Interpersonal Relationships among University Safety Professionals: The Impact of a Safety Department

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Abstract

Forming strong interpersonal relationships enables an organization or individual to achieve more favorable outcomes. The objectives of this study were to examine the frequency of interpersonal interactions among safety professionals (SPs) employed at Taiwanese universities and the factors that affected this frequency. To accomplish these objectives, we mailed questionnaires to a simple random sampling of 200 university SPs. Moreover, an interpersonal relationship scale was developed in this study; exploratory factor and internal consistency analyses revealed that the scale was valid and reliable. Results derived from the questionnaire revealed that in SP interpersonal relationships, general affairs department personnel, laboratory or internship unit supervisors, and teaching staff ranked highest in frequency of interactions. Multivariate analysis of variance results showed that establishing a safety department exerted a statistically significant effect on SP interpersonal relationships. SPs employed by universities with safety departments interacted more frequently with both internal and external relationships. Therefore, we suggest that universities without a safety department establish such a department to strengthen the labor safety and health structure, thereby benefitting SPs in fulfilling

responsibilities to promote safety and health management.

1. Introduction

1.1. Background and Motivation

The goals of universities include advancing academic research, nurturing talent, promoting cultural growth, contributing to social services, and stimulating national development (UA, 2011). The quality of education in universities is affected by occupational safety and health facilities. Incidents occurring because a university lacks appropriate safety procedures may adversely affect national image for the present and in the future (Hossain et al., 2015). Gutierrez et al. (2013) suggested that universities are unique workplaces because employees may be exposed to a variety of situations involving acute or chronic risks.

To reduce the incidence of disasters in university laboratories, the Council of Labor Affairs, Executive Yuan, Taiwan (CLAEYT), included university laboratories as worksites protected by the Occupational Safety and Health Act (OSHA) in 1993 (CLAEYT, 1993). The OSHA (2013) requires employers to formulate occupational safety and health management plans according to the nature and scope of the worksite, establish and staff safety and health departments, and implement safety and health management and automatic inspection.

The goal of health and safety management in universities is preventing accidents or disasters and ensuring the safety and health of laboratory personnel and students (Chiang et al., 2002). Guey (1997) asserted that implementing health and safety management practices requires establishing a health and safety department and safety professionals (SPs) to execute related tasks. Wu (2005) stated that SPs are part of the safety structure established by universities for preventing accidents and loss. Thus, SPs must establish congenial interpersonal relationships to effectively execute tasks related to safety and health management; ensure the safety of personnel, facilities, and property; and ultimately achieve the goal of optimal health and safety.

Finally, when executing occupational safety and health management tasks, SPs must manage complex interpersonal relationships, including internal and external relationships. Whom SPs interact with and how frequently these interactions occur are topics warranting exploration. In addition to these topics, we examined which factors affect SPs interpersonal relationships.

1.2. Safety Professional Interpersonal Relationships

Wu (2011) defined SPs as those employed in the planning and supervision of tasks related to occupational safety and health management for ensuring the employee safety and health. SPs act as safety coordinators, controllers, and experts, performing nine functions: inspection and research, regulatory tasks, emergency procedures and damage settlement, management and

finances, workplace culture changes, solution development and implementation, problem identification and analysis, knowledge management, and training and communication.

In a large-scale investigation of American employers, Frederick, Winn, and Hungat (1999) explored the qualities employers sought in SPs, determining that the most desired skills were written and oral communication skills, interpersonal skills, teamwork, computer skills, and legal knowledge. This indicates that the role of SPs is ever changing; SPs are no longer considered technical specialists, but are generalists with relationship and management techniques.

In general, interpersonal relationships are the psychological relationships established to mutually satisfy the needs of people engaged in a common activity (Hsu, 1997). The key job responsibilities of SPs are formulating, planning, and promoting safety and health management and guiding relevant departmental policies (OSHMR, 2014). Therefore, in executing these tasks, SPs necessarily form relationships with others. Organizational relationships are most commonly categorized as internal or external relationships. Internal relationships refer to relationships between departments, between leaders, between employees, or between leaders and employees. External relationships refer to relationships with customers, suppliers, competitors, or the government (Jiu, 2003). Because SPs are support personnel, not line managers, they are most likely to focus on forming relationships with other departments or employees.

