Investigation of the Relationship between Staff Members' Daily Chats in a Refresh Room and Their Knowledge Sharing in the Workplace

Hidenori Fujino*, Hiroshi Shimoda**, Hirotake Ishii**, and Takayoshi Kitamura***

Abstract : The purpose of this study is to examine the relationship between staff members' daily chats in a refresh room during break times and their knowledge sharing in the workplace, using a subjective questionnaire survey and statistical analysis relying on a social psychological methodology. The data was gathered from staff in a Japanese hospital and a hierarchical regression analysis and a simple slope analysis were conducted. As a result, it was found that among those who seldom participate in refresh room chats, staff members who frequently talk about positive job experiences when they do occasionally participate are likely to evaluate their knowledge sharing better than others who do not often talk so. In addition, among those who do not discuss positive job experiences, staff members who often participate in chats are likely to evaluate their knowledge sharing better than those who participate better their knowledge sharing better than the provide their knowledge sharing better their show often participate in chats are likely to evaluate their knowledge sharing better than those who participate less often. Therefore, the development of measures both to promote participation in chats and to enable and encourage staff to talk about positive job experiences will be recommended in order to foster effective knowledge sharing.

Key Words : daily chat, refresh room, knowledge sharing, safety management, informal communication.

1. Introduction

It is believed that having staff members share each person's practical knowledge, such as senior workers' experiences of incidents and accidents they have actually faced, their knowhow for avoiding or managing human error, ideas that spontaneously emerge while engaged in their daily work, and other information to improve members' performance, is essential to maintain safety in socio-technical systems and areas such as the railway, aviation, nuclear power, maritime, and health care sectors [1]–[3].

Regarding measures to foster knowledge sharing by staff members, the literature of administrative studies indicates that informal communication is believed to be important [4],[5]. It is also often argued in safety culture studies that informal communication would lead to promoting a safety culture because it would foster knowledge sharing [6],[7].

In practical contexts, some practitioners have already intuitively understood the importance of such communication based on their own experience of practices. Furthermore, some of them focus on "staff members' daily refresh room chats" in particular as a situation where such communication occurs. They have attempted some improvements to refresh rooms and their amenities to make staff feel more relaxed, foster lively and spontaneous conversation, and enable them to feel they can speak more freely [8]. Another common measure is installing a coffee machine or constructing an eat-in space in a refresh room, because having a coffee or eating together can

*** College of Information Science and Engineering, Ritsumeikan University, Kusatsu 525-8577, Japan E-mail: fujino@fpu.ac.jp (Received March 22, 2016) (Revised August 1, 2016) make staff more open and friendly and can lead to animated conversations [9]. Furthermore, a workplace can be improved by building a refresh room that allows staff from various units and departments to gather together [10]. This is based on a belief that when many staff members from a variety of different practical backgrounds gather together, there will be considerable conversation about a wide range of topics, resulting in significant knowledge sharing.

While there is literature on this topic and examples as given above, the effectiveness of staff members' daily conversation for knowledge sharing is mainly argued by qualitative discussions based on case studies of actual workplaces by interview or observation. Although some studies related to safety culture have been conducted by quantitative methods, those studies do not pick up on "a daily chat" but just "an informal communication." These two concepts are similar but a daily chat is a narrower concept from the point of view of where and when the communication is carried out. In this study, a daily chat is defined as one in a refresh room during a break time. The concept of an informal communication covers a broader situation, not only in a refresh room during a break time but also around a workbench or a desk in an office or in other working situations. It is still not clear, from a quantitative perspective, which of various situations best facilitates effective informal communication that will foster knowledge sharing. More specifically, the issue of whether daily chats in a refresh room during break times would be connected to staff members' knowledge sharing has not been quantitatively examined.

This is what this study aims to do: quantitatively examine the relationship between staff members' daily refresh room chats and their knowledge sharing, using a subjective questionnaire survey and statistical analysis relying on a social psychology methodology.

^{*} Department of Economics, Fukui Prefectural University, Eiheiji 910-1198, Japan

^{**} Graduate School of Energy Science, Kyoto University, Kyoto 606-8501, Japan



Fig. 1 A hypothetical relationship among experimental variables.

Table 1 Expected state of knowledge sharing in our hypothesis.

