

## Interprofessional education in Japanese university nursing programs: Current status and evaluation of its impact

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### Abstract

This study was aimed to identify the current status and the evaluation of the impact of interprofessional education (IPE) on nursing education in Japanese universities. Two hundred Japanese universities with nursing programs were the target of this study. Backward Binary Logistic Regression Analysis ( $P_{in}=0.14$ ,  $P_{out}=0.15$ ) was performed to determine the relationship between subjective evaluations of IPE and 24 indices such as the founding year of the university and the department of nursing, and the participation or nonparticipation of departments and each profession.

One hundred ten valid responses (55.0%) were collected. Among those responses, 58 universities implemented IPE (52.7%) and 52 did not have an IPE program at their institute (47.3%). These results indicated that the significance of IPE program on nursing education tended to be highly evaluated when students of the Department of Nutrition and Dietetics, and Occupational Therapy participated in the program, whereas the significance of IPE tended to be considered low with the participation of students of the Department of Speech, Language

and Hearing Sciences.

Regarding the treatment or support of their clients (i.e., patients), when the IPE participating students shared the areas of responsibility of their intended professions, the impact of IPE was more likely to have the high evaluation score. On the contrary, the tendency of the Department of Speech, Language and Hearing Sciences (DSL&HS) indicated that the significance of IPE received low evaluations due to the low recognition by other professions for the contents of DSL&HS's high expertise.

### Introduction

Interprofessional education (IPE) has been defined as that which “occurs when two or more professionals learn with, from, and about each other to improve collaboration and the quality of care [1].” However, simple learning without interactive exchanges of knowledge or skills was excluded from the definition of IPE used in this study. In Japan, the need for close collaboration among medical, health, and welfare professionals was acknowledged in the 1997 Council Report entitled, “Ideal method of cultivating nursing

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care workers for the twenty-first century” by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) [2]. Since 2002 and in response to this report, IPE, which was developed in the UK, has been implemented in all universities with nursing programs, with the support of MEXT [3-7]. Then, in 2008, the development and implementation of curricula which promote close collaboration among medical, health, and welfare professionals began on a full scale. When such a collaboration is implemented, nurses are expected to play a crucial role in interprofessional collaboration, because they often communicate and coordinate with various professionals as part of their duties [8-12].

However, even though more and more universities are establishing nursing programs at a rapid rate, the current status of IPE and its impact on nursing education has not been clarified in Japan [13, 14]. It was thought that the current situation about the prevailing of IPE in Japan was not quantitatively and qualitatively clarified precisely and investigation was necessary. The purpose of this study was to determine and describe the current status of IPE at Japanese universities with existing nursing programs and to evaluate the impact of IPE on nursing education by employing the backward binary logistic regression analysis (Bw-BLRA) model.

### **Materials and Methods**

In this study, as of the end of March 2010, 200 universities belonging to the Japan Association of Nursing Programs in Universities (JANPU) and registered on JANPU homepage were examined. A postal survey was used to collect data. An anonymous self-administered questionnaire was sent and returned by mail. Participants were asked to complete the questionnaire by themselves. The survey was conducted from November to December 2010.

This research consists mainly of the following questions: 1) The founding year of the university,

2) The founding year of the nursing department, 3) Type of institution, Does your department have an IPE program in which your students learn (and practice) with students from other departments?, 4) During which year do your students take IPE courses?, 5) Which of these best describes your partner department for your IPE program?, 6) Please circle the intended professions of the students who partnered with your students (nursing students) for IPE. Two other important items on the questionnaire were 7) Results of the internal assessment by faculty non-charge members of the IPE program on campus, and 8) Evaluation by the faculty member in charge of the IPE program: 1) Not effective, waste of time, 2) Not much effect on nursing education, 3) Neither good nor bad, 4) Effective for nursing education, 5) Very effective for nursing education. Refer to Listed in Table 1 for details.

