

Total	129	2379	2508	100.0%
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**Figure 1 Chronic diseases of yoga class attendees.**

### *Characteristics of adverse events*

There were 687 attendees (27.4%) who reported some type of adverse event after a yoga class. Table 2 shows the specific symptoms and frequencies. The most common symptoms were of the musculoskeletal system, which were reported by 277 attendees (11.0%). These musculoskeletal symptoms were muscular pain in 132 attendees (5.3%), joint pain in 122 attendees (4.9%), and muscle cramp in 43 attendees (1.7%). The second most common symptoms were of the nervous system, which were reported by 237 attendees (9.4%). These neurological symptoms were dizziness in 101 attendees (4.0%), numbness in a certain body part in 47 attendees (1.9%), twitching in a certain body part in 41 attendees (1.6%), faintness in 33 attendees (1.3%), and heaviness of the head in 24 attendees (1.0%). The third most common symptoms were of the respiratory system, which were reported by 129 attendees (5.1%). These respiratory symptoms were coughing in 80 attendees (3.2%), nasal congestion in 31 attendees (1.2%) and runny nose in 27 attendees (1.1%). Symptoms affecting at least 1% of the attendees also included fatigue in 25 attendees (1.0%).

**Table 2 Symptoms and incidence of adverse events reported after yoga class**

	Symptoms	n	Incidence
Eyes and ears	Tinnitus	13	0.5%
	Blackout	7	0.3%
	Pruritus of the eye	4	0.2%
Respiratory system	Coughing	80	3.2%
	Congested nose	31	1.2%
	Runny nose	27	1.1%
	Sputum production	7	0.3%
Cardiovascular system	Breathlessness	22	0.9%
	Palpitation	13	0.5%
	Chest pain	1	0.0%
Gastrointestinal system	Gastric and abdominal pain	7	0.3%
	Nausea	6	0.2%
	Diarrhea	2	0.1%
Musculoskeletal system	Muscular pain	132	5.3%
	Joint pain	122	4.9%
	Foot and muscle cramp	43	1.7%
Skin	Flushing of the face	24	1.0%
	Pruritus of the skin	13	0.5%
	Excessive perspiration	10	0.4%
Neurological system	Dizziness	101	4.0%
	Numbness of a certain body part	47	1.9%
	Twitching in a certain body part	41	1.6%
	Faintness (dazed)	33	1.3%
	Heaviness of the head	24	1.0%

	Feeling of hotness and coldness	22	0.9%
	Headache	18	0.7%
Fatigue	Feeling of exhaustion	25	1.0%
	Feeling of illness	16	0.6%
Psychological symptoms	Tension	14	0.6%
	Shaking of the body	6	0.2%
	Anxiety	5	0.2%
	Recollection of bad experience	5	0.2%
	Gloominess	3	0.1%
	Feeling of wanting to cry	2	0.1%
	Irritation	2	0.1%
	Scary thoughts	1	0.0%
	Frightened feeling	1	0.0%
	Heightened emotion	1	0.0%
	Total	931	37.1%

### *Severity of adverse events*

The severity of adverse events during a yoga class was rated on a 4-point scale: “no interference with subsequent class participation” “slight interference,” “major interference,” and “immediate discontinuance of class participation.” The attendees without interference from adverse events accounted for 63.8% of the attendees responding to questions on the severity of adverse events. The attendees with slight interference accounted for 30.7% of the attendees responding to such questions, the attendees with major interference accounted for 3.6%, and the attendees with immediate discontinuance accounted for 1.9% (Figure 2). In the attendees with major interference or immediate discontinuance, the adverse events included blackout, coughing, abdominal pain, muscular pain, joint pain, physical unsteadiness, and a feeling of illness. In this study, no one needed to call an ambulance. All of these symptoms improved gradually after stopping the activity and taking a rest.

**Figure 2 Severity of adverse events occurring during yoga class.**

### **Risk factors for adverse events**

#### *Risk factors for adverse events*

The risk factors for adverse events were examined by comparing the following items between the yoga class attendees with adverse events and those without: age, frequency of attending classes, condition on the day of class, and presence or absence of chronic disease. If factors showed a significant difference ( $p < 0.05$ ) in univariate analysis using a chi-square test, their odds ratios and 95% confidence intervals (CI) were calculated (Table 3). Furthermore, multivariate analysis was performed using multiple logistic regression, and adjusted odds ratios were calculated (Table 4). The significant factors in univariate analysis were age (less than 40 years), condition on the day of class (severity of physical condition on that day, level of overexertion, physical strain, and mental strain), and chronic disease (respiratory disorders, musculoskeletal disorders, and neurological disorders). There was no difference by sex or frequency of attending classes. Multivariate analysis showed that factors considered significant by odds ratio analysis were age (less than 40 years) and condition on the day of

class (severity of physical condition on that day, level of overexertion, physical strain, and mental strain), and chronic disease (only respiratory disorders and musculoskeletal disorders).

**Table 3 Risk factors for adverse events reported after yoga class**

<b>Factors</b>	<b>Chi-square value</b>	<b>P-value</b>	<b>Odds ratio (95% CI)</b>
Sex	2.67	0.125	
Age (less than 40 years)	14.65	0.000	1.73(1.30-2.30)
Frequency of attending classes	0.23	0.661	
Condition on the day of class			
Severity of physical condition on that day	15.54	0.000	1.83(1.35-2.47)
Level of overexertion	73.73	0.000	2.55(2.05-3.17)
Physical strain	83.84	0.000	2.86(2.27-3.59)
Mental strain	48.27	0.000	6.36(3.51-11.51)
Presence of chronic disease	20.08	0.000	1.52(1.26-1.82)
Ocular and otologic disorders	0.31	0.625	
Respiratory disorders	7.22	0.011	1.90(1.18-3.07)
Cardiovascular disorders	0.03	0.909	
Gastrointestinal disorders	0.61	0.462	
Musculoskeletal disorders	16.72	0.000	1.54(1.25-1.89)
Skin disorders	3.35	0.075	
Neurological disorders	4.69	0.035	1.63(1.04-2.57)
Psychological disorders	0.03	0.897	
Endocrine disorders	1.53	0.228	
Gynecological disorders	0.28	0.671	
Previous cancer	0.13	0.852	