		Frequency of participating in daily chat in a refresh room					
		High	Low				
Frequency of selecting a job-related	High	Very Good	Good				
topic in refresh room chats	Low	Good	Poor				

2. Hypothesis

This study's hypothesis is depicted in Fig. 1 and Table 1. In this hypothesis, the objective variable is "the state of knowledge sharing in a workplace." "Poor" in Table 1 means that staff members do not share their practical knowledge, information, and experience very much with others. On the other hand, "Good" means that they share large amounts of such information. It is hypothesized that this objective variable will be predicted by two explanatory variables: "frequency of each staff member's participation in refresh room chats" and "frequency of talking about a job-related topic during refresh room chats."

The first explanatory variable is used to examine the effect on knowledge sharing of actual participation in daily chats. As described in Sec. 1, managers usually think there is such an effect. If this is actually the case, it is expected that the more often staff members participate in refresh room chats, the more their knowledge will be shared among other staff members in the workplace.

On the other hand, the second explanatory variable is used based on the authors' original idea that the crucial factor for knowledge sharing is not only the participation itself but also the contents of the conversation. The authors expect that if most conversation is not job-related, it cannot foster knowledge sharing, even when members often participate in refresh room chats. In fact, contrary to the existing interpretation, the authors also expect that if most conversation is job-related, large amounts of knowledge can be shared even when the frequency of participation itself is low.

The state of knowledge sharing will be predicted by a combination of these two variables as shown in Table 1. The purpose of the survey conducted in this study is to examine this relationship.

3. Method

3.1 Methodology

In this study, the methodology of social psychology is applied to examine the hypothesis. In this methodology, a hypothesis is mainly examined by a subjective questionnaire survey and a statistical analysis. It means that what is examined in the present study is the relationship among variables based only on participants' subjective evaluations. In other word, strictly speaking, the factual objective relationship among variables is not examined. The paradigm of social psychology methodology asserts that subjective evaluations will be derived from the objective states of facts, although various biases and heuristics can affect subjective evaluations to some extent. Based on this premise, social psychology asserts that if some relationships among variables are found in subjective evaluation, such relationships will also be found among the variables related to the objective facts. This study is also based on this premise. In other words, for example, if staff members' subjective evaluations of knowledge sharing in their workplaces are good, that result will be interpreted as indicating that the objective state of knowledge sharing is good.

3.2 Subjects

The subjects of this survey were staff members in a Japanese hospital who participated in a seminar about patient safety management, which was held on a day in July 2015 in that hospital. There were 388 subjects, made up of 79 doctors, 183 nurses and 126 other staff, such as pharmacists, paramedics, and clerks. One possible concern related to this sampling method is that it might be expected that people participating in such a seminar would already be strongly concerned about patient safety and/or improving their job performances. If so, they might be expected to often participate in chats related to their job in a refresh room and to have already formed a positive attitude to knowledge sharing in the workplace. The possibility of such a bias based on personalities could affect the result in various ways. However, we do not believe that this problem arises in this present case. The seminar in question was regarded as part of the regular training in which all hospital staff must participate. Staff were strongly requested to participate in the seminar unless an emergency situation occurred at that time or it would extremely inconvenience their work. In other words, the subjects did not all participate in the seminar purely by choice. Therefore, it is considered that such a bias as stated above is minor enough to be ignored, and it is expected that this survey's sampling method will not affect the result.

3.3 Survey Procedure

Questionnaire sheets were given to each subject before the seminar. The purpose of the survey, directions for answering, and the privacy policy were explained at the beginning of the seminar. The questionnaire was to be answered during the seminar (around one hour) while listening to the lecture. The completed sheets were gathered after the seminar.

The lecture was related to patient safety, which is an important keyword for their performance. Thus, the fact that the content of the lecture might affect each subject's answers must be taken into consideration, as they would be answering the questions not before but during the lecture. However, we feel that such a possibility can be ignored in this survey because the main topic of the lecture was safety management practice in other industrial fields; moreover, knowledge sharing and staff members' communication were not referred to at all. Therefore, we consider that the possible effects on this survey are sufficiently minor to be ignored.