1.3. Safety professional internal relationships

In Chinese societies, relationships have a far-reaching influence. In addition to social interactions in daily life, relationships in corporate organizations are crucial. An organization that can cultivate employee relationships gains an intangible asset of a competitive advantage or increased value (Fang et al., 2009). In addition, positive interactions between organizations enable both organizations to share resources and knowledge and will eventually maximize benefits (Haeckel, 1998). Clearly, the relationships between an organization's departments or employees can affect the organization operations and performance.

Because an organization is formed by an aggregation of people, it is considerably and unavoidably heterogeneous (Shiuan et al., 2010). Therefore, work units commonly comprise a collection of various roles and require teamwork among the roles to achieve goals. These collections are sometimes permanent units with a variety of names, such as department, group, or division, each occupying a different position within the organizational hierarchy (Jenq, 2000). Generally speaking, relationships between employees or departments such as the board of directors, administration, general affairs, research and development, production, labor safety and health, or human resources, within a corporate organization are called "internal relations." In this study, we defined internal relationships for university SPs as relationships with one of the twelve following parties: licensed physicians or nurses, laboratory or internship unit supervisors,

teaching staff, department (or college) heads, high-level management, the labor safety and health committee, the administrative department, the department of academic affairs, the department of general affairs, the personnel or human resources department, the accounting department, or the legal affairs department.

1.4. Safety professional external relationships

For an organization, interactions with clients, the community, government agencies, interest groups, or social agencies are encountered in the external environment, affecting the operation and growth of an organization (Lin, 2001). Jarillo (1988) asserted that many necessary resources are uncontrollable by the organization itself; thus, organizations engage in reciprocal trading or interdependence or use resources provided by other individuals or organizations to achieve goals that are unachievable by the organization alone. Liou (2000) claimed that although cooperative relationships with clients or suppliers begin as arrangements to ensure mutual commercial interests, the final goal is establishing long-term relationships to enhance the profitability of both parties. Implementing collaborative operations between organizations and their partners (e.g., clients, suppliers, contractors, or internal departments) to achieve the goal of sharing information can promote organizational performance (Forum, 2007).

SPs must contend with rapidly advancing technology and industrial processes. To adapt to these swiftly changing circumstances, SPs must continually interact with others to gain new knowledge and skills. SPs can gain such knowledge and skills to execute their responsibilities through the Internet, but they must also interact with external organizations (e.g., labor inspection agencies, universities, certification bodies, occupational safety and health organizations, and local authorities) to gain up-to-date information or abilities. The relationships between employees and these external organizations or agencies are called "external relations." In this study, we defined external relationships for university SPs as relationships with one of the twelve following parties: contractors or suppliers, CLAEYT, science park management bureaus, local governments (city or county), local firefighting units, industry unions, trade associations, professional associations or societies, universities, certification bodies, occupational safety and health service agencies, and insurance companies.

1.5. Research objectives

Based on the aforementioned background, motivation, and literature review, the objective of this study was to examine the interactions in the interpersonal relationships of SPs at Taiwanese universities. Specifically, the research objectives were listed as follows:

(1) Develop an interpersonal relationship scale (IRS) for university SPs;

(2) Rank the interpersonal relationships of university SPs according to interaction

frequency; and

(3) Examine the effect of organizational or personal factors on the interpersonal relationships of university SPs.

2. Methods

2.1. Population and Sample

The target population in this study comprised SPs employed by Taiwan's universities. Currently, SPs in Taiwanese universities do not have a contact network. Therefore, we searched the Internet for an SP roster from each university's environmental safety and health department, finding an accessible population of 256 SPs. Next, we randomly sampled 200 SPs for the survey sample. In mid-December 2009, we mailed each SP the questionnaire, a token of our appreciation, an informed consent form, and a self-addressed return envelope.

