as humble dedication, doing more and saying less, and being grounded.

11) Risk Management (RM)

Risk Management refers to identifying, assessing, and handling potential or existing risks in rescue operations. This involves risk awareness, risk identification, risk assessment, risk monitoring, risk warning, and risk handling. It is also known as safety awareness, risk control awareness, and safety handling.

12) Concern for Order, Quality, and Accuracy (CO)

Concern for Order, Quality, and Accuracy represents a potential motivation to reduce environmental uncertainty. It is also referred to as objectivity and Accuracy, concern with clarity, and keeping tracking.

13) Achievement Orientation (ACH)

Achievement Orientation refers to focusing on performing well at work, setting standards to challenging oneself, and pursuing excellence. The "standard" here could be based on past performance (striving for improvement), an objective measurement (results orientation), others' performance (competitiveness), challenging goals set by the individual, or even what anyone has ever done (innovation). Achievement Orientation is also referred to as results orientation, efficiency orientation, concern for standards, focus on improvement, and entrepreneurship.

14) Operational Skills (OS)

Operational Skills refer to the set of abilities to understand, operate, and maintain rescue equipment required for completing rescue tasks. It is also known as practical skills, equipment handling skills, and manual dexterity.

15) Information Seeking (INFO)

Information Seeking involves proactively collecting relevant rescue information through means such as observation, questioning, measuring, and testing to gain a deeper understanding of rescue-related matters. This information includes the cultures, customs, geography, and

hydrology of disaster-stricken areas, the current situation of the disaster, and characteristics of the rescued individuals. Information Seeking is also known as disaster investigation, disaster assessment, problem definition, looking deeper, diagnostic focus, information sensitivity, and information verification.

16) Initiative (INT)

Initiative focuses on taking actions, especially making efforts beyond the expectations and requirements of a job and doing things that no one has requested, which will improve or enhance rescue effectiveness, avoid problems, or create new opportunities. It is also referred to as being proactive, bias for action, decisiveness, strategic future orientation, seizing opportunities, and foresight.

17) Relationship Building (RB)

Relationship Building involves establishing and maintaining good relationships or communication networks with individuals or organizations that contribute to achieving rescue goals. It is also referred to as interpersonal relationships, networking, use of resources, developing contacts, and ability to establish rapport.

18) Impact and Influence (IMP)

Impact and Influence reflects an individual's intention to actively influence others through means such as speech and persuasion in order to gain support from others, or the desire to make a specific impact or effect on others. It is different from interpersonal understanding or communication because the individual has his or her own agenda, a specific type of impression to make, or a course of action that he or she wishes the others to adopt, with stronger purposes. Impact and Influence is also referred to as strategic influence, impression management, showmanship, targeted persuasion, and collaborative influence.

19) Organizational Awareness (OA)

Organizational Awareness refers to one's ability to understand the power relationships within his or her own organization or other organizations. "Other organizations" here include other rescue teams, international rescue organizations, local emergency management authorities, and communities. This competency involves analyzing the organization's position and level in the field of rescue, identifying true decision-makers, influencers, and other roles or factors that affect decision-making within the organization. Organizational Awareness is also known as political astuteness, focusing on key points, and decision awareness.

20) Upward Communications (UC)

Upward Communications refers to communications between an individual and his or her organization or superiors, or communications with other organizations and individuals on

behalf of the organization. It has a broad connocationo, not excluding communications to or from other organizations or individuals in name of his or her own organization or superiors. It is also known as organizational communication, reporting ability, upward management, and managing superiors.

21) Obedience (OBE)

Obedience refers to following rules, service discipline, and commands to achieve rescue goals through organizations such as rescue teams. It is also known as discipline and obedience, command following, confidentiality awareness, self-discipline, and rule compliance.

22) Interpersonal Understanding (IU)

Interpersonal Understanding refers to the ability to understand others' motives and perspectives. It involves listening carefully listening and perceiving others' unspoken or implied thoughts, feelings, or viewpoints. Here, "others" include individuals and groups with similar thoughts or considerations. Interpersonal Understanding is also referred to as interpersonal communication, sensitivity to others, empathy, listening, awareness of others' feelings, diagnostic understanding, and cross-cultural sensitivity.

23) Life Saving Orientation (LSO)

Life Saving Orientation refers to the motivation to help others, respect life, and save lives and taking action to achieveing the life-saving goal. It emphasizes reverence for life and nature, without bias toward rescue subjects based on race, politics, or other reasons. However, the implied willingness to "help others" here differs from customer orientation or simple service orientation; it places more focus on the rescued individuals or the rescue mission. Life saving orientation is also known as respect for life, helping others, and saving lives.

24) Altruism (ALT)

Altruism refers to voluntarily dedicating one's time, energy, and resources for public welfare rescue without expecting anything in return. It is also known as enthusiasm for public welfare and a spirit of giving.

25) Teamwork and Cooperation (TW)

Teamwork and Cooperation refers to genuine intention to work cooperatively with others, to be part of a team, and to work together rather than working separately or competitively. Teamwork and Cooperation can be demonstrated in any role within a team, whether or not one is a leader or in a position of formal authority. Teamwork and Cooperation is also referred to as group management, group facilitation, conflict resolution, managing branch climate, and motivating others.

26) Developing Others (DEV)

Developing Others refers to the intention to teach or foster the development of one or several other individuals. This reflects a genuine intent to foster others' learning and development, as opposed to routine teaching or training that is simply procedural. Developing Others is also known as coaching, teaching, training, assuring subordinates' growth and development, and providing support.

27) Directiveness: Assertiveness and Use of Positional Power (DIR)

Directiveness (Assertiveness and Use of Positional Power) refers to the intent to make others to comply with his or her wishes. It involves giving firm instructions that may even be demanding or threatening. Reasoning with, persuading, and convincing others to comply belong to Impact and Influence, rather than Directiveness. Moreover, Directiveness must always take into account the long-term interests of the organization. It is also referred to as decisiveness, taking charge, control and discipline, and the use of power.

3.3.3 Scale development and model validation

Through a literature review and behavioral event interviews, we preliminarily established a competency model for emergency rescue volunteers, which was still subject to validation. Therefore, we developed a competency scale based on the 27 indicators and conducted a questionnaire survey to collect sample data from different teams with varying levels of performance, in order to validate the competency model we constructed.

3.3.3.1 Scale development

Spencer and his colleague Boyatzis developed and validated Spencer's Competency Dictionary (Spencer & Spencer, 1993), which categorizes competencies into 3-6 clusters, each containing 2-5 competency elements. Each competency element includes 3-6 behavioral indicators. They also provided a scale for measuring each competency. Given that many of the competency behaviors identified through the interviews with superior performers were consistent with the descriptions in these scales, and we decided to adopt Spencer's scales.

Moreover, through the cases provided by superior emergency rescue volunteers, we identified many new and contextualized competencies, making it necessary to make revisions and supplements to the scale. Empirical research by Spencer and Spencer (1993) suggested that such unique competencies would account for 2% to 20% of the total. They also showed that the validated scales are applicable to corporate settings. Therefore, we needed to make contextual adjustments to the scale to better suit emergency rescue work. With this step completed, we would have the competency scale for emergency rescue volunteers developed.

Scale Format. Spencer's competency scale mainly focuses on secondary indicators, including measurement dimensions, behavioral descriptions, and rating levels. For example, the secondary indicator of Analytical Thinking includes two dimensions: complexity of analysis and size of problem addressed. Each dimension has 5-7 rating levels, corresponding to 5-7 behavioral descriptions. These descriptions range from negative to positive behaviors, with the excellence of behavior increasing. To better differentiate competency evaluation scores and maintain consistency in the scoring criteria, we standardized the behavioral descriptions to six items, corresponding to six rating levels.

Contextualization of the scale: Spencer's competency scale can be directly applied to the measurement for most of the indicators in our competency list. The original scale covers 18 secondary indicators (out of a total of 27) from the six primary indicators, including Analytical Thinking (AT), Technical/Professional/Managerial Expertise (EXP), Self-Control (SCT), Flexibility (FLX), Self-Confidence (SCF), Organizational Commitment (OC), Concern for Order, Quality, and Accuracy (CO), Achievement Orientation (ACH), Information Seeking (INFO), Initiative (INT), Relationship Building (RB), Impact and Influence (IMP), Organizational Awareness (OA), Interpersonal Understanding (IU), Life Saving Orientation (LSO), Teamwork and Cooperation (TW), Developing Others (DEV), and Directiveness (Assertiveness and Use of Positional Power) (DIR). These original scales were mainly developed for organizations like corporations and military units. Therefore, we made contextual revisions and reductions to the behavioral descriptions in the scale based on the rescue scenes and volunteer behavioral descriptions gathered during the behavioral event interviews. For example, "Customer Service Orientation" was modified to "Life Saving Orientation", and non-applicable behavioral descriptions in Flexibility were removed.

Addition and development of new items: Nine secondary indicators in our competency list are not covered by Spencer's competency scale. Based on the rescue scenes and volunteer behavioral descriptions from the behavioral event interviews, we added corresponding scales for the following nine competencies: Learning Effectiveness (LEA), Rescue Cognition (RC), Accurate Self-Assessment (ASA), Low Profile (LOW), Risk Management (RM), Operational Skills (OS), Upward Communications (UC), Obedience (OBE), and Altruism (ALT). These new scales are described as follows:

1) "Learning Effectiveness" includes learning methods and learning efficiency;

2) "Rescue Cognition" includes self-preservation and saving others, scientific rescue, improving efficiency, and creating tools;

3) "Accurate Self-Assessment" includes understanding oneself and others, acting within

one's capabilities, leveraging strengths, and providing reasonable suggestions;

4) "Low Profile" includes behavioral descriptions such as vanity, avoidance of exposure (media exposure), acknowledgment and implementation of actions, and sticking to one's stance after misunderstandings;

5) "Risk Management" includes taking risks for glory, risk identification, risk assessment and monitoring, early warning and handling, and building a risk control system;

6) "Operational Skills" includes basic knowledge, general operations (five or fewer rescue devices), intermediate operations (5-10 rescue devices), advanced operations (10 or more rescue devices), maintenance and repairs, and modifications;

7) "Upward Communications" includes behavioral descriptions such as avoiding upward communications, information transmission, gaining attention, and achieving results;

8) "Obedience" includes behavioral descriptions such as lack of discipline, perfunctory obedience, passive obedience, active obedience, exemplary compliance, and adherence to the greater good.

9) "Altruism" includes behavioral descriptions such as personal utilitarianism in public welfare, equal altruism, selfless dedication, continuous contributions, and mobilizing others for assistance.

Scale testing and revision. Based on the initial development of the scale, we organized a discussion group to solicit feedback regarding the scale. The group consisted of six members, including two academic doctors, two management consultants in the field of human resources, and two emergency rescue team members. The group provided the following revision suggestions for names of the competency indicators, behavioral descriptions, and scale levels:

1) Unified number of levels: Behavioral descriptions for each scale should be uniformly divided into six levels to facilitate analysis.

2) Simple and clear expression: The language should be concise, avoiding repetition and ensuring clarity for ease of understanding.

3) Independent behavioral descriptions: The behavioral descriptions for each level should be independent of one another.

4) Contextual relevance: The behavioral descriptions should align with the rescue scenarios.

Through the above revisions, we finally developed the competency scale for emergency rescue volunteers (including 27 indicators and 36 items). For example, the competency scale for Technical/Professional/Managerial Expertise was tailored to the actual scenarios of emergency rescue and contained six levels of behavioral descriptions (corresponding to 1-6 points in scoring). The detailed scale is presented in Table 3.6.

Table 3.6 Competency scale for emergency rescue volunteers—Technical/Professional/Managerial Expertise

Levels	Behavioral Descriptions
A	**Depth of Knowledge**
A1	Primary Professional: Tasks that can be learned in a few hours to a few days (e.g., volunteers who have recently joined the rescue team).
A2	Intermediate Professional: Tasks that require several weeks to months to master (e.g., volunteers before being promoted to reserve members).
A3	Advanced Professional: Tasks that require general planning and organization to complete (e.g., reserve members after promotion).
A4	Primary Expertise: Tasks that require complex planning and organization to complete (e.g., reserve members before being promoted to formal members).
A5	Intermediate Expertise: Capable of providing professional skills or managing part of the tasks (e.g., formal members after promotion).
A6	Advanced Expertise: Possessing certain technical skills and experience, capable of teaching specialized skills or managing complex tasks (e.g., formal members who can serve as trainers).
B	**Breadth of Knowledge**
B1	Limited Knowledge: Mastery of basic general knowledge.
B2	Partial Knowledge: Mastery of some knowledge within specialized fields such as water rescue, rope rescue, and urban search and rescue.
B3	One Skill: Mastery of one specific technique within specialized fields such as water rescue, rope rescue, and urban search and rescue.
B4	Multiple Skills: Mastery of multiple techniques within specialized fields such as water rescue, rope rescue, and urban search and rescue.
B5	Technical and Managerial Knowledge: Mastering rescue procedures and command knowledge in addition to multiple technical skills.
B6	Expert in 1-2 Areas: Mastery of knowledge in multiple areas such as technical, managerial, command, and logistics, with expertise in 1-2 of these areas.
C	**Knowledge Sharing**
C1	Unwilling to Share: Treating new technologies and knowledge as secrets, not willing to share them with others.
C2	No Knowledge to Share.
C3	Willing to Share: Willing to share knowledge and techniques when asked by others.
C4	Willing to Answer and Able to Solve Problems: Responding to technical questions and helping others solve technical problems.
C5	Professional Technical Support: Helping others resolve technical problems, improving their success rate in rescue operations or task completion.
C6	Disseminating New Technologies: Actively learning external new technologies, knowledge, and equipment, and sharing them within the rescue team through teaching.

Note: The Expertise scale in Spencer's Competency Dictionary includes not only depth of knowledge, breadth of knowledge, and knowledge sharing but also acquisiton of expertise. Since the last dimension overlaps with Learning Effectiveness, we removed it from the Expertise scale and merged it with Learning Effectiveness.

Based on Spencer's Competency Dictionary, we developed the competency scale for emergency rescue volunteers, which includes 34 items that reflect the 34 tertiary indicators (see Annex H).

3.3.3.2 Survey sample

After initially determining the scope of participants for the survey, we considered the following specific factors when designing the sampling strategy, based on which, the sample of the survey were determined.

Factor 1: Criteria for supervisors

In questionnaire surveys, supervisors are selected mainly based on whether they possess rich theoretical knowledge of rescue techniques or substantial practical rescue experience (He, 2007). In this study, we primarily considered emergency rescue personnel who are familiar with the rescue teams, have rescue experience, and hold management positions in the Sichuan Blue Sky Rescue Team.

Factor 2: Regional representation

This study targets emergency rescue volunteers in China. In selecting survey participants, we aimed to cover all regions of China, including the North, South, West, and East. The survey was conducted in 17 provinces (including municipalities and autonomous regions) across four regions of China, totaling 45 prefecture-level cities (or districts).

Factor 3: Team representation

In addition to the Blue Sky Rescue Team, other rescue teams were considered for sampling. The survey covered 70 teams, including Blue Sky Rescue, Dawn Rescue, Yong'an Rescue, Blue Leopard Rescue, Iron Army Rescue, Canal Lighthouse Rescue, and Peaceland Foundation Rescue, among others.

Considering these three factors, and based on the actual conditions of the survey, this study ultimately gathered samples from 70 teams (see Annex C).

The sample size for surveys is generally no less than five times the number of questionnaire items. With 34 competency-related items in the survey, the preliminary estimate for the sample size was no less than 170.

Considering the number of returned questionnaires and their validity, an additional 109 samples are added as a buffer. Therefore, the adjusted number of samples is:

n = 171+109=280 (70 teams; 4 participants per team)

3.3.3.3 Questionnaire survey data collection

This study used a questionnaire survey to collect data to validate the developed preliminary competency model for emergency rescue volunteers in China. We adopted the competency model for technical personnel and human service workers in Spencer and Spencer (2003) and contextualized it to fit rescue scenarios. The survey collected performance evaluations and

competency performance scores from supervisors for superior and average volunteers. The questionnaire survey process included the preliminary development of the questionnaire, pilot test, revision of the questionnaire, and formal questionnaire survey.

Data collection period. The questionnaire survey data were collected from August 14, 2024, to August 22, 2024. During this period, two reminders were sent to the participants: one on August 15 and another on August 18.

Data collection method: Due to the wide geographical scope and large number of survey participants, collecting data via paper-and-pencil questionnaires was neither economical nor convenient. Therefore, a more efficient method—online questionnaire survey—was adopted. The online survey was conducted using a questionnaire survey tool powered by Tencent.

Timeliness and validity: To ensure timely completion of the questionnaires, we used the social media platform WeChat to send invitations directly to the participants or their respective teams, along with follow-up reminders throughout the process. To ensure the validity of the questionnaire responses, we required real-name registration for filling out the questionnaire and monitored the duration of completion and the content of responses via the backend of the Tencent survey tool. The responses were screened based on time spent to ensure validity.

3.3.3.4 Pilot test and formal survey

The participants in the survey come from different regions, and there are differences in their educational backgrounds and comprehension abilities. Therefore, a pilot test was necessary before the formal questionnaire survey. The main tasks included questionnaire design, pilot test, revision of the scale and questionnaire, formal survey, and data processing.

- Demographic distribution of survey participants

The participants in the survey were supervisors of volunteers from China's public emergency rescue teams. They were asked toevaluate the performance and competency of the rescue volunteers under their supervision.

The survey involved 70 teams, covering North China, South China, Central China, East China, and West China. Among them, the number of teams in North China accounted for 11.43% of the total number of survey teams, South China teams accounted for 7.14%, Central China teams accounted for 35.71%, East China teams accounted for 8.58%, and West China teams accounted for 37.14%.

The teams were located in 46 cities of 17 provinces across mainland China.

There were seven different brands of teams, including Blue Sky Rescue, Blue Leopard Rescue, Canal Lighthouse Rescue, Yong'an Rescue, Peaceland Foundation Rescue, Dawn

Rescue, and Iron Army Rescue. Among them, Blue Sky Rescue teams accounted for 91.43% of the total number of surveyed teams, and non-Blue Sky Rescue teams accounted for 8.57%.

The supervisors were divided into two categories: team leaders and group leaders, totaling 206 individuals. In particular, there were 62 team leaders, including rescue team responsibles such as chairpersons and team leaders, accounting for 30.10% of the total survey participants; there were 144 group leaders, accounting for 69.90% of the total participants.