Bw-BLRA was performed on the data collected from universities which had nursing programs that included IPE. The objective variable of the Bw-BLRA was the evaluation of the impact of IPE on nursing education by nursing department faculty member in charge of the IPE programs and the evaluation by faculty non-charge members' internal assessment. These two questionnaire items consisted of five response choices (effectively a Likert scale) regarding the impact of IPE, which were then consolidated into two choices (0: non-effective, 1: effective) using a cut-off point of equal to or greater than Level 4 out of 5 on the response scale. No-answer responses were treated as 0 based on the PWS:personal worst score method AA01) out of imputation techniques for handling missing values because no-answer responses were considered to be the same as “ non-effective”.

The explanatory variables included the founding year of the university, the year of establishment of the nursing program, and thirteen intended professions of the partner students in the IPE program (dummy variables: participated = 1, not participated = 0). Bw-BLRA was conducted using

Table 1. Questionnaire items.

No.	Questionnaire items
1	The founding year of 1) the university: 2) the nursing department: 3) Type of institution: 1. Nursing department only 2. Multiple departments
2	Does your department have an IPE program in which your students learn (and practice) with students from other departments? 1) Yes (Proceed to questions 3 through 9) 2) No (Proceed to questions 10 through 13)
3	During which year do your students take IPE courses? 1) 1st year 2) 2nd year 3) 3rd year 4) 4th year
4	Which of these best describes your partner department for your IPE program? 1) different department in the same faculty at the same university 2) department in a different faculty at the same university 3) department at another university
5	Please circle the intended professions of the students who partnered with your students (nursing students) for IPE. (MA) 1) Doctor 2) Physical therapist 3) Occupational therapist 4) Speech-language-hearing therapist 5) Pharmacist 6) Registered dietitian 7) Social worker 8) Psychiatric social worker 9) Dentist 10) Dental hygienist 11) Prosthetist or orthoptist 12) Health fitness programmer 13) Other (Specify: _____)
6	When did your department start the IPE program? ( _____ )
7	Have you changed the curriculum of the IPE program between its implementation and fiscal year 2010? 1) Yes 2) No
8	Results of the internal assessment by faculty non-charge members (except No.9) of the IPE program on campus: (SA) 1) Not effective, waste of time 2) Not much effect on nursing education 3) Neither good nor bad 4) Effective for nursing education 5) Very effective for nursing education
9	Evaluation by the faculty member in charge of the IPE program: (SA) 1) Not effective, waste of time 2) Not much effect on nursing education 3) Neither good nor bad 4) Effective for nursing education 5) Very effective for nursing education
These questions (10–13) are only for those who answered “No” to question 2	
10	Why has your department not yet implemented IPE as of fiscal year 2010? (SA) 1) Our department started IPE in fiscal year 2011. 2) Our department plans to start IPE after fiscal year 2012. 3) We have no plan to implement IPE at this time.
11	Do you think IPE is necessary? (SA) 1) Unknown 2) Yes, necessary 3) No, unnecessary (1) We doubt the educational effectiveness of IPE. (2) We have other educational goals which take priority. (3) We have received no instruction by the Ministry of Education. (4) Other
12	What factors inhibit the implementation of IPE in your department? (SA) 1) Related faculties refuse to increase the number of course subjects any further. 2) There are difficulties in coordinating with other departments. 3) Workload of instructors has already reached its limit. 4) Other
13	What are the most important factors in implementing IPE? (SA) 1) Top level decision-making 2) Ability of faculty facilitators 3) Coordination among departments 4) Other

Note: SA: single answer MA: multiple answers

SPSS 21.0J with well-known variable selection criteria (PIN=0.14, POUT=0.15). If the standard error of the coefficient was larger than 2.0 in the last step of the backward regression model [15], the model would become unstable due to multicollinearity; therefore, the variable with the single highest p-value was removed and the Bw-BLRA was repeated until the standard error of the coefficient was below 2.0.