Table 2 Items on questionnaire

	Table 2 Items on questionnaire.
No.	Sentence
Frequer	ncy of participating in daily refresh room chats: FP
I.1	How often do you spend break times chatting with colleagues in a refresh room daily?
I.2	How often do you spend break times alone in a refresh room?
Frequer	ncy of talking about a job-related topic during refresh room chats: FT
I.3	How often are job-related issues a major topic in your daily refresh room chats during breaks?
I.4	How often are anyone's positive job experiences (including your own) a major topic in your daily refresh room chats during breaks
	(such as happy or funny incidents)?
I.5	How often are anyone's negative job experiences (including your own) a major topic in your daily refresh room chats during breaks
	(such as sad or painful incidents)?
I.6	How often is news related to incidents or accidents in your or other hospitals a major topic in your daily refresh room chats during breaks?
Knowle	dge sharing in workplace: KS
I.7	In my workplace, it is easy to correct and advise colleagues to prevent them from making errors.
I.8	In my workplace, many ideas are generated for improving performance.
I.9	In my workplace, seniors' experience, including their failures and success and their know-how, is passed on to younger colleagues smoothly.
I.10	In my workplace, lessons from previous failures or incidents are effectively exploited by staff in order to improve performance.
I.11	In my workplace, many staff members think they have no relationship with or responsibility for anything that happens in the workplace
	after handing over to the next shift.
I.12	In my workplace, information related to medical errors occurring in our or other hospitals is shared very well.
I.13	In my workplace, colleagues rarely advise each other in relation to each other's job.
I.14	In my workplace, many staff members make an effort to learn others' skills and knowledge to improve their performance.
I.15	In my workplace, a new colleague can easily be open with other staff members.
I.16	Although small mishaps that do not have to be officially reported happen, information such as details of that mishap or the situation at the time
	are shared among colleagues.
I.17	In my workplace, most colleagues take pride in their work.
Staff me	mbers' awareness of their colleagues and workplace: AW
I.18	My colleagues understand and accept my personality well.
1.19	I do not know much about what kinds of things my colleagues usually pay attention to in practicing their jobs to maintain performance and
	prevent errors.
1.20	I am well aware of the details of my colleagues' jobs.
1.21	I am well aware of previous incidents and accidents in my workplace.
1.22	For improving my performance, I have learned a lot from colleagues' know-how.
1.23	I understand and accept my colleagues' personalities well.

* Note that the actual questionnaire was written in Japanese.

3.4 Contents of Questionnaire

The survey questionnaire consisted of 23 items¹ shown in Table 2. Those were related to: "frequency of participating in daily refresh room chats" (FP), "frequency of talking about a job-related topic during refresh room chats" (FT), "knowledge sharing in the workplace" (KS), and "staff members' awareness of their colleagues and workplace" (AW). Items I.1 to I.6 were answered on a scale of 1 to 5, 1 meaning "not often at all" and 5 meaning "very often." The other items were also answered on a scale of 1 to 5, 1 meaning "strongly disagree" and 5 meaning "strongly agree."

In relation to FP, the questionnaire contained not only I.1, which directly asked the frequency of participating in chats, but also I.2, which asked indirectly the frequency of spending breaks alone. The reason for inserting I.2 was that some biases such as social acceptance demonstrated by the frequency of communication in the refresh room or while on breaks; the frequency of communication when actually working (not on breaks or in the refresh room); and the level of friendship among staff members could influence subjects' answer to I.1 when asked from a positive point of view. By asking I.2 from a negative point of view, the effect of such biases should be reduced.

In relation to FT, the frequencies of chatting about positive and negative job experiences were asked in I.4 and I.5, as well as in I.3, which asked about the frequency of discussing their job in general. This is because such storytelling based on one's practical experiences can be particularly expected to foster knowledge sharing more effectively than other topics related to their job, as stories of positive experiences can be expected to include the key to success and stories of negative experience will often include any lesson that should be learned. Furthermore, I.6 related to the news of medical incidents and accidents was inserted because the survey subjects were hospital staff. As they would have a keen interest in such news, it should be chosen as a topic of their daily chats. It is expected that such chats would also foster their knowledge sharing.

The items related to KS were developed based on questionnaires used in previous studies of safety culture and climate, especially items about organizational members' communication [6],[7].

Although AW is not placed in the hypothesis model in Fig. 1, 6 items (I.18 to I.23) related to this were placed in this questionnaire. This is to eliminate the possibility of spurious correlations between hypothesized explanatory variables and an objective variable occurring. It is possible that, while neither FP nor FT are actually directly connected to KS, these two explanatory variables could have a significant correlation coefficient or significant regression coefficient to KS in a statistical analysis, if these three variables in the hypothesis correlate independently with AW as shown in Fig. 2. By introducing AW as a control variable in the hypothesis model, problems with

¹ Two other items were included on the sheet but they were not related to this study.



