

## Risk Factors of Poor Mental Health Outcomes When Studying Abroad: A Retrospective Cohort Study at a Japanese University

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### Abstract

**Background:** In higher education, globalization has been rapidly developing worldwide. In general, adolescent and young-adulthood are highly risky for mental health. Especially, international students have poorer supporting resources and higher hurdles to get any information in help-seeking behavior than local students. They are apart from their family and exposed to new cultures, and some develop severe mental health disorders, resulting in poor outcomes such as suicide. However, there are no cohort studies on these poor outcomes. Thus, we elucidated how to prevent poor mental health outcomes when studying abroad via a five-year retrospective cohort study undertaken at a Japanese university.

**Results:** Demographic data, language ability, diagnoses, main stressors, and help-seeking behavior were analyzed and then poor and non-poor outcome cases were compared. In the poor outcome cases, the ratio of delusional psychosis was higher than that in the non-poor outcome cases. The other cases in the poor outcome cases were categorized as common mental disorders, such as depressive withdrawal disorders. Long distance regions from the host country and the non-regular student status showed higher risks for poor mental health outcomes, but their Japanese ability did not show any meager tendency, comparing with non-poor outcome cases. The group of delusional psychoses had an earlier onset, and culture shock was experienced. In contrast, the group of depressive withdrawal disorders had a later onset and were related to individual vulnerabilities.

**Conclusion:** For the prevention of poor outcome cases, general social support and health education, such as anti-stigma for mental health, is essential. Especially, for the prevention of delusional psychosis, mother tongue use and home culture connection should be promoted for newcomers to gradually acclimatize in host countries. For depressive withdrawal disorders, a comprehensive approach of early detection, intervention, and health advice for both students and supervisors is necessary.

**Keywords:** Mental health; Preventive psychiatry; Poor outcome; Globalization; Acute psychosis; Depression; Culture adaptation; Study-abroad; Travel medicine; Health services

**Abbreviations:** ICD-10: International Statistical Classification of Diseases and Related Health Problems; JLPT: Japanese-Language Proficiency Test; GAF: Global Assessment of Functioning

### Introduction

Rapid globalization has occurred in many fields, such as economics, science, politics, and technology. In higher education, the number of international students has been increasing worldwide [1]. Studying abroad, overseas posting, and immigration are known to be high risks for mental health impairments due to maladjustment to host countries or an identity crisis in the new culture [2-4].

Additionally, they have many barriers to seeking help, such as language difficulties, cultural differences, poor human resources, and difficulties obtaining information [5,6].

Furthermore, among those demonstrating severe symptoms, forcible hospitalization for treatment can be difficult because of their

family's absence in the host countries. Thus, some individuals will exhibit poor outcomes, such as forced return home or, in extreme examples, suicide [7,8].

However, there has not yet been a cohort study on the prevalence of poor mental health outcomes among those studying abroad. Therefore, we conducted a retrospective cohort study with international students at an integrated university over a five-year period.

This study had two aims: First, we sought to extract the characteristics of poor mental health outcomes among international students and to elucidate the main risk factors in order to prevent severe cases from occurring through comparison non-poor outcome cases. Second, we aimed to clarify the details of poor outcome cases, classifying them into two sub-groups: Psychotic mental disorders and so-called common mental disorders.

The ultimate goals in this study are to establish a method of intervening in mental health issues at an earlier stage and to better prevent such severe cases more precisely.

## Methods

### Study setting and participants

A retrospective cohort study was conducted at Kyoto University in Japan, covering a five-year period from April 2011 to March 2016. Founded in June 1897, Kyoto University is one of the largest and oldest integrated national university corporations in Japan. It comprises 10 faculties, 18 graduate schools, 14 research institutes, 17 educational institutes, and various other establishments. As of May 1, 2018, the total number of regular students was 22,654, of which 1,905 were international.