- Pilot test and formal survey process

Questionnaire design. The competency scale could not be directly applied to the survey, and further questionaire design was needed. This involved converting the behavioral descriptions into questionnaire items, providing explanations and examples to facilitate the understanding of competencies' academic terms, and adding performance evaluation indicators. For example, the competency "Self-Control" might be interpreted by rescue volunteers as "procedual control," which could lead to significant errors. Therefore, we explained it as "remaining calm," which is easier to understand—i.e., "Self-control refers to the ability of rescue volunteers to remain calm and suppress negative emotions and actions when faced with provocation, resistance, hostility, or pressure." Based on the revised scale, we developed a questionnaire for the competency of emergency rescue volunteers in China, including their basic information, performance evaluation, and competency evaluation (see Annex F for the questionnaire sample).

Pilot test. The pilot test mainly aimed to assess the feasibility of the questionnaire, including the number of items, comprehensibility, completion time, and response method. We planned to conduct a pilot test with both emergency rescue volunteers (four representatives from different fields) and competency research peers (two individuals). We sent six invitations, and six individuals participated in the pilot test. After they filled out the questionnaires, we seeked their feedback and collected five responses regarding the questionnaire design, the experience of filling out the questionnaire, time spent, and revision suggestions. The pilot test provided the following feedback for improvement:

1) The paper-and-pencil survey method was not practical; the online questionnaire method was generally acceptable. However, instructions or training were needed prior to the survey.

2) Since online questionnaires automatically number the responses, the number at the top right of the questionnaire was no longer necessary.

3) Each evaluator was allowed to evaluate 2-4 individuals, but in practice, they evaluated 1-2 individuals (direct subordinates).

4) The time to fill out the questionnaire was generally 5-15 minutes; the questionnaire could

not be completed within less than two minutes.

5) The online questionnaire survey was conducted using the Sojump platform, which offers convenience, efficiency, and good confidentiality.

6) The questions and options were clear enough, but further improvement was necessary to make them more concise to improve efficiency.

Scale and questionnaire revision. After the pilot test, the scale was revised. In particular, some of the tertiary indicators were merged or deleted, and thus, the number of scale items was reduced from 36 to 34. At the same time, we revised the questionnaire and developed the Emergency Rescue Volunteer Competency Questionnaire (II). The revised questionnaire consisted of three sections: basic information, performance evaluation, and competency evaluation.

Measure: 1) The basic information section contained seven items, including the participant's name, position, responsibility, the name of the rescue team, and the name of the person being evaluated. 2) The competency evaluation section contained 34 items, corresponding to the 34 tertiary indicators. 3) The performance evaluation section contained four items adopted from Han (2006), covering the performance and responsibility fulfillment status of the individual being evaluated (See Annex F for the details).

Formal survey. We invited emergency rescue teams to participate in the formal survey through various channels, including phone calls, instant messaging apps, rescue task WeChat groups, and public welfare foundations. We sent inviations to a total of 280 individuals. The questionnaire filling-out and response collection lasted for nine days, and reminders were sent on the 2nd and 4th days. A total of 206 responses were collected, with a response rate of 73.57%.

Data processing. First, we screened the original responses based on validity. Out of the 206 collected responses, 19 were invalid, including those filled out in less than two minutes, those where all answers were the same, and those with obvious errors. A total of 187 valid responses were obtained, resulting in a effective rate of 90.78%. Since the survey required real-name registration and participants were asked to provide their phone numbers, this increased the level of attention in completing the survey and improved the effective rate. Then, prior to EFA, we manually filtered and categorized the survey data. We identified valid data and divided the participants into two groups: the superior group and the average group. We set the standard for superior performance at 80 points on a 100-point scale. This means that participants with a performance evaluation score between 4.8 and 6 (inclusive of 4.8) were considered to have superior performance. Those scoring between 60 and 80 on a 100-point scale, that is, with an evaluation score between 3.6 and 4.8 (inclusive of 3.6 but exclusive of 4.8), were classified as

average performers. Those scoring less than 60 points were considered underperformers.

3.4 Reliability and validity testing

This study employed a mixed approach, combining both qualitative and quantitative methods. To ensure the reliability and validity of the research, we employed multiple strategies, including triangulation and various statistical tests. In particular, according to the principles of scale construction, after converting the competency evaluation indicator system into a scale, it was necessary to test the reliability and validity of the scale (Ma, 2022).

3.4.1 Reliability

Reliability refers to consistency, reflecting the degree of relevance and consistency between the measurement and the results. In this study, we employed triangulation and the Cronbach's α to test the reliability.

3.4.1.1 Content consistency and Cronbach's α coefficient

There are five main methods for analyzing reliability: test-retest reliability, alternate form reliability, split-half reliability, Kuder-Richardson reliability, and Cronbach's α coefficient. Among them, Cronbach's α is commonly used for assessing test reliability, estimating the internal consistency of a test using a formula. As a reliability index, it overcomes some of the drawbacks of the split-half method and is currently the most widely used reliability index. The Cronbach's α value ranges from 0 to 1.000, and a value above 0.700 is generally considered acceptable.

In this study, the scale's overall Cronbach's α was 0.985, higher than the acceptable threshold of 0.700. The competency characteristic subscale had a Cronbach's α value of 0.984, and the performance subscale had a Cronbach's α value of 0.958, both greater than 0.700, indicating that the internal consistency of the scale met the criteria.

3.4.1.2 Exploratory factor analysis (EFA)

The process of EFA consists of three steps: data testing, component analysis, and factor discussion.

Data testing. We used IBM SPSS Statistics 27.0.0 d to test the valid data in order to determine if the sample data was suitable for EFA.

Factor analysis. The principal component analysis was employed to analyze the covariance

matrix of the data. A total of three to six components or factors with eigenvalues greater than 1 were extracted (considering that the number of validated competency clusters in the Spencer model is between three and six). The extracted components were then classified based on the rotated component matrix.

Factor discussion. By comparing and discussing the results of data analysis using SPSS, the number of principal components and classifications were determined, as well as the names of the components. This led to the revised competency scale (Competency Scale II) and Competency Model I.

3.4.2 Validity

The validity testing includes the examination of the construct validity, content validity, goodness of fit, discriminant validity, and convergent validity of the questionnaire. This study used tools such as the KMO test, Bartlett's test, and one-way ANOVA for validity testing.

3.4.2.1 Construct validity

Prior to factor analysis, KMO and Bartlett's tests were performed to determine if the data was suitable for factor analysis. The KMO test evaluates whether the sample size is adequate and examine the partial correlations between variables. The KMO value should range from 0 to 1, with values closer to 1 indicating better suitability. A KMO value below 0.6 suggests that the data is not suitable for factor analysis, and a value above 0.7 indicates acceptable. Bartlett's test examines whether the variables are independent of each other. If the *p*-value is less than 0.005, it indicates statistical significance and confirms that data is suitable for factor analysis.

In this study, the KMO test for the 34 items in the scale yielded a value of 0.977, which is above the acceptable threshold of 0.7. The Bartlett's test showed an approximate chi-square value of 6799.432, with a *p*-value close to 0.000, which is below 0.05, indicating statistical significance and confirming that the scale was suitable for factor analysis.

3.4.2.2 Triangulation

Triangulation is a strategy commonly applied in qualitative research. It aims to comprehensively understand the research subject and process by using multiple methods or data sources, thereby enhancing the validity of the research. There are four types of triangulation: methodological triangulation, researcher triangulation, theoretical triangulation, and data triangulation (Carter et al., 2014). This study employed three of these triangulation methods.

Methodological triangulation. In addition to behavioral event interviews, this study also

employed content analysis and EFA. W. S. Chen (2004) suggested using statistical data analysis to verify the consistency of the results in competency model research. In this study, this method was applied to validate the results following the questionnaire survey.

Researcher triangulation. Many researchers use peer review to enhance research reliability (Cornell, 2023; Gallardo et al., 2015; Ross-Hellauer & Gorogh, 2019). In this study, after the competency indicator list or competency model was proposed, we employed multiple rounds of peer reviews to improve the research reliability.

Data triangulation. Following the suggestion by Cochran (2009), the data of this study came from three different sources, and they support and supplement each other. These three different data sources are:

1) Validated and referable competency characteristics obtained through literature research.

2) Competency characteristic data directly obtained from the research subjects through behavioral event interviews.

3) Emergency rescue volunteers' competency characteristic data obtained through a questionnaire survey.

3.4.2.3 Criterion validity and one-way ANOVA

The China Emergency Rescue Volunteer Competency Questionnaire was primarily developed based on the competency model, with reference to the competency scale by Spencer and Spencer (2003). The scale was adapted to the rescue context and underwent peer review and a pilot test. This ensures a certain level of content validity.

To further examine the impact of competency on volunteers with different performance levels, we employed one-way ANOVA to compare the differences in competency and its dimensions between superior and average volunteers. One-way ANOVA was performed using IBM SPSS Statistics 27.0.0 on the valid sample data, and the results determined whether any adjustments would be needed for the competency model and scale. In addition, final classification, naming, and definition of the indicators in the competency model were determined, and the model's visualization was conducted, resulting in the final competency model.

3.4.2.4 Goodness of fit and confirmatory factor analysis (CFA)

The competency model obtained from EFA was subject to subsequent confirmatory factor analysis (CFA). With the four factors generated from EFA as latent variables, and the scale items as observed variables, CFA was performed on the four-dimension model. Following

previous research, we used the following goodness-of-fit criteria for CFA: $\chi 2/df < 3$, $p < 0.05$, RMSEA < 0.08, IFI > 0.95, TLI > 0.95, CFI > 0.95 (Schreiber et al., 2006).

3.5 Research ethics

This study involves research on human behavior (namely, emergency rescue volunteers in China), but it does not fall under the requirements of *Measures for Ethical Review of Biomedical Research Involving Human Beings* promulated by the Chinese government (National Health Commission of the People's Republic of China, 2016). Considering the need to respect the right to informed consent of the volunteers and their respective rescue teams, this study provided written notice to the volunteers and the Sichuan Blue Sky Rescue Team prior to the behavioral event interviews and obtained informed consent signed by the volunteers (See Annex E).

In addition, we informed the research subjects that they had the right to suspend or terminate their participation in the study at any time. We assured the research subjects that our study strictly adhered to the principles of voluntariness and confidentiality, and that we fully complied with the ethical guidelines outlined in documents such as the *Declaration of Helsinki* by the World Medical Association.

Chapter 4: Results

In response to the research questions, this chapter will present the study's findings according to the research phases. These include the literature review on competency models, behavioral event interviews and modeling, and model validation. Finally, we will validate the results.

4.1 Results of literature review on competency models

Through a literature search, we identified a total of 113 documents related to "emergency rescue volunteers". We summaried and sorted the competency indicators extracted from these documents, resulting in the Competency Indicator List (I), as shown in Table 4.1.

Table 4.1 Competency indicator list (I) in the emergency rescue context

No.	Indicator	Abbreviation	Counts	Frequency (%)
1	Expertise	EXP	78	69.03%
2	Interpersonal Understanding	IU	75	66.37%
3	Practical skills	PS	58	51.33%
4	Self-Control	SCT	54	47.79%
5	Analytical Thinking	AT	49	43.36%
6	Flexibility	FLX	49	43.36%
7	Organizational Commitment	OC	45	39.82%
8	Teamwork and Cooperation	TW	45	39.82%
9	Organization and coordination	ORC	41	36.28%
10	Self-Confidence	SCF	41	36.28%

After literature review, we identified 47 competency indicators. These indicators had different names and varying frequencies of occurrence, with some not aligning with the definition. We refined the indicators by removing those that did not match the definition and merging duplicates, resulting in 43 indicators. After ranking them and eliminating those mentioned fewer than 10 times, we obtained 27 indicators. Finally, we selected the top 10 indicators based on their frequency. Table 4.2 presents this process and the results.

Table 4.2 Changes in competency indicators based on literature review

47 indicators	43 indicators	27 indicators	10 indicators
Literature review	Initial screening	Removal of low-frequency items	Selection of the most frequent indicators
Analytical Thinking Conceptual Thinking Expertise Achievement Orientation Impact and Influence Organizational Awareness Relationship Building Developing Others Directiveness: Assertiveness and Use of Positional Power Teamwork and Cooperation Team Leadership Interpersonal Understanding Customer Service Orientation Self-Control Self-Confidence Flexibility (Ability to Change) Organizational Commitment Accurate Self-Assessment Occupational Preference Affiliative Interest Concern for Order, Quality, and Accuracy Initiative/Proactiveness Information Seeking Directness/Assertiveness Organization and Coordination Practical Skills Strategic Thinking (Big Picture Awarenness) Risk Management	Removed three indicators: “Board and Committee Development,” “Geographic Location”, and “Spare Time.” Merged two indicators: “Directiveness: Assertiveness and Use of Positional Power” with “Directness/Decisiveness”. The remaining 43 competency indicators are unchanged (as in the left column).	After removing 16 indicators with a frequency of less than 10, the remaining 27 competency indicators are: Expertise Interpersonal Understanding Practical Skills Self-Control Analytical Thinking Flexibility Organizational Commitment Teamwork and Cooperation Organizational Coordination Self-Confidence Achievement Orientation Initiative Information Seeking Physical Fitness Risk Management Customer Service Orientation Psychological Fitness Impact and Influence Optimism and Cheerfulness Accurate Self-Assessment Occupational Preference Integrity, Justice, and Honesty Team Leadership Directiveness: Assertiveness and Use of Positional Power Courage	Selected the top 10 ranked indicators based on frequency: Expertise Interpersonal Understanding Practical Skills Self-Control Analytical Thinking Flexibility Organizational Commitment Teamwork and Cooperation Organization and Coordination Self-Confidence

47 indicators	43 indicators	27 indicators	10 indicators
Board and Committee Development		Tolerance and Equality	
Tolerance and Equality		Discipline and Obedience	
Geographic Location			
Free Time			
Integrity, Justice, and Honesty			
Physical Fitness			
Psychological Fitness			
Discipline and Obedience			
Career Development			
Optimism and Cheerfulness			
Confidentiality			
Friendliness			
Humor			
Courage			
Imagination			
People Orientation			
Leading by Example			
Practical Experience			
Attention/Focus			

4.2 Behavioral event interviews and modeling

4.2.1 Behavioral event interviews

We planned to interview a total of 31 volunteers for the behavioral event interviews, and all 31 interviews were successfully concluded, achieving a 100% completion rate. The average interview duration exceeded the initially planned duration, averaging 100 minutes per interview. Theoretical saturation was reached at the 23rd interview. Through interviews with superior performers, the behavioral event cases validated the 10 competency indicators identified from the literature review and revealed nine new competency indicators. The newly identified indicators are: Objectivity and Accuracy, Learning Ability, Rescue Philosophy, Discipline and Obedience, Safety Handling, Achievement Orientation, Developing Others, Role Awareness, and Proactiveness.

4.2.2 Text coding analysis and modeling

We utilized the iFLYTEK X2 speech-to-text conversion tool along with manual verification to transcribe the interview recordings, resulting in 31 transcripts with a total of 690,727 Chinese characters. Then, we used MAXQDA 2020 for text analysis of the interview transcripts and generated the code list for the competency of emergency rescue volunteers (see Annex G). Subsequently, based on Spencer's competency naming method (Spencer & Spencer, 2003) and group discussions, we preliminarily established the competency model for emergency rescue volunteers. This model consists of six primary competency clusters, 27 secondary indicators, and 34 tertiary indicators.

The six primary competency clusters are Cognitive Cluster, Personal Effectiveness Cluster, Achievement and Action Cluster, Impact and Influence Cluster, Helping and Rescue Service Cluster, and Managerial Cluster.

The Cognitive Cluster includes the following four secondary indicators:

- Analytical Thinking (AT)
- Learning Effectiveness (LEA), which includes two tertiary indicators: Learning Methods and Learning Efficiency
- Technical/Professional/Managerial Expertise (EXP), which includes three tertiary indicators: Depth of Knowledge, Breadth of Knowledge, and Knowledge Sharing
- Rescue Cognition (RC)

The Personal Effectiveness Cluster includes the following six secondary indicators:

- Self-Control (SCT)
- Flexibility (FLX)
- Self-Confidence (SCF), which includes two tertiary indicators: Self Assurance and Dealing with Failure
- Organizational Commitment (OC)
- Accurate Self-Assessment (ASA)
- Low Profile (LOW)

The Achievement and Action Cluster includes the following six secondary indicators:

- Risk Management (RM)
- Concern for Order, Quality, and Accuracy (CO)
- Achievement Orientation (ACH), which includes two tertiary indicators: Target Setting and Innovativeness
- Operational Skills (OS)
- Information Seeking (INFO)
- Initiative (INT)

The Impact and Influence Cluster includes the following four secondary indicators:

- Relationship Building (RB)
- Impact and Influence (IMP)
- Organizational Awareness (OA)
- Upward Communications (UC)

The Helping and Rescue Service Cluster includes the following four secondary indicators:

- Obedience (OBE)
- Interpersonal Understanding (IU), which includes two tertiary indicators: Depth of Understanding Others and Listening and Responding Others
- Life Saving Orientation (LSO), which includes two tertiary indicators: Focus on Saving Lives and Initiative to Help or Serve Others
- Altruism (ALT)

The Managerial Cluster includes the following three secondary indicators:

- Teamwork and Cooperation (TW)
- Developing Others (DEV)
- Directiveness: Assertiveness and Use of Positional Power (DIR)

4.3 Scale development and model testing results

4.3.1 Scale development and survey results

Based on Spencer's competency framework and in combination with the emergency rescue context, we developed the Emergency Rescue Volunteer Competency Scale (see Annex H). This scale consists of six primary competency clusters, 27 secondary indicators, and 34 tertiary indicators, with each behavioral indicator assigned six rating levels.

Using this scale, we designed the Emergency Rescue Volunteer Competency Questionnaire. The questionnaire includes three sections, containing a total of 45 items: seven items on basic information, four for performance evaluation, and 34 for competency evaluation. A total of 280 questionnaires were distributed, with 206 returned, yielding a response rate of 73.57%. Among them, 187 were valid, with an effective rate of 90.78%. We conducted tests for internal consistency and construct validity of the questionnaire.

4.3.1.1 Internal consistency test

We used SPSS 27.0.0 to examine the internal consistency of the questionnaire. The results indicated that the Cronbach's α coefficient for the competency scale was 0.984, while the Cronbach's α coefficient for the performance scale was 0.958. Both values exceed the generally accepted threshold of 0.700 (Lee & David, 1995), demonstrating that the internal consistency of the questionnaire met the criteria.

4.3.1.2 Model fit test

We conducted a confirmatory factor analysis (CFA) using SPSSAU to assess the model fit. As shown in the model fit indices presented in Table 4.3, the model demonstrated a good fit, indicating that the construct validity of the questionnaire is satisfactory.