Fig. 2 Possible spurious correlations.

spurious correlations should be eliminated.

In addition to these 23 items, information on subjects' gender, age, job, job experience, tenure of current post, and number of colleagues in the workplace was also gathered. These were also added to the model as control variables.

4. Results

As stated in Sec. 3.2, the total number of subjects was 388, of whom 302 responded. After respondent validity was checked by whether all questions had been appropriately answered, the number of valid respondents was 241, as 61 respondents who had not answered one or more questions were eliminated.² The numbers for gender and job descriptions of valid respondents are shown in Table 3. In Table 3, "response rate" means the ratio of the number of valid respondents to the number of members participating in that seminar for each job. While the exact number of doctors and nurses who participated in this survey is known, the exact number of pharmacists, paramedics, clerks, and others (termed as "other staff") is not known. Thus, in Table 3, separate response rates for doctors and nurses are shown, while response rates for the other jobs are aggregated.

4.1 Scales Construction

The explanatory factor analysis was carried out on the 11 items of KS. Based on a scree plot, factor loadings, and comprehensibility of extracted factors, one factor constituting 6 items was extracted. Those 6 items' loadings and communalities and the proportion of variance of the extracted factors are shown in Table 4. Cronbach's α , which was computed for these 6 items in order to check their consistency, was .79, meaning good consistency. Therefore, the sum of these 6 items was used as a scale for KS

Next, the explanatory factor analysis of the 6 items relating to AW was conducted in the same way and one factor constructed from all 6 items was extracted as shown in Table 5. The Cronbach α of this factor was .77, which is also good. Therefore, the sum of these 6 items was used as a scale for AW.

In regard to FP, the correlation between I.1 and I.2 was .54, reasonably strong.³ Therefore, the sum of I.1 and I.2 was used

³ I.2 was inversed.

Table 3 The number of valid responses by gender and job.

	Female	Male	Total	Valid response rates for all sub- jects (%)
Doctor	12	19	31	39
Nurse	126	7	133	73
Pharmacist	12	0	12)
Paramedic	12	16	28	61
Clerk	24	3	27	01
Other	9	1	10	J
Total	195	46	241	62

Fable 4	Factor	analysis	results	for K	S.
---------	--------	----------	---------	-------	----

Item	Loadings	Communality
I.10	.75	.56
I.9	.68	.46
I.8	.66	.44
I.14	.60	.35
I.16	.58	.33
I.12	.50	.25
Proportion	40	
of variance	.40	
	OTOP OPOLIZA10 1	oculto for AW
Item	Loadings	results for AW.
Item I.23	Loadings	cesults for AW. Communality .59
Item I.23 I.20	Loadings .77 .65	results for AW. Communality .59 .42
Item I.23 I.20 I.21	Loadings .77 .65 .63	results for AW. Communality .59 .42 .40
Item I.23 I.20 I.21 I.18	Loadings .77 .65 .63 .59	results for AW. Communality .59 .42 .40 .35
Item I.23 I.20 I.21 I.18 I.22	Loadings .77 .65 .63 .59 .51	Communality .59 .42 .40 .35 .26
Item I.23 I.20 I.21 I.18 I.22 I.19	Loadings .77 .65 .63 .59 .51 50	Communality .59 .42 .40 .35 .26 .25
Item I.23 I.20 I.21 I.18 I.22 I.19 Proportion	Loadings .77 .65 .63 .59 .51 50	Communality .59 .42 .40 .35 .26 .25

as a scale for FP.

4.2 Descriptive Statistics

Having constructed these three scales, the descriptive statistics of all the variables used to examine the hypothesis and the correlations are presented in Table 6.

As shown in Table 6, KS has significant correlations with FP, I.4, and AW. This means that the more often subjects participate in chats or the more often they talk about anyone's positive job experiences during the chats, the better they evaluate the state of their workplace's knowledge sharing. This seems to support this study's hypothesis. However, the correlations between AW and each of KS, FP, and I.4 are also significant; therefore, there is a possibility that the correlations between KS and each of I.4 and FP could be just spurious correlations mediated by AW. Thus, more detailed analysis is required to control the effect of AW or other control variables.