2.2. Research Instrument

The survey method involved mailing a questionnaire, which was a modified version of a questionnaire for safety professionals developed by Hale et al. (2005) and administered in Europe. Our questionnaire included two sections: The first section contained demographic questions used to determine organizational factors (geographical location, nature, and size of organization, and existence of a safety department) and personal factors (gender, age, total years of experience, years of experience at the current position, title, work status, level of education, major at the highest level of study, and basis of certifications or work qualifications). The second section included the 24-item IRS, on which internal and external relationships were addressed with 12 questions each. Respondents assessed the frequency of interactions in various interpersonal relationships on a 5-point Likert scale. Possible responses were 1 (*weekly*), 2 (*monthly*), 3 (*quarterly*), 4 (*yearly*), or 5 (*never*).

2.3. Data Analysis

Data analysis was performed using SPSS 12.0 Statistical methods included the following: Descriptive statistical analysis was used to describe the sample, and exploratory factor analysis (EFA) was applied to analyze each item and construct validity. The internal consistency of the scale was evaluated using reliability analysis (RA). Multivariate analysis of variance (MANOVA) was used to determine differences in SP interpersonal relationships caused by organizational or personal factors.

3. Results and Discussion

3.1. Sample Overview

After two reminder notices, 153 questionnaires were returned by late January 2010. After discarding invalid responses, we obtained 144 valid questionnaires (72% response rate). The majority of respondents was men (72.2%) and worked at private universities (65.3%). In addition, the average age of respondents was 42 years (standard deviation [SD] = 8.68) and the average experience of work was 7 years (SD = 5.6).

We used MANOVA to determine whether a difference existed between questionnaires returned at different times. The null hypothesis was as follows: No significant difference exists between the responses returned before the reminder and those returned after the reminder. The results revealed that no significant difference existed between questionnaires returned at these two stages (Wilks' Λ = .991, df = 2, p = .516).

Subsequently, we performed a chi-square test to determine whether the gender ratio and the geographical distribution of the sample were representative of the population. The chi-square test is based on residual analysis coupled with χ^2 distribution and used to determine statistical significance. The null hypothesis is rejected when the expected and observed values differ greatly (Keller & Warrack, 2003). The null hypothesis was as follows: The nature ratio and geographical distribution of the respondents and the population do not differ significantly. Test results did not achieve statistical significance (nature ratio: χ^2 = .103, df = 1, p = .748; geographical distribution: χ^2 = 3.062, df = 2, p = .216). Thus, the distribution of the respondents was similar to that of the population.

3.2. Item Analysis

We used correlation analysis to calculate the product momentum correlation between each survey item and the total scale score. As shown in Table 1, the average score (M) of items on the IRS ranged from 1.12 to 3.83 (SD = 0.434–1.329). In addition, the product momentum correlations between each survey item and the total scale score all exceeded 0.30 and achieved the level of significance ($p < .01$). This indicated that each item and the total scale differentiated significantly in the same direction and that each item possessed appropriate discriminative power (Seo, Torabi, Blair, & Ellis, 2004). However, the skewness and kurtosis of industry unions (R18) and trade associations (R19) deviated from normal distribution (Kline, 2005); therefore, these two items were excluded.

Table 1. Item analysis result for interpersonal relationship scale.

R1	Licensed physicians or nurses	2.15	1.084	.68	-.43	.50**
R2	Laboratory or internship unit supervisors	3.63	1.036	-.59	-.29	.61**
R3	Teaching staff	3.58	1.081	-.39	-.78	.60**
R4	Department (or college) heads	3.32	.958	-.20	-.16	.63**
R5	High-level management	2.98	.993	-.00	-.12	.63**
R6	Labor safety and health committee	2.76	.591	-1.33	2.21	.43**
R7	Administrative department	2.69	1.248	.14	-.97	.70**
R8	Department of academic affairs	2.36	1.144	.48	-.63	.70**
R9	Department of general affairs	3.83	1.134	-.75	-.23	.68**
R10	Personnel or human resources department	2.27	1.225	.67	-.53	.74**
R11	Accounting department	2.65	1.329	.32	-1.09	.71**
R12	Legal affairs department	1.44	.809	1.99	3.77	.54**
R13	Contractors or suppliers	2.95	1.303	-.02	-1.12	.59**
R14	CLAEYT	2.23	.859	.61	-.10	.57**
R15	Science park management bureaus	1.24	.606	2.89	8.72	.39**
R16	Local governments (city or county)	2.37	.944	.51	-.21	.50**
R17	Local firefighting units	2.25	.832	.46	.17	.47**
R18	Industry unions	1.12	.434	4.26	19.75	.41**
R19	Trade associations	1.13	.456	4.08	17.48	.44**
R20	Professional associations or societies	1.97	.931	.69	-.38	.57**
R21	Universities	2.59	.978	.27	-.35	.56**
R22	Certification bodies	1.72	.842	1.08	.92	.60**
R23	Occupational safety and health service agencies	1.85	.819	.74	.50	.49**
R24	Insurance companies	1.47	.658	1.37	1.91	.42**