Table 4.3 Model fit indices

Indices	χ^2	df	χ^2/df	p	RMSEA	IFI	TLI	CFI
Criteria	-	-	<3	<0.05	<0.08	>0.9	>0.9	>0.9
Values	1130.068	644	1.755	0.000	0.064	0.941	0.936	0.939
Results	-	-	Good	Good	Good	Good	Good	Good

4.3.2 Model validation results

We conducted KMO testing, Bartlett's test of sphericity, exploratory factor analysis (EFA), CFA, and one-way analysis of variance (one-way ANOVA) on the questionnaire data. The results are as follows:

4.3.2.1 KMO test for EFA

The Kaiser-Meyer-Olkin (KMO) test compares the simple correlation coefficients and partial correlation coefficients between variables and is primarily applied in factor analysis of multivariate statistics. We used SPSS 27.0.0 to perform the KMO test, and the result showed that the KMO value was between 0 and 1. In general, the closer the KMO value is to 1, the stronger the correlation between the variables, indicating that the original variables are more suitable for factor analysis. In this study, the KMO value was 0.977, which is close to 1, demonstrating a strong correlation between the variables and confirming the suitability for factor analysis.

4.3.2.2 Bartlett's test of sphericity for EFA

Bartlett's test of sphericity examines the strength of correlation between variables. This test starts with the correlation matrix of the variables. If the test value is large and the associated probability is smaller than the significance level, it indicates that there is a correlation between the original variables and that the data is suitable for factor analysis. In this study, we used SPSS 27.0.0 to conduct Bartlett's test of sphericity. The approximate chi-square value was 6799.432, with a degrees of freedom of 561 and a significance value of 0.000, which confirms the suitability for factor analysis.

4.3.2.3 EFA results

Through an EFA on the valid questionnaire data, the 34 tertiary competency indicators were validated, and four factors were extracted. After a careful discussion, a competency model was established, including four primary indicators, 27 secondary indicators, and 33 tertiary indicators.

Factor analysis results: The factor extraction method applied in this study was principal component analysis, and the rotation method was Varimax with Kaiser normalization. We first performed factor analysis using the software default eigenvalue of 1. After rotation, two principal components were extracted (see Table 4.4).

Table 4.4 Rotated component matrix with eigenvalue set to 1

Variables (Tertiary indicators)	Factor 1 **36.782%**	Factor 2 **33.260%**
Analytical Thinking		0.607
Learning Effectiveness – Learning Methods		0.715
Learning Effectiveness – Learning Efficiency		0.795
Expertise – Depth of Knowledge		0.723
Expertise – Breadth of Knowledge		0.788
Expertise – Knowledge Sharing		0.764

Variables (Tertiary indicators)	Factor 1 **36.782%**	Factor 2 **33.260%**
Rescue Cognition		0.663
Self-Control		0.560
Flexibility		0.666
Self-Confidence – Self Assurance		0.679
Self-Confidence – Dealing with Failure	0.642	
Organizational Commitment	0.651	
Accurate Self-Assessment		0.680
Low Profile	0.735	
Risk Management	0.650	
Concern for Order, Quality, and Accuracy	0.672	
Achievement Orientation – Target Setting		0.621
Achievement Orientation – Innovativeness		0.749
Operational Skills		0.665
Information Seeking	0.583	
Initiative		0.603
Relationship Building	0.543	
Impact and Influence	0.743	
Organizational Awareness	0.671	
Upward Communications	0.681	
Obedience	0.736	
Interpersonal Understanding – Depth of Understanding Others	0.701	
Interpersonal Understanding – Listening and Responding Others	0.762	
Life Saving Orientation – Focus on Saving Lives	0.670	
Life Saving Orientation – Initiative to Help or Serve Others	0.781	
Altruism	0.772	
Teamwork and Cooperation	0.814	
Developing Others	0.682	
Directiveness: Assertiveness and Use of Positional Power		0.646

As shown in Table 4.4, these two factors had a cumulative explained variance of 70.042%, but they were too general and could not explain the meaning of the 34 tertiary indicators.

Considering that the competency dimensions or clusters typically range from three to six (Spencer & Spencer, 2003), we fixed the number of components for factor analysis. When the number of components was set to four, the classification was more consistent with Spencer's Competency Model. The eigenvalues of the four factors were 22.62, 1.19, 0.84, and 0.82, with a total explained variance of 74.932%, increasing from 70.042% from the two-factor solution. The rotated component matrix is shown in Table 4.5.

Table 4.5 Rotated component matrix with fixed component number of four

Variables (Tertiary indicators)	Factor 1 **Interpersonal Communication and Influence** **22.193%**	Factor 2 **Personal Effectiveness and Values** **21.340%**	Factor 3 **Professional Knowledge and Learning Ability** **17.559%**	Factor 4 **Action and Operation Skills** **13.840%**
Impact and Influence	0.593			
Organizational Awareness	0.595			
Upward Communications	0.567			
Obedience	0.631			
Interpersonal Understanding – Depth of Understanding Others	0.623			
Interpersonal Understanding – Listening and Responding Others	0.630			
Life Saving Orientation – Focus on Saving Lives	0.700			
Life Saving Orientation – Initiative to Help or Serve Others	0.716			
Altruism	0.733			
Teamwork and Cooperation	0.635			
Developing Others	0.530			
Rescue Cognition		0.604		
Self-Control		0.609		
Flexibility		0.622		
Self-Confidence – Dealing with Failure		0.613		
Organizational Commitment		0.684		
Accurate Self – Assessment		0.655		
Low Profile		0.636		
Concern for Order, Quality, and Accuracy		0.544		
Analytical Thinking		0.461		
Learning Effectiveness – Learning Methods			0.715	
Learning Effectiveness – Learning Efficiency			0.682	
Expertise – Depth of Knowledge			0.659	
Expertise – Breadth of Knowledge			0.706	
Expertise – Knowledge Sharing			0.637	
Self-Confidence – Self Assurance			0.569	

Variables (Tertiary indicators)	Factor 1 **Interpersonal Communication and Influence** **22.193%**	Factor 2 **Personal Effectiveness and Values** **21.340%**	Factor 3 **Professional Knowledge and Learning Ability** **17.559%**	Factor 4 **Action and Operation Skills** **13.840%**
Directiveness: Assertiveness and Use of Positional Power			0.503	
Risk Management		0.669		
Achievement Orientation – Target Setting				0.523
Achievement Orientation – Innovativeness				0.570
Operational Skills				0.756
Information Seeking				0.547
Initiative				0.498
Relationship Building	0.483			0.527

Using Varimax with Kaiser normalization, the factors converged after nine iterations, and four principal components were extracted. All factor loadings were above 0.4. Specific indicator differences are as follows:

a) Analytical Thinking (Factor 2, loading: 0.461): In the factor analysis with the eigenvalue set to 1, Analytical Thinking was grouped with the "knowledge and learning" category (see Table 4.4). However, according to the behavioral event interviews, superior volunteers believed that Analytical Thinking is not simply a personal trait but rather a competency formed after accumulating expertise. Therefore, we did not categorize Analytical Thinking under Factor 2 but under Factor 3.

b) Risk Management (Factor 2, loading: 0.669): Risk Management is a new indicator. It might be misinterpreted as a cognitive concept (similar to risk awareness), making it seem to be closer to Factor 2. However, Risk Management, in fact, is more of a skill-based operation.Thus, based on its definition and the results of behavioral event interviews, we placed it under Factor 4.

c) Relationship Building (Factor 1, loading: 0.483; Factor 4, loading: 0.527): The factor analysis results supported categorizing Relationship Building under Factor 1, which is more related to Interpersonal Understanding, aligning with Spencer's definition of "Impact and Influence" in business organizations (Spencer & Spencer, 1993). However, from the behavioral event interviews, we learned that, for rescuers, Relationship Building is more about a set of procedures and behaviors for building relationships. Therefore, we classified Relationship Building under Factor 4.

d) Self-Confidence – Dealing with Failure (Component 2, loading: 0.613): The other indicator of Self-Confidence, "Self-Confidence – Self Assurance", was placed under Factor 3 (Factor 3, loading: 0.569). Both the behavioral event interviews and the questionnaire survey indicated that the "Self-Confidence" here equals to "Self Assurance", rather than including two parts—"Self Assurance" and "Dealing with Failure"—as suggested by Zullow et al. (1988). Therefore, we removed the indicator "Self-Confidence – Dealing with Failure" and merged it with Self-Control under Factor 2.

Based on the factor analysis results and the meanings of the indicators from the interviews, we named Factor 1 "Interpersonal Communication and Influence," Factor 2 "Personal Effectiveness and Values," Factor 3 "Professional Knowledge and Learning Ability," and Factor 4 "Action and Operation Skills". Thus, we obtained a competency model for emergency rescue volunteers in china with four primary indicators, 27 secondary indicators, and 33 tertiary indicators (the tertiary indicators "Dealing with Failure" and "Self-Control" were merged after discussion), as shown in Table 4.6.

Table 4.6 Indicators of the competency model for emergency rescue volunteers in China

Primary Indicators	Secondary Indicators	Tertiary Indicators
Professional Knowledge and Learning Ability	Learning Effectiveness	Learning Effectiveness – Learning Methods
	Expertise – Depth of Knowledge	Learning Effectiveness – Learning Efficiency
	Expertise – Breadth of Knowledge	Expertise – Depth of Knowledge
	Expertise – Acquisiton of Expertise	Expertise – Breadth of Knowledge
	Expertise – Knowledge Sharing	Expertise – Knowledge Sharing
	Self-Confidence	Self-Confidence
	Directiveness: Assertiveness and Use of Positional Power	Directiveness: Assertiveness and Use of Positional Power
	Analytical Thinking	Analytical Thinking
Action and Operation Skills	Risk Management	Risk Management
	Achievement Orientation	Achievement Orientation – Target Setting
		Achievement Orientation – Innovativeness
	Operational Skills	Operational Skills
	Information Seeking	Information Seeking
	Initiative	Initiative
	Relationship Building	Relationship Building
Interpersonal Communication and Influence	Impact and Influence	Impact and Influence
	Organizational Awareness	Organizational Awareness
	Upward Communications	Upward Communications
	Obedience	Obedience
	Interpersonal Understanding	Interpersonal Understanding – Depth of Understanding Others

Primary Indicators	Secondary Indicators	Tertiary Indicators
	Life Saving Orientation	Interpersonal Understanding – Listening and Responding Others
		Life Saving Orientation – Focus on Saving Lives
		Life Saving Orientation – Initiative to Help or Serve Others
	Altruism	Altruism
	Teamwork and Cooperation	Teamwork and Cooperation
	Developing Others	Developing Others
Personal Effectiveness and Values	Rescue Cognition	Rescue Cognition
	Self-Control	Self-Control
	Flexibility	Flexibility
	Organizational Commitment	Organizational Commitment
	Accurate Self-Assessment	Accurate Self-Assessment
	Low Profile	Low Profile
	Concern for Order, Quality, and Accuracy	Concern for Order, Quality, and Accuracy

This model has four dimensions, rather than six in the Spencer model (see Table 4.7). The differences between the two models are as follows: The “Professional Knowledge and Learning Ability” dimension in this model includes indicators in the Cognitive Cluster, Managerial Cluster, and Personal Effectiveness Cluster from the Spencer model, such as “Learning Effectiveness”, “Self-Confidence”, and “Directiveness”. The dimension of “Action and Operation Skills” includes the Achievement and Action Cluster, the indicator “Risk Awareness” from the Personal Effectiveness Cluster, and the indicator “Relationship Building” from the Impact and Influence Cluster in the Spencer model. The dimension of “Interpersonal Communication and Influence” primarily includes the Impact and Influence Cluster from the Spencer model and the indicators “Team Leadership” and “Developing Others” from the Managerial Cluster. The dimension of “Personal Effectiveness and Values” includes the Personal Effectiveness Cluster from the Spencer model. The newly identified indicators in this study include “Operational Skills”, “Rescue Cognition”, “Low Profile”, and “Altruism”, among otherss. However, the indicator “Conceptual Thinking” was not included. “Safety Awareness” was expanded to “Risk Management,” and “Customer Service Orientation” was changed to “Life Saving Orientation”. A detailed analysis of the differences can be found in Chapter 5.

Table 4.7 Comparison of indicator classification between the model in this study and the Spencer model

The Spencer model		The model in this study	
Cognitive	Analytical Thinking	Professional Knowledge and Learning Ability	Analytical Thinking
	Expertise – Depth of Knowledge		Expertise – Depth of Knowledge
	Expertise – Breadth of Knowledge		Expertise – Breadth of Knowledge
	Expertise – Knowledge Sharing		Expertise – Knowledge Sharing
	Expertise – Acquisiton of Expertise		Learning Effectiveness – Learning Methods
	Conceptual Thinking		Learning Effectiveness – Learning Efficiency
Achievement and Action	Concern for Order, Quality, and Accuracy		Self-Confidence
	Achievement Orientation – Target Setting		Directiveness: Assertiveness and Use of Positional Power
	Achievement Orientation – Innovativeness	Action and Operation Skills	Risk Management
	Information Seeking		Achievement Orientation – Target Setting
	Initiative		Achievement Orientation – Innovativeness
Managerial	Teamwork and Cooperation		Operational Skills
	Team Leadership		Information Seeking
	Developing Others		Initiative
	Directiveness: Assertiveness and Use of Positional Power		Relationship Building
Impact and Influence	Relationship Building	Interpersonal Communication and Influence	Impact and Influence
	Impact and Influence		Organizational Awareness
	Organizational Awareness		Upward Communications
Helping and Human Service	Interpersonal Understanding – Depth of Understanding Others		Obedience
	Interpersonal Understanding – Listening and Responding Others		Interpersonal Understanding – Depth of Understanding Others

The Spencer model		The model in this study	
	Customer Service Orientation – Prioritizing Customer Needs		Interpersonal Understanding – Listening and Responding Others
	Customer Service Orientation – Initiative to Help or Serve Others		Life Saving Orientation – Focus on Saving Lives
Personal Effectiveness	Self-Control		Life Saving Orientation – Initiative to Help or Serve Others
	Flexibility		Altruism
	Self-Confidence – Self Assurance		Teamwork and Cooperation
	Self-Confidence – Dealing with Failure		Developing Others
	Organizational Commitment	Personal Effectiveness and Values	Rescue Cognition
	Accurate Self-Assessment		Self-Control
	Upward Communications		Flexibility
	Learning Effectiveness		Organizational Commitment
	Safety Awareness		Accurate Self-Assessment
			Low Profile
			Concern for Order, Quality, and Accuracy

4.3.2.4 CFA results

To further test the dimensional structure and reliability of the competency model, we conducted a CFA on the sample using SPSSAU. Figure 4.1 presents the standardized solution for the parameter estimates of the four competency factors. The four factors were treated as latent variables, while the competency indicators were treated as observed variables. The factor loadings of the observed variables on the latent variables ranged from 0.710 to 0.905, indicating that the observed variables explained a large portion of the variance in the latent variables with small errors, confirming that the four-dimension competency model is reliable. Therefore, we can conclude that the CFA validated the four-dimension competency model obtained from EFA as an acceptable model.

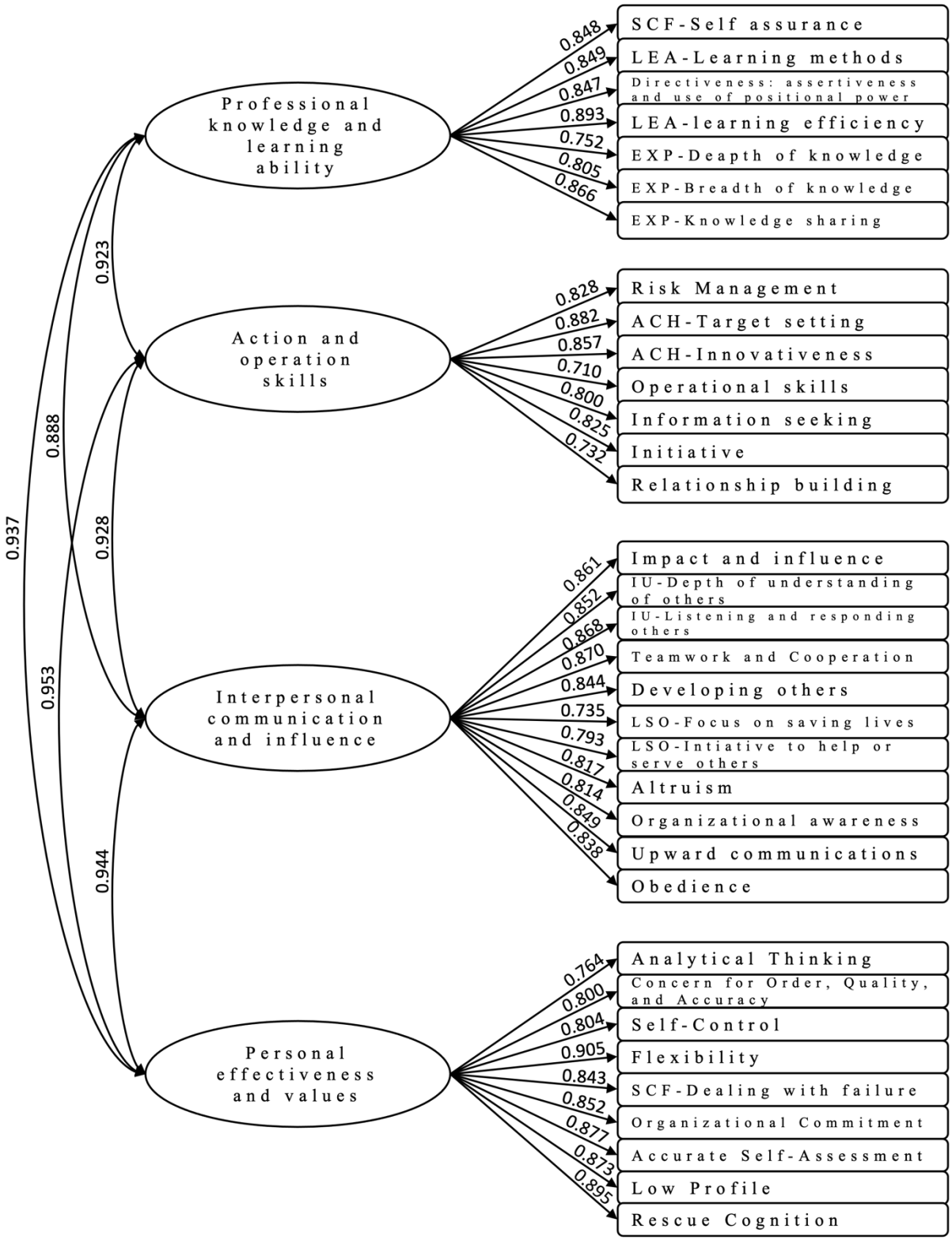

Figure 4.1 Path diagram of the four-dimension competency model in CFA

4.3.2.5 One-way ANOVA results

To further examine the competency differences among groups with different performance levels, one-way ANOVA was conducted. Prior to the ANOVA, Levene's test was employed to assess

the homogeneity of variances. The results indicated that the assumption of homogeneity was not met (significance level did not satisfy $p > 0.05$), suggesting that the competency variances were not homogeneous or that data distribution skewness rendered Levene's test results unreliable. Therefore, we employed two robust test methods—Welch and Brown-Forsythe tests—both of which yielded significant results ($p < 0.01$), meeting the criterion of $p < 0.05$.