4.3 Selection of Control Variables

In order to remove redundant control variables, selection of control variables by multiple regression analysis and the stepwise method was carried out. As a result, it appeared that the adjusted R^2 of the model without gender, age, and experience (stepwise model) was slightly higher than that with all control variables (baseline model) as shown in Table 7,4 although the difference between the two models was not significant. As

² The details of the 61 respondents eliminated are as follows: twenty did not answer one or more questions about their own demographic information like gender, age, or job. It is possible that they felt they could be identified by such informations of them. Twenty-five did not answer any of the questions from I.7 to I.23. They may not have noticed those questions because they were printed on the back of the sheet. Five were included in both groups. Another 21 subjects did not answer a few questions excluding the questions about demographic information, probably because they could not think of the answer for them immediately, and submitted the sheet without answering them.

⁴ Gender and Job were both Category variables, therefore, intercept was computed as a case where Gender was female and Job was Clerk.

TT 1 1 (D	
Table 6	Descriptive	statistics.

	Variable	Maan	S D					С	orrelatior	is				
	variable	Wiean	5.D.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Hypoth	hesized variables													
1	FP	3.64	1.08	1										
2	I.3	3.74	0.89	.134	1									
3	I.4	2.88	0.98	.316	.224	1								
4	I.5	3.26	1.04	.046	.478	.141	1							
5	I.6	2.75	0.95	.163	.258	.262	.413	1						
6	KS	3.55	0.61	.183	.015	.151	.047	.099	1					
Contro	ol variables													
7	AW	3.57	0.60	.200	.153	.255	.155	.214	.469	1				
8	Age	33.51	10.77	365	<u>149</u>	096	.054	.008	.004	.185	1			
9	Ten	5.24	5.72	175	061	021	.008	.108	048	.256	.509	1		
10	Exp	9.76	9.05	268	084	055	023	.042	.035	.276	.856	.597	1	
11	NC	25.18	9.06	.306	.274	.184	.098	.080	063	054	396	053	323	1

FP: Frequency of participating in daily refresh room chats, KS: Knowledge sharing in workplace; AW: Staff members' awareness of their colleagues and workplace; Ten: Tenure; Exp: Experience. NC: Number of colleagues in his/her workplace. Please note that all underlined correlation coefficients in this table are significant to at least a 5% level.

Table 7 Result of variable selection by stepwise method.

			<i>y</i> 1	
	Baseline model		Stepwise model	
	β		β	
(Intercept)	141		098	
Gen: Male	058			
Age	.122			
Exp	093			
Ten	130	ŧ	128	*
NC	112	ŧ	119	†
Job: Doctor	308		360	
Job: Nurse	.328		.260	
Job: Others	128		092	
Job: Pharmacist	.419		.374	
Job: Paramedic	044		115	
AW	.498	***	.495	***
adjusted R^2	.266	***	.272	***
ΔR^2			.006	

 ΔR^2 = Adjusted R^2 of each model - Adjusted R^2 of Step 1 model. ***: prob. < .001, **: prob. < .01, *: prob. < .05, †: prob. < .10.

a simpler model with fewer variables and sufficient predictive power would be preferable, these three variables—gender, age, and experience—were removed in the following analysis. Note that all the variables' variance inflation factors (VIFs) in the stepwise model were lower than 10. If VIF were over 10, there would be a high risk of multicollinearity. On the other hand, If below 10, that risk would be low in general. Therefore, in the selected model, the risk of multicollinearity was considered small.

4.4 Hierarchical Multiple Regression Analysis

Hierarchical multiple regression analysis was conducted in order to examine the hypothesis. In step 1, the model that KS can only be predicted by control variables—tenure, NC, job, and AW—was examined. In step 2, the model that KS can be predicted by FP as well as the control variables included in step 1 was examined. In step 3, the models that KS can be predicted by each of I.3 to I.6 and their interaction terms with FP, as well as all the independent variables of step 2, were examined.

The result is shown in Table 8. β in this table is a standardized partial regression coefficient. *Intercept* for each model was computed as a case where Job was set as Clerk. The value of β for other jobs means the amount of change of *intercept* in the case where Job was set each of other jobs. The VIFs of all variables for all models were below 10.

As shown in Table 8, the model including I.4 in step 3 showed a significant improvement of $\Delta R^2(prob. = .007 < .01)$ and the β of the interaction term of FP and I.4 was significant (*prob.* = .001 < .01).

4.5 Simple Slope Analysis

Because the interaction term of FP and I.4 was significant and the adjusted R^2 of that model was also significantly improved compared to Step 1's model, a further simple slope analysis was conducted.