Notes: **$p < .01$; SD = standard deviation

Validity Analysis

After item analysis, we performed EFA to test the construct validity of the scale. The results revealed that the Kaiser–Meyer–Olkin measure of sampling adequacy was 0.87, and the

Bartlett's test of sphericity was near the chi-square value and significant (χ^2 =1363.22, df = 231, $p < .001$). This indicated that the data was suitable for factor analysis (Kaiser, 1974). Next, principal component analysis was performed to extract factors, and the varimax method was used for orthogonal rotation. Following the approach of Hair et al. (2006), we deleted five items for which the factor loading did not achieve 0.50 (R1, licensed physicians or nurses; R6, labor safety and health committee; R13, contractors or suppliers; R17, local firefighting units; R24, insurance companies). The results revealed that two factors, internal relationships and external relationships, had eigenvalues of 4.93 and 3.58, respectively. These two factors accounted for 28.98% and 21.03% of the variance, respectively, and their cumulative explanatory power was 50.01% (Table 2). Kaiser (1960) asserted that only factors with an eigenvalue exceeding 1 should be retained in factor analyses because these factors possess greater explanatory power. Furthermore, Cattell (1966) advocated retaining all factors with eigenvalues less than the break point. As shown in Fig. 1, both factors were retained. Therefore, both the eigenvalues and the scree plot suggested that the IRS possessed satisfactory construct validity.

Table 2.EFA results for interpersonal relationship scale.

Item	Internal relationship	External relationship
R9 Department of general affairs	.78	
R8 Department of academic affairs	.78	
R10 Personnel or human resources department	.76	
R7 Administrative department	.76	
R5 High-level management	.73	
R11 Accounting department	.72	
R3 Teaching staff	.65	
R4 Department (or college) heads	.62	
R2 Laboratory or internship unit supervisors	.62	
R20 Professional associations or societies		.74
R22 Certification bodies		.71
R14 CLAEYT		.67

R12 Legal affairs department		.66
R15 Science park management bureaus		.61
R23 Occupational safety and health service agencies		.60
R21 Universities		.54
R16 Local governments (city or county)		.53
Eigenvalues	4.93	3.58
Explained variance (%)	28.98	21.03
Total explained variance (%)	28.98	50.01