The one-way ANOVA results demonstrated that competency scores differed significantly across the three performance groups, $F(2,186) = 94.205$, $p = 0.000$. Post hoc multiple comparisons were performed using the LSD method. The results showed that the superior group scored significantly higher in competency than the underperformance group ($p = 0.000$, mean difference = 2.04), and slightly higher than the average group ($p = 0.000$, mean difference = 0.59). Additionally, the average group scored significantly higher than the underperformance group ($p = 0.000$, mean difference = 1.45). Considering the heterogeneity of variances, Tamhane's T2 test was employed for further post hoc multiple comparisons, and the results were consistent with the above findings. This confirms that the differences in competency across these performance groups were statistically significant. We also conducted the same analysis for each of the four competency dimensions, and the results indicated significant differences in competency scores across different performance groups for each dimension. Details are shown in Table 4.8.

Table 4.8 One-way ANOVA results

Competency	Sum of Squares	*df*	Mean Square	F	Sig.
Professional Knowledge and Learning Ability	138.295	2	69.148	95.863	0.000
Action and Operation Skills	109.831	2	54.916	69.118	0.000
Interpersonal Communication and Influence	96.816	2	48.408	65.918	0.000
Personal Effectiveness and Values	147.459	2	73.729	87.767	0.000
Overall competency	96.816	2	48.408	65.918	0.000

4.4 The competency model diagram

Based on the results of the model construction and validation, we produced a diagram of the four-dimension competency model (see Figure 4.2). We name this model the "PAIP four-dimension competency model", abbreviated as "the PAIP model" or "the four-dimension model". The first factor is Professional Knowledge and Learning Ability (PKL), the second factor is Action and Operation Skills (AOS), the third factor is Interpersonal Communication and Influence (ICI), and the fourth factor is Personal Effectiveness and Values (PEV).

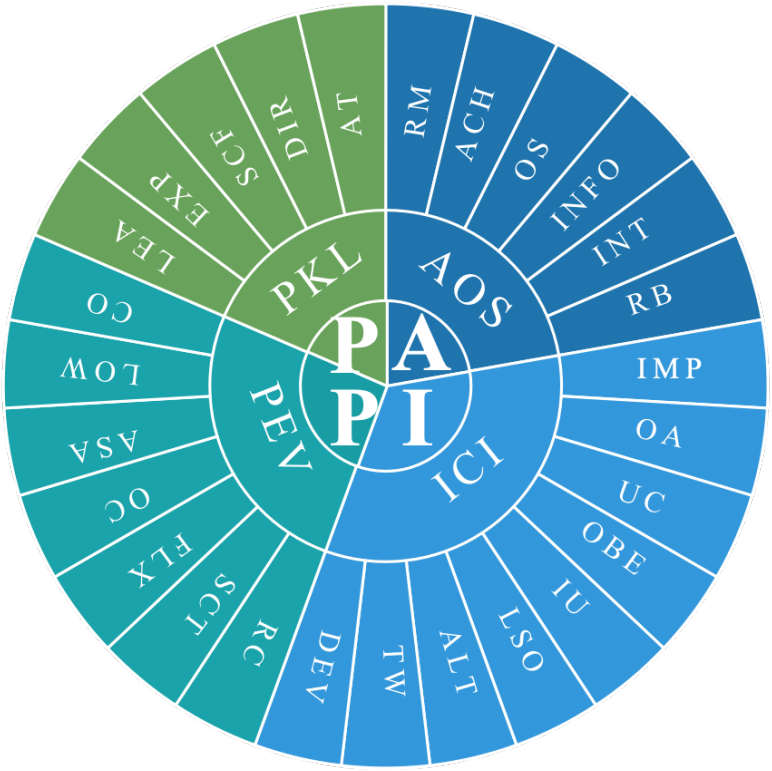

Figure 4.2 PAIP four-dimension competency model diagram

Note: ACH = Achievement Orientation; ALT = Altruism; AOS = Action and Operation Skills; ASA = Accurate Self-Assessment; AT = Analytical Thinking; CO = Concern for Order, Quality, and Accuracy; DEV = Developing Others; DIR = Directiveness: Assertiveness and Use of Positional Power; EXP = Expertise; FLX = Flexibility; ICI = Interpersonal Communication and Influence; IMP = Impact and Influence; INFO = Information Seeking; INT = Initiative; IU = Interpersonal Understanding; LEA = Learning Effectiveness; LOW = Low Profile; LSO = Life Saving Orientation; OA = Organizational Awareness; OBE = Obedience; OC = Organizational Commitment; OS = Operational Skills; PEV = Personal Effectiveness and Values; PKL = Professional Knowledge and Learning Ability; RB = Relationship Building; RC = Rescue Cognition; RM = Risk Management; SCF = Self-Confidence; SCT = Self-Control; TW = Teamwork and Cooperation; UC = Upward Communications.

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Chapter 5: Discussion and Conclusions

In this chapter, we will review the research objectives and questions, compare and discuss the results, and elaborate on the managerial implications of the findings from the perspectives of policy makers, organizational managers, and rescue volunteers. Finally, we will present the theoretical contributions, limitations, and future prospects of the research.

5.1 Research overview

Since the concept of competency was proposed over six decades ago, the relationship between competency and performance has been confirmed by numerous studies. The competency model was proposed over 30 years ago, and the competency modeling movement led to its widespread application in organizations such as businesses and the military. However, research in public welfare emergency rescue organizations is quite limited, especially regarding whether the competency model is applicable in the field of public welfare rescue, what are the competencies of emergency rescue volunteers, and how these competencies are defined and measured, all of which are research gaps in this area. This study contributed by addressing these theoretical and practical questions.

Against this background, the aim of this study is to construct and validate a competency model for emergency rescue volunteers and to develop a scale for measuring these competencies. The research objectives are fourfold: 1) to construct a competency model for emergency rescue volunteers, 2) to validate this model, 3) to develop a competency scale for emergency rescue volunteers, and 4) to compare different competency models. Correspondingly, this study addresses two research questions: RQ1 “What are the key competencies of emergency rescue volunteers?” and RQ2 “To what extent is the competency model for emergency rescue volunteers valid, in distinguishing superior performance from average performance?”. We answered the first question through literature review and behavioral event interviews and addressed the second question through model validation using questionnaire survey data. A brief review of the findings is provided as follows.

5.1.1 Competencies of emergency rescue volunteers

In Chapter 1, we proposed the first research question, RQ1 "What are the key competencies of emergency rescue volunteers?". To address this question, we need to answer three sub-questions: What are the key competency characteristics? What are the behavioral descriptions of each key competency characteristic? Do these competency characteristics and behavioral descriptions align with the realities of public welfare emergency rescue teams?

Based on the results from Sections 4.2 and 4.4, the competencies of the emergency rescue volunteers in China are categorized under four factors: Professional Knowledge and Learning Ability (PKL), Action and Operation Skills (AOS), Interpersonal Communication and Influence (ICI), and Personal Effectiveness and Values (PEV).

According to the results in Sections 4.2 and 4.4, these competency characteristics are described by 27 behavioral descriptions (secondary indicators). Specifically, the PKL factor includes five secondary indicators, the AOS factor includes six secondary indicators, the ICI factor includes nine secondary indicators, and the PEV factor includes seven secondary indicators.

As these competency characteristics and behavioral descriptions were derived from interviews with superior frontline volunteers and from the analysis of high-frequency indicators in validated literature (see Sections 4.2 and 4.3.1.4), they align with the actual rescue scenarios of public welfare emergency rescue teams.

5.1.2 Validity of the competency model for emergency rescue volunteers

The second research question proposed in Chapter 1 is: RQ2 "To what extent is the competency model for emergency rescue volunteers valid, in distinguishing superior performance from average performance?" Addressing this question requires answering two sub-questions: Is the constructed competency model applicable in other regions of China? Is this model valid to distinguish between superior volunteers and average volunteers in terms of rescue performance?

The validation results in Section 4.3.2.4 showed that this competency model is valid in other regions of China. The model, constructed based on the Sichuan Blue Sky Rescue Team, was supported by the data from 70 rescue teams across Eastern, Southern, Western, and Northern China.

According to the validation results in Section 4.3.2.5, this competency model can distinguish between different levels of performers. The sample of superior performers exhibited significant differences compared to the sample of average performers across all four

competency dimensions: Professional Knowledge and Learning Ability (PKL), Action and Operation Skills (AOS), Interpersonal Communication and Influence (ICI), and Personal Effectiveness and Values (PEV).

5.2 Comparison and discussion of the PAIP model and the Spencer model

The PAIP model, developed and validated in this study, is primarily based on the framework of the Spencer model. Of the 27 secondary indicators in the PAIP model, 20 are consistent with or closely align with those in the Spencer model (e.g., Life Saving Orientation is similar to Customer Service Orientation). However, seven indicators in the PAIP model are not found in the Spencer model, and the meanings of the other 20 indicators differ from those in the Spencer model to some extent. Furthermore, the most significant difference between the two models lies in the classification of the secondary indicators. The primary indicators in the PAIP model are under four factors, rather than six in the Spencer model. In the following, we will discuss the classification of the indicators and their meanings.

5.2.1 Indicator classification

In Chapter 4, we made a preliminary comparison between the PAIP four-dimension model and Spencer's six-dimension model (see Table 4.7). The PAIP model includes seven indicators that are not found in the Spencer model, while the different classifications of the other 20 indicators can be owed to different application contexts. In the following, we will discuss these differences based on statistical data and rescue scenarios.

The factor analysis results supported including Learning Efficiency and Expertise under Factor 3, which aligns with the Spencer model, which classified these indicators under the primary indicator Cognitive Cluster. Analytical Thinking was not classified into Factor 3, but when we performed a factor analysis using samples of superior performers (those with performance scores of 5 or above), the results showed that Analytical Thinking, Learning Efficiency, and Expertise all fell under the same factor. This suggests that Analytical Thinking is an important cognitive ability for superior performers. Similarly, Spencer and Spencer (1993) posits that both Analytical Thinking and Conceptual Thinking are intellectual processes to apply knowledge. Therefore, we classified Analytical Thinking into Factor 3.

Rescue Cognition fell under Factor 2 (Personal Effectiveness Cluster) instead of Factor 3 (Cognitive Cluster). According to the discussion on the definition of Rescue Cognition, this cognition refers to an ideological cognition—a value-based understanding—distinct from the

knowledge cognition in Factor 3 (Cognitive Cluster). Therefore, based on the factor analysis results, we classified Rescue Cognition into Factor 2. Consequently, Factor 3, which initially included cognitive competencies, was renamed "Professional Knowledge and Learning Ability".

Most of the competencies under Factor 2 (Personal Effectiveness Cluster) were supported by the results from the factor analysis. However, the two dimensions of Self-Confidence showed different results. The first dimension of Self-Confidence, Self Assurance, was classified under Factor 3 (Professional Knowledge and Learning Ability), while the second dimension, Dealing with Failure, remained under Factor 2 (Personal Effectiveness Cluster). Upon revisiting this issue, we found that Self-Confidence – Self Assurance was clearly defined and consistently categorized as part of Personal Effectiveness in previous studies, including Spencer and Spencer (1993). However, these authors also noted that self-concepts lie between knowledge and traits, and that self-confidence can be changed through training, psychological therapy, and positive developmental experiences. That explains the relationship between self-confidence and professional knowledge. In the behavioral event interviews, nearly all interviewees believed that self-confidence in the rescue field is built upon professional knowledge. They emphasized that rescue is a scientific practice, which cannot be based on blind self-confidence, suggesting a close relationship between self-confidence and professional knowledge. This perspective also applies to the competency of Directiveness: Assertiveness and Use of Positional Power. Respondents pointed out that directiveness is not about management but about using positional power based on knowledge. This view was supported by factor analysis data, as shown in Table 4.5, where the indicator Directiveness: Assertiveness and Use of Positional Power was classified under Factor 3 (Professional Knowledge and Learning Ability). Therefore, considering that the second dimension of Self-Confidence, Dealing with Failure, shares similar meaning with the indicator of Self-Control, we merged them and retained the name "Self-Control". The first dimension of Self-Confidence, Self Assurance, was classified into Factor 3 (Professional Knowledge and Learning Ability), with its name remained as Self-Confidence.

Risk Management: The behavioral descriptions of this competency in the scale are related to the Flexibility in the Personal Effectiveness Cluster, which aligns with the factor analysis results. That is also why Spencer and Spencer (1993) categorized Safety Awareness as part of the Personal Effectiveness Cluster. However, in the rescue field, risk management is more than just safety awareness—it emphasizes action and operation skills for managing risks. Therefore, we retained Risk Management under Factor 4 (Achievement and Action Cluster), and this factor was renamed "Action and Operation Skills".

Concern for Order, Quality, and Accuracy: The behavioral descriptions of this competency include self-management and managing work-related mistakes. That made respondents view it as more of a personal effectiveness requirement, which aligns with the factor analysis results. Therefore, Concern for Order, Quality, and Accuracy was moved from the Action and Operation Skills Cluster to the Personal Effectiveness Cluster.

Based on the above analysis, competencies such as Rescue Cognition, Self-Control, Flexibility, Organizational Commitment, Accurate Self-Assessment, Low Profile, and Concern for Order, Quality, and Accuracy were classified under Factor 2, which was then renamed "Personal Effectiveness and Values".

Relationship Building: This indicator was classified under Factor 4 (Action and Operation Skills), but the estimate of its correlation with Factor 1 was 0.488, which is close to 0.5 and does not differ much from the estimate of 0.527 with Factor 4. Furthermore, considering the indicator's definition, which is closer to impact and influence, we decided to retain Relationship Building under Factor 1.

In Factor 1, we included competencies from the Impact and Influence Cluster in addition to the Helping and Rescue Service Cluster and the Managerial Cluster.

Helping and Rescue Service Cluster includes Obedience, Interpersonal Understanding, Life Saving Orientation, and Altruism. According to the factor analysis results, both the Helping and Rescue Service Cluster and the Impact and Influence Cluster were classified into Factor 1. The Helping and Rescue Service Cluster is called "Helping and Human Service" in the Competency Dictionary, also known as "Customer Service Orientation". However, the Competency Dictionary mostly targeted corporate employees and clients, whereas this study's focus is on public welfare rescue volunteers and those in need of rescue. These two groups differ in terms of proactivity and passivity. Rescue volunteers are more concerned with professional and technical issues and do not base their actions entirely on the willingness of the person in need of rescue, making "Customer Service Orientation" less prominent in this context. Moreover, Spencer and Spencer (1993) emphasized that competencies such as Interpersonal Understanding also serve to strengthen the compatencies in the Impact and Influence Cluster and the Managerial Cluster. Their research showed that the Managerial Cluster consists of a special set of competencies within the Impact and Influence Cluster. In other words, the Helping and Rescue Service, Impact and Influence, and Managerial Clusters belong to a broader category. Thus, we took into account the factor analysis results and classified all these clusters into Factor 1, renaming it as "Interpersonal Communication and Influence".

Directiveness: Assertiveness and Use of Positional Power: As discussed earlier, we

classified this indicator under Factor 3 (Professional Knowledge and Learning Ability).

5.2.2 Defining the dimensions

In the previous sections, we obtained and validated the PAIP four-dimension competency model. The four competency categories—"Professional Knowledge and Learning Ability," "Action and Operation Skills," "Interpersonal Communication and Influence," and "Personal Effectiveness and Values"—represent the competency combinations of professional rescue volunteers in China's public emergency rescue. Particularly, the specific competency indicators embody the motives and behaviors of public welfare rescue operations and provide theoretical tools for the behavioral descriptions and measurements of these abstract competencies. They also offer a theoretical reference and operational methods for talent identification, selection, and training within public rescue teams. However, the meanings of some of the indicators differ from those in the Spencer model. In the following, we will elaborate on these differences in detail.

5.2.2.1 Professional Knowledge and Learning Ability

"Professional Knowledge and Learning Ability" reflects the fundamental competencies of emergency rescue volunteers in carrying out rescue missions. In both the iceberg model and the onion model, knowledge is considered the most basic and surface-level competency. This study has validated this perspective. However, these theoretical models view knowledge as a static entity, failing to explain its sources and impacts. According to the validation results of this study, "Expertise" is associated with "Learning Effectiveness," "Self-Confidence," and "Directiveness: Assertiveness and Use of Positional Power", and these indicators have been confirmed as components of a single factor.

In Spencer and Spencer (1993), "Learning Effectiveness" and "Self-Confidence" are categorized under the "Personal Effectiveness Cluster", treating them as personality traits. However, this classification cannot explain why the confidence levels of rescue volunteers change over time—for instance, interviews revealed that rescue volunteers with superior performance often start with low self-confidence but later develop strong and sustained self-confidence. Similarly, "Directiveness: Assertiveness and Use of Positional Power" is classified under the "Managerial Cluster" in Spencer's framework; however, many superior rescue volunteers without management roles exhibit this trait, and their performance shows an association with expertise. These discrepancies indicate gaps in existing research, where certain competencies may be misclassified or left unexplained. That could lead to the oversight of key

competencies in talent selection, as rescue positions differ from management roles.

This study revealed the relationship between these competencies and Expertise and showed how these competencies are acquired.

"Learning Effectiveness" and "Expertise": Emergency rescue is a complex and high-risk task that demands personnel with strong comprehensive capabilities. Expertise, particularly continuously updated expertise, is essential in this field. The relationship between "Learning Effectiveness" and "Expertise" reflects the dynamic and principle-based nature of the expertise of rescue volunteers. Interviews with superior rescue volunteers indicated that, beyond the professional knowledge obtained from routine training, they need to acquire more profound knowledge through continuous learning, diverse learning approaches, reflective reviews, external exchanges, and participation in competitions. This ability enables them to gain more expertise and achieve higher performance. For example, from the interviews with water rescue volunteers, we found that volunteers with only basic expertise relied solely on "grappling hooks" to search for victims; in contrast, volunteers possessing both "Expertise" and "Learning Effectiveness" were more likely to acquire the knowledge of "sonar search" through continuous learning, significantly improving search efficiency and success rates. They attributed this to the idea that "possessing knowledge is important, but the ability to acquire more knowledge through learning is even more critical". Furthermore, Expertise is fundamentally based on principles. Behavioral event interviews suggested that Expertise should be acquired through "principle-based learning," which allows rescue volunteers to operate more "smartly".