The relationship between I.4 and KS for each case where raw FP is rated 1 to 5 was depicted in Fig. 3. Here, the horizontal axis unit is 1S.D. of I.4 and the horizontal axis range is set to the domain of I.4 in this analysis. The 95% β confidence band of I.4 by FP is depicted in Fig. 4. Here, the horizontal axis unit is 1S.D. of FP and the horizontal axis range is set to the domain of FP in this analysis. The center slope line represents a β prediction of I.4 to KS by FP, and the upper and lower curves represent the upper and lower bounds of the 95% confidence bands of prediction. The vertical hashed line on FP = .545SDrepresents the 5% prediction significance level threshold. When FP is less than this value, the prediction of β of I.4 to KS would be significant under a 5% significance level. Based on Fig. 3 and Fig. 4, when FP was rated 3 or less, the positive relationship between I.4 and KS appeared significant. On the other hand, when FP was rated 4 or 5, the relationship between I.4 and KS was not significant (5% significance level).

Further, the relationship between FP and KS for each case where raw I.4 is rated 1 to 5 is depicted in Fig. 5. Here, the horizontal axis unit is also 1*S*.*D*. of FP and the horizontal axis range is set to the domain of FP in this analysis. The 95% confidence band of β of FP by I.4 is depicted in Fig. 6. Here, the horizontal axis unit is 1*S*.*D*. of I.4 and the horizontal axis range is set to the domain of I.4 in this analysis. The center slope line represents the prediction of β of I.4 to KS by FP, and the upper and lower curve lines represent the upper and lower bounds of the 95% confidence bands of prediction.

The vertical hashed line on FP =-1.029SD and FP=1.295SD represents the threshold of the 5% prediction significance level.

Table 8 Results of hierarchical regression analysis.

	Step 1		Step 2		Step 3							
	β	Prob.	β	Prob.	β	Prob.	β	Prob.	β	Prob.	β	Prob.
Intercept (Job: Clerk)	098		073		137		.008		078		045	
Control variables												
Ten	128	*	118	ŧ	125	*	104	†	119	†	119	t
NC	119	†	132	*	115	†	112	†	129	*	138	*
Job: Doctor	360		371		307		430	ŧ	367		382	t
Job: Nurse	.260		.223		.298		.198		.228		.199	
Job: Others	092		120		079		241		118		142	
Job: Pharmacist	.374		.389		.512		.353		.412		.358	
Job: Paramedic	115		141		113		141		145		153	
AW	.495	***	.481	***	.503	***	.473	***	.488	***	.476	***
Explanatory variables												
FP			.053		.051		011		.053		.053	
1.3					094							
FP×I.3					.023							
1.4							.057					
FP×I.4							170	**				
1.5									028			
FP×I.5									.013			
1.6											.012	
FP×I.6											057	
Adjusted R ²	.272	***	.271	***	.274	***	.300	***	.266	***	.269	***
ΔR^2			001		.002		.028	**	006		003	

 $\varDelta R^2 = \text{Adjusted } R^2 \text{ of each model} - \text{Adjusted } R^2 \text{ of Step 1 model} \\ ***: prob. < .001, **: prob. < .01, *: prob. < .05, †: prob. < .10.$



Fig. 3 Results of simple slope analysis with setting I.4 as predictor.

When FP is less than -1.029SD or larger than 1.295SD, the β prediction of FP to KS would be significant below a 5% significance level. Based on Fig. 5 and Fig. 6, when I.4 was rated 1 or 5, FP could predict KS under 5% significance level. This means as following: When I.4 was rated 1, the relationship between FP and KS was significantly positive. On the other hand, when I.4 was rated 5, the relationship between them was significantly negative. When I.4 was rated between 2 and 4, the relationship between FP and KS was not significant.

5. Discussion

The results of the analysis can be summarized as follows: (1) Regarding conversation topics, only the frequency with which topics relating to positive job experiences were the subject matter (I.4) was connected to KS. Others, like negative experiences or general topics related to work, were not connected



Fig. 4 95% confidence band of a predicted β of I.4 to KS by FP.

with KS.

(2) Subjects who rated both FP and I.4 low evaluated KS more poorly.

(3) Subjects who rated FP high, evaluated KS better than the subjects in (2). Among subjects who rated FP high, the KS of subjects who rated I.4 high was slightly worse than the KS of subjects who rated I.4 low, but not significantly (5% significance level).

(4) Subjects who rated FP low and I.4 high evaluated KS better than all other subjects.