Note: Factor loadings less than .50 have not been printed and variables have been sorted by loadings on each factor.
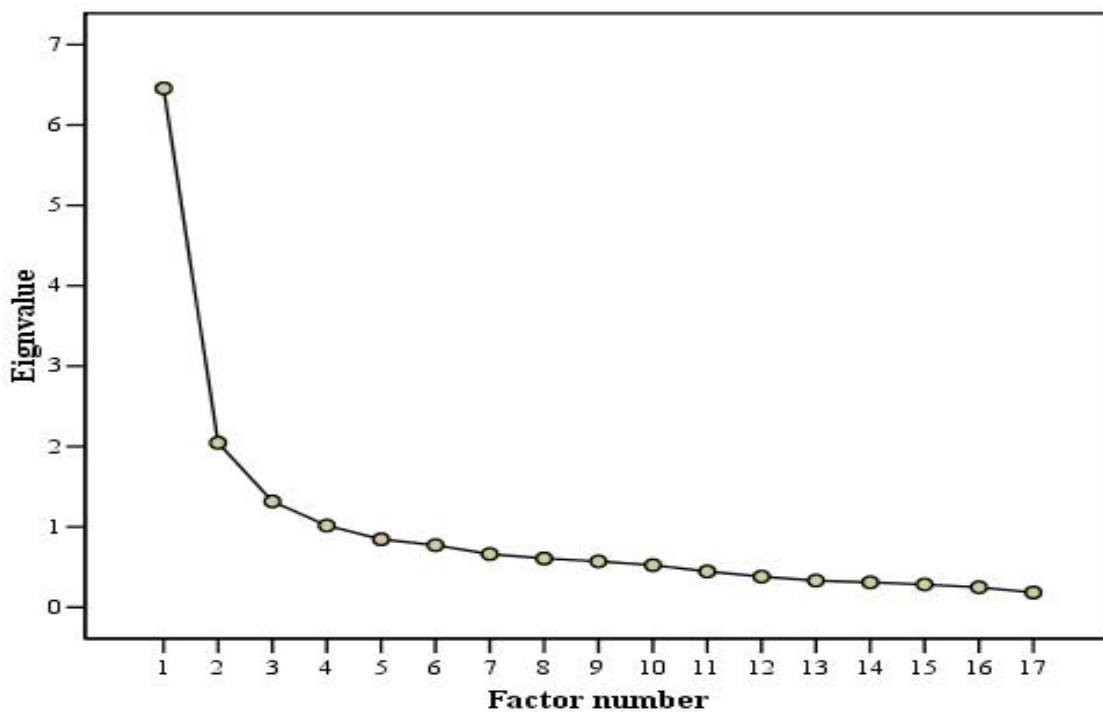

Fig. 1. Scree plot of factors

3.3. Reliability Analysis

After factor analysis, to further ascertain the reliability of the IRS, we performed reliability analysis by determining Cronbach's alpha for the 9 items related to internal relationships and the 8 items related to external relationships. The results revealed that the Cronbach's alpha was 0.90

for internal relationships, 0.81 for external relationships, and 0.90 for the scale overall. This indicated that the scale possessed satisfactory reliability (Hair et al., 2006).

3.4. Ranking Interpersonal Relationships According to Frequency of Interaction

Results showed that university SPs most frequently interacted with general affairs departments, laboratory or internship unit supervisors, and teaching staff. This result is similar to that found by Wu et al. (2014), who examined the overall interpersonal relationships of SPs in science and industry parks. Wu et al. noted that SPs most frequently interacted with employees, contractors or suppliers, line supervisors, administrative departments, and technical or maintenance departments. We observed that among internal relationships, SPs most frequently interacted with general affairs departments, laboratory or internship unit supervisors, and teaching staff. In external relationships, SPs most frequently interacted with universities, local governments (city or county), and CLAEYT (including labor inspection agencies and the Institute of Labor, Occupational Safety, and Health; Table 3.)

Table 3. Ranks of interpersonal relationship frequency.

Rank	Internal relationship (*M*)	External relationship (*M*)	All (*M*)
1	Department of general affairs (3.83)	Universities (2.59)	Department of general affairs (3.83)
2	Laboratory or internship unit supervisors (3.63)	Local governments (city or county) (2.37)	Laboratory or internship unit supervisors (3.63)
3	Teaching staff (3.58)	CLAEYT (2.23)	Teaching staff (3.58)
4	Department (or college) heads (3.32)	Professional associations or societies (1.97)	Department (or college) heads (3.32)
5	High-level management (2.98)	Occupational safety and health service agencies (1.85)	High-level management (2.98)
6	Administrative department (2.69)	Certification bodies (1.72)	Administrative department (2.69)
7	Accounting department (2.65)	Legal affairs department (1.44)	Accounting department (2.65)
8	Department of academic	Science park management	Universities (2.59)

	affairs (2.36)	bureaus (1.24)	
9	Personnel or human resources department (2.27)		Local governments (city or county) (2.37)
10			Department of academic affairs (2.36)
11			Personnel or human resources department (2.27)
12			CLAEYT (2.23)
13			Professional associations or societies (1.97)
14			Occupational safety and health service agencies (1.85)
15			Certification bodies (1.72)
16			Legal affairs department (1.44)
17			Science park management bureaus (1.24)