**Table 4 Multivariate analysis of factors associated with adverse events reported after yoga class**

<b>Factors</b>	<b>Odds ratio</b>	<b>95% Confidence interval</b>	<b>P-value</b>
Age (less than 40 years)	1.95	1.44-2.63	<0.001
Condition on the day of class			
Severity of physical condition on that day	1.58	1.14-2.18	0.006
Level of overexertion	1.82	1.41-2.34	<0.001
Physical strain	1.89	1.45-2.47	<0.001
Mental strain	3.93	2.11-7.33	<0.001
Presence of chronic disease	1.29	1.03-1.62	0.030
Respiratory disorders	1.78	1.06-2.97	0.028
Musculoskeletal disorders	1.30	1.01-1.67	0.042
Neurological disorders	1.39	0.86-2.26	0.180

The risk factors were examined for adverse events that interfered with subsequent class participation by comparing the attendees with such adverse events (slight interference, major interference, and discontinuance of participation) and those with adverse events that did not interfere with participation. The significant factors in univariate analysis were age of 70 years or older (OR = 2.41, 95% CI: 1.27-4.61,  $p < 0.01$ ), physical condition on that day (OR = 2.11, 95% CI: 1.11-4.01,  $p < 0.05$ ), and chronic musculoskeletal disorders (OR = 1.74, 95% CI: 1.05-2.86,  $p < 0.05$ ). Multivariate analysis showed that the only factors considered significant by adjusted odds ratio analysis were age 70 years or older (OR = 2.25, 95% CI: 1.10-4.59,  $p < 0.05$ ) and physical condition on that day (OR = 1.99, 95% CI: 1.02-3.89,  $p < 0.05$ ).

### ***Relationship between chronic disease and risk of adverse events***

The relationship between the systems affected by chronic diseases and the risk of adverse events related to the affected systems was examined. The odds ratio and 95% CI were calculated for factors with  $p < 0.05$  in univariate analysis using a chi-square test. The results showed that the risk of musculoskeletal system adverse events was higher in the attendees with chronic musculoskeletal disorders compared with those without (OR = 2.25, 95% CI: 1.10-4.59,  $p < 0.05$ ). Of the musculoskeletal adverse events, muscular pain (OR = 2.25, 95% CI: 1.10-4.59,  $p < 0.05$ ) and joint pain (OR = 2.25, 95% CI: 1.10-4.59,  $p < 0.05$ ) showed significant association with chronic musculoskeletal disorder. The attendees with chronic respiratory disorders had a higher incidence of respiratory adverse events (OR = 4.77, 95% CI: 2.58-8.81,  $p < 0.001$ ). Of the respiratory adverse events, the following events showed significant association with chronic respiratory disorders: coughing (OR = 2.92, 95% CI: 1.22-6.96,  $p < 0.05$ ), congested nose (OR = 6.77, 95% CI: 2.52-18.17,  $p < 0.001$ ), and runny nose (OR = 10.75, 95% CI: 4.18-27.64,  $p < 0.001$ ). The attendees with previous cancer had a high risk of respiratory adverse events (OR = 2.99, 95% CI: 1.14-7.82,  $p < 0.05$ ). Of the respiratory events, coughing (OR = 3.70, 95% CI: 1.28-10.68,  $p < 0.05$ ) showed a significant association with previous cancer. The attendees with chronic neurological disorders showed a higher incidence of ocular and otologic adverse events (OR = 6.09, 95% CI: 2.02-18.32,  $p < 0.01$ ) and gastrointestinal adverse events (OR = 5.37, 95% CI: 1.53-18.78,  $p < 0.01$ ) compared with the attendees without them. Of these adverse events, tinnitus (OR = 14.65, 95% CI: 4.32-49.66,  $p < 0.001$ ) and gastric and abdominal pain (OR = 11.45, 95% CI: 2.19-59.89,  $p < 0.01$ ) showed significant association with chronic neurological disorders.

### ***Adverse events in students observed by yoga therapists***

In this study, 271 yoga therapists were asked about adverse events that they had observed to date in their students during yoga classes. They divided the adverse events into three categories. (1) Mild events were temporary and the students were able to continue class participation. (2) Moderate events required the students to discontinue class participation, to take a wait-and-see approach, and to rest. (3) Severe events required the students to discontinue class participation and to be examined or treated by a physician. In addition, they were asked to use a free-response format to describe the characteristics of the moderate and severe adverse events.

### ***Severity of adverse events***

There were 229 yoga therapists (84.5% of the therapists who responded) who had observed to date mild adverse events during yoga classes, 81 therapists (30.0%) had observed moderate adverse events and 22 therapists (8.1%) had observed severe events.

### *Characteristics of moderate and severe adverse events*

The therapists reported 93 cases of moderate or severe adverse events (Table 5). Eight cases required emergency transport. These events included post-class subarachnoid hemorrhage, subluxation of the hip joint, backward fall, sudden attack of abdominal pain, dizziness, arrhythmia, hyperventilation, and inability to move due to illness and increased anxiety. There were 14 cases for which the students were examined at medical institutions. These adverse events included contusion and bone fracture from a fall due to loss of balance, fall due to illness, illness due to elevation of blood pressure, fall due to physical unsteadiness, severe pain of the hip joint, knee joint and abdomen, pain due to meniscal injury and Achilles tendon rupture, hyperventilation, dizziness, and palpitation. There were 46 other cases in which the attendees discontinued class participation and rested due to symptoms such as dizziness, physical unsteadiness, illness, muscular pain, fall, and hyperventilation. There were nine cases in which instructions were given to control breathing, and three cases in which massage was given.