Table 9 represents the summary of (2), (3), and (4).

In the hypothesis stated in Sec. 2, it was expected that subjects who rated FP high and I.4 high would evaluate KS higher than those who rated FP low and I.4 high. However, the actual result was significantly contrary to the hypothesis. Based solely on the results of this survey, the reason for this is un-



Fig. 5 Results of simple slope analysis with setting I.4 as predictor.



Fig. 6 95% confidence band of a predicted β of FP to KS by I.4.

Table 9 Summary of results of this analysis.

		Frequency of participating in daily chat in a refresh room (FP)				
		High	Low			
Frequency of selecting a job- related topic in refresh room chats (I.4)	High	signi Good ◀	ficant ► Very Good ਜ਼			
	Low	igi tig Good ← signit	→ Poor			

clear. One possible reason is the characteristics of human memory and the influence of availability heuristics. In the literature of human memory, it has been shown by experiments that atypical events are more memorable (recallable) than typical events [11]. Based on this literature, subjects who rate FP low and I.4 high can recall the memory of a conversation better than those who rate both FP and I.4 high, because for the latter, participating in lively conversations and talking about positive job experiences, leading to the sharing of useful knowledge, would be a commonplace occurrence. On the other hand, it would not be usual for subjects rating FP low and I.4 high to participate in conversations, although they would always talk about positive job experiences whenever they occasionally participated in one. Furthermore, such recallability affects the frequency judgment known as an availability heuristic [12]. The more a person can recall information related any event, the more he is likely to judge subjectively that such an event frequently happened than is in fact the case. Namely, subjects rating FP low and I.4 high would evaluate their KS higher than the actual state of their KS because they can recall very well the occasions of conversations from which they gained useful knowledge. On the other hand, subjects rating both factors high would evaluate their KS lower than in fact because they cannot recall such scenes as well. Of course, this is a hypothesis based on the premise that the acquired result of subjects rating FP low and I.4 high would not accurately reflect the actual state of their KS. There might be many reasons for why the KS of subjects rating FP low and I.4 high would actually be higher than the others. Therefore, further research on this issue is required.

Meanwhile, practical implications can be suggested based on the results, especially regarding staff members whose knowledge sharing would be considered poor:

(1) Regardless of conversation topics, knowledge sharing will be enhanced as long as they are allowed to frequently participate in refresh room chats during break times (see Fig. 5).

(2) Even if staff members cannot participate frequently, their knowledge sharing will be enhanced if they discuss topics related to positive job experiences whenever they do occasionally participate in a conversation (see Fig. 3).

Based on (1), it is expected that practical measures such as those in Sec. 1, that aim at promoting lively conversation among staff members, will enhance lively knowledge sharing. However, there may be some staff whose job conditions prevent them from participating frequently in such conversations. Even for such staff, based on (2), their knowledge sharing should be enhanced if they could be provided with opportunities to discuss positive topics related to staff members' job experiences. Therefore, research into and development of such methods would be desirable.

6. Limitations

All the variables in this survey were at a personal level, not a group level. Naturally, the hypothesis of a relationship between the liveliness of refresh room conversations during break times and knowledge sharing in a workplace should be established using group-level variables. Therefore, it is more desirable to group subjects' answers by each unit or workplace and establish group-level variables. However, to do so, it would be necessary to ask the name of their unit or workplace in a questionnaire. In this survey, if such a question were inserted, there would be a risk of decreasing the number of valid respondents because subjects might feel at risk of being identified by their answers, including answers to a question about their demographic information. Furthermore, such a concern would also decrease their motivation to answer honestly. This is a problem related to the dilemma of balancing the theoretical strictness of research methods and the reliability of respondents. In this study, because the latter issue was considered more critical, there is a limitation related to the theoretical strictness of the research methods.

This survey was conducted in only one hospital. Therefore, whether the same results would be found in other hospitals and

other industrial organizations is open to question. In order to establish a more generalized theory, the same survey needs to be carried out in other organizations.

7. Conclusions

This study aimed at quantitatively examining the relationship between staff members' chats in a refresh room and knowledge sharing in the workplace by subjective survey and statistical analysis. As a result of the investigation conducted on staff in a Japanese hospital, it was found that (1) fostering staff members' lively conversations, regardless of topic, would enhance their knowledge sharing, and (2) promoting the discussion of positive job experiences, even if the frequency of participation in chats is low, would also enhance staff members' knowledge sharing.