In internal relationship interactions, general affairs departments are responsible for campus fire safety inspections and maintenance, administration, and construction projects and maintenance, all of which are closely linked to labor safety and health. First, an examination of the universities employing the SPs in this study showed that 55.6% of the universities placed their safety departments under the general affairs departments, increasing the interactions between the SPs and general affairs departments. Second, the safety and health of laboratories is a key focus of university safety and health management. To promote safety and avoid health hazards (including chemical hazards, physical hazards, biological hazards, and ergonomic hazards) in laboratories, SPs must frequently interact with laboratory supervisors. Finally, the teaching staff is the primary beneficiaries of OSHA protection. According to the law, employers must provide employees with necessary safety and health facilities and implement health screening and management as well as safety and health education and training, thereby increasing the frequency of interactions between the SPs and the teaching staff.

In external relationships, governmental agencies such as the Ministry of Labor and the Ministry of Education host legal seminars or education and training activities to increase ties

with universities. Thus, interactions with governmental agencies are quite frequent. Moreover, many university SPs are responsible for environmental protection and safety and health management. To fulfill these responsibilities, SPs frequently interact with local environmental protection agencies at the county or city level. In addition, CLAEYT is the central regulating authority of labor safety and health concerns, responsible for establishing and staffing safety departments, codifying regulations for health and safety, and compiling a monthly occupational injury report. Thus, SPs frequently interact with CLAEYT (including labor inspection agencies and the Institute of Labor, Occupational Safety, and Health).

3.5. Multivariate Analysis of Variance

3.6.1. Central location and variation of interpersonal relationship interactions

The study results showed that in SP interpersonal relationships, the average scores of internal and external relationships were 3.04 and 1.93, respectively. This indicated that the frequency of internal relationship interactions ranged from once per month to once per quarter, whereas the frequency of external relation interactions ranged from never to once per year. Repeated measure MANOVA results revealed that the frequency of interactions for both factors achieved statistical significance (Wilks' Λ = .301, df = 1, p < .001). Pairwise analysis showed that the frequency of internal relation interactions was significantly higher than that of external relationship interactions (Table 4), possibly because university SPs are responsible for planning and monitoring safety and health management tasks on campus and must act as experts, coordinators, and controllers (Wu, Lin, & Shiau, 2010). Thus, the frequency of interactions with intraorganizational units or personnel is higher than that with extraorganizational units or personnel. These results correspond with those of Hale et al. (2005) and Wu et al. (2014), who also found that frequency of internal relationship interactions exceeded that of external relationship interactions.

Table 4. One-way MANOVA with repeated measures.

Variable	N	M	SD	Wilks'Λ	ω^2	$1-\beta$	F	p	Pairwise comparison
Internal relationship	144	3.04	.838	.301[***]	.70	1.00	332.24[***]	.000	Internal relationship
External relationship	144	1.93	.561						> External relationship

Note: [***]p < .001

3.6.2. One-way MANOVA

To understand the correlation between the independent variables and dependent variable, we

defined four organizational factors (geographical location, nature, and size of organization, and existence of a safety department) and ten personal factors (gender, age, total years of experience, years of experience at the current position, title, work status, educational attainment, major at the highest level of study, channel to obtain work qualifications, and basis of task execution) as independent factors. Interpersonal relationship was defined as the dependent variable. MANOVA was used to explore the effect of organizational and personal factors on frequency of interpersonal interactions. The results revealed that the only factor exerting a significant effect on SP interpersonal relationships was the existence of a safety department (Wilks' $\Lambda = .944$, $df = 2$, $p = .018$, $\omega^2 = .056$, power $= .725$); none of the other 13 factors achieved significance. Univariate ANOVA revealed that the frequency of interactions with both internal and external relationships by SPs employed at universities with safety departments was significantly higher than that by SPs employed at universities without safety departments (Tables 5–7, Figs. 2–3).

Table 5.Descriptive statistics for interpersonal relationship: Safety department.

Variable	Presence ($N = 131$)			Absence ($N = 13$)		
	M	SD	95% CI	M	SD	95% CI
Internal relationship	3.09	.820	[2.94, 3.23]	2.54	.889	[2.00, 3.08]
External relationship	1.97	.552	[1.87, 2.06]	1.54	.519	[1.22, 1.85]

Note: CI = Confidence interval

Table 6. ANOVA for safety department difference in interpersonal relationship: Internal relationship.