The subjects were informed with a survey request form which described the purpose and method of the study, anonymity assurance, and the absence of disadvantage of non-participation. Answering and returning the questionnaire was deemed as consent to participate. This study has been approved by the research ethics committee of Niigata University of Health and Welfare (Number:17307).

## Results

Out of 112 returned questionnaires, 110 contained valid responses. Among the valid responses, 34 were from nursing colleges containing only a nursing department, while 76 were from nursing departments within universities that have multiple departments. Fifty-eight of the responding universities had implemented IPE programs, whereas 52 had not. Table 2 shows the basic statistics, namely, frequency distribution (%), mean, and standard deviation (SD) for each questionnaire item. Three measures of goodness of fit were used for the logistic regression model [16]: (i) Nagelkerke's R-squared, (ii) Hosmer-Lemeshow test, and (iii) Omnibus test. For the Bw-BLRA model shown in Table 3, all three measures indicate that the model is highly accurate. On the other hand, for the Bw-BLRA model shown in Table 4, the significance level of (ii) Hosmer-Lemeshow test indicated that the model [16] was less accurate. However, the level of (i) Nagelkerke's pseudo R-squared was a rather high 0.4152, and the (iii) Omnibus test was highly significant ( $p=0.0002$ ). Therefore, the goodness

of fit of the model in Table 4 was also determined to be acceptable.

The results of the Bw-BLRA on factors relating to the evaluation of the effectiveness of IPE in nursing education by faculty in charge of an IPE program are shown in Table 3. The backward elimination process stopped at step 9. The measures of goodness of fit for logistic regression models, namely, (i) Nagelkerke's R-squared, (ii) Hosmer-Lemeshow test, and (iii) Omnibus test, indicate that the model in this study was highly accurate. The directionality of the following tendencies was ascertained from the signs (plus or minus) of the B coefficients. According to the adopted logistic model comprising five variables ( $p<0.15$ ) shown in Table 3, there are the following tendencies concerning the evaluation of the effectiveness of IPE in nursing education by faculty in charge of IPE programs: 1) being higher at a statistically significant level when students in departments of nutrition and dietetics participated in the program ( $p<0.05$ ), 2) being lower with the participation of the students from departments of speech, language, and hearing sciences, indicated by the nearly significant negative coefficient ( $p=0.12$ ), 3) being lower at a nearly significant level for older universities ( $p=0.07$ ), 4) decreasing at a nearly significant level as the number of participating departments increased ( $p=0.08$ ).

The results of the Bw-BLRA on factors relating to the internal assessment of the impact of IPE on nursing education are shown in Table 4. The backward elimination process stopped at step 10. Among the measures of goodness of fit for logistic regression models, (i) Nagelkerke's R-squared, (ii) Hosmer-Lemeshow test, and (iii) Omnibus test, (i) and (iii) indicated that this model was highly accurate. The directionality of the following tendencies was ascertained from the signs (plus or minus) of the B coefficients.