The study participants were all international students with mental health issues who were diagnosed by a university psychiatrist for the sample period. At Kyoto University, there are two medical services for international students: the Health Service and the International Center. The psychiatrists in these two institutions cooperate closely and promote the mental health of international students. We checked all of the medical records from both the International Center and Health Service for the sample period. In addition, the university admission records for all cases were also certified in order to decide each outcome. In this study, a poor outcome was defined as suicide, withdrawing from study to return to their home countries voluntarily because of mental health problems, or being forcibly withdrawn because of these problems. We certified the outcome of each case as of April 2018 because the Japanese university year finishes its one-year term every March.

### Exclusion criteria

International students with pre-existing mental health disorders were excluded before coming to Japan. This is because the aim of this study was to clarify the risk factors for the onset of poor mental health outcomes when studying abroad.

### Survey items

For each case, we obtained data regarding age, sex, home country, student status, Japanese oral ability, time between coming to Japan to first medical counseling, medical past history, severity of mental disorder (in terms of functional impairment), diagnosis, primary stressors affecting mental health, and help-seeking behavior.

Regarding Japanese oral ability, data were obtained through their medical records and were classified into four grades-1, 2, 3, and 4-as primary, intermediate, upper, and nearly or perfectly native level, respectively. Our Grades-1, 2, 3 are equivalent to N-3, 2, 1 by Japanese-Language Proficiency Test (JLPT), respectively. The JLPT under joint organization of the Japan Foundation and Japan Educational Exchanges and Services is a test to measure and certify the Japanese-language proficiency of those whose native language is not Japanese. Grade 1 denotes having the ability to understand Japanese used in everyday situations to a certain degree. Grade 2 is equivalent to having the ability to understand Japanese used in everyday situations, and in a variety of circumstances to a certain degree. Grade 3 denotes having the ability to understand Japanese used in a variety of circumstances.

Regarding functional severity of mental disorders, each medical record at the first medical counseling was evaluated by the Global Assessment of Functioning (GAF) scale [9]. Furthermore, all cases

were diagnosed and classified using the International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> Edition (ICD-10) of the World Health Organization [10]. According to the ICD-10, the F2 diagnosis code encompasses schizophrenia, schizotypal, and delusional disorders; F3 denotes mood disorders; F4 refers to neurotic, stress-related, and somatoform disorders; F5 refers to behavioral syndromes associated with physiological disturbances and physical factors; and F6 refers to disorders of adult personality and behavior. Regarding mental health-related stress factors, we extracted the first primary stressor influencing their mental issues from the medical records.

### Statistical analysis

Regarding comparisons of continuous variables between two groups, Mann-Whitney's U test was used. For comparisons of 2 × 2 contingency tables of categorical data between two groups, Fisher's exact test was used. All analyses were conducted using JMP statistical software (SAS Institute, Tokyo, Japan) and Excel Statistics 2018 (SSRI Co., Ltd., Tokyo, Japan). The two-sided significance level was set at 5%.

### Ethical consideration

This investigation was approved by the Ethical Committee of the Kyoto University Graduate School of Medicine (R1237). The research was undertaken in compliance with the 2008 Declaration of Helsinki, and was completed in compliance with the ethical guidelines for health science research by the Japanese Ministry of Health, Labour and Welfare [11].

### Competing interests

The authors declare the Conflict of Interest Review Committee of Kyoto University that we have no competing interest (CIRC 29-86).

## Results

First, we compared mental health-related factors between the poor outcome cases and the non-poor outcome cases in order to examine the risk factors of poor mental health outcomes when studying abroad. Second, we compared the details between the F2-categorized poor outcome cases and F3 and F4-categorized cases, aiming to elucidate the specific risks in each category to plan for earlier and more effective interventions and prevention of severe cases.

### Demographic data of poor outcome cases among international students with mental health disorders

A total of 130 international students were given mental health disorder diagnoses over the five-year period, of which 13 had pre-existing mental disorders before coming to Japan and thus were excluded. As shown in Table 1, 117 individuals were diagnosed with mental health issues by university doctors; of them, 25 (13 female, 12 male; Mage=26.6 years, SD=3.2) had poor outcomes and 92 (49 female, 43 male; Mage=25.6 years, SD=3.6) had non-poor outcomes. Among poor outcome cases, one student (4.0%) died by suicide, six students (24.0%) were forcibly returned to their home countries for treatment, and 18 (72.0%) students voluntarily left halfway through their university course because of their mental disorder.