Source of variation	SS	df	MS	F	p	ω^2	$1-\beta$	Comparison
Between-subjects	3.54	1	3.54	5.19*	.024	.035	.619	P > A
Residual	96.87	142	.68					
Total	100.41	143						

Notes: *$p < .05$; P = Presence of safety department; A = Absence of safety department

Table 7. ANOVA for safety department difference in interpersonal relationship: External relationship.

Source of variation	SS	df	MS	F	p	ω^2	$1-\beta$	Comparison
Between-subjects	2.16	1	2.16	7.15**	.008	.048	.757	P > A

Residual	42.86	142	.30				
Total	45.02	143					

Notes: [**]*p* < .01; P = Presence of safety department; A = Absence of safety department
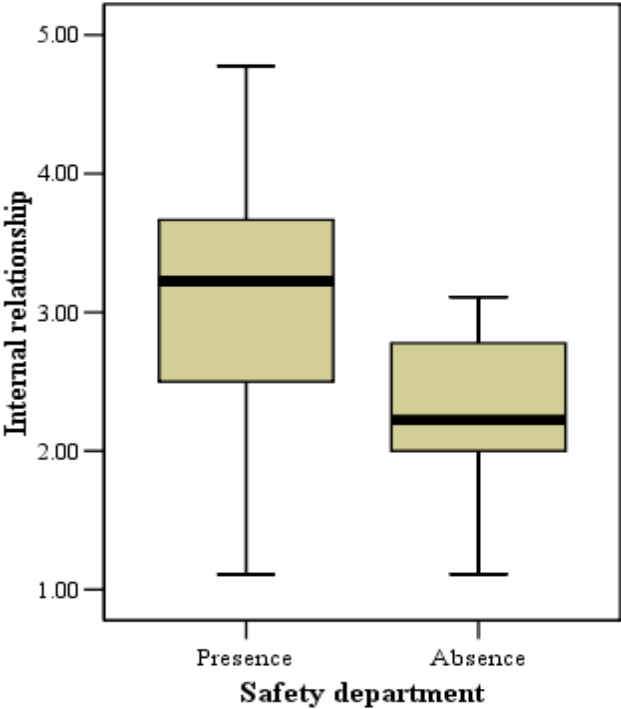

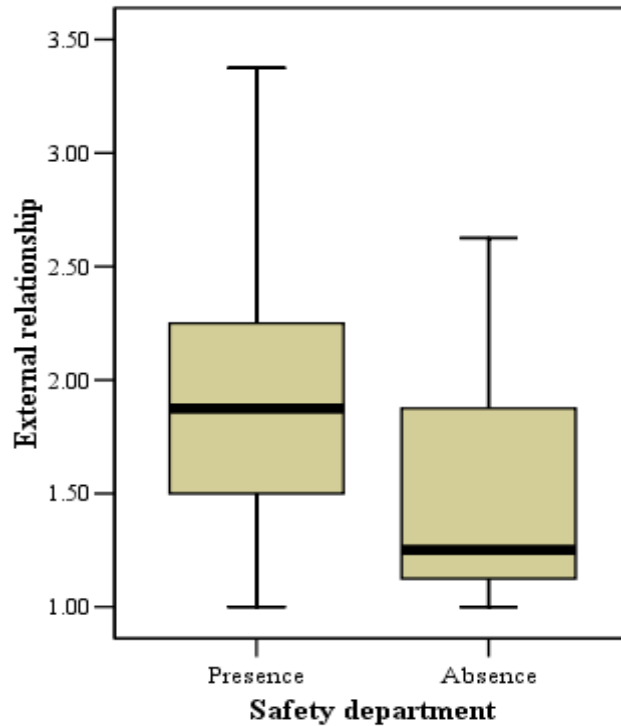Fig. 2. Difference of internal relationship by safety department

Fig. 3. Difference of external relationship by safety department

According to domestic OSHA (2013), employers must implement certain labor safety and health management practices, such as establishing and staffing safety and health units in accordance with relevant regulations, according to the nature and size of the organization. A safety department is responsible for planning and conducting affairs related to labor health and safety within an institution, and SPs are responsible for planning and supervising these tasks. Both safety departments and SPs are part of the safety structure of an institution and fulfill safety functions such as assisting in establishing, improving, and transmitting safety culture within the organization. SPs in universities with safety departments typically have greater safety authority and more resources. This is conducive to increasing the SPs' frequency of interactions with internal and external units or personnel, leading to strong interpersonal relationships and more effective hazard identification, assessment, and control in the workplace.