The following work remains to be done in the future: first is to examine the issue of subjects who rated both FP and I.4 high and the others who rated FP low and I.4 high, especially from the view point of the influence of availability heuristics. The second is to examine the hypothesis of this study using other research methods or methodologies, for example, by using more objective indices, longitudinal research, or participant observation. The third is to examine further the model in other organizations. And the fourth is to develop methods of giving staff members opportunities to talk about job-related topics, especially positive job experiences, during refresh room chats.

References

- E. Hollnagel, J. Pariès, D. Woods, and J. Wreathall: *Resilience Engineering in Practice: A Guidebook*, Ashgate Publishing, Ltd., 2012.
- [2] J. Reason and A. Hobbs: Managing Maintenance Error: A Practical Guide, Ashgate Publishing, Ltd., 2003.
- [3] K.E. Weick and K.M. Sutcliffe: *Managing the Unexpected: Assuring High Performance in an Age of Complexity*, Wiley, 2001.
- [4] I. Nonaka and H. Takeuchi: *The Knowledge-Creating Com*pany: How Japanese Companies Create the Dynamics of Innovation, Oxford University Press, 1995.
- [5] E. Wenger, R.A. McDermott, and W. Snyder: *Cultivating Communities of Practice: A Guide to Managing Knowledge*, Harvard Business Press, 2002.
- [6] H. Fukui: Questionnaire survey of safety climate at nuclear power plants, *Journal of Group Dynamics*, Vol. 29, pp. 71–88, 2012.
- [7] H. Sakurai, M. Onda, M, Takaki, A. Nakagawa, Y. Gato, Y. Arakawa, and Y. Hayase: An investigation on the relationship between "attitude toward the organization and duties" and "safety consciousness" in the community pharmacy, *The Japanese Journal of Quality and Safety in Healthcare*, Vol. 6, No. 1, pp. 3–21, 2011.
- [8] Bestinteriordesigners: Top 5 office designs by Best Interior Designers, August 3, 2015. http://www.bestinteriordesigners.eu/ top-5-office-designs-by-best-interior-designers/
- [9] B. Waber: *People Analytics: How Social Sensing Technology Will Transform Business and What It Tells Us about the Future of Work*, FT Press, 2013.
- [10] ANA business solutions: *Habits ANA Thinks a Great Deal of*, Fusosha, 2015.
- [11] J.I. Skowronski, A.L. Betz, C.P. Thompson, and L. Shannon: Social memory in everyday life: Recall of self-events and other-events, *Journal of Personality and Social Psychology*, Vol. 60, No. 6, pp. 831–843, 1991.
- [12] A. Tversky and D. Kahneman: Availability: A heuristic

for judging frequency and probability, *Cognitive Psychology*, Vol. 5, No. 2, pp. 207–232, 1973.

Hidenori FUJINO (Member)



He received his B.S., M.S., and Ph.D. degrees from Kyoto University, Japan, in 2002, 2004, and 2008, respectively. In 2015, he joined Fukui Prefectural University, where he is currently a lecturer in the Faculty of Economics. His research interests include communication design, safety management, and human-machine systems. Among the organizations of which he is a mem-

ber are the Human Interface Society and the Japanese Association of Industrial and Occupational Psychology.

Hiroshi Shimoda (Member)



He received his B.S., M.S., and Ph.D. degrees from Kyoto University, Japan, in 1987, 1989, and 1998, respectively. In 2015, he joined Kyoto University, where he is currently a professor of the Graduate School of Energy Science. His research interests include communication design and human-machine systems. Among the organizations of which he is a member are the Human Interface

Society and the Atomic Energy Society of Japan.

Hirotake Ishii



He received B.S. and M.S. degrees in electrical engineering from Kyoto University in 1996 and 1998, respectively and a Ph.D. degree in energy science from Kyoto University in 2000. He is currently an assistant professor at the Graduate School of Energy Science, Kyoto University. His current research interests includes augmented

reality, the promotion of pro-environmental behavior and human intellectual productivity.

Takayoshi Kitamura



He received his B.S. degree from Kagoshima University, Japan in 2009 and an M.S. degree from Kyoto University, Japan in 2012. In 2015, he joined Ritsumeikan University, where he is currently an Assistant of the College of Information Science and Engineering. His research interests include social communication design. Among the organizations of which he is a member are

the Human Interface Society and the Information Processing Society of Japan.