**Table 5 Moderate and severe adverse events observed by yoga therapists**

	<b>Symptoms</b>	<b>n</b>
Eyes and ears	Blackout	1
Respiratory system	Difficult breathing and hyperventilation	7
	Rapid breathing	1
Cardiovascular system	Breathlessness	2
	Palpitation	2
	Heart attack	2
	Chest tightness	1
	Arrhythmia	1
Gastrointestinal system	Nausea	4
	Abdominal pain	3
Musculoskeletal system	Muscular pain	11
	Joint pain	3
	Foot and muscle cramp	3
	Bone fracture	2
	Achilles tendon rupture	1
	Meniscal injury	1
	Subluxation of the hip joint,	1
	Skin	Perspiration, cold sweat, and stress-induced perspiration
	Pruritus of the skin	1
Neurological system	Dizziness and physical unsteadiness	20
	Fall	9
	Headache	2
	Dazed	1
	Cold limbs	1
	Faintness	1
	Shaking of the body	1
	Flushing of the body	1
	Numbness of the body	1

Fatigue	Feeling of unwellness	18
Psychological symptoms	Recollection of bad experience	4
	Heightened emotion	2
	Confusion	2
	Tension	1
Other	Subarachnoid hemorrhage	1
Pain of surgical scar		1
Other		3

### ***Possible causes of adverse events***

Figure 3 shows the causes of the mild to severe adverse events in the opinion of the yoga therapists teaching the class. Many causes were associated with the students such as “overexertion and overdoing” and “poor physical condition and neglect of physical condition.” The specific causes included effortful breathing method causing coughing, overloading causing pain and cramp of the limbs, psychological problems causing hyperventilation, and meditation causing recollection of bad experiences. Other causes were attributed to the yoga therapists: “inadequate instructions” (i.e., the therapists did not notice because they were not aware of the students’ chronic diseases or health conditions) and inadequate observation and verbal communication. In addition, some yoga therapists thought the adverse events were transient symptoms caused by improved blood flow and muscle relaxation that result in alleviation of symptoms in the long term. Such alleviating events were “favorable physiological response” and “symptoms due to relaxation” and included pruritus and temporary pain.

**Figure 3 Causes of adverse events in the opinion of yoga therapists (ranging from mild to severe events).**

## **Discussion**

This study examined the characteristics and frequencies of adverse events occurring during yoga classes in 2508 class attendees. It also examined the characteristics and frequencies of adverse events observed to date by 271 yoga therapists. Our survey showed that the class attendees with chronic disease accounted for 54% of the class attendees and the attendees who were hospital outpatients accounted for 42% of the attendees. These results show that, in Japan, people who take yoga classes are not necessarily healthy individuals and that many patients receiving treatment for their disease take classes to improve health. These chronic diseases were wide ranging and included orthopedic conditions, such as lower back pain and shoulder muscle stiffness, cardiovascular diseases, endocrine diseases, neurological diseases, and psychological disorders. Clinical effects and indications of yoga have not necessarily been established for these diseases. Therefore, unexpected adverse events can occur, and caution is required when yoga therapy is performed for patients with these diseases.

The results of this study demonstrated that 27% of the yoga class attendees experienced some type of adverse event during class. The most common adverse events were of the musculoskeletal system such as muscular pain, joint pain, and muscle cramp, and 11% of the attendees complained of these symptoms. In previous studies, the most commonly reported adverse events were also musculoskeletal symptoms [3,4,6-9]. In our study, 1% or more of

the clients reported adverse events that are infrequently discussed in previous studies. These adverse events included neurological symptoms, such as dizziness and numbness, and respiratory symptoms, such as coughing. In our study, the adverse events reported by the class attendees were mostly mild and did not interfere with subsequent class participation.

The following factors were found to increase the risk of adverse events: age (less than 40 years), condition on the day of class (poor physical condition, overexertion, a sense of physical strain, and a sense of mental strain), and chronic diseases (presence of respiratory and musculoskeletal disorders). Mental strain was the factor with the highest odds ratio, and the class attendees with mental strain had an odds ratio of approximately 4 times higher risk for adverse event. Thus, a sense of mental strain from yoga class may be a good indicator of a risk of adverse events. The risk factors that interfered with subsequent class participation were age of 70 years or older, physical condition on that day, and presence of chronic musculoskeletal disorder. Although the occurrence of adverse events was high among individuals less than 40 years, adverse events were more severe in elderly individuals 70 years or older. Previous studies stated that the elderly were more likely to be affected by sudden postural and blood pressure changes, that caution is required for specific poses in osteoporotic individuals, and that considerations for safety are needed, such as automated external defibrillators in yoga studios [34,35]. Elderly individuals are likely unable to handle as much physical load as young individuals and are slower to recover from adverse events. Therefore, yoga should be performed carefully based on the individual's disease and physical condition on that day. Special attention is necessary when elderly people practice yoga.

As to the relationship between diseases and adverse events, individuals with musculoskeletal diseases had significantly higher occurrences of adverse events, such as muscular pain and joint pain. Individuals with respiratory diseases had significantly higher occurrences of the adverse events of coughing, nasal congestion, and runny nose. These results suggest that patients with specific diseases may develop or exacerbate their disease-related symptoms by practicing yoga. Although the reason is uncertain, individuals with a history of cancer had significantly higher occurrences of the adverse event of coughing. Kaley-Isley et al. showed that the risk of adverse event was high in individuals with diseases such as intervertebral disk disease, extremely high or low blood pressure, glaucoma, retinal detachment, and atherosclerosis [36]. DiStasio stated that patients with symptomatic anemia, orthostatic hypotension, and lightheadedness should avoid prolonged standing poses, that cancer patients with fever and systemic infection should avoid vigorous yoga poses [37], and that patients with signs of osteoarthritis are not recommended to do yoga [5]. Since individuals with various chronic diseases practice yoga, it is important for these individuals to let the yoga therapists know in advance about their diseases [36,38]. Certain yoga poses or the practice of yoga itself might be prohibited or not recommended for individuals with certain conditions or diseases.

The survey for yoga therapists showed that 84.5% of the yoga therapists had observed mild adverse events in their students. The adverse events that required emergency transport included subarachnoid hemorrhage, subluxation of the hip joint, backward fall, attack of abdominal pain, and inability to move due to illness and increased anxiety. The details are unknown regarding the causal relationship between these events and yoga, but yoga therapists need to be able to respond to such events. Previous studies have reported on individuals with adverse events who required examination at medical institutions. These events included bone fracture, Achilles tendon rupture, and dyspnea [11-14,23-25]. The frequencies of these events are low, but it is necessary to devise measures in case they occur.

Although severe ocular disorders were reported in other previous studies [17-22], such disorders were not reported in our survey. In our study, when the yoga therapists were asked about the causes of adverse events, they provided many factors associated with yoga class attendees: condition of attendees in class (such as overexertion, overdoing, and neglect of physical condition), presence of disease, and age. These therapists' impressions were consistent with the findings based on the analysis of this study. Some instructors responded that they could not provide sufficient instructions to their students, partly because they did not know their students' diseases and health conditions. Other instructors mentioned that the students did not know how much effort to put into yoga classes.