	Poor outcome cases (n=25) n (%) or mean (SD)	Non poor outcome cases (n=92) n (%) or mean (SD)	p (Poor outcome vs. Non poor outcome)	International students as May 1 <sup>st</sup> , 2014 (n=1733) n (%) or mean (SD) 1)	p (Poor outcome vs. International students)
Male	12 (48.0%)	43 (46.7%)	1	936 (54.0 %)	0.593
Age	26.6 (3.2)	25.6 (3.6)	0.221	25.9 (3.4)	0.417
Japanese oral ability	2.4 (1.1)	2.4 (1.1)	0.945	n.d. 2)	-
Period (months)	16.7 (16.4)	16.3 (16.7)	0.773	n.d.	-
GAF 3)	55.7 (22.4)	72.1 (11.0)	<.001	n.d.	-
Having a past history	7 (28.0%)	20 (21.7%)	0.593	n.d.	-
<b>Region</b>					
Asian countries	11 (44.0%)	61 (66.3%)	0.049	1380 (79.6 %)	<.001
China	5 (20.0%)	27 (29.3%)	0.452	764 (44.1%)	0.024
Republic of Korea	2 (8.0%)	9 (9.8%)	1	241 (13.9%)	0.564
Other Asian countries	4 (16.0%)	25 (27.2%)	0.306	375 (21.6%)	0.629
Non-Asian countries	14 (56.0%)	31 (34.8%)	0.049	353 (20.4%)	<.001
Europe including NIS 4)	4 (16.0%)	15 (16.3%)	1	156 (9.0%)	0.278
Africa	4 (16.0%)	3 (3.3%)	0.037	54 (3.1%)	0.008
Latin America	4 (16.0%)	3 (3.3%)	0.037	41 (2.4%)	0.003
Noth America	1 (4.0%)	4 (4.3%)	1	47 (2.7%)	0.501
Other countries	1 (4.0%)	6 (6.5%)	1	55 (3.2%)	0.557
<b>Status</b>					
Regular students	15 (60.0%)	59 (64.1%)	0.816	1421 (82.0%)	0.015
Undergraduate	1 (4.0%)	5 (5.4%)	1	189 (10.9%)	0.511
Master	6 (24.0%)	34 (37.0%)	0.342	432 (24.9%)	1
Doctor	8 (32.0%)	20 (21.7%)	0.299	714 (41.2%)	0.418
Professional degree	0 (0.0%)	0 (0.0%)	1	86 (5.0%)	0.631
Non-regular students	10 (40.0%)	33 (35.9%)	0.816	312 (18.0%)	0.015
Research students	1 (4.0%)	12 (13.0%)	0.294	107 (6.2%)	1
Exchange students	3 (12.0%)	7 (7.6%)	0.443	50 (2.9%)	0.037
Others	6 (24.0%)	14 (15.2%)	0.369	155 (8.9%)	0.022
SD: Standard Deviation; n.d.: no data; GAF: Global Assessment of Functioning score; NIS: New Independent States from the former soviet union					

**Table 1:** Demographic data for international students with common mental disorders.

Regarding Japanese oral ability, the average was grade 2.4 (SD=1.1), which equates to the upper-middle stage. This means that they could communicate in Japanese in daily life, but found it difficult to converse about complex situations or hold academic discussion. For the time between coming to Japan and the first medical counseling, the mean was 16.7 (SD=16.4) months. Regarding severity of mental disorders at the first medical counseling, the mean GAF score was 55.7 (SD=22.4).

Regarding national origins, 14 (56.0%) out of 25 were from non-Asian countries, including four (16.0%) each from Europe, Africa, and Latin America.

Regarding student status, there were 15 (60.0%) regular students, including one (4.0%) undergraduate student, six (24.0%) master's course students, and eight (32.0%) doctoral course students, and 10 (40.0%) non-regular students.