"Self-Confidence" and "Expertise": Traditional perspectives consider Self-Confidence a personal trait. Existing studies have categorized it under the Personal Effectiveness Cluster, defining it as an individual's belief in his or her ability to complete a task. However, in rescue operations, professional rescue volunteers cannot rely on mere bravado or empty assurances to demonstrate self-confidence, as their actions affect the success of a mission and even the safety of themselves and their teammates. As a result, rescuer are generally cautious and even "risk-averse." Their self-confidence is typically established based on a solid foundation of expertise. Once they acquire expertise, especially updated and more effective expertise, they will demonstrate significantly stronger self-confidence. During the behavioral event interviews, nearly all interviewees disagreed with the label "Courage and Self-Confidence" as a competency. They argued that self-confidence stems from expertise rather than courage. Furthermore, in the measurement scale, the items for Self-Confidence included not only "Self Assurance" but also "Dealing with Failure." The research of Spencer and Spencer (1993) supported Zullow et al.'s view that Self-Confidence consists of these two dimensions (Zullow

et al., 1988). However, both behavioral event interviews and factor analysis in this study indicated that the second dimension, “Dealing with Failure”, is not a manifestation of self-confidence but is more closely related to stress resistance. That is why we classified “Dealing with Failure” under “Self-Control.”

“Directiveness (Assertiveness and Use of Positional Power)” and “Expertise”: Similar to “Self-Confidence”, “Directiveness: Assertiveness and Use of Positional Power” is also an outcome of “Expertise.” Although this view was only supported by the restuls of behavioral event interviews, without data to clearly support the causal relationships (which is not the focus of this study), the factor analysis results confirmed their correlation, and thus, we categorized them under the same factor. This finding suggests that “Directiveness: Assertiveness and Use of Positional Power”, along with “Self-Confidence”, is not a personality trait. It highlights that in the cultivation of rescue volunteers, developing this competency is more valuable than merely identifying it. That is because individuals who are identified to be naturally decisive do not necessarily possess the “professional decisiveness” required for handling emergency rescue situations or the ability to issue effective commands. Instead, this competency must be cultivated through continuous learning for expertise acquisition, rescue competitions and drills, and accumulated experience from real rescue missions.

“Analytical Thinking” reflects the cognitive abilities of emergency rescue volunteers. The Spencer model includes both Analytical Thinking and Conceptual Thinking as competencies. While the former applies to rescue operations, the latter is applicable to research fields. This study supports Analytical Thinking as a competency in the rescue field but does not support the relevance of Conceptual Thinking.

5.2.2.2 Action and Operation Skills

“Action and Operation Skills” reflect the practical skills of emergency rescue volunteers to execute rescue missions. However, the “skills” here iss different from the single-concept “skill” described in the iceberg model. Instead, it comprises a set of integrated skills necessary for accomplishing rescue tasks, including equipment operation, risk management, and relationship building.

The data in this study supports the idea that these skills form a composite competency set, which provides a clear depiction of the rescue scene. Typically, rescue missions begin when a distress signal is received or when the government issues a coordinated rescue task. At this stage, various teams will actively seek opportunities to participate. Once a task is assigned to a rescue team, individual team members need to proactively sign up to join the mission. This

aspect is the “Initiative” in this competency set. After the task is assigned, team members must gather online and offline information to facilitate mission assessment, which requires the competency of “Information Seeking”. Subsequently, the rescue team must coordinate various on-site relationships, conduct risk assessments, and establish plans. These involve “Relationship Building”, “Risk Management”, and the “Target Setting” aspect of “Achievement Orientation”.

“Risk Management” is a critical competency for rescue personnel. A key contribution of this study is the identification and definition of this competency, as well as its refinement and integration into the competency model. While scholars from Taiwan, India, and other regions have previously mentioned this competency, their research has only validated some individual aspects, such as risk identification. This study enriched the connocation of this competency and provided a measurable scale for its assessment.

“Relationship Building” was classified under the “Impact and Influence Cluster” by Spencer and Spencer (1993). However, this study found such classification inappropriate for rescue personnel. The “Impact and Influence Cluster” emphasizes motives—the intent to actively make an influence and establish relationships. However, rescue missions are different from business operations. In the rescue context, relationship building is more of a behavioral process than a motive. This behavior includes obtaining on-site information, securing access to equipment and energy sources, obtaining authorization, and gaining external support. These actions are accomplished through forming “organizational relationships” with relevant stakeholders.

In addition to these two findings, this study also validated other competencies in this category, including “Achievement Orientation,” “Operational Skills,” “Information Seeking,” and “Initiative.” These results align with the Spencer model.

5.2.2.3 Interpersonal Communication and Influence

“Interpersonal Communication and Influence” reflects the organizational and social nature of the competencies within the field of public welfare rescue. The organizational nature means that these competencies are related to a rescue volunteer’s relationship with his or her team or organization. That includes competencies such as “Teamwork and Cooperation”, “Developing Others”, “Organizational Awareness”, “Upward communications”, “Interpersonal Understanding”, “Impact and Influence”, and “Obedience”. The social nature means that these competencies are not driven by commercial motives but are instead rooted in public welfare motives. Such competencies include “Life Saving Orientation” and “Altruism”.

This study validates the competency set related to "Interpersonal Communication and Influence" and identified new competencies, including "Upward Communications", "Obedience", and "Altruism". Additionally, it revised a competency that is suitable for business organizations but not for rescue organizations—"Customer Service Orientation" was renamed as "Life Saving Orientation", with modifications to its definition and behavioral descriptors.

5.2.2.4 Personal Effectiveness and Values

"Personal Effectiveness and Values" reflect both the public welfare nature and the contradictory nature of emergency rescue volunteering. The public welfare nature refers to that emergency rescue volunteers engage in non-remunerated public service, requiring them to dedicate their time and financial resources, or even risk their lives. The value system of public welfare differs significantly from that of business organizations. The public welfare aspect encompasses competencies such as "Rescue Cognition", "Organizational Commitment", and "Low Profile." The contradictory nature refers to that many competencies of emergency rescue volunteers may appear contradictory. However, superior volunteers are able to balance and embody these seemingly contradictory competencies, such as "Self-Control" and "Flexibility", "Accurate Self-Assessment" and "Self-Confidence", as well as "Concern for Order, Quality, and Accuracy" and "Obedience".

"Rescue Cognition" reflects the principles and core values underlying rescue work. Unlike commercial settings that emphasize a "customer-oriented" approach, emergency rescue is "task-oriented", fostering values such as safety awareness, self-protection in rescue, respect for life, and awe for life. The interviews in this study revealed that differences in these cognitive aspects impact volunteers' motives, which in turn affect their behaviors and performance. However, unlike expertise, this "cognition" cannot be acquired through short-term learning or easily changed; the development of such cognition requires "long-term advocacy", "real-life case demonstrations", and "personal experiences".

"Organizational Commitment" reflects rescue volunteers' loyalty, oneness, and voluntary spirit. Identifying these competency elements is crucial for selecting suitable volunteers in practice. The interviews in this study revealed that the high turnover rates in many rescue teams were related to deficiencies in this competency.

"Low Profile" reflects the confidentiality and social impact of rescue missions. Rescue teams' information dissemination is clearly and strictly regulated, and individuals who lack the characteristic of "Low Profile" may compromise the success of rescue missions. Publicizing sensitive details could lead to conflicts between the victims' families and rescue personnel, as

well as problems such as “cyber violence” due to misunderstandings from society.

“Self-Control” is critical in addressing the stress associated with rescue missions. Rescuers not only endure the physical stress caused by prolonged high-intensity and high-stakes rescue operations but also face distressing sights such as severed limbs and decomposed bodies, as well as emotional stress steming from victims’ families. This competency can assist with identifying individuals with strong resilience to stress.

“Accurate Self-Assessment” highlights the rigor required in rescue work. Unlike professional teams, volunteer teams for public welfare rescue are not fixed. That is because the volunteers have their primary occupations, and they vary in terms of availability, financial resources, skills, knowledge, and even values. Since volunteers’ participation in public welfare rescue is based on self-registration and approval by the team, both team managers and volunteers must have strong abilities to assess the applicants’ competencies. Moreover, even after being selected into a team, volunteers must conduct “Accurate Self-Assessment” when they face risks in rescue mission or different task choices. This competency significantly influences the success of rescue operations and even personal safety.

“Concern for Order, Quality, and Accuracy” reflects the rational characteristics of rescue personnel. Although categorized as a competency in Personal Effectiveness Cluster, it is closely linked to rationality. “Concern for Order” reflects the meticulous planning of rescue missions and individuals’ structured and rational thinking. “Quality” represents the high-intensity and high-quality efforts demanded in every rescue operation, as well as the pursuit of quality in both rescue plans and procedures. “Accuracy” underscores the need for accurate and precise information in rescue operations, including environmental data such as weather, hydrology, and target parameters, as well as accurate eyewitness descriptions, surveillance footage, and on-site evidence.

5.3 Comparison of the PAIP model with other competency models

In Chapter 2, we conducted a literature review of representative competency models and categorized them into three categories: 1) three-dimension models (e.g., KSA and KSAO models), 2) two-layer models (e.g., the iceberg model and the onion model), and 3) multi-dimensional models (e.g., WoW model and the Great Eight model). Therefore, in addition to the comparation with the Spencer model presented earlier, the comparision of the PAIP model with other models is also necesssary.

5.3.1 Comparison with the KSA model and the KSAO model

Both the KSA model and the KSAO model are three-dimension models. The difference between the PAIP model and these models does not merely lie in the number of factors (one additional factor in PAIP) but also in the different definitions of competency.

On the surface, the PAIP model differs from the KSA model in terms of the number of factors—the PAIP model adopts a four-dimension structure, whereas the KSA model consists of three factors. However, the core difference lies in the inclusion of the motive factor in the PAIP model. This discrepancy arises primarily from the difference in competency's definition. This study adopts the definition of competency proposed by Spencer and Spencer (1993), which emphasizes the motive factor. As a result, when extracting competency indicators, the PAIP model interprets and selects behavioral indicators from the perspective of motives. This distinction is both valid and valuable. The PAIP model has been empirically validated, enriching the evaluation dimensions of competency models.

Although the PAIP model and the KSAO model both appear to have four factors, the fundamental nature of the KSAO model remains that of a three-dimension model, similar to the KSA model. The key difference is that the KSAO model categorizes competencies that do not fit into knowledge, skills, or attitudes under the category of "others". This approach is essentially a simple classification and listing method that does not reveal the internal relationships among the competency indicators. In contrast, the PAIP model managed to achieve that, which was enabled by the following three: 1) Attention was paid to exploring the underlying motives behind events during behavioral event interviews; 2) interviewees explained the relationships between certain indicators (e.g., the relationship between knowledge and learning, and between knowledge and authority establishment); and 3) factor analysis wass performed to validate these relationships, and indicators were classified accordingly).

5.3.2 Comparison with the iceberg model and the onion model

Both the iceberg model and the onion model are two-layer models. The PAIP model also includes surface-level and underlying-level competencies, yet it differs from the iceberg model and the onion model in certain ways. In the following, we compare the PAIP model with the iceberg model and the onion model separately.

- Comparison with the iceberg model

The first layer of the PAIP model, Professional Knowledge and Learning Ability (PKL), and the second layer, Action and Operation Skills (AOS), correspond to the layers of knowledge

and skills in the iceberg model, respectively. These factors are on the surface level, meaning they are relatively easier to develop and can be improved through training. The third layer, Interpersonal Communication and Influence (ICI), and the fourth layer, Personal Effectiveness and Values (PEV), correspond to the self-concept, traits, and motives of the iceberg model, which are below the surface and are more difficult to assess and develop. Therefore, the PAIP model and its measurement scale show better applicability to talent identification.

- Comparison with the onion model

The factors of Professional Knowledge and Learning Ability (PKL) and Action and Operation Skills (AOS) in the PAIP model correspond to the knowledge and skill layers of the onion model, representing its outermost layer. The factor Interpersonal Communication and Influence (ICI) in the PAIP model corresponds to the onion model's intermediate layer, which includes self-concept, attitudes, and values. The factor Personal Effectiveness and Values (PEV) aligns with the core layer of the onion model, which consists of traits and motives. According to the results of the one way analysis of variance (one-way ANOVA) presented earlier, superior performers significantly outperformed average performers in both the outermost layer and the core layer of the onion model. However, there was no significant difference between the two groups in the middle layer. This suggests that superior volunteers are task-oriented and knowledge-driven, with distinctive personal traits and motives. However, these two groups did not show significant differences in self-concept, attitudes, and values.

5.3.3 Comparison with the WoW model and the Great Eight model

Both the WoW model and the Great Eight model are multi-dimensional models. These two models consist of multiple factors, differing greatly from the PAIP model. The main differences stem from research objectives (the WoW model) and research pathways (the Great Eight model).

Comparison of the PAIP model with the WoW model: The WoW model focuses on the factors influencing job performance, including job competency, occupation competency, goal competency, and role competency. In particular, job competency refers to a set of general and fundamental handling abilities that contribute to achieving expected performance results or outcomes. The PAIP model places greater focus on the job competency domain of the WoW model and further refines it into four distinct factors. This difference arises from varied research objectives of the two models: the purpose of this study is to construct a competency model for emergency rescuers and apply it to address human resource issues, whereas the WoW model was developed to explore the relationship between performance and competency.

Comparison of the PAIP model with the Great Eight model: Similar to the WoW model, the Great Eight model aims to explore the relationship between performance and competency. However, different from the WoW model, the Great Eight model establishes eight competencies based on the process of performance generation, forming a "competency chain" that extends from decision-making to performance outcomes. In contrast, the PAIP model focuses more on identifying key competencies and was constructed using a process of extraction followed by validation.

5.4 Managerial implications

This study established a competency model for emergency rescue volunteers in China. It was validated through multi-sample, multi-regional, and multi-team data. We obtained four key findings with practical value. 1) The PAIP model can be applied to rescue teams for volunteer management. 2) The PAIP model identifies competencies associated with superior performance and those related to average performance, and thus, it can be used for the formulation of professional qualification policies. 3) The PAIP competency scale can be applied to competency measurement. In the following section, we will provide managerial recommendations from the perspectives of policy makers, organizational managers, and volunteers.

5.4.1 Policy makers

The Ministry of Emergency Management of China supervises social emergency rescue organizations in China and is responsible for formulating policies related to the capacity building of social emergency rescue forces. It has successively issued the *Occupational Skill Standards for Emergency Rescuers*, the *Basic Norms for the Construction of Social Emergency Rescue Forces*, and the *Implementation Measures for the Classification and Grading Evaluation of Social Emergency Forces (Trial)*. However, these policies primarily focus on the macro-management of emergency rescue teams, lacking specific guidance on the management of emergency rescue volunteers. Therefore, we recommend that government authorities take the research findings based on the competency model for emergency rescue volunteers as a reference to formulate policies related to the admission, assessment, and exit of emergency rescue volunteers and teams. The specific recommendations are as follows:

1) Establish competency standards for emergency rescue volunteers. Currently, there is a lack of regulatory documents for the admission of emergency rescue volunteers. Most emergency rescue volunteer organizations follow the *Occupational Skill Standards for*

Emergency Rescuers, which primarily targets professional personnel such as government firefighters and corporate rescuers, including the professionals engaged in the prevention and preparedness of emergencies, the rescue of affected individuals and public or private property, and the coordination of self-rescue, mutual rescue, and post-rescue efforts (MEMPRC, 2019). However, volunteers are non-professional and non-employed personnel, and their competency requirements differ from those of the professionals. A targeted standard should be established by integrating the *Occupational Skill Standards for Emergency Rescuers* with the research findings based on the PAIP model.

2) Diversify the assessment methods for emergency rescue volunteers. The *Occupational Skill Standards for Emergency Rescuers* stipulates that the "occupational competency characteristics" of emergency rescuers primarily include general intelligence, normal color vision, stable psychological quality, coordinated movements, flexible fingers, a certain degree of spatial awareness, computational ability, and expressive ability (MEMPRC, 2019). However, in practice, the actual assessments focus mainly on emergency rescue knowledge and operational skills. These knowledge and skills can be "mastered" through short-term training courses prior to the assessment, while some underlying threshold indicators are not evaluated, leading to a lack of rigor in qualification admission. Therefore, we suggest that policy makers consider incorporating the competency indicators of the PAIP model into occupational skill standards. In addition to knowledge tests, assessments should also include interviews or leaderless group discussions based on the PAIP model and its measurement scales.

3) Raise the admission threshold for emergency rescue volunteers. The current admission threshold is relatively low. The assessment primarily includes educational background and basic knowledge, and the requirements are minimal, considering a high school education level sufficient. Given that the annual number of volunteer applications in China is huge and continues to increase (T. Yang & Zhu, 2022), raising the admission threshold can improve management efficiency and enhance the overall quality of emergency rescue volunteers. Furthermore, emergency rescue volunteers perform life-threatening tasks, similar to those of professional firefighters. In recent years, the sacrifices of firefighters in China have increasingly involved younger personnel. Liu (2020) posits that this trend is related to the low admission threshold, and therefore, it is necessary to further raise the entry requirements.

4) Introduce guidance on the training of emergency rescue volunteers. Currently, the training primarily focuses on occupational qualifications to get emergency rescuers prepared for the occupational assessment, covering only related knowledge and skills, whereas other aspects of the competency model are not included. Additionally, the trainings are relatively

short, typically consisting of two to three days of intensive training and assessment conducted by occupational qualification certification institutions. We recommend that guidelines should be developed based on the PAIP model to address multiple dimensions, including knowledge, skills, and rescue cognition, to provide planning and implementation guidance for the training of rescue teams.

5) Establish an admission and exit mechanism for emergency rescue volunteer teams. Currently, emergency rescue teams are registered as social organizations with the Ministry of Civil Affairs, but there is a lack of a structured admission and exit mechanism. Although the government has issued the *Implementation Measures for the Classification and Grading Evaluation of Social Emergency Rescue Forces (Trial)*, this measure primarily evaluates the daily management, equipment configuration, and professional capabilities of social emergency rescue forces (MEMPRC, 2024). We suggest incorporating competency assessments for volunteers into the grading evaluation system and developing mechanisms for the admission and exit of teams based on the evaluation results.