Healthcare providers and yoga therapists need to share medical information, especially the potential risks of the attendees, and to be aware of the possible adverse events that could occur, depending on the patient's disease, the yoga pose, and other contents of the yoga class. It is also desirable for healthcare providers and yoga therapists to educate the yoga class attendees, including providing adverse event-related information in advance. When individuals with chronic diseases or risk factors for adverse events want to practice yoga, they should practice carefully, under the guidance of qualified yoga therapists. Furthermore, when severe adverse events do happen in the class, the information should be shared among all yoga therapists, and a follow-up system should be established to avoid such events in the future.

This study had several limitations. First, a very high percentage of the subjects were women who were 40 years or older. The mean age of the yoga class attendees (58.5 years) in this study might be higher than that in previous studies, i.e., 41.4 years in a study in Australia [32] and 46.7 years in a study in England [39]. However, this number may reflect typical yoga students in Japan, because the survey samples were obtained not from special settings, but from typical sports gyms and community centers throughout Japan. Second, the yoga class attendees filled out the questionnaire immediately after class. Thus, the data did not include adverse events occurring a few days after class. Third, our study did not examine physiological parameters, such as blood pressure, or laboratory test results, such as blood glucose levels. Therefore, adverse events associated with abnormalities of these parameters were not examined in this study. Future studies should be conducted to survey more young individuals and men, to examine longer term effects involving follow-up surveys of a few days to months after yoga class, and to examine laboratory test results and physiological parameters.

## **Conclusions**

The results of our large-scale survey demonstrated that approximately 30% of yoga class attendees had experienced some type of adverse event. Although most adverse events were mild, some individuals experienced severe events, which caused them to discontinue the class. This study also showed that the following factors can increase the risk of adverse events: age, presence of chronic disease, and condition of attendees on the day of class, such as poor physical condition on that day and overexertion. Therefore, special attention is necessary when yoga is introduced to patients with stress-related, chronic diseases.

## **Competing interests**

The authors declare that they have no competing interests.



## Authors' contributions

TO designed the survey. TM conducted the survey and collected the data. TO and TM analyzed the data and drafted the manuscript. All of the authors read and approved the final manuscript.

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九州大学大学院医学研究院 岡 孝和

平成26年度厚生労働科学研究委託事業（地域医療基盤開発推進研究事業）

「統合医療に係る医療の質向上・科学的根拠収集事業」

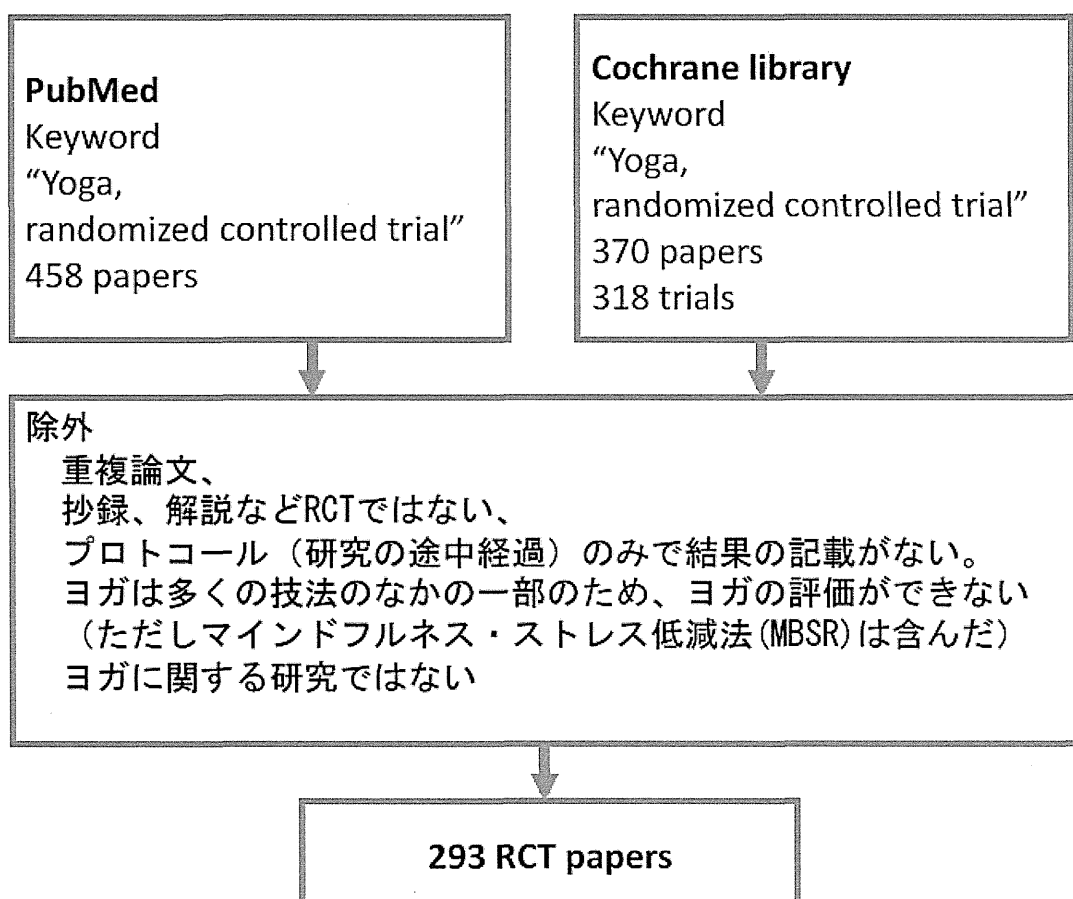
ヨガの安全性と有用性に関する科学的根拠集積研究

(H26-統合-一般-008)

## 1. 背景と目的

本事業の目的は、ヨガの有用性に関して、これまで行われてきたランダム化比較試験の日本語での構造化抄録を作成し、ヨガに関するエビデンスを、広く国民に紹介することにある。