4. Conclusion and Recommendations

4.1. Conclusion

Through EFA of the IRS developed in this study, we extracted the two factors, internal relationships and external relationships. The factor loading, eigenvalues, and explained variance all reached satisfactory levels. Using Cronbach's α to analyze the internal relationship and external relationship subscales and the overall scale, we found that the scales were highly valid.

Thus, the scale had high construct validity, internal consistency, and reliability and was appropriate for assessing the frequency of interpersonal interactions by university SPs.

Regarding the ranking of frequency of SP interpersonal interactions, the three highest ranked units or people involved in both interpersonal overall and internal relationship interactions (in descending order) were general affairs departments, laboratory or internship unit supervisors, and teaching staff. The three highest ranked units or people in external relationships (in descending order) were universities, local authorities, and CLAEYT (including labor inspection agencies and the Institute of Labor, Occupational Safety, and Health).

One-way MANOVA results showed that the existence of a safety department was the only factor significantly affecting frequency of SP interpersonal interactions. Univariate ANOVA results revealed that SPs employed by universities with established safety departments have a significantly higher frequency of interactions in both internal and external relationships than do SPs employed by universities with no safety department.

4.2. Recommendations

4.2.1. Recommendations for universities

Strengthen ties between SPs and general affairs departments, laboratory or internship unit supervisors, and teaching staff. Because the general affairs department is responsible for campus safety inspections and construction projects and maintenance, it is closely linked to labor safety and health. Laboratories, where universities conduct experiments and teach, and are often the sites of disasters or accidents. The teaching staff are the primary beneficiaries of OSHA protection. Thus, to prevent occupational accidents, the work ties between SPs and these units or personnel should be prioritized.

Increase interactions between SPs and other universities, local authorities, and CLAEYT. To effectively promote labor safety and health, SPs must have ties with authorities that are responsible for monitoring the SPs' work. Ties with other universities enable SPs to share work experiences, increasing the performance of all SPs involved.

Establish and staff safety departments. A safety department is responsible for planning and conducting affairs related to labor health and safety within an institution, and SPs plan and supervise these tasks. To effectively promote safety and health services, universities should establish and staff safety departments.

Strengthen SP communication skills to enable SPs to establish congenial interpersonal relationships. The quality of interpersonal relationships crucially affects the SPs' ability to execute safety and health management tasks. Effective communication skills are keys to establishing strong interpersonal relationships. Therefore, SPs must increase their

communication skills and establish congenial interpersonal relationships to effectively execute safety and health management tasks and ensure employee safety and health.

Lifelong learning for SPs to maintain the professional standards of occupational safety and health. Although the risk level in universities laboratories is not necessarily higher than that in other industries, university SPs must continually receive education and training related to occupational safety and health to appropriately manage the various potential hazards in the workplace, thereby fulfilling their work responsibilities.

4.2.2.   Recommendations for future studies

Perform cross-validation. In the EFA, we analyzed only one sample. Two samples may be chosen and cross-validated in future studies to determine whether the same factor model fits both samples.

Examine the mutual influence of internal and external relationships. Determining whether internal relationships affect external relationships or vice versa, or whether internal and external relationships affect each other requires additional study.

Increase the external validity of the study. This study focused on SPs employed by Taiwanese universities. To increase external validity, we suggest extending the target populations to other industries to increase the applicability of the results.

Explore the skills and training courses required by SPs. This study only examined the frequency of interactions in SP interpersonal relationships. Future studies should focus on the skills required by SPs for executing safety and health tasks. After determining the required skills, future studies can further explore whether various courses are appropriate for cultivating SPs.

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