### Comparison between the poor outcome cases and non-poor outcome cases

The comparison between the poor outcome cases and non-poor outcome cases is shown in Table 1. The GAF score of the poor outcome group was significantly lower than was that of the non-poor outcome group ( $p < 0.001$ ). The mean GAF score in the poor outcome group, which was 55.7 (SD=22.4), indicated moderate symptoms or moderate difficulty in functioning. On the other hand, the GAF score in the non-poor outcome group was 72.1 (SD=11.0), indicating transient or expected reactions to psychosocial stressors and no more than slight impairment in functioning [9].

Regarding national origin, the ratio of non-Asian students in the poor outcome group was significantly higher compared to in the non-poor outcome group ( $p = 0.049$ ). In particular, the ratios of students from Africa and Latin America in the poor outcome group were significantly higher compared to in the non-poor outcome group (both  $p = 0.037$ ). No significant differences were found in other items between the poor outcome cases and non-poor outcome cases.

### Comparison between the poor outcome cases and the general sample as May 1<sup>st</sup>, 2014

The comparison between the poor outcome cases and the general sample for international students as May 1<sup>st</sup>, 2014 is shown in Table 1.

Regarding national origin, the ratio of non-Asian students in the poor outcome group was significantly higher compared to in the general sample ( $p < .001$ ). In particular, the ratios of students from Africa and Latin America in the poor outcome group were significantly higher compared to in the general sample ( $p = .008$  and  $p = .003$ , respectively). On the other hand, there were significantly fewer Chinese students in the poor outcome group than in the general sample ( $p = .024$ ). Regarding student status, the ratio of non-regular students in the poor outcome group was significantly higher compared to the general sample ( $p = .015$ ).

### Breakdown of diagnoses according to ICD-10 classifications

This is shown in Table 2. In the poor outcome cases, the ratio of each diagnosis was as follows: F2 code group (20.0%), F3 code group (20.0%), F4 code group (60.0%), F5 code group (0.0%), F6 code group (0.0%), and other diagnosis (0.0%). On the other hand, in the non-poor outcome cases, the ratio of each diagnosis was as follows: F2 code group (1.1%), F3 code group (9.8%), F4 code group (63.0%), F5 code group (14.1%), F6 code group (7.6%), and other diagnosis (4.3%). When comparing the ratio of each diagnosis between the two groups, only the F2 code group showed a significant difference, with the ratio being higher in the poor outcome group than in the non-poor outcome group ( $p = .002$ ).

Categories of mental disorders by ICD-10	Poor outcome cases (n=25) n (%)	Non-poor outcome cases (n=92) n (%)	p (Poor outcome vs. Non poor outcome)
<sup>1</sup> F2	5 (20.0%)	1 (1.1%)	0.002
<sup>2</sup> F3	5 (20.0%)	9 (9.8%)	0.171
<sup>3</sup> F4	15 (60.0%)	58 (63.0%)	0.805
<sup>4</sup> F5	0 (0.0%)	13 (14.1%)	0.121
<sup>5</sup> F6	0 (0.0%)	7 (7.6%)	0.348
Others	0 (0.0%)	4 (4.3%)	0.577

<sup>1</sup>F2 refers schizophrenia, schizotypal, and delusional disorders; <sup>2</sup>F3 refers mood disorders; <sup>3</sup>F4 refers to neurotic, stress-related, and somatoform disorders; <sup>4</sup>F5 refers to behavioral syndromes associated with physiological disturbances and physical factors; <sup>5</sup>F6 refers to disorders of adult personality and behavior

**Table 2:** Diagnosis of international students with mental disorders.

### Mental health-related stress factors

The primary stressors influencing participants' mental health issues is shown in Table 3. In the poor outcome group, "studying or research" (48.0%) was the most oft-cited stressor, followed by "cultural adaptation" (36.0%).

On the other hand, in the non-poor outcome group, "studying or research" (42.2%) was the most oft-cited stressor, followed by "human relationships in Japan" (18.5%). The poor outcome group showed a significantly higher ratio of "cultural adaptation" compared to the non-poor outcome group ( $p = .043$ ).