構造化抄録を作成するための論文は、次のようにして集められた。2014年11月20日の時点で、PubMed, Cochrane library で yoga, randomized controlled trial で検索し、対象となる論文を全て集めた。その中から、重複論文、抄録や解説、プロトコルの説明だけで結果を記載していない論文等を除外したところ、293論文が残った。この293論文の構造化抄録を作成した。



構造化抄録は、ICD-10に基づいて分類され、その中で、さらに疾患、病態ごとにまとめ、最近の論文から順に紹介した。ヨガは、本来、健康な人が健康増進のために用いられることが多いため、健常人での研究も多い。そこで、今回は疾患群だけでなく、健常人での研究についてもあわせて紹介することとした。

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## 2. 構造化抄録・論文リスト

### 1. 感染症 (3論文)

	Research Question	論文
1	肺結核患者について、肺活量と細菌学的な見地からヨガ群と呼吸意識化群における抗結核治療の効果について比較検討する	Viswaswarah NK, et al. Randomized trial of yoga as a complementary therapy for pulmonary tuberculosis. <i>Respirology</i> ; 2004; 9: 96–101.
2	HIV感染者においてヨガによる生活習慣介入が新血管疾患 (CVD) リスクファクター、ウイルス学的または免疫学的状態、生活の質 (QoL) を改善させるか評価する	Cade T, et al. Yoga lifestyle intervention reduces blood pressure in HIV-infected adults with cardiovascular disease risk factors. <i>HIV Medicine</i> ; 2010; 11: 379– 388.
3	ヨガのグループプログラムがHIV/AIDSを患う人々の幸福度を改善するか	Brazier A, et al. Evaluating a Yogic Breathing and Meditation Intervention for Individuals Living With HIV/AIDS. <i>AmJ Health Promot.</i> 2006; 20(3): 192-5.

### 2. 新生物 (36論文)

	Research Question	論文
1	乳癌生存者にみる炎症、気分、疲労に対するヨガの効果の評価する	Kiecolt-Glaser JK, et al. Yoga's Impact on Inflammation, Mood, and Fatigue in Breast Cancer Survivors: A Randomized Controlled Trial. <i>JOURNAL OF CLINICAL ONCOLOGY</i> , 2014; 32: 1040-1049
2	放射線治療中の乳癌患者に対するヨガの介入が患者のQOLを改善するかどうか	Chandwani KD, et al. Randomized, Controlled Trial of Yoga in Women With Breast Cancer Undergoing Radiotherapy. <i>J Clin Oncol.</i> 2014 Apr 1; 32(10): 1058-65.
3	倦怠感を訴える乳がん生存者のために特別に作成したアイアンガーヨガプログラムが炎症に関連する遺伝子発現と末梢炎症性サイトカイン活性の指標を低下させるか検討する	Bower JE, et al. Yoga reduces inflammatory signaling in fatigued breast cancer survivors: A randomized controlled trial. <i>Psychoneuroimmunology</i> , 2014; 43: 20-29.
4	8週間のヨガプログラムが、補助的な化学療法を受けている乳がん患者の心理的・肉体的健康を促進させるかについて、うつ・不安・疲労という観点からその有効性を検証する	Taso et al.: The effect of yoga exercise on improving depression, anxiety, and fatigue in women with breast cancer: a randomized controlled trial, <i>J. Nursing Research</i> , 22(3), 2014
5	ヨガが乳がん生存者の自覚される認知機能の問題に影響を及ぼすかを調べる	Derry HM, et al. Yoga and self-reported cognitive problems in breast cancer survivors. <i>Psycho-Oncology</i> , 2014; Oct 21
6	治療後の癌生存者の睡眠の質を改善するためにヨガ群と通常治療群で比較する	Mustian KM, et al. Multicenter, randomized controlled trial of yoga for sleep quality among cancer survivors. <i>J Clin Oncol.</i> 2013 sep ;31(26): 3233-41.
7	MBSRプログラムの乳がん患者の睡眠の質に及ぼす効果を検討する	Andersen S.R, et al. Effect of mindfulness-based stress reduction on sleep quality: Results of a randomized trial among Danish breast cancer patients. <i>Acta Oncol</i> , 2013; 52(2): 336-44.
8	進行性乳がんの女性患者に対して、スダルシャンクリヤとブラーナーヤーマの認知・行動ストレスマネジメントが血中コルチゾー	Kumar N, et al.: Randomized Controlled Trial in Advance Stage Breast Cancer Patients for the Effectiveness on Stress Marker and Pain through Sudarshan Kriya and Pranayam. <i>Indian Journal of Palliative Care / Sep-Dec</i>