The internal assessment of the impact of IPE on nursing education tended to

i) be higher at a statistically significant level

**Table 2. Basic statistics: frequency distribution (%), mean, and standard deviation (SD) of each item.**

No.	Questionnaire items																											
1	<p>The founding year of</p> <p>1) the university: Mean = 1979.48 SD = 26.78 yrs.</p> <p>2) the nursing department: Mean = 2000.49 SD = 8.75 yrs.</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th style="text-align: left;">Year of establishment of nursing program</th> <th style="text-align: center;">With IPE program</th> <th style="text-align: center;">Without IPE program</th> </tr> </thead> <tbody> <tr> <td>1949–1969</td> <td style="text-align: center;">1 (1.7%)</td> <td style="text-align: center;">1 (1.9%)</td> </tr> <tr> <td>1970–1986</td> <td style="text-align: center;">2 (3.4%)</td> <td style="text-align: center;">0 (0%)</td> </tr> <tr> <td>1990–1994</td> <td style="text-align: center;">7 (12.1%)</td> <td style="text-align: center;">8 (15.4%)</td> </tr> <tr> <td>1995–1999</td> <td style="text-align: center;">11 (19.0%)</td> <td style="text-align: center;">12 (23.1%)</td> </tr> <tr> <td>2000–2004</td> <td style="text-align: center;">14 (24.1%)</td> <td style="text-align: center;">9 (17.3%)</td> </tr> <tr> <td>2005–2011</td> <td style="text-align: center;">20 (34.5%)</td> <td style="text-align: center;">21 (40.4%)</td> </tr> <tr> <td>Unknown</td> <td style="text-align: center;">3 (5.2%)</td> <td style="text-align: center;">1 (1.9%)</td> </tr> <tr> <td>Total</td> <td style="text-align: center;">58 (100%)</td> <td style="text-align: center;">52 (100%)</td> </tr> </tbody> </table> <p>3) Type of institution: 1. Nursing department only: 30.9% 2. Multiple departments: 69.1%</p>	Year of establishment of nursing program	With IPE program	Without IPE program	1949–1969	1 (1.7%)	1 (1.9%)	1970–1986	2 (3.4%)	0 (0%)	1990–1994	7 (12.1%)	8 (15.4%)	1995–1999	11 (19.0%)	12 (23.1%)	2000–2004	14 (24.1%)	9 (17.3%)	2005–2011	20 (34.5%)	21 (40.4%)	Unknown	3 (5.2%)	1 (1.9%)	Total	58 (100%)	52 (100%)
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1949–1969	1 (1.7%)	1 (1.9%)																										
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2000–2004	14 (24.1%)	9 (17.3%)																										
2005–2011	20 (34.5%)	21 (40.4%)																										
Unknown	3 (5.2%)	1 (1.9%)																										
Total	58 (100%)	52 (100%)																										
2	<p>Does your department have an IPE program in which your students learn (and practice) with students from other departments? n = 110</p> <p>1) Yes (Proceed to questions 3 through 9): 52.7% 2) No (Proceed to questions 10 through 13): 47.3%</p>																											
3	<p>During which year do your students take IPE courses? n = 110</p> <p>1) 1st year: 43.6% 2) 2nd year: 16.4% 3) 3rd year: 11.8% 4) 4th year: 24.5%</p>																											
4	<p>Which of these best describes your partner department for your IPE program? n = 110</p> <p>1) different department in the same faculty at the same university: 45.5%</p> <p>2) department in a different faculty at the same university: 30.9%</p> <p>3) department at another university: 17.3%</p> <p>4) No answer: 6.4%</p>																											
5	<p>Please circle the intended professions of the students who partnered with your students (nursing students) for IPE. (MA)</p> <p>1) Doctor: 20.9% 2) Physical therapist: 20.0% 3) Occupational therapist: 17.3%</p> <p>4) Speech-language-hearing therapist: 6.4% 5) Pharmacist: 10.9% 6) Registered dietitian: 10.0% 7) Social worker: 12.7%</p> <p>8) Psychiatric social worker: 10.0% 9) Dentist: 0.9% 10) Dental hygienist: 2.7% 11) Prosthetist or orthoptist: 1.8%</p> <p>12) Health fitness programmer: 3.6% 13) Other (Specify: ): 22.7%</p>																											
6	<p>When did your department start the IPE program? Mean = 2005.27 SD = 4.70 yrs.</p>																											
7	<p>Have you changed the curriculum of the IPE program between its implementation and fiscal year 2010? n = 110</p> <p>1) Yes: 13.6% 2) No: 35.5% 3) No answer: 50.9%</p>																											
8	<p>Results of the internal assessment of the IPE program on campus: (SA) n = 58</p> <p>1) Not effective, waste of time: 0.0% 2) Not much effect on nursing education: 0.0%</p> <p>3) Neither good nor bad: 10.9% 4) Effective for nursing education: 24.5%</p> <p>5) Very effective for nursing education: 10.0% No answer: 54.5%</p>																											
9	<p>The evaluation by the faculty in charge of the IPE program: (SA) n = 58</p> <p>1) Not effective, waste of time: 0.0% 2) Not much effect on nursing education: 0.0%</p> <p>3) Neither good nor bad: 14.5% 4) Effective for nursing education: 18.2%</p> <p>5) Very effective for nursing education: 11.8% 6) No answer: 55.5%</p>																											
<p>These questions (10–13) are only for those who answered “No” to question 2</p>																												
10	<p>Why has your department not yet implemented IPE as of fiscal year 2010? (SA) n = 52</p> <p>1) Our department started IPE in fiscal year 2011. 0.9% 2) Our department plans to start IPE after fiscal year 2012. 7.3%</p> <p>3) We have no plan to implement IPE at this time. 31.8% 4) No answer: 60.0%</p>																											
11	<p>Do you think IPE is necessary? (SA) n = 52</p> <p>1) Yes, necessary: 59.6% No answer: 30.8%</p> <p>2) No, unnecessary: 9.6%</p> <p>(1) We doubt the educational effectiveness of IPE. 0.0%</p> <p>(2) We have other educational goals which take priority. 60.0%</p> <p>(3) We have received no instruction by the Ministry of Education. 0.0%</p> <p>(4) Other: 40.0%</p>																											
12	<p>What factors inhibit the implementation of IPE in your department? (SA) n = 52</p> <p>1) Related faculties refuse to increase the number of course subjects any further. 11.5%</p> <p>2) There are difficulties in coordinating with other departments. 23.1%</p> <p>3) Workload of instructors has already reached its limit. 3.8%</p> <p>4) Other: 17.3%</p> <p>5) No answer: 44.2%</p>																											
13	<p>What are the most important factors in implementing IPE? (SA) n = 52</p> <p>1) Top level decision-making: 21.2% 2) Ability of faculty facilitators: 13.5%</p> <p>3) Coordination among departments: 21.2% 4) Other: 5.8% 5) No answer: 38.5%</p>																											