	Poor outcome cases (n=25) n (%)	Non-poor outcome cases (n=92) n (%)	p (Poor outcome vs. Non poor outcome)
Culture adaptation	9 (36.0%)	14 (15.2%)	0.043
Study or research	12 (48.0%)	39 (42.4%)	0.654
Human relationship in Japan	2 (8.0%)	17 (18.5%)	0.238
Troublesomeness in home countries	1 (4.0%)	8 (8.7%)	0.682
Other reasons	1 (4.0%)	8 (8.7%)	0.682

Not having any particular reason	0 (0.0%)	6 (6.5%)	0.339
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**Table 3:** Stressors affecting mental disorders.

### Help-seeking behavior

The ratios of help-seeking behaviors are shown in Table 4. Among the 25 poor outcome cases, only nine (36.0%) sought help themselves. Five of these nine students (20.0%) sought out medical services for themselves. On the other hand, in the 92 non-poor outcome cases, 66 students (71.7%) sought help themselves, including 42 students

(45.7%) who sought medical services themselves. The ratio of help-seeking behavior by themselves in the poor outcome cases was significantly less than that of the non-poor outcome cases ( $p=.002$ ). Especially, the ratio of seeking medical services by themselves in the poor outcome group was significantly lower compared to the non-poor outcome students ( $p=.023$ ).

	Poor outcome cases (n=25) n (%)	Non-poor outcome cases (n=92) n (%)	p (Poor outcome vs. Non poor outcome)
Help seeking by themselves	9 (36.0%)	66 (71.7%)	0.002
Seeking medical help by themselves	5 (25.0%)	42 (45.7%)	0.023
Seeking non-medical help by themselves	4 (20.0%)	24 (26.1%)	0.591
Help seeking by others	16 (64.0%)	26 (28.3%)	0.002
Seeking medical help by others	13 (52.0%)	15 (16.3%)	0.003
Seeking non-medical help by others	3 (12.0%)	11 (12.0%)	1

**Table 4:** Help seeking behavior.

### Detailed comparison of poor-outcome cases

To clarify the characteristics of the poor outcome cases, they were divided into the F2-categorized group, and F3- or F4-categorized group. This is because F3- and F4-categorized mental disorders are so-called “common mental diseases,” which show similar symptoms, such as withdrawal and depressive mental states, in this study. Among the 25 poor outcome cases, five cases were allocated to the F2 group, and 20 cases were allocated to the F3 or F4 group.

The F2-categorized group had a significantly shorter period from coming to Japan to the first medical counseling than the F3- or F4-categorized group ( $p=.021$ ). Regarding the severity of mental disorders, the GAF score in the F2-categorized group was significantly lower than that in the F3- or F4-categorized group ( $p=.011$ ). The mean GAF score in the F2-categorized group was 32.4 (SD=27.6), which indicated some degree of impairment in reality testing or communication or major impairment in several areas, such as work or school, family relationships, judgment, thinking, or mood [9]. On the other hand, the mean GAF score in the F3- or F4-categorized group was 61.6 (SD=17.2), which means some mild symptoms or some difficulty in school functioning, but generally functioning well [9].

Regarding the primary stressor, the ratio of “cultural adaptation” in the F2-categorized group was higher compared to in the F3- or F4-categorized group ( $p=.041$ ). Regarding the other terms, no significant differences were found in this study.

### Discussion and Conclusion

This appears to be the first study to analyze poor mental health outcomes epidemically. We aimed to elucidate the risk factors in order to improve prevention of poor mental health outcomes. The ultimate

goal was to establish a method of intervening in mental health issues at an earlier stage and to better prevent such severe cases more precisely.