	ルと痛みのレベルに与える効果を調査する	2013 / Vol-19 / Issue-3.
9	乳がん生存者における、26週のホームベースで管理構成されたヨガ介入のアドヒアランスに影響を与える人口統計学的、心理学的、健康関連的、地理的な予測因子を明らかにする	Cadmus-Bertram L, et al: Predictors of Adherence to a 26-Week Viniyoga Intervention Among Post-Treatment Breast Cancer Survivors, THE JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE Volume 19, Number 9, 2013: 751-758.
10	心理的苦痛を抱えた乳がん生存者へのマインドフルネスベースの癌の回復 (MBCR) と集団表現療法 Expressive サポートグループ (SET) の有効性を比較する	Carlson LE, et al. Randomized Controlled Trial of Mindfulness-Based Cancer Recovery Versus Supportive Expressive Group Therapy for Distressed Survivors of Breast Cancer (MINDSET) J Clin Oncol, 2013; 1; 31(25): 3119-26.
11	早期乳がんと診断された患者に対し、手術後に直ちにヨガを行う事でQOLの向上、身体活動の改善が見られるか	F.Siedentopf, et al. Yoga for Patients with Early Breast Cancer and its Impact on Quality of Life – a Randomized Controlled Trial. Geburtshilfe Frauenheilkd, 2013; 73(4):311-317.
12	ヨガリラクゼーショントレーニングが手術後の乳がん患者の不安に及ぼす影響を調べる	Kovačič T, Zagoričnik M, Kovačič M: Impact of relaxation training according to the Yoga In Daily Life® system on anxiety after breast cancer surgery., J Complement Integr Med. 2013;(1):1-12.
13	乳がんの女性において、マインドフルネスをベースとしたストレス軽減プログラム (MBSR) が不安と抑うつに及ぼす影響を検討する	Wu'rtzen H et al. Mindfulness significantly reduces self-reported levels of anxiety and depression: Results of a randomised controlled trial among 336 Danish women treated for stage I-III breast cancer. European Journal of Cancer. 2013; 49, 1365- 1373.
14	Yoga In Daily Life (YIDL) によるリラクゼーショントレーニングが手術後の乳がん患者の不安に及ぼす影響を調べる	Kovacic T, et al. Impact of relaxation training according to the Yoga In Daily Life system on anxiety after breastcancer surgery. J Complement Integr Med. 2013; 10 (1):1-12.
15	治療後の持続する倦怠感を訴える乳癌生存者に対するアイアンガーヨガの実施可能性と有用性を検討する	Bower J, et al. Yoga for persistent fatigue in breast cancer survivors. Cancer, Aug 2012: 3766-3775.
16	肥満を伴う乳癌生存者のQOLと身体計測値に及ぼす効果を検討	Littman AJ, et al. Randomized Controlled Pilot Trial of Yoga in Overweight and Obese Breast Cancer Survivors Effects on Quality of Life and Anthropometric Measures. Support Care Cancer, 2012 February; 20(2): 267-277.
17	マインドフルネスストレス低減法 (MBSR) に参加した治療後の乳がん生存者の、(乳がんに伴う) 症状や症候群の発生頻度とその重症度を検討する	Lengacher CA et al: Mindfulness based stress reduction in post-treatment breast cancer patients: an examination of symptoms and symptom clusters. J Behav Med (2012) 35:86-94.
18	乳がんと診断された直後の患者のQOL、気分、疲労、受けたストレス等にヨガがどのような影響を及ぼすのか	Pruthi S, et al. A Randomized Controlled Pilot Study Assessing Feasibility and Impact of Yoga Practice on Quality of Life, Mood, and Perceived Stress in Women With Newly Diagnosed Breast Cancer. Global Advances In Health and Medicine , 2012; 1(5), 30-35
19	アイアンガーヨガを定期的実践し、自覚的心理社会的機能および日中唾液中コルチゾール濃度に対する効果を評価する	Banasik J, et al. .Effect of Iyengar yoga practice on fatigue and diurnal salivary cortisol concentration in breast cancer survivors. J Am Acad Nurse Pract, 2011; 23:135-142.
20	乳癌で放射線治療中の女性患者においてヨガの介入がQOLや心理社会的結果にどのような影響を与えるか	Chandwani KD, et al. Yoga Improves Quality of Life and Benefit Finding in Women Undergoing Radiotherapy for Breast Cancer. Journal of the society for Integrative Oncology,2010;8(2)



21	補助放射線治療中の初期乳がん患者の不安、抑うつと唾液コルチゾールリズムに対するヨガプログラムの効果を簡単な支持療法と比較する	Raghavendra RM et al. Effects of a Yoga Program on Cortisol Rhythm and Mood States in Early Breast Cancer Patients Undergoing Adjuvant Radiotherapy. Integrated Cancer Therapies, 2009; Volume 8 number 1: 37-46.
22	通常の治療を受けている初期乳がん患者に対するヨガの抗不安効果を、短期支持的療法と比較する	Rao MR, et al. Anxiolytic effects of a yoga program in early breast cancer patients undergoing conventional treatment: A randomized controlled trial. Complement Ther Med 2009;17:1-8
23	アジュヴァント放射線療法を受けている乳がんの外来患者に対してヨガ療法と短期支持的療法を行った各群の苦痛を伴う症状への効果を比較する	S Hosakote Vadiraja, et al. Effects of yoga on symptom management in breast cancer patients: A randomized controlled trial. International Journal of Yoga,2009; (2): 73-79
24	乳がん女性におけるリストラティブヨガ(RY)の実施可能性と、感情面、健康に関するQOLと症状に対する効果をコントロール群と比較する	Danhauer SC, et al. Restorative yoga for women with breast cancer: findings from a randomized pilot study. Psycho-Oncology, 25 February 2009; 18: 360-68
25	初期乳がん生存者の更年期症状に対する“気づきのヨガ”プログラムの有効性をランダム化比較試験によって検証する	Carson JW, et al. Yoga of Awareness program for menopausal symptoms in breast cancer survivors: results from a randomized trial.Support Care Cancer,2009; 17: 1301-1309
26	癌センターでアジュヴァント(補助)放射線療法を受けている初期乳癌外来患者のQoLと感情に対する統合的ヨガプログラムと短期的支持的療法との効果を比較する	Vadiraja HS, et al. Effects of yoga program on quality of life and affect in early breast cancer patients undergoing adjuvant radiotherapy: A randomized controlled trial. Complementary Therapies in Medicine, 2009; 17: 274-28.
27	外科手術を受ける初期乳がん患者に対するヨガ療法の術後の結果ならびに創傷治癒に対する効果を検討する	Rao RM, et al. Influence of yoga on postoperative outcomes and wound healing in early operable breast cancer patients undergoing surgery.International Journal of Yoga,2008; Vol.1:33-41.
28	初期乳癌術後の患者の不安、抑うつ、治療に関連した症状、QOL(生活の質)、免疫に及ぼすヨガの効果を評価する	Rao RM, et al. Influence of yoga on mood states, distress, quality of life and immune outcomes in early stage breast cancer patients undergoing surgery. Int J Yoga. 2008 Jan-Jun; 1(1): 11-20
29	多民族的なサンプルの乳がん患者に対して、アーサナ、呼吸、および、瞑想エクササイズを含むヨガが、生活の質(QOL)、疲労、苦悩、精神的な幸福に関してどのような影響を及ぼすか評価する	Moadel AB, et al.Randomized Controlled Trial of Yoga Among a Multiethnic Sample of Breast Cancer Patients. Effects on Quality of Life.Journal of Clinical Oncology, 2007, 25(28): 4387-4394.
30	統合的ヨガの乳癌患者の化学療法による吐き気と嘔吐に与える影響を調べる	Raghavendra R.M. et al. Effects of an integrated yoga programme on chemotherapy-induced nausea and emesis in breast cancer patients European Journal of Cancer Care 2007; 16, 462-474.
31	放射線療法を受ける乳がん女性の自覚ストレスレベル、不安、抑うつ、DNA損傷に対する統合的ヨガプログラムの調整効果を調べる	Banerjee B, et al. Effects of an integrated yoga program in modulating psychological stress and radiation-induced genotoxic stress in breast cancer patients undergoing radiotherapy. Integr Cancer Ther 2007; 6: 242-250.
32	乳がん生存者に対する7週間のヨガ実習の身体的及び心理的効果を検証する	Culos-Reed S N, et al. “A Pilot Study of Yoga for Breast Cancer Survivors: Physical and Psychological Benefits.” Psycho-Oncology. 2006; 15:891-897.
33	化学療法を受けている患者に対して、ヨガ呼吸法が化学療法の副作用を軽減し、生活の質を向上させ	Dhruva A, et al. Yoga Breathing for Cancer Chemotherapy-Associated Symptoms and Quality of Life: Results of a Pilot Rndomized Controlled Trial. THE