**Table 3. Factors related to the evaluation of the impact of IPE on nursing education by faculty in charge of IPE programs (backward binary logistic regression analysis).**

Final step (9)	Explanatory variables	B:coefficient	S.E.	Wald	df	p-value	Exp(B): Odds ratio	Exp(B) 95% CI	
								Lower	Upper
	Founding year of the university	-0.0274	0.0153	3.189	1	0.0741	0.973	0.94	1.00
	Year of establishment of the nursing program	0.0814	0.0645	1.5908	1	0.2072	1.0848	0.95	1.23
	Number of participating departments	-0.3719	0.2123	3.0676	1	0.0799	0.6894	0.45	1.04
	Departments of speech, language, and hearing sciences participating	-2.0282	1.3147	2.3798	1	0.1229	0.1316	0.01	1.73
	Departments of nutrition and dietetics participating	2.4826	1.2256	4.1031	1	0.0428	11.9725	1.08	132.26
	(Constant)	54.424	30.3677	3.2119	1	0.0731	4.32572E+23		

Note 1) Objective variable: evaluation by faculty in charge of an IPE program (rating 1, 2, or 3 = 0; rating 4 or 5 = 1)

Note 2) Explanatory variables at Step 1: founding year of the university; total number of departments participating in IPE; participation or non-participation of following departments (0, 1): i) physical therapy, ii) occupational therapy, iii) speech-language-hearing sciences, iv) pharmacy, v) dietetics, vi) social work, vii) psychiatric social work, viii) health fitness science, ix) others; total number of intended professions represented among participants; participation or not-participation of students intending to pursue professions in the above fields (0,1) (excluding doctor, dentist, dental hygienist, and prosthetist/orthoptist due to the small number of cases)

Note 3) Goodness of fit for this model: (i) Nagelkerke's R-squared=0.4152; (ii) Hosmer-Lemeshow test, p=0.4482 (non-significance for (i) and (ii) means the model is accurate); (iii) Omnibus test, p=0.0015 (the model is highly accurate).