### Long cultural distance regions as a risk factor for poor mental health outcomes

First, as shown in Table 1, non-Asian regions, especially Africa and Latin America region are thought to be one of the risk factors for poor mental health outcomes. It is speculated that cultural adaptation in Japan for non-Asian students is more difficult than for Asian students because of both geographical and cultural distance. Japan is an Asian country and belongs to the Chinese character cultural sphere. On the other hand, Japan is one of the developed countries like most western countries and the member of Organization for Economic Co-operation and Development since 1964. Therefore, Africa and Latin America region are considered to be both geographically and culturally far from Japan. According to previous studies, not only geographic distance but also cultural distance plays an important role as an individual-level variable in the acculturation process [12,13]. Furthermore, most students coming from very distant regions, such as Africa and Latin America, rarely return to their home countries because of expensive airfares. For young adults, meeting with their families should provide favorable effects for their mental health in most cases. Additionally, the lack of compatriots can cause poor quantities of familiar contact in their mother tongue and produce rushed exposure to foreign cultures.

### Differences in poor outcome mental health issues by national origin

As shown in Table 1, the ratio for both Africa and Latin America were significantly higher in the poor outcome cases. Among the milder cases (i.e., higher than 70 on the GAF scale, indicating transient

stressful state with very mild symptoms), only 26.3% and 14.3% were European and Latin American, respectively. Additionally, regarding the ratio of students seeking help themselves; European students comprised 57.9%, but Latin American students only 14.3%. These deviations among the national regions can be partially accounted for by the difference between cultures in terms of the mind-set for mental disorders and primary education for mental health care [14]. According to previous studies, stigma against mental disorders can be altered through appropriate education [15], which in turn improves help-seeking behavior [16]. However, further detail studies are needed to make this clearer.

**Non-regular student status as a risk factor for poor-outcome mental health issues**

As shown in Table 1, non-regular student status was a significant risk factor for poor mental health outcomes. In general, such students do not belong to a given laboratory or have close ties with their supervisors. Additionally, their Japanese ability tends to be poorer than that of regular students, and their length of stay in Japan tends to be shorter. As a result, it is difficult for some of them to obtain sufficient social support, and detection of mental disorders among them tends to be later than that among regular students. Previous studies have suggested that social support is an essential individual-level variable in the acculturation process [17,18]; thus, non-regular student status is may be one of the risk factors for poor mental health outcomes, possibly due to poor acculturation.

**The characteristics of F2-categorized cases in the poor outcome group**

As shown in Table 2, the breakdown according to mental disorders is very distinct, particularly concentrating on three ICD-10 classifications: F2, F3, and F4. The ratio of F2 among the poor outcome group was far higher than that in the non-poor outcome group. More interestingly, most F2 cases were categorized as F22 or F23. F23 refers to an acute and transient psychotic disorder, which is characterized by delusions, hallucinations, disorganized speech, and/or grossly disorganized behavior that generally resolve within one month.

Previous studies have similarly noted that international students and travelers are at risk of brief psychotic disorders [17,19]. The F2 cases demonstrated three characteristic tendencies. First, all of the cases showed a conspicuous persecution complex. Very interestingly, their oral Japanese ability was never poorer than the other groups (Tables 1 and 5); however, it is nonetheless too insufficient to perfectly read the social atmosphere in Japanese.

This halfway language ability may accelerate the idea of persecution. Thus, they refused any advice and support, resulting in many involuntary medical admissions. In this way, they could not continue their studies, and had to return to their home countries. Second, as shown in Table 5, the onset takes a very short time: about less than six months. According to one theory of acculturation [20], three to nine months is needed to overcome culture shock at first, while true adaptation to a new culture requires 10 to 24 months. Therefore, it is speculated that this first step of acculturation is associated with the risk of an outbreak of F2-categorized mental disorders. In particular, greater geographical and cultural distance, few compatriots, and being a non-regular student status are speculated to be major risk factors for F2-categorized mental health issues.

Third, their help-seeking behavior is extremely poor. A possible reason for this is that their psychiatric functioning was too poor to seek help themselves because of rapid aggravation of symptoms. Additionally, almost all had no consciousness regarding their disease because of persecution or delusion. As a result, they refused any help and medication.