	る効果があるか検討する	JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE,2012; 18: 473-479.
34	乳がん関連続発性上肢リンパ浮腫 (BCRL)ステージ1 に対するヨガ 実習の効果調査	Loudon A, et al. Yoga management of breast cancer-related lymphedema: a randomized controlled pilot-trial. Bio Med Central Complementary and Alternative Medicine. 2014. 14: 214
35	乳がん治療に伴う続発性腕部リンパ浮腫発症者に対するヨガの効果 を通常の治療と比較する	Loudon A et al. The effect of yoga on women with secondary arm lymphoedema from breast cancer treatment.BMC Complementary and Alternative Medicine, 2012:12-66.
36	チベットヨガがリンパ腫患者の心理的適応、疲労、睡眠に対して有効か	Cohen L et al: Psychological Adjustment and Sleep Quality in a Randomized Trial of the Effects of a Tibetan Yoga Intervention in Patients with Lymphoma. 2004 Cancer 100, 2253-2260.

#### 4. 内分泌、栄養および代謝疾患（17論文）

	Research Question	論文
1	2型糖尿病のリスク軽減に対するヨガの効果を BMI、胴囲、空腹時血糖値、食後血糖値、インスリン、インスリン抵抗性、血圧、およびコレステロールで評価する。また精神的健康についても評価する	McDermott1 KA, et al. A yoga intervention for type 2 diabetes risk reduction: a pilot randomized controlled trial, BMC Complementary and Alternative Medicine,2014; 14(212): 1-14
2	笑いヨガを用いた笑い療法の効果を2型糖尿病患者の血糖値で評価する	M. Čokolič, et al. The inhibitory effect of laughter yoga on the increase in postprandial blood glucose in type 2 diabetic patients. Diabetologia Croatica. 2013; 42-2: 54-58
3	2型糖尿病患者の脂質異常に対するヨガの効果を検討する	Shantakumari N, et al : Effects of a yoga intervention on lipid profiles of diabetes patients with dyslipidemia. HEART JOURNAL 65(2013):127-131
4	確定的で多施設研究デザインについての情報を得ることを視野に入れながら、2型糖尿病におけるコミュニティベースのヨガクラスの実行可能性を探求する	Skoro-Kondza L et al.,Community based yoga classes for type 2 diabetes: an exploratory randomised controlled trial. BMC Health Services Research 2009, 9:33
5	2型糖尿病患者に対してのヨガと従来型運動の短期介入の効果を調査する	Gordon L, et al. Effect of Yoga and Traditional Physical Exercise on Hormones and Percentage Insulin Binding Receptor in Patients with Type 2 Diabetes. American Journal of Biotechnology and Biochemistry, 2008; 4 (1), 35-42
6	2型糖尿病患者に対する24週間のヨガ及び従来の運動療法が生化学パラメーター、酸化ストレスマーカー、及び酸化状態に及ぼす効果を調査する	Gordon, L.A., et al. "Effect of exercise therapy on lipid profile and oxidative stress indicators in patients with type 2 diabetes." BMC Complementary and Alternative Medicine. 2008. 8: 21.
7	2型糖尿病患者に対するハタヨガと従来型理学的トレーニングの臨床的および生化学パラメーターに及ぼす影響を研究する	Lorenzo Gordon, et al. Changes in clinical and metabolic parameters after exercise therapy in patients with type 2 diabetes. Archives of Medical Science 2008; 4, 4: 427-437.
8	インスリン療法によるコントロールが不良の糖尿病患者にヨガの介入が有効かどうか	Kerr D, et al. An Eastern art form for a Western disease: randomised controlled trial of yoga in patients with poorly controlled insulin treated diabetes.Practical Diabetes International.2002; 19(6),164-6
9	ヨガ療法介入の前糖尿病状態者の酸化ストレス、血糖値、血圧、身体測定値に対する効果を検討する	Hegde SV, et al: Effect of community-based yoga intervention on oxidative stress and glyceimic parameters in prediabetes: a randomized controlled trial. Complementary