5.4.2 Organizational managers

Organizational managers primarily refer to the emergency rescue volunteer organizations in China, such as public welfare rescue foundations, volunteer associations, and volunteer rescue teams. At present, these organizations lack scientific and systematic tools for managing emergency rescue volunteers. However, every year, they face significant tasks related to volunteer application assessments, trainings, and promotion or elimination decisions. Based on the findings of this study, we suggest the following measures to address this challenge:

1) Integrate the PAIP competency model into volunteer management. This model can be applied to the recruitment and selection, training and development, and promotion assessment of emergency rescue volunteers, which will assist with establishing standardized procedures, thereby enhancing management efficiency.

2) Apply the PAIP model to the promotion assessments for emergency rescue volunteers to identify high-potential individuals.

3) Develop tools such as interview assessment guide and training outcome assessment forms based on the PAIP competency scale.

The *Basic Norms for the Construction of Social Emergency Rescue Forces – Part 1: General Requirements* states that social emergency rescue forces should have clear management systems for the recruitment, training, promotion, rewards, punishments, and exit of personnel (MEMPRC, 2022a). Based on that, we provide specific recommendations for

applying the PAIP model in volunteer management such as recruitment, training, and promotion.

1) Recruitment management. The behavioral event interviews in this study revealed that many teams still rely on "reviewing applications" as their primary recruitment assessment method. This can result in admission of unqualified volunteers, increasing volunteer management difficulties. Some teams have started raising selection criteria, such as increasing the minimum educational requirement from high school to college. However, a higher level of education does not necessarily equate to better skills. Other teams use IQ tests for selection. However, as McClelland (1973) pointed out early on, intelligence cannot substitute competency. Some teams prioritize applicants who are passionate about public welfare, yet emergency rescue is a highly risky activity that requires not only enthusiasm but also meticulousness and professionalism. These qualities can be assessed using the PAIP model's indicators such as "Concern for Order, Quality, and Accuracy", "Operational Skills", and "Risk Management". Additionally, some teams prefer applicants with extensive rescue knowledge, but our research on superior rescue volunteers shows that among individuals with similar knowledge, the "smarter" ones are more competent. This can be evaluated using the PAIP model's indicators "Learning Effectiveness" and "Analytical Thinking". In short, the PAIP model covers all dimensions of the iceberg model, providing a broader perspective and a more balanced evaluation tool for volunteer recruitment and selection. Therefore, we recommend that emergency rescue teams implement competency-based screening as early as in the recruitment stage.

2) Training management. Through the interviews in this study, we found that emergency rescue teams focus their training mainly on rescue knowledge, physical fitness, and equipment operation, with little attention has been paid to other areas. However, the *Basic Norms for the Construction of Social Emergency Rescue Forces* require social emergency rescue forces to establish training curriculum guidelines and design training programs tailored to different volunteer positions and emergency scenarios (MEMPRC, 2022a). S. Li et al. (2019) found that using a competency-based training model in emergency rescue training could yield better results, making it a valuable approach for widespread adoption. We suggest that training managers use the PAIP model as a reference to design training curriculum and select appropriate training methods. For instance, considering the competency dimension of "Professional Knowledge and Learning Ability", courses can include rescue laws and regulations, principles of rescue operations, rescue procedures and command, and learning strategies; for the dimension of "Action and Operation Skills", training can include risk management procedures, rescue equipment operation, information seeking, and rescue relationship building; for the

dimension of "Interpersonal Communication and Influence", courses can cover interpersonal understanding, teamwork and cooperation, upward communications, presentation skills, and compliance with regulations; for the dimension of "Personal Effectiveness and Values", training can encompass aspects such as stress management, logical thinking, rescue plan design, and rescue concept and cognition. In addition to courses, training methods can include lectures, tabletop exercises, hands-on practice, and group competitions tailored to different competency dimensions, to enhance training relevance and volunteer engagement.

3) Position management. Through the interviews in this study, we found that many rescue teams still use a simple "team leader – team member" organizational structure without professional division of labor. This leads to rescue inefficiencies and, in some cases, failed rescue operations. The *Basic Norms for the Construction of Social Emergency Rescue Forces – Part 2: Building Collapse Search and Rescue* explicitly require emergency rescue volunteer teams to establish clearly defined roles and ensure adequate personnel for each position (MEMPRC, 2022b). We recommend that emergency rescue teams establish positions according to these norms and define job qualifications and descriptions for each position based on the competency dimensions of the PAIP model.

4) Assessment and incentive management. Spencer and Spencer (1993) highlighted the causal relationship between competency and performance. Meduri (2020) confirmed the relationship between emergency rescuers' competency and their job performance and satisfaction. However, at present, most volunteer rescue teams lack formal assessment mechanisms or rely solely on rescue time indicators (participation hours) to evaluate emergency rescue volunteers' performance, which is overly simplistic. Some teams use subjective evaluations by team leaders, but such assessments lack standardized criteria. We recommend incorporating the PAIP model's competency indicators into volunteer performance evaluations and provide incentives and feedback based on the results. This approach provides clear insights into volunteers' strengths and areas for improvement, helping them to continuously improve. For example, if a volunteer scores low in "Professional Knowledge and Learning Ability", further analysis of the secondary indicators can determine whether they need to improve their "Technical/Professional/Managerial Expertise" or enhance their "Learning Effectiveness".

5) Promotion and exit management. The *Basic Norms for the Construction of Social Emergency Rescue Forces – Part 1: General Requirements* state that rescue teams should establish volunteer promotion and exit mechanisms (MEMPRC, 2022a). The *Occupational Skill Standards for Emergency Rescuers* define a career progression path: junior worker (Level 5 rescuer) – intermediate worker (Level 4 rescuer) – senior worker (Level 3 rescuer) –

technician (Level 2 rescuer) – senior technician (Level 1 rescuer) (MEMPRC, 2019). The PAIP model evaluates competency using a six-level behavioral indicator scale, which supports the development of a six-level volunteer promotion and evaluation system. Therefore, we recommend that emergency rescue teams establish a promotion and exit management system for volunteers based on their specific circumstances, referencing both the *Occupational Skill Standards for Emergency Rescuers* and the PAIP model's evaluation criteria.

5.4.3 Volunteers

As public engagement in public welfare activities continues to grow, the number of volunteer applications has been increasing every year. Before applying to become an emergency rescue volunteer, individuals should conduct a self-assessment to avoid situations where they find themselves unsuitable after joining the team, eventually leading to withdrawal or dismissal. This approach can help reduce the waste of both social and personal resources. We recommend that prospective volunteers evaluate their interests in public welfare and personal capabilities by referring to the PAIP competency indicators. This self-assessment can assist in making informed application decisions, preventing impulsive enrollment in rescue teams that could result in wasted time and effort or even personal safety risks. For those who have already become emergency rescue volunteers, they can also conduct self- assessment based on the PAIP competency scale to identify areas of weakness, guiding targeted skill improvement.

5.5 Theoretical contributions

This study extended and further developed the competency model, theoretically demonstrating that "Professional Knowledge and Learning Ability", "Action and Operation Skills", "Interpersonal Communication and Influence", and "Personal Effectiveness and Values" are the key competency factors for emergency rescue volunteers in China. This research redefined and supplemented the competency model in this field, established a competency model specific to public welfare emergency rescue, and developed and validated the corresponding competency scale. These contributions have practical application value in addressing the identification and development of competencies for emergency rescue volunteers in China.

1) This study extended and further developed the competency model. It reaffirmed the classification of competencies (knowledge, skills, traits, and values) in the iceberg model and onion model, while also proposing relationships between them, such as the relationship between knowledge and traits, skills and traits, and skills and values. These relationships are reflected

in the combination of secondary indicators under the four primary competency indicators. This study supports Spencer and Spencer (1993) definition of competency as a set of behaviors driven by motives, while also enriching this definition by proposing the relationships between cognition, motives, and behavior.

2) It established a competency model for emergency rescue volunteers. This study proposed the "PAIP four-dimension competency model" and developed a three-tiered indicator system, ranging from competency clusters to behavioral descriptions. This system includes four primary indicators, 27 secondary indicators, and 33 tertiary indicators, providing names, definitions, and behavioral descriptions for each indicator, making it easy to be applied by emergency rescue teams. The model is tailored to real-world rescue scenarios and introduced and validated multiple new competencies. It has strong applicability and practical value for emergency rescue teams.

3) This study developed a competency scale for emergency rescue volunteers. Building on Spencer's competency scale (Spencer & Spencer, 1993), a competency scale was specifically designed for emergency rescue volunteers in China under the "PAIP four-dimension competency model". This scale can directly measure the tertiary competency indicators of emergency rescue volunteers, making it applicable for specific competency identification and assessment.

5.6 Limitations and future research prospects

5.6.1 Limitations

Although this study has significant theoretical and practical implications, it also has the following four limitations:

1) While the survey data covered multiple regions in mainland China, there is an issue of uneven geographic distribution. Due to constraints in the invitation channels and methods, the survey data were not evenly distributed across the provinces in China, with a significant portion concentrated in a few populous provinces such as Sichuan and Henan. Although this aligns with the principle of proportional representation based on population size, it may affect the results of model validation and, consequently, the applicability of the model.

2) Although this study included both superior and average volunteers, the sample size of average performers was insufficient. The original research plan aimed to maintain a 1:1 ratio between superior and average performers. However, direct supervisors were more inclined to

evaluate “superior” individuals rather than “average” or “underperforming” ones. Despite adopting an anonymous evaluation approach, evaluators remained cautious and tended to assess superior performers more frequently. That led to limitated average performer samples, which might affect the results of one-way ANOVA.

3) Due to factors such as time constraints, the study did not employ the Delphi method for validation or explore factor weightings. As a result, although an evaluation scale was developed, this study was unable to determine the weight relationships among the indicators, which limits the scale’s practical application.

4) The dimensions for performance evaluation are overly simplistic, potentially affecting the validity of performance evaluation data. Unlike corporate settings, where key performance indicators (KPIs) are used for assessment, this study relied on evaluations from direct supervisors without incorporating self-evaluations, peer reviews, subordinate assessments, or feedback from other stakeholders, such as rescued individuals or requesting organizations.

5.6.2 Future research prospects

The competency model is increasingly applied in organizations, but its use in nonprofit organizations, particularly emergency rescue volunteer teams, remains limited and varies significantly. This study has certain limitations. Further validation of the “PAIP model” in a broader scope is still needed, and the model remains to be enriched by incorporating more dimensions. Future research may consider the following directions:

1) Validation of the “PAIP model” in non-public welfare rescue domains. The “PAIP model” primarily applies to emergency rescue volunteers in China. However, since the model takes into account a variety of emergency rescue scenarios, it may also be applicable to non-public welfare rescue areas. Future research can further validate and improve the model in these domains.

2) Research on the relationships among the competency indicators within the “PAIP model”. During the construction and validation of the “PAIP model”, it was observed that causal and other relationships might exist between the competency indicators. Future research can further exploration these associations.

3) Exploration of the mechanism by which the competencies in the “PAIP model” influence rescue performance. This study is based on the premise that a causal relationship exists between competencies and rescue performance. While previous research has already validated this premise, there remains a lack of studies specifically focused on volunteer rescue performance and its measurement. Further research could be conducted to explore the mechanisms through which competencies affect rescue performance.

4) Enrichment and refinement of the “PAIP model”. While the “PAIP model” broadly covers the key competencies of emergency rescue volunteers, it does not encompass all aspects. By revewing other models, we found that factors such as “occupational preference” and “personality traits” are also important elements of competency. Although rescue volunteering is not an “occupation”, it remains valuable to study volunteers’ occupational preference and personality traits.

(5) Validation and application of the “PAIP model” in different rescue scenarios. The current “PAIP model” is designed for various rescue scenarios, including mountain, water, and earthquake rescues, but it does not specify the competency requirements for each rescue scenario. As volunteer specialization advances—such as mountain rescue volunteers, water rescue volunteers, and earthquake rescue volunteers—future research could focus on each specific scenario. This could include two key areas: (i) developing “PAIP+ models” tailored to different scenarios based on the “PAIP model” and (ii) analyzing the weight relationships among the indicators in the “PAIP model” for each rescue scenario.

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Annex A: List of Social Emergency Rescue Teams in Chengdu, Sichuan Province, China

No.	Team name	Category	Specialization
1	Chengdu Emergency Anneng Rescue Team	Corporate	Engineering emergency response, landslides, road clearance, barrier lake risk mitigation, and dam emergencies.
2	Chengdu Emergency Construction Engineering Rescue Team	Corporate	Engineering emergency response, foundation pit collapse, pit flooding, external scaffold collapse, and road clearance.
3	Chengdu Emergency Water Supply Rescue Team	Corporate	Water supply rescue
4	Chengdu Emergency Hazardous Waste Disposal Rescue Team	Corporate	Hazardous waste disposal, waste mineral oil, waste acids, and waste alkalis.
5	Chengdu Emergency Rail Transit Rescue Team	Corporate	Subway vehicle, overhead catenary, and track maintenance – responsible for emergency rescue operations for subway train derailment recovery, catenary wire breakage repairs, rail fractures, and track displacement.
6	Chengdu Emergency Gas Rescue Team	Corporate	Gas rescue, pipeline leak emergency response, and valve pit maintenance on pipelines.
7	Chengdu Emergency Power Rescue Team	Corporate	Power rescue
8	Chengdu Emergency Telecom Rescue Team	Corporate	Telecommunications rescue – providing basic telecommunication support in emergencies.
9	Chengdu Emergency Unicom Rescue Team	Corporate	Unicom network assurance, power supply security, and satellite vehicle support.
10	Chengdu Emergency China Mobile Rescue Team	Corporate	Mobile communication rescue – providing basic mobile network services during emergencies.
11	Pengzhou Squad of Work Safety Emergency Rescue	Public organization	Work safety accident rescue, confined space rescue, earthquake disaster response, and mine rescue.
12	Wenjiang Division of Work Safety Emergency Rescue	Public organization	Work safety accident rescue, hazardous chemical disposal, and fire safety.
13	Pidu Division of Work Safety Emergency Rescue	Public organization	Work safety accident rescue and hazardous chemical disposal.
14	Xindu Division of Work Safety Emergency Rescue	Public organization	Confined space rescue, hazardous chemical disposal, demolition explosives, and water rescue.
15	Chongzhou Division of Work Safety Emergency Rescue	Public organization	Water rescue, mountain rescue, radio communication support, data statistics.
16	Jianyang Division of Work Safety Emergency Rescue	Public organization	Hazardous chemical plant incident response

No.	Team name	Category	Specialization
17	Longquan Division of Work Safety Emergency Rescue	Public organization	Tank leak sealing, tanker transfer, small pipeline leakage repair, and hazardous chemical technical support.
18	Chengdu Emergency Sichuan Petrochemical Rescue Team	Corporate	Hazardous chemical rescue, chemical fire, and hazardous chemical leakage response.
19	Chengdu Emergency Pipeline Repair Rescue Team	Corporate	Pipeline emergency repair and rescue
20	Chengdu Emergency 104 Oil Depot Rescue Team	Corporate	Oil fire emergency response
21	Chengdu Emergency Yanchang Rescue Team	Corporate	Oil spill and oil fire emergency response
22	Chengdu Emergency 102 Oil Depot Rescue Team	Corporate	Petrochemical oil fire emergency response
23	Chengdu Emergency Jinjiang Blue Sky Rescue Team	Volunteer organization	Urban building collapse rescue, water rescue, and earthquake rescue.
24	Chengdu Emergency Tianhu Rescue Team	Volunteer organization	Building collapse, mountain rescue, and water rescue.
25	Chengdu Emergency Mountain Rescue Team	Volunteer organization	High-altitude mountain rescue and urban high-altitude rescue.
26	Chengdu Emergency Dujiangyan Blue Sky Rescue Team	Volunteer organization	Disaster prevention and mitigation training, water rescue, earthquake response, and mountain rescue.
27	Chengdu Emergency Qingbaijiang Hengxin Rescue Team	Volunteer organization	Water rescue and urban search.
28	Chengdu Emergency Qionglai Eagle Rescue Team	Volunteer organization	Geological disaster rescue, mountain search, water rescue, drone search and rescue, underwater salvage, and radio communication support.
29	Chengdu Emergency Chongzhou Haoyun Rescue Team	Volunteer organization	Water rescue, mountain search and rescue, structural support rescue, and shaft rescue.
30	Chengdu Emergency Jinniu District Mountain Rescue Team	Volunteer organization	High-rope rescue, water rescue, mountain search, cave rescue, and shaft rescue.
31	Chengdu Emergency Chenghua Yong'an Rescue Team (Jiujiewuba Yong'an Rescue Center)	Volunteer organization	Water rescue, underwater rescue, rope rescue, and search dogs.
32	Chengdu Emergency Xindu Radio Communication Support Team (Xindu District Radio Enthusiasts Association)	Volunteer organization	Emergency radio communication support
33	Chengdu Emergency Xindu Xiangcheng Rescue Team (Xindu Xiangcheng Emergency Rescue)	Volunteer organization	Center safety training and water rescue.

No.	Team name	Category	Specialization
34	Chengdu Emergency Dayi Flying Eagle Rescue Team (Dayi Flying Eagle Seismic Disaster Prevention & Emergency Rescue Service Center)	Volunteer organization	Mountain and water rescue.
35	Chengdu Emergency Pengzhou Love Aid Rescue Team	Volunteer organization	Engineering machinery rescue, water rescue, and mountain search and rescue.
36	Chengdu Emergency Dujiangyan Minjiang Rescue Team	Volunteer organization	Earthquake and water rescue.
37	Chengdu Emergency Tianfu New District Crane Support Team	Corporate	Obstacle clearance and crane gondola high-altitude rescue.
38	Chengdu Emergency Xindu Heavy Machinery Support Team	Corporate	Collapse rescue, retaining wall repair, road emergency repair, and fire rescue.
39	Chengdu Emergency Timestech UAV Support Team	Corporate	Drone disaster reconnaissance, mapping, high-altitude broadcasting, and thermal imaging.
40	Chengdu Emergency ShineTech UAV Support Team	Corporate	Drone search, large-scale area assessment, thermal imaging, high-altitude broadcasting, and airdrop operations.
41	Chengdu Emergency Aossci UAV Support Team	Corporate	Helicopter aerial reconnaissance, cargo transport, and personnel transfer.
42	Chengdu Emergency Toefl Air Rescue Team	Corporate	Helicopter aerial reconnaissance, rescue equipment transport, and personnel evacuation.
43	Chengdu Emergency Jinhui Air Rescue Team	Corporate	Helicopter power line patrol, casualty transport, supply delivery, and rope rescue.
44	Chengdu Emergency Haoyun Air Rescue Team	Corporate	Drone imaging, mapping, and real-time monitoring.
45	Chengdu Emergency Xiangyun Air Rescue Team	Corporate	Material transport, casualty evacuation, personnel evacuation, and live video and image transmission.
46	Chengdu Emergency Dinganhua Information Technology Support Team	Corporate	Information technology support and the development, deployment, and functional development of customized emergency information system.
47	Chengdu Emergency Mobile Research Institute UAV Support Team	Corporate	Emergency mapping, emergency communication, drone cargo drop, and disaster assessment (2D and 3D imaging).
48	Chengdu Emergency Zhongke Lingdong UAV Support Team	Corporate	Long-endurance (2-hour) hybrid drone support, vehicle-mounted drone system, and UAV search.
49	Chengdu Emergency Chongzhou Shiboheng Engineering Support Team	Corporate	Landslide rescue, cutting, and welding operations.
50	Chengdu Emergency Chengdu Engineering Corporation Technical Support Team	Corporate	Seismic and geological disaster investigation, secondary disaster evaluation, and hydrological survey.