**Table 4. Factors related to the impact of IPE on nursing education by internal assessment (backward binary logistic regression analysis).**

Final step (10)	Explanatory variables	B:coefficient	S.E.	Wald	df	p-value	Exp(B): Odds ratio	Exp(B) 95% CI	
								Lower	Upper
	Founding year of the university	-0.0235	0.0137	2.942	1	0.0863	0.9768	0.95	1.00
	Number of participating departments	-0.5407	0.2314	5.461	1	0.0194	0.5823	0.37	0.91
	Departments of occupational therapy participating	1.6526	0.9333	3.1353	1	0.0766	5.2206	0.83	32.52
	Departments of nutrition and dietetics participating	3.5248	1.5956	4.8799	1	0.0272	33.9469	1.48	774.46
	(Constant)	47.3028	26.9919	3.0712	1	0.0797	3.49421E+20		

Note 1) Objective variable: internal assessment (rating 1, 2 or 3 = 0; rating 4 or 5 = 1)

Note 2) Same as Note 2) in Table 3

Note 3) Goodness of fit for this model: (i) Nagelkerke's R-squared=0.4152 (non-significance means the model is accurate); (ii) Hosmer-Lemeshow test p=0.0001 (significance means the model is not accurate); (iii) Omnibus test, p=0.0002 (the model is highly accurate).

when students in departments of nutrition and dietetics participated in the program ( $p < 0.05$ ).  
 ii) be higher at a nearly significant level when students in departments of occupational therapy participated ( $p = 0.08$ ).  
 iii) be lower at a nearly significant level for older universities ( $p = 0.09$ ).  
 iv) decrease at a significant level as the number of departments participating in the IPE increased ( $p < 0.05$ ).

Students intending to enter the following professions did not remain in either of the Bw-BLRA models mentioned above: pharmacist, social worker, psychiatric social worker, and health fitness programmer. For the following intended professions, the number of cases was too small to be entered into the model to begin with: doctor, dentist, dental hygienist, and prosthetist/orthoptist.

## Discussion

This study was conducted in order to examine the current status of IPE in nursing education in Japanese university nursing programs, as well as the evaluations of the effectiveness thereof. Based on the results of this study, sharing areas of responsibility among students with different intended professions and including IPE-related contents in the curriculums of the various health-related departments would likely increase the efficacy of IPE in nursing education. On the other hand, it seems that including students from certain departments which have high expertise and independence may negatively impact the effectiveness of such programs.

The positive effect of nutrition and dietetics student participation in the IPE program, as revealed by the post-implementation assessment, is considered to have its source in the nonspecific and widespread influence resulting from improvements in nutritional status. This might be due to the Nutrition Support Team (NST) concept that was developed in the early 1970s in the US and introduced in Japan around 1998 [17]. In the US, multidisciplinary NSTs have been shown to be associated with lower mortality rate, reduced complications, therapeutic value, and reduced medical expenses [17]. In response to these findings, the NST system was officially introduced to the Japanese health insurance system in 2010. An NST is composed of four healthcare professionals: a physician, a nurse, a pharmacist, and a registered dietician). The introduction of IPE to Japan was a noteworthy achievement [18]. In terms of diet and nutrition, registered dietitians share this critical area of responsibility with other health-related professionals; therefore, dietetics students may have played a particularly active part in facilitating and coordinating collaboration and cooperation with the nursing students.

The negative effect of SLHS student participation in the IPE program, as revealed by the evaluation after implementation, is that

a speech-language-hearing therapist (SLHT) seems to be influenced by having a very specific responsibility range. For example, in the Speech-Language-Hearing Therapists Act, a SLHT is defined as a person who engages in providing language and other training as well as exams, advice, instruction, and other assistance necessary for the training. The SLHT's legally mandated duties are highly independent, so in Japan they do not normally work closely with other healthcare professionals, with the exception of medical doctors. This might explain the results of this study, which revealed that SLHS students might have trouble participating collaboratively with nurses and other healthcare professionals in the IPE context.