		Therapies in Medicine (2013) 21, 571—576.
10	多嚢胞性卵巣症候群 (PCOS) の青年女子におけるホリスティックヨガプログラムの内分泌パラメーターに及ぼす効果を通常運動プログラムと比較	Nidhi R. et al: Effects of a holistic yoga program on endocrine parameters in adolescents with polycystic ovarian syndrome: a randomized controlled trial. The journal of alternative and complementary medicine, 2013, 19, 2, 153-160
11	ヨガの介入が青年期多嚢胞性卵巣症候群 (PCOS) 患者の QOL にどのような影響を与えるか	Nidhi R, et al. Effect of Yoga Program on Quality of Life in Adolescent Polycystic Ovarian Syndrome: A Randomized Control Trial. Applied reseach in quality of life,2013, 8,373-383.
12	30歳以下の多嚢胞性卵巣症候群 (PCOS) の40%がメタボリックシンドロームを呈する。PCOSの思春期女性の糖代謝および血中脂質値に対するヨガ療法の有効性を評価する	Nidhi, R. et al. Effect of a yoga program on glucose metabolism and blood lipid levels in adolescent girls with polycystic ovary syndrome. International Journal of Gynecology and Obstetrics, 2012. 27-41.
13	リストラティブヨガとストレッチが、メタボリックシンドローム患者の日中コルチゾール変動と心理社会的成果に与える効果を比較検討する	Corey SM, et al. Effect of restorative yoga vs. stretching on diurnal cortisol dynamics and psychosocial outcomes in individuals with the metabolic syndrome: The PRYSMS randomized controlled trial. Psychoneuroendocrinology, 2014; 49: 260-271
14	肥満の閉経後女性におけるメタボリックシンドロームと血清アディポネクチンに対するヨガの効果について評価する	Lee JA, et al. Effect of yoga exercise on serum adiponectin and metabolic syndrome factors in obese postmenopausal woman. The Journal of Nouth American Menopause Society,2014,19(3): 296-301
15	メタボリックシンドローム女性の性機能障害に対するヨガの有効性を検討する	Kim HN, et al. Effects of Yoga on Sexual Function in Women with Metabolic Syndrome: A Randomized Controlled Trial. The Journal of Sexual Medicine,13; 10: 2741-51
16	肥満かつ不活発なメタボリックシンドロームの成人に対するリストラティブヨガの効果と実行可能性の予備試験	Cohen BE, M.D. et al. Restorative Yoga in Adults with Metabolic Syndrome: A Randomized, Controlled Pilot Trial. METABOLIC SYNDROME AND RELATED DISORDERS, 2008 Volume 6, Number 3: 223-229.
17	メタボリック症候群の臨床、生化学パラメーターに与えるヨガ、瞑想の影響を調べる	Khatri D, et al. Effects of yoga and meditation on clinical and biomedical parameters of metabolic syndrome. Diabetes Research and Clinical Practice,2007; 78: 9-10.

## 5. 精神および行動の障害 (41論文)

	Research Question	論文
1	高齢女性におけるカタリア式笑いヨガの抑うつ低減効果と人生満足度向上効果を、グループ・エクササイズ療法と比較する	Shahidi, M., et al. Laughter Yoga versus group exercise program in elderly depressed women: a randomized controlled trial International Journal of Geriatric Psychiatry.2011, 26: 322-27
2	高齢成人に対する6カ月のシルバーヨガ運動の効果、特に睡眠の質、抑うつ、健康状態に対する自己認識を調べる	Chen KM, Chen MH, Chao HC, Hung HM, Lin HS, Li CH: Sleep quality, depression state, and health status of older adults after silver yoga exercises: Cluster randomized trial. Int J Nurs Stud 2009;46:154-163.
3	施設入所高齢者において、6ヶ月間のヨガ・プログラムとアーユルヴェーダ生薬製剤の抑うつ改善効果を検討する	Krishnamurthy MN et al. Assessing Depression Following Two Ancient Indian Interventions: Effects of Yoga and Ayurveda on Older Adults in a Residential Home. Journal of Gerontological Nursing; 2007; 17-23.
4	統合失調症では身体的不安定が転	Ikai S, et al. Effects of yoga therapy on postural stability in

	倒のリスクを増すため重要な問題である。統合失調症患者の姿勢安定と柔軟性に対するヨガ療法の効果を検討する	patients with schizophrenia-spectrum disorders:A single-blind randomized controlled trial. Journal of Psychiatric Research, 2013,Vol. 47, pp1744-1750
5	統合失調症外来患者に対してヨガアーサナ追加介入の治療的有用性を検討する	Varambally S, et al. Therapeutic efficacy of add-on yogasana intervention in stabilized outpatient schizophrenia: Randomized controlled comparison with exercise and waitlist. Indian Journal of Psychiatry . 2012 ; 54(3): 227–232.
6	精神病施設に入院中の成人統合失調症患者の症状と QOL に対するヨガ療法プログラムの効果を検討する	Visciglia E, et al: Yoga Therapy as an adjunctive Treatment for Schizophrenia: A Randomized, Controlled Pilot Study. The Journal of Alternative and Complementary Medicine (2011) 17(7), 601-607.
7	抗精神病薬で安定している統合失調症患者の顔情動認知障害に対するヨガの効果を明らかにする	Behere RV et al. Effect of yoga therapy on facial emotion recognition deficits, symptoms and functioning in patients with schizophrenia. Acta Psychiatr Scand 2011;123:147–53
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10	統合失調症で服薬治療中の患者に対するヨガの介入がどのような効果をもたらすか	Duraiswamy G, et al. Yoga therapy as an add-on treatment in the management of patients with schizophrenia –a randomized controlled trial. Acta Psychia Scand 2007sep;116(3): 226-32.
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12	急性解毒治療期間直後のアルコール依存症患者に対する SKY 療法の抗うつ作用を検討	Vedamurthachar A,et al. Antidepressant efficacy and hormonal effects of Sudarshana Kriya Yoga (SKY) in alcohol dependent individuals. Journal of Affective Disorders,2006: 249-253.
13	禁煙者の欲求に対するヨガのプレーナーヤーマに基づいた呼吸法の急効果を評価する	Shahab L, et al : The acute effects of yogic breathing exercises on craving and withdrawal symptoms in abstaining smokers.Psychopharmacology,225,pp875-882,2013.
14	健康な喫煙女性の禁煙に対する補充療法としてのヨガの実行可能性と効果の検討	Bock BC, et al: Yoga as a Complementary Treatment for Smoking Cessation in Women. Journal of Womens Health (Larchmt). 2012 February; 21(2): 240–248.
15	喫煙する渴望、禁煙禁断症状に対する身体的活動（ハタヨガと有酸素運動）の急性効果を調べる	Elibero A et al. Acute Effects of Aerobic Exercise and Hatha Yoga on Craving to Smoke. Nicotine & Tobacco Research, Volume 13, Number 11 (November 2011) 1140–1148.
16	大うつ病患者で抗うつ薬としてクエチアピン (QXR) もしくはエスシタロプラム (ESC) を服用している者に、追加でハタヨガを実施した場合、臨床効果そして HPA axis 機能に対して、さらなる効果がみられるか	Sarubin N, et al. The influence of Hatha yoga as an add-on treatment in major depression on hypothalamic-pituitary-adrenal-axis activity: A randomized trial. Journal of psychiatric reseach, 2014; 53(1).
17	大うつ病性障害患者に対するサハジャヨガ療法の認知神経科学的効	Sharma VK et al: Effect of Sahaj Yoga on neuro-cognitive functions in patients suffering from major depression.