No.	Team name	Category	Specialization
51	Chengdu Emergency CETC Rongwei Technology Support Team	Corporate	3D modeling, high-risk geological hazard monitoring, and information technology services.
52	Chengdu Emergency Tengchuan UAV Support Team	Corporate	Large UAV reconnaissance, live video and image transmission, precision material drop, and emergency communication networking.
53	Chengdu Emergency Shuanjia Flood Control Rescue Team	Corporate	Water rescue, plan development, and rescue training.
54	Chengdu Emergency Nuclear Industry Southwest Geotechnical investigation & Design Institute Rescue Team(Nuclear Industry Southwest Geotechnical investigation & Design Institute Engineering Emergency Rescue Team)	Corporate	

Annex B: Representative Emergency Rescue Teams Worldwide under the INSARAG Framework

No.	Team Name	Region	INSARAG Classification (Year)	Number of Personnel
1	Austrian Forces Disaster Relief Unit (AFDRU)	Oceania	Heavy IEC USAR team (2012)	197
2	Urban Search and Rescue (USAR) Team of South Africa	Africa	Medium IEC USAR team (2017)	49
3	US Agency for International Development-Fairfax County - USA-01	America	Heavy IEC USAR team (2006)	79
4	China International Search and Rescue (CHN-1)	Asia	Heavy IEC USAR team (2009)	82
5	Japan Disaster Relief Team	Asia	Heavy IEC USAR team (2010)	60-70
6	Singapore Operation Lionheart Contingent	Asia	Heavy IEC USAR team (2008)	60-79
7	Korea Disaster Relief Team	Asia	Heavy IEC USAR team (2011)	60
8	Central Airmobile Rescue Team of EMERCOM of Russia	Europe	Heavy IEC USAR team (2011)	599
9	HUSAR - UIISC 1 - FRA02 (France)	Europe	Heavy IEC USAR team (2014)	70
10	Technisches Hilfswerk SEEBA: Rapid Deployment Urban Search & Rescue	Europe	Heavy IEC USAR team (2007)	230

Source: INSARAG (2022)

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Annex C: Emergency Rescue Teams Involved in the Survey

No.	Team name	City and Province
1	Anhui Blue Sky Rescue Coordination Center	Hefei, Anhui Province
2	Hefei Blue Sky Rescue Team	Hefei, Anhui Province
3	Huainan Blue Sky Rescue Team	Huainan, Anhui Province
4	Guangde Blue Sky Rescue Team	Xuancheng, Anhui Province
5	Ningguo Blue Sky Rescue Team	Xuancheng, Anhui Province
6	Beijing Peaceland Foundation	Haidian District, Beijing
7	Tongzhou District Canal Lighthouse Emergency Rescue Center, Beijing	Tongzhou District, Beijing
8	Shenzhen Blue Sky Rescue Team	Shenzhen, Guangdong Province
9	Lipu Blue Sky Rescue Team, Guangxi	Guilin, Guangxi Zhuang Autonomous Region
10	Yindu District Blue Sky Emergency Rescue Team, Anyang	Anyang, Henan Province
11	Jingzhong Blue Sky Rescue Center, Tangyin County	Anyang, Henan Province
12	High-Tech Zone Blue Sky Rescue Team, Jiaozuo	Jiaozuo, Henan Province
13	Zhongzhan District Blue Sky Rescue Team, Jiaozuo	Jiaozuo, Henan Province
14	Wuzhi County Blue Sky Rescue Emergency Service Center	Jiaozuo, Henan Province
15	Luolong District Iron Army Disaster Relief Team, Luoyang	Luoyang, Henan Province
16	Tongbai Blue Sky Rescue Team	Nanyang, Henan Province
17	Xinhua District Blue Sky Rescue Team, Pingdingshan	Pingdingshan, Henan Province
18	Hualong District Blue Sky Rescue Team, Puyang	Puyang, Henan Province
19	Lushi County Blue Sky Rescue Team	Sanmenxia, Henan Province
20	Yima Emergency Blue Sky Rescue Team	Sanmenxia, Henan Province
21	Minquan County Blue Sky Rescue Team	Shangqiu, Henan Province
22	Fengqiu County Blue Sky Rescue Emergency Center	Xinxiang, Henan Province
23	Luoshan Blue Sky Rescue Association	Xinyang, Henan Province
24	Pingqiao District Blue Sky Rescue Team, Xinyang	Xinyang, Henan Province
25	Weidu District Blue Sky Rescue Team, Xuchang, Henan	Xuchang, Henan Province
26	Xinmi Blue Sky Rescue Team	Zhengzhou, Henan Province
27	Xingyang Blue Sky Rescue Team	Zhengzhou, Henan Province
28	Guancheng Hui District Blue Sky Rescue Team, Zhengzhou	Zhengzhou, Henan Province
29	Erqi District Blue Sky Rescue Team, Zhengzhou	Zhengzhou, Henan Province
30	Zhongmu County Blue Sky Rescue Team	Zhengzhou, Henan Province
31	Shangshui Blue Sky Rescue Team	Zhoukou, Henan Province
32	Shenqiu County Blue Sky Emergency Rescue Team	Zhoukou, Henan Province
33	Xiangcheng Emergency Blue Sky Rescue Team	Zhoukou, Henan Province
34	Pingyu County Blue Sky Rescue Team	Zhumadian, Henan Province
35	Gucheng Blue Sky Rescue Team	Xiangyang, Hubei Province
36	Changshu Blue Sky Youth Team	Suzhou, Jiangsu Province
37	Huichang Blue Sky Rescue Team	Ganzhou, Jiangxi Province
38	Huludao Blue Sky Rescue Team	Huludao, Liaoning Province

No.	Team name	City and Province
39	Xilingol League Blue Sky Rescue Team	A league under the administration of Inner Mongolia Autonomous Region
40	Qinghai Province Blue Sky Emergency Coordination Center	Xining, Qinghai Province
41	Changzhi Blue Sky Rescue Team	Changzhi, Shanxi Province
42	Liquan Emergency Blue Sky Rescue Team	Xianyang, Shaanxi Province
43	Weicheng District Dawn Rescue Team, Xianyang	Xianyang, Shaanxi Province
44	Enyang District Blue Sky Rescue Team	Bazhong, Sichuan Province
45	Yuxi Squad, Enyang District Blue Sky Rescue Team	Bazhong, Sichuan Province
46	Tongjiang Blue Sky Rescue Team	Bazhong, Sichuan Province
47	Jinjiang District Blue Sky Emergency Rescue Center, Chengdu	Chengdu, Sichuan Province
48	Chongzhou Red Cross Blue Sky Rescue Team	Chengdu, Sichuan Province
49	Dayi County Blue Sky Rescue Team	Chengdu, Sichuan Province
50	Dujiangyan Red Cross Blue Sky Rescue Team	Chengdu, Sichuan Province
51	Qionglai Blue Sky Rescue Service Center	Chengdu, Sichuan Province
52	Qu County Blue Sky Rescue Team	Dazhou, Sichuan Province
53	Dazhou Red Cross Blue Sky Rescue Team, Sichuan	Dazhou, Sichuan Province
54	Xuanhan Blue Sky Rescue Team	Dazhou, Sichuan Province
55	Deyang Blue Sky Rescue Center	Deyang, Sichuan Province
56	Guanghan Yong'an Rescue Team	Deyang, Sichuan Province
57	Linshui County Blue Sky Emergency Rescue Team	Guang'an, Sichuan Province
58	Qianfeng District Blue Sky Rescue Team	Guang'an, Sichuan Province
59	Guangyuan Blue Sky Rescue Team	Guangyuan, Sichuan Province
60	Qianwei County Blue Sky Rescue Team	Leshan, Sichuan Province
61	Liangshan Prefecture Blue Leopard Emergency Rescue Team	Liangshan Yi Autonomous Prefecture, Sichuan Province
62	Meishan Red Cross Blue Sky Rescue Team	Meishan, Sichuan Province
63	Mianyang Blue Sky Emergency Rescue Center	Mianyang, Sichuan Province
64	Shizhong District Blue Sky Rescue Team, Neijiang	Neijiang, Sichuan Province
65	Panzhihua Blue Sky Rescue Team	Panzhihua, Sichuan Province
66	Ya'an Blue Sky Rescue Center	Ya'an, Sichuan Province
67	Zigong Blue Sky Rescue Team	Zigong, Sichuan Province
68	China State Construction Sixth Engineering Bureau Blue Sky Volunteer Service Team	Binhai New Area, Tianjin
69	Urumqi Blue Sky Rescue Team	Urumqi, Xinjiang
70	Chongqing Blue Sky Rescue Team	Wanzhou District, Chongqing

Annex D: Interview Guide for Emergency Rescue Volunteers

Steps	Questions or explanations	Objectives and supplement questions
1. Introduction and notice to the interviewee	1.1 Thank you for participating in this interview. This research project aims to contribute a competency model for China's rescue volunteer teams to improve the talent selection and training processes. Your experience is extremely valuable and will help us identify key success factors.	1.1 Explanation of the purpose of the interview to the interviewee.
	1.2 To improve the accuracy and efficiency of the interview, we would like to ask for your permission to record the conversation. Please rest assured that the recording will only be used for research purposes, and we will ensure confidentiality. If you are uncomfortable with the recording, we will take notes during the interview instead. Thank you for your understanding.	1.2 Informing the interviewee that the interview will be recorded.
	1.3 Please briefly introduce (or select from the questionnaire) your basic information (e.g., educational background, occupation, age, years of service in the team, and position within the team).	1.3 Gathering basic information about the interviewee.
2. Introduction to volunteer work	2.1 What types of field rescue missions have you participated in? These may include, but are not limited to, earthquake rescue, water rescue, mountain rescue, and emergency rescue drills.	2.1 Understanding the interviewee's volunteer rescue experience.
3. Behavioral event interviews	3.1 Please describe an earthquake rescue mission that you consider successful.	3.1 Understanding successful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers helped complete the task during this process?
	3.2 Please describe an earthquake rescue mission that you consider unsuccessful or lacking in some way.	3.2 Understanding unsuccessful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers were lacking and thus affected the completion of the task?

Steps	Questions or explanations	Objectives and supplement questions
	3.3 Please describe a water rescue mission that you consider successful.	3.3 Understanding successful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers helped complete the task during this process?
	3.4 Please describe a mountain rescue mission that you consider unsuccessful or lacking in some way.	3.4 Understanding unsuccessful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers were lacking and thus affected the completion of the task?
	3.5 Please describe a mountain rescue mission that you consider successful.	3.5 Understanding successful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers helped complete the task during this process?
	3.6 Please describe an emergency rescue drill that you consider successful.	3.6 Understanding successful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers helped complete the task during this process?
	3.7 Please describe an emergency rescue drill that you consider unsuccessful or lacking in some way.	3.7 Understanding unsuccessful cases. Additional questions: What situation did you encounter at that time? What work did you and your teammates do? What was the outcome? What qualities and abilities of the volunteers were lacking and thus affected the completion of the task?
4. Supplementary competency characteristics	4.1 Lastly, I would like to ask you: aside from what was discussed above, what other characteristics do you think are essential for being an effective emergency rescue volunteer?	4.1 Additional inquiry into other characteristics. Additional question: What behavioral traits do superior volunteers exhibit?
	4.2 During your time as a rescue volunteer, whiich colleague or peer do you admire the most? What qualities and characteristics of his/hers do you admire?	4.2 Asking from another perspective about the characteristics of superior emergency rescue volunteers.

Steps	Questions or explanations	Objectives and supplement questions
	4.3 Which of the following characteristics do you think are also important for emergency rescue volunteers? Expertise, interpersonal understanding, practical skills, resistance to stress (self-control), analytical ability (analytical thinking), ability to change (flexibility), volunteer spirit or spirit of dedication (organizational commitment), teamwork and cooperation, organization and coordination, self-confidence.	4.3 Before concluding the interview, ask the interviewee about their views on the importance of the competencies identified in the literature review.
5. Closing remarks and gratitude	5.1 This concludes today's interview. Thank you for your participation! Your experience is very valuable to this research, and we greatly appreciate your involvement!	5.1 Closing remarks and thanking the interviewee.

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Annex E: Informed Consent Form for Interviews with Emergency Rescue Volunteers

I have carefully read and understood the following contents, and I agree to participate in this interview.

1) This interview is conducted by the "Construction and Validation of the Competency Model for Emergency Rescue Volunteers" interview team, aimed at understanding the superior qualities, skills, and other characteristics of emergency rescue volunteers.

2) I can voluntarily choose whether to participate in this interview and have the right to terminate the interview at any time.

3) I am aware that this interview may involve personal privacy and sensitive information, but I am still willing to participate.

4) I consent to the interviewer recording or videotaping this interview and using the recordings for academic and other legitimate purposes.

5) I agree that the interview may be used or shared by the interview team or other researchers, but my personal identity information will not be disclosed.

6) I consent that this interview will not pose any threat or harm to my life, health, reputation, or other interests.

7) I confirm that I have fully understood the content and purpose of this interview and agree to participate.

Interviewee (Signature):

Interviewer (Signature):

Interview Date:

Interview Location:

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Annex F: Emergency Rescue Volunteer Competency Questionnaire (Sample)

Dear Sir/Madam,

Thank you very much for participating in the "Questionnaire Survey on the Competency of Emergency Rescue Volunteers in China". We will maintain strict confidentiality and ensure that all data is used solely for academic research purposes. This survey requires you to evaluate multiple team members under your command in the rescue team, including both superior performers and average performers. Please select the option that most accurately represents your views. We greatly appreciate your support and cooperation!

I. Basic information

1) What is your name? _____ (Please fill in)

2) What is the name of the rescue team you belong to? _____ (Please fill in)

3) What is your position in the rescue team? (Single choice)

A. Overall team leader (Team Leader or Chairman)

B. Vice Chairman, Vice Team Leader, Rotating Team Leader, Group Leader, Unit Leader, or other similar roles.

4) What is the area you are responsible for? (Single choice)

A. Overall work of the entire team

B. Urban search and rescue

C. Water rescue

D. Rope rescue

E. Information/secretary

F. Equipment

G. Logistics

H. Other

5) What is the name of the team member you are evaluating? _____ (Please fill in)

II. Performance evaluation

1) Compared to other members in the team, this team member's performance in rescue missions stands out and ranks among the top in the rescue team. (Single choice)

A. Strongly disagree

B. Disagree

C. Slightly disagree

D. Slightly agree

E. Agree

F. Strongly agree

2) This team member is always able to excellently complete the tasks assigned to him/her. (Single choice)

A. Strongly disagree

B. Disagree

C. Slightly disagree

D. Slightly agree

E. Agree

F. Strongly agree

3) This team member effectively fulfills all of his/her work responsibilities. (Single choice)

A. Strongly disagree

B. Disagree

C. Slightly disagree

D. Slightly agree

E. Agree

F. Strongly agree

4) This team member has made a significant contribution to the overall performance of the emergency rescue team. (Single choice)

A. Strongly disagree

B. Disagree

C. Slightly disagree

D. Slightly agree

E. Agree

F. Strongly agree

III. Competency evaluation

1) Analytical Thinking is the ability of rescue volunteers to break down a large problem into smaller parts or to explore the causes of problems step by step. When analyzing rescue-related problems or situations, which of the following options best describes the performance of this team member? (Single choice)

A. No analysis. Responds to others' requests for help without thinking; lacks independent

thinking at work and needs others to assign tasks.

B. Problem breakdown. Able to break down a problem into simple tasks or activity lists.

C. Identifying basic relationships. Able to analyze the relationships between several components of a problem to derive simple causal links and draw simple conclusions of support or opposition.

D. Identifying multiple relationships. Able to analyze the relationships between several components of a problem, systematically break down complex tasks into manageable parts, and identify causes of similar events or consequences of actions.

E. Making complex plans or analyses. Able to systematically break down a complex problem into smaller parts; able to break down and solve complex problems based on experience.

F. Making highly complex plans or analyses. Able to systematically break down a problem with multiple complex facets into smaller parts; able to use analytical tools to identify several solutions and evaluate the advantages and disadvantages of each.