The national qualification for SLHTs was established in the SLHS Act of 1997. The phrase, "under the direction of a physician or dentist," which is a common phrase in the laws for other medical professions, is not used in the legal definition of SLHTs. The act clearly states that a SLHT's job is not to assist in medical care for injured people, but rather is an independent medical profession. Kozono called into question the ability of relevant healthcare professionals to comprehend language disabilities, identifying this as a topic for future investigation. She also pointed out that not enough education was being provided to such healthcare professionals to attempt to rectify the knowledge gap [19]. This viewpoint is echoed in Sakai's opinion that "the main obstacle to collaboration is the shortage of knowledge of each other's professions" [20]. Kurisaki pointed out that SLHTs were not effective at creating a collaborative system with nurses, registered dietitians, and dental hygienists, who have common professional knowledge, such as the knowledge of the lifestyle-related diseases [21]. In other words, the lack of knowledge about SLHTs work seems to impede collaboration between SLHTs and other healthcare professionals. It was suggested that IPE might not be smoothly

established not only with SLHT but also with radiologists because of the legal differences for the two businesses.

There was a tendency for internal assessments to more highly evaluate the effectiveness of IPE programs where students of departments of occupational therapy participated more frequently. The reason for this was that the life model for improving everyday life is considered to be nonspecific and is influenced by a broad range of sources.

Occupational therapists (OTs) have to consider not only medical issues but also the life model for their clients [22]. The life model requires a wide variety of knowledge to improve each client's daily life. However, OTs cannot gain this extensive or deep knowledge without effective support and input from other health-related professionals. Therefore, interprofessional collaboration may be essential for OTs to gain the knowledge they require to provide adequate assistance to their clients.

This might be due to the positive influence of the Minimum Standards for the Education of Occupational Therapists [23] which was created by Japanese Association of Occupational Therapists in 2003. In the Standards, "understanding the necessity of collaboration with relevant professionals" was clearly defined as one of the educational objectives. As a result, IPE programs and principles might already be well established in the educational curriculum for occupational therapy students. These specific factors surrounding OTs may have positively influenced the internal assessment of the impact of IPE programs on nursing education when occupational therapy students are participating.

The older the university was, the lower the evaluation scores from both the IPE program faculty and the internal assessment. This most likely occurred due to older universities being entrenched in traditions as well as the long-standing independence of individual departments

and the lack of communication between departments. Kuwata has pointed out that "organizations become cohesive over time, and powerful organizational cultures tend to develop. This stronger organizational culture displays a resistance to change, and organizational innovation becomes more difficult" [24]. Applying this to the relationship between university longevity and perceived efficacy of IPE programs, it seems likely that university organizations develop rigid and entrenched cultures over time, and this may hinder the introduction of a new culture or program such as IPE.

Additionally, the results of the Bw-BLRA indicated a tendency for lower evaluation scores as the number of departments participating in the IPE program increased. On one hand, it seems reasonable to assume that having a larger number of departments participate in an IPE program would increase its effectiveness in a nursing education context. However, the results of this study indicates that keeping the number of departments low increases the perceived efficacy of IPE in nursing programs.

There are no previous studies regarding the appropriate number of departments that should participate in IPE programs. However, it does seem that the number of departments should be limited to those directly relevant to each case. The methodology for investigating this topic would be quite different from those used in the current study, so this should be researched in a future study. In the future, it will be necessary to perform the specific approaches in order to both confirm the roles of the faculty members of nursing departments and increase the effectiveness of such programs. Furthermore, current and future health, medical and welfare policies require effective and meaningful IPEs among relevant professionals, because effective collaboration among professionals is essential for both patients suffering lifestyle related diseases and elderly people with long-term care needs in Japan under



an accelerated aging society.

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### Conflicts of interest

None of the authors has any conflicts of interest or any financial ties to disclose.

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