Based on the above findings, we suggest that prevention of onset of F2-categorized mental disorders should be the primary focus. This is because the medical course in many cases is so rapid that it is impossible to intervene at the early stage. Therefore, for gradual acclimatization rather than extreme immersion, new-coming international students should be recommended to use their mother tongue proactively and connect with their own home countries' cultures frequently. Additionally, social support, such as peer advising, stress checks, and basic health education, such as the promotion of moderate exercise and good sleep, should be conducted intensively for newcomers within the first nine months of their arrival [20].

	F2-categorized poor outcome cases (n=5) n (%) or mean (SD) 1)	F3- and F4-categorized poor outcome cases (n=20) n (%) or mean (SD)	p (F2-categorized vs. F3- and F4-categorized poor outcome cases)
Male	4 (80.0%)	8 (40.0%)	0.161
Age	26.6 (3.8)	26.7 (3.3)	0.891
Japanese oral ability	2.4 (1.3)	2.5 (1.0)	0.944
Period (months)	5.0 (7.0)	19.6 (16.9)	0.021
GAF 2)	32.4 (27.6)	61.6 (17.2)	0.011
Having a past history	1 (20.0%)	6 (33.3%)	1
Non-Asian students	3 (60.0%)	11 (55.0%)	1
Non-regular students	3 (60.0%)	7 (35.0%)	0.357
<b>Main stressor</b>			
Culture adaptation	4 (80.0%)	5 (25.0%)	0.041
Study or research	1 (20.0%)	11 (55.0%)	0.322

Other issues	0 (0.0%)	4 (20.0%)	0.549
<b>Help seeking behavior</b>			
Seeking help by themselves	1 (20.0%)	8 (40.0%)	0.621
SD=standard deviation; GAF=the score of Global Assessment of Functioning score at the first examination.			

**Table 5:** The details of poor outcome cases.

### The characteristics of cases categorized as F3 and F4 in the poor outcome group

In this study, almost all of the F3- and F4-categorized cases showed similar symptoms, such as depressive, apathetic, and withdrawal states. In this group, there was no significant deviation according to national origin. In addition, their major primary stressor was not cultural adaptation but studying or research [21,22]. According to a detailed analysis of their medical records, they potentially did not sufficiently move beyond the first step of acculturation. Originally, they tended to have some kind of vulnerability for mental health problems. Some had a severe past psychiatric history, such as an eating disorder, PTSD, and depression, while others had difficulty with close persons in their home countries. Furthermore, some have already experienced adjustment disorders in their home countries because of their tendency of developmental disorder. These findings suggest that these individuals not only experienced maladaptation to the new culture, but also a poor mental health status in their home country. Such vulnerability or poor self-help capabilities may induce a delay in culture-specific skill acquisition, thereby generating poor stress coping strategies in their new culture [13,23]. As a result, they could not achieve the second step: deep-level adaptation to the host country. In many cases, their days and nights were reversed and, gradually, they avoided all social communication. Once they withdrew, support was very difficult. From the above, early detection and intervention is essential for the prevention of such cases. Peer supporters and supervisors should pay attention to international students who appear to be vulnerable to mental disorders, and they had better to refer them to health services as soon as they notice their unsociable change. In addition, on the entrance examination, adaptation ability and communication skill should be regarded as more important. Furthermore, orientation to social resources for health, mental health guidance for their instructors, frequent encouragement of help-seeking behavior, and enlightenment for stigma against mental health issues, are also all important for the complete prevention of poor outcome cases categorized at F3 and F4.

### Limitation and future prospects

It appears that this is the first study regarding poor mental health outcomes among international students. As this was a retrospective cohort study for a five-year period, we could not sufficiently control for possible confounding factors. In addition, this study was conducted at a single integrated university in one country. Therefore, in the future, international collaborative studies should be undertaken to develop transculturally new methods for the prevention of poor mental health outcomes.

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### Author Contributions

Associate Professor Yu Sakagami, Health Services, Kyoto University, the author of the paper, designed the study, analysed and interpreted the data, and took responsibility for writing the paper. Assistant professor, Jiro Takeuchi, Department of Clinical Epidemiology, Hyogo College of Medicine, cooperated with the author to obtain the data and contributed to the interpretation of the findings.

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