2) Learning Effectiveness refers to the process by which rescue volunteers acquire targeted knowledge or experience to improve rescue efficiency and skills. In terms of learning methods, which of the following options best describes the performance of this team member? (Single choice)

A. Views learning as a burden or rejects learning.

B. Able to...

C. Able to...

D. Able to...

E. Able to...

F. Able to...

3) Flexibility (Ability to Change) refers to…… Which of the following options best describes the performance of this team member? (Single choice)

A. Able to...

B. Able to...

C. Able to...

D. Able to...

E. Able to...

F. Able to...

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Annex G: Text Analysis Code List of Emergency Rescue Volunteer Interviews

No.	Competency indicators		Descriptions	Frequency
1	Rescue Philosophy	Scientific Rescue	Rescue should not be based on blind enthusiasm or heroism, but on the use of scientific methods and approaches, pursuing professionalism.	27
2		Self-Preservation Before Saving Others	Prioritize protecting oneself before participating in rescue activities, focusing on self-preservation rather than sacrificing oneself to save others.	26
3		Pursuit of Efficiency	Use the most suitable plans, equipment, and shift arrangements based on on-site conditions to improve efficiency, reduce workload, and conserve resources.	50
4		Reverence for Life	Respect life and nature, avoid prejudice against those in need of rescue based on ethnicity, politics, or other factors.	25
5		Non-Instrumentalization	Rescue efforts are aimed at solving problems, rather than using tools for the sake of using them. Rescuers should not be restricted by tools and should be able to devise rescue plans, or even create rescue tools when necessary.	13
6	Role Awareness	Acting within One's Capabilities	Able to take reasonable action based on one's skills, experience, financial conditions, and physical abilities; participate in rescue efforts within reasonable limits.	16
7		Self-Awareness	Have a clear understanding of one's job responsibilities, authority boundaries, work tasks, capabilities, and experience, avoiding overstepping his/her roles or acting recklessly.	34
8	Practical Skills	Equipment Operation Proficiency	Proficient in operating relevant rescue equipment.	76
9		Maintenance and Modification of Equipment	Able to maintain and repair equipment and propose modification plans based on the rescue scenario and operational habits.	5
10	Developing Others	Motivation and Feedback	Able to guide, motivate, and influence others, with clear rewards and punishments; provide timely communication and feedback.	23

No.	Competency indicators		Descriptions	Frequency
11		Instruction Skills	Possess instruction and teaching skills; able to transfer knowledge or skills to others in an engaging and humorous manner.	34
12		Willingness to Share		23
13		Guiding Through Questions	Use questioning techniques to help others gain knowledge.	4
14	Safety Handling	Risk Identification	Aware of safety issues and be able to identify potential hazards in the rescue process.	30
15		Prioritizing Prevention	Able to anticipate safety issues and possesses "situational awareness" similar to that of pilots, including the ability to foresee what is happening and what is likely to happen next; able to prepare emergency response plans in advance.	31
16		Safety Response Measures	Able to implement safety measures based on identified hazards.	32
17		Safety Assessment	Able to conduct safety assessments based on learned knowledge and on-site conditions.	19
18		Safety Monitoring	Able to monitor safety during operations.	12
19	Analytical Judgment	Systematic and Comprehensive Thinking	Process a broad perspective and big picture awareness; think in a systematic and comprehensive manner.	35
20		Plan Formulation	Able to formulate targeted search or rescue plans based on available information and equipment.	16
21		Logical Analysis	Conduct logical analysis such as comparing, summarizing, and reasoning the information they have collected or received from others.	122
22		Information Seeking	Able to gather information through observation, inquiry, measurements, and tests, including knowledge of local customs and building features in disaster areas.	69
23		Optimal Choice	Able to make optimal decisions on the rescue plan based on on-site conditions, rather than seeking perfection.	12
24		Data Computation	Able to calculate relevant data from collected information or from memory.	22
25	Achievement Orientation	Perseverance	Demonstrate determination and perseverance in their efforts in order to improve themselves or complete tasks.	29

No.	Competency indicators		Descriptions	Frequency
26		Result Orientation	Able to set goals and pursue the completion of tasks or work outcomes with determination—undaunted by failure, unwilling to give up, and persistent to the end; when facing multiple tasks and situations, able to identify key priorities and maintain a results-oriented focus on the ultimate objective, rather than attempting to address every detail at the expense of achieving the overall goal.	29
27		Pursuit of Excellence	Demonstrate continuous dedication to tasks and learning, striving for excellence with a meticulous and conscientious approach—never perfunctory or careless; show enthusiasm for new things and emerging technologies, with a strong desire for innovation and creativity; able to think outside the box, with a flexible mindset.	45
28		Leading by Example	Able to influcne others by leading by example through proactive action and discipline, so as to achieve task goals.	6
29	Discipline and Obedience	Confidentiality Awareness	Possess an awareness of confidentiality regarding rescue operations and the information related to the rescued individuals; able to adhere to relevant confidentiality regulations and remind and discourage others from disclosing sensitive information.	18
30		Obedience to Command		53
31		Self-Discipline	Maintain self-discipline in both rescue work and daily life.	16
32		Adherence to Rules	Adhere to laws, regulations, and operational protocols in the absence of command instructions or when command instructions are clearly erroneous.	51
33	Resistance to Stress	Preventing Emotional Involvement	Able to alleviate the grief and anxiety of family members at the scene through methods such as empathy; avoid becoming emotionally involved, staying calm and rational.	4
34		Blocking Stress	Constantly vigilant against the spread of negative emotions and their “contagion” among team members; maintain a pure and focused mindset toward rescue; employ methods such as physical separation to prevent the spread of negative emotions and the transmission of stress.	11

No.	Competency indicators		Descriptions	Frequency
35		Desensitization Protection	Able to provide protection, encouragement, and desensitization guidance to rescue newcomers or individuals experiencing stress, helping both onself and others reduce sensitivity to irrelevant or harmful stimuli.	25
36		Attention Diversion	Build psychological resilience by viewing images and studying case examples to directly confront traumatic scenarios, allowing rescue situations to become routine, diverting one's attention to avoid excessive focus on traumatic scenarios.	17
37		Psychological Counseling	Able to apply relevant psychological knowledge and skills to provide psychological support to others or oneself, such as mental suggestions, to achieve emotional relief and stress reduction.	38
38	Expertise	Multiple Disciplinary	Master rescue-related knowledge across multiple disciplines, such as physics, chemistry, psychology, and trace analysis.	51
39		Local Customs and Traditions	Possess knowledge of the customs and traditions of different regions, ethnicities, and communities; understand and respect cultural differences.	5
40		Parameter Memory	Able to remember relevant parameters such as material, density, and other characteristics of the rescue objects.	13
41		Equipment Knowledge		6
42		Rescue Procedures		50
43	Volunteer Spirit	Selfless Dedication	Contribute one's time, energy, and financial resources voluntarily for public rescue, without seeking personal gain.	37
44		Self-Improvement	Seek self-improvement and self-fulfillment through rescue learning and helping others, thus inspiring oneself to keep moving forward.	7
45		Respect and Tolerance	Understand different cultural backgrounds, viewpoints, and habits; respect and tolerate others, treating everyone equally.	17
46		Altruistic Behavior		22
47		Gratitude and Reciprocity		4

No.	Competency indicators		Descriptions	Frequency
48		Sense of Mission	Possess a sense of mission for saving lives and aiding the injured, a sense of personal or collective honor and achievement, and a sense of responsibility for the tasks.	26
49		Low Profile and Pragmatism	Low profile, unpretentious, and not vain; simple and sincere, focusing on tasks rather than people; diligent and hardworking, speaking less and doing more; humble, modest, and amiable.	47
50		Endurance and Hard Work	Demonstrate basic physical fitness, a strong work ethic, and patience; able to endure certain levels of psychological and physical stress, monotony, and fatigue; able to carry out tasks continuously.	74
51		Enthusiasm for Public Welfare	Passionate about public welfare and professional rescue, contributing with a pure purpose.	22
52	Objectivity and Accuracy	Rigor	Follow basic cause-and-effect logic, seek evidence to support decisions, and avoid making subjective assumptions or acting arbitrarily.	17
53		Calm and Rational	Remain calm and rational in the face of emergencies or adverse factors; not influenced by the emotions of oneself others, maintaining objectivity and calmness; avoid personal heroism and a disaster-waiting mindset.	49
54		Data Sensitivity	Sensitive to data.	77
55		Information Verification	Have a preliminary judgment on the source and reliability of information; able to verify unreliable information.	20
56		Attention to Detail		43
57	Communication Skills	Interpersonal Communication	Possess certain communication skills and able to enhance interpersonal communication through empathy, approachability, and humor; able to resolve conflicts through coordination and compromise.	69
58		Cross-Cultural Communication	Take the initiative to understand and respect the ethnicities, cultures, customs, and traditions of disaster-affected areas and the rescue team; possess a certain level of foreign language communication ability.	8

No.	Competency indicators		Descriptions	Frequency
59		Professional Communication	Able to communicate using professional language tailored to the background of the communication counterpart, such as using standardized forms and terminology with USAR teams, explaining the effectiveness and necessity of operational plans to family members at the scene, and conducting effective inquiries with eyewitnesses on site.	40
60		Conciseness and Clarity	Able to understand the concerns of the communication counterpart and respond or elaborate with a clear focus; when giving orders or assigning tasks, use concise language with all necessary elements included (e.g., key points of the task, time, location, responsible personnel, and disciplinary requirements).	11
61		Organizational Communication	Able to represent the organization in communications with other organizations or individuals; able to leverage the influence of other organizational forces, such as the police, to facilitate communication.	30
62	Teamwork and Cooperation	Trusting Others		8
63		External Collaboration	Able to cooperate with other Blue Sky Rescue teams or other rescue organizations.	7
64		Mutual Help		20
65		Technical Coordination		51
66		Big Picture Awareness	Have a clear understanding of the relationship between individuals and teams; recognize that rescue is a team-based collaborative activity.	15
67	Ability to Change	Resourcefulness	Not constrained by the limitations of instruments or equipment, able to adapt to real-world conditions by using available local resources and responding flexibly to solve problems on site.	14
68		Quick Response	Able to respond swiftly to changing situations.	42
69		Plan Adjustment	When conventional methods fail to solve a problem, able to adapt flexibly, think from different perspectives, and develop and apply alternative approaches.	33
70		Accepting Challenges	Able to listen to different opinions and respond with flexibility; demonstrate flexible thinking and attitude, not being stubborn; not fear being challenged by others.	7

No.	Competency indicators		Descriptions	Frequency
71	Learning Ability	Empty Cup Mentality	Focus on the acquisition of knowledge—unafraid of losing face and willing to adopt a humble attitude in order to acquire knowledge and learn; respect expertise, listen modestly to professionals and experienced individuals, and learn from them.	23
72		Focus on Key Points	Focus on learning the key knowledge points for solving the problem, without aiming for perfection or getting overwhelmed by excessive details.	4
73		Reflection and Summary	Like to think and ask questions; able to summarize rescue experiences and cases and transform them into a personal knowledge base.	38
74		Multiple Learning Methods	Able to engage in learning through various methods, such as online learning, expert consultation, case studies, group discussions, practical application, scenario simulations, and learning through competitions.	26
75		Emphasis on Principles	Able to learn by asking questions around specific issues; focus on understanding principles; able to apply knowledge to related areas through analogies and reasoning.	20
76		Continuous Learning	Continuous learning, lifelong learning, and repeated practice.	22
77		Fast Learning	Able to proactively collect and share blind-spot knowledge of oneself or the team.	14
78		Drawing Inferences		12
79		High-Frequency Progression	Adopt a progressive approach to learning, with frequent practice.	3
80	Proactiveness	Initiative	Able to identify problems and actively think of ways to solve them, rather than passively following or remaining indifferent.	34
81		Positive and Optimistic	With a positive attitude and an optimistic mindset, having a positive influence; able to pass on this optimism to others; do not become discouraged or complain.	8
82	Organization and Coordination	Segmented Management	Able to divide the rescue task into spatial segments and carry out the rescue in stages or by designated areas based on the characteristics of the mission and the available resources of the teams and personnel.	13

No.	Competency indicators		Descriptions	Frequency
83		Planning Ability	Able to make overall plans for the resources or personnel under one's management and allocate them effectively.	28
84		Time Management	Able to improve efficiency in the management of materials or equipment through time segmentation and categorizing personnel, ensuring effective management; when managing personnel tasks, consider the intensity of the rescue operation and implement shift-based work and rotation management.	3
85		Talent Identification and Utilization	Know the skills and characteristics of personnel and adept at assigning them suitable tasks accordingly.	23
86		Clear Division of Labor		57
87		Balancing Relationships	Able to effectively balance between public welfare rescue, occupation, and family responsibilities, maintaining a harmonious relationship between them.	20
88		Resource Coordination	Able to seek external resources and assistance in order to acquire the necessary conditions and influence to accomplish the task (e.g., media attention).	37
89		Proper Delegation	The person responsible for organizing and coordinating should reasonably designate someone else to take over all or part of the coordination authority before leaving the position, ensuring the continuity of the task.	3
90		Command and Control	Able to intervene in and control the situation or development of events and capable of commanding task operations.	12
91	Courage and Self-Confidence	Responsibility and Accountability	Have a sense of responsibility when facing troublesome situations; willing to take charge when confronted with dangerous tasks; unafraid to take responsibility in the face of potential misunderstandings.	29
92		Self-Trust	Willing to tackle problems based on one's skills, equipment, and assessments; confident in one's ability to complete tasks or fulfill missions, but not blindly confident.	24
93		Willingness to Challenge	Not afraid of the unknown or competition; courageous in taking on tasks; embrace challenges.	36

No.	Competency indicators	Descriptions	Frequency
94	Decisiveness	With self-assurance, handle rescue operations and give commands decisively, without hesitation.	25
	Total		2554

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Annex H: Emergency Rescue Volunteer Competency Scale (Sample)

Note: Due to space limitations, the following is a sample excerpt from the scale. For the complete scale, please contact the author (email: 306773674@qq.com).

1. Analytical Thinking

Level	Behavioral Description
A	Analytical Thinking
A1	No analysis. Responds to others' requests for help without thinking; lacks independent thinking at work and needs others to assign tasks.
A2	Problem breakdown. Able to break a problem into simple tasks or activity lists.
A3	Identifying basic relationships. Able to analyze the relationships between several components of a problem to derive simple causal links (e.g., A leads to B) and draw simple conclusions of support or opposition.
A4	Identifying multiple relationships. Able to analyze the relationships between several components of a problem, systematically break down complex tasks into manageable parts, and identify causes of similar events or consequences of actions.
A5	Making complex plans or analyses. Able to systematically break down a complex problem into smaller parts; able to break down and solve complex problems based on experience.
A6	Making highly complex plans or analyses. Able to systematically break down a problem with multiple complex facets into smaller parts; able to use analytical tools to identify several solutions and evaluate the advantages and disadvantages of each.

2. Learning Effectiveness

Level	Behavioral Description
A	Learning Methods
A1	Views learning as a burden or rejects learning.
A2	No observed learning behavior.
A3	Able to learn as required by the rescue team, but not actively or proactively.
A4	Able to engage in self-initiated learning, but the learning methods are relatively singular.
A5	Able to learn through various methods and acquire new knowledge (e.g., reading, attending lectures, watching online videos, consulting others, and participating in discussions).
A6	Actively makes reviews and reflections based on rescue missions.

Level	Behavioral Description
B	Learning Efficiency
B1	Not applicable or no learning efficiency.
B2	Slow in learning and absorbing knowledge.
B3	Able to quickly learn rescue knowledge of interest in a short time.
B4	Has a relatively comprehensive understanding of rescue knowledge and able to learn knowledge continuously and quickly.
B5	Not only able to learn rescue knowledge quickly and continuously, but also explores the underlying principles and integrates them.
B6	Not only masters rescue knowledge and its theoretical principles, but also applies them to rescue scenarios by analogy.

3. Flexibility

Level	Behavioral Description
A	Flexibility
A1	Always sticks to his/her own views and cannot accept others' opinions.
A2	Follows rescue protocols but shows no flexibility.
A3	Able to understand or acknowledge others' correct viewpoints.
A4	Follows rescue protocols flexibly. Adjusts actions to achieve goals depending on the situation.
A5	Adjusts techniques according to the situation or others' responses. Changes personal behavior, strategy, or goals to adapt to the environment.
A6	Facilitates organizational adjustments. Promotes flexibility in oneself and others to adapt to changes based on the emergency situation.

4. Low Profile

Level	Behavioral Description
A	Low Profile
A1	Showy, vain, and boastful.
A2	No particular behavior of vanity or showing off.
A3	Avoiding voluntary exposure. Has strong awareness of confidentiality and follows team rules actively.
A4	Endorsing low profile. Believes silent contribution is more valuable than boasting in rescue teams; prefers solely performing tasks but will cooperate with interviews if needed by the team.
A5	Practicing low profile. Embraces a low-profile approach; works diligently, proactively, and selflessly, not seeking fame or gain.
A6	Remaining committed despite misunderstandings. Stays committed to the mission of rescue even when misunderstood and continues to behave with low profile.

5. Risk Management

Level	Behavioral Description
A	Risk Management
A1	Acts recklessly even when warned of danger, potentially causing risks.
A2	Seeks vanity, lacks safety awareness, and disobeys safety rules.
A3	Not applicable or no observed risk management behavior. Lacks risk prevention awareness but follows safety rules after being reminded.
A4	Risk identification. Has risk prevention awareness; sensitive to unsafe factors.
A5	Risk assessment and monitoring. Able to identify risk factors; evaluates and continuously monitors risks such as hazardous gases, oil or electricity leaks, structural collapses, and dam failures according to protocols.
A6	Early warning and response. Able to issue warnings and respond based on risk assessment and monitoring information.

6. Operational Skills

Level	Behavioral Description
A	Operational Skills
A1	Basic operational skills. Able to operate one type or only a few pieces of equipment (e.g., fewer than five types of water rescue equipment, fewer than five types of earthquake rescue equipment, and fewer than 10 types of rope equipment).
A2	Intermediate operational skills. Able to operate two types or a moderate number of equipment (e.g., 5-10 types of water rescue equipment, 5-10 types of earthquake rescue equipment, and 10-15 types of rope equipment).
A3	Advanced operational skills. Able to operate multiple types or many pieces of equipment (e.g., more than 10 types of water rescue equipment, more than 10 types of earthquake rescue equipment, and more than 15 types of rope equipment).

Level	Behavioral Description
A4	Familiarity with principles. Possesses advanced operational skills and understands equipment principles.
A5	Maintenance and repair. Able to maintain, care for, and perform simple repairs on equipment.
A6	Modification and creation. Able to modify equipment or even create new equipment for specific rescue scenarios.

7. Life Saving Orientation

Level	Behavioral Description
A	Focus on Saving Lives
A1	Discriminates against rescuees or their families (e.g., discrimination based on gender, ethnicity, region, culture, habits, educational background, and communication style).
A2	Unaware of rescuees' needs or problems and unsure how to help them.
A3	Repeatedly emphasizes his/her rescue skills or the team's rescue capabilities without considering rescuees' feelings or needs; unable to offer assistance and fails to think from the perspective of rescuees or provide suggestions.
A4	Gives direct and simple answers to rescuees' questions without clarifying the situation.
A5	Provides feedback on rescuees' requests, requirements, and complaints, keeping them informed about rescue progress and status, or reasons for refusal.
A6	Provides follow-up feedback that makes rescuees feel comfortable and recognize professionalism, even when declined.

Level	Behavioral Description
B	Initiative to Help or Serve Others
B1	Passive or negative behavior. Shows indifference or even aversion or disdain toward those seeking help.
B2	No real action. Expresses willingness to help but makes excuses to avoid actual assistance.
B3	Routine procedure. Offers only minimal, superficial assistance.
B4	Sincere help. Enthusiastically and proactively takes real actions to assist others.
B5	Mobilizing collective help. Able to gather more people and resources to help others.
B6	Sustained help. Sacrifices personal time, even at the cost of work or family, to help others.

8. Upward Communications

Level	Behavioral Description
A	Upward Communications
A1	Avoiding upward communications. Afraid to communicate with superiors; cannot focus on key points when reporting.
A2	Perfunctory upward communications. Responds perfunctorily when required to communicate with superiors.
A3	Information transmission. Able to clearly articulate basic information and make intentions clear to superiors.
A4	Professional influence. Able to elaborate from the perspective of organizational procedures, interests, and other aspects to provoke thought in superiors or others.
A5	Attracting attention. Proactively reports and exerts professional influence to attract superiors' attention.
A6	Outcome achievement. Able to persuade superiors to adopt suggestions and gain their support.