

表4 ベースラインにおける血液性状

	介入群	コントロール群	p値
血清グルコース (mg/dL)	90.5 ± 17.0	92.8 ± 13.2	0.616
HbA1c (%)	5.2 ± 0.5	5.3 ± 0.6	0.695
フルクトサミン (μmol/L)	263.6 ± 23.2	272.2 ± 30.5	0.297
乳酸 (mg/dL)	7.1 ± 2.9	8.7 ± 3.1	0.093
T-C (mg/dL)	215.6 ± 24.7	215.7 ± 20.9	0.990
TG (mg/dL)	111.0 ± 48.7	175.5 ± 88.6	0.005
HDL-C (mg/dL)	64.5 ± 16.9	54.6 ± 12.3	0.031
LDL-C (mg/dL)	131.3 ± 27.6	132.0 ± 25.2	0.932
遊離脂肪酸 (mEq/L)	0.5 ± 0.2	0.5 ± 0.2	0.592
GOT (IU/L)	32.2 ± 24.0	28.3 ± 11.6	0.495
GPT (IU/L)	41.3 ± 49.7	37.5 ± 22.1	0.744
γ-GTP (IU/L)	69.8 ± 61.8	56.2 ± 37.2	0.382
コリンエステラーゼ (IU/L)	373.0 ± 56.3	391.4 ± 75.2	0.366
NK細胞活性 (%)	42.6 ± 10.8	38.4 ± 12.7	0.240
T細胞 (%)	87.0 ± 4.7	85.2 ± 5.8	0.259
B細胞 (%)	5.7 ± 3.6	6.2 ± 3.5	0.639
CD4+ (%)	41.9 ± 8.1	43.7 ± 11.2	0.539
CD8+ (%)	32.4 ± 9.3	30.8 ± 7.1	0.528
CD4/8 (%)	1.5 ± 0.7	1.6 ± 0.8	0.642
UA (mg/dL)	6.0 ± 1.3	6.5 ± 1.2	0.173

Mean±SD

表5 ベースラインにおける精神心理状態(気分) : Tスコア

	介入群	コントロール群	p値
T-A	49.1 ± 10.3	50.6 ± 11.2	0.645
D	51.1 ± 10.2	52.8 ± 9.7	0.569
A-H	52.2 ± 9.7	52.3 ± 9.2	0.975
V	52.0 ± 8.0	49.3 ± 7.1	0.238
F	49.4 ± 8.9	50.9 ± 9.1	0.572
C	52.3 ± 11.2	51.3 ± 7.8	0.733

Mean±SD

表6 ベースラインにおける日常生活の状況

	介入群	コントロール群	p値
朝食の規則性	あり 22 (100%) なし (0%)	21 (95%) 1 (5%)	1.000
睡眠時間 (時間/日)	6.5±0.6	6.8±1.1	0.303
間食の習慣	ほとんど食べない 9 (41%) 月に1-2回 2 (9%) 週に1-2回 6 (27%) 週に3-4回 2 (9%) ほぼ毎日 3 (14%)	10 (45%) 2 (9%) 5 (23%) 1 (5%) 4 (18%)	0.961
飲酒状況	飲む 16 (73%) 以前は飲んだがやめている 0 (0%) ほとんど飲まない 6 (27%)	13 (59%) 1 (5%) 8 (36%)	0.450
酒量 (合)	1.8±1.0	1.7±0.8	0.829
喫煙状況	吸っている 9 (41%) 以前は吸っていたがやめた 6 (27%) 吸わない 7 (32%)	10 (45%) 5 (23%) 7 (32%)	0.931
日常のストレス	かなり多い 2 (9%) 多い 5 (23%) ふつう 8 (36%) 少ない 7 (32%)	1 (5%) 8 (36%) 12 (55%) 1 (5%)	0.097
中等度(3METs)以上「運動」時間(分/月)	243.2±341.0	237.0±445.8	0.959
身体活動実践意識	いつも意識している 4 (18%) まあまあ意識している 11 (50%) あまり意識していない 4 (18%) ほとんど意識していない 3 (14%)	5 (23%) 6 (27%) 7 (32%) 4 (18%)	0.468
運動の実施状況	無関心期 4 (18%) 関心期 6 (27%) 準備期 7 (32%) 実行期 2 (9%) 維持期 3 (14%)	4 (18%) 9 (41%) 4 (18%) 0 (0%) 5 (23%)	0.417

離散変数 : N (%)

連続変数 : Mean±SD

2007年2月現在で、すでに欠席傾向の者がいるが、もし脱落者が出たとしても、最終評価には参加を依頼し、ITT分析による総合評価ができるようにする必要がある。また、コンプライアンス別に見たサブグループ分析も行う予定である。

ところで、本研究のデザインで最も重要な視点は、総合的な健康教育プログラムに温泉入浴を組み合わせることで、相乗効果が得られるかどうか、という点にある。上馬場ら⁹⁾の報告によれば、中高年女性を対象とした3ヶ月間の介入研究において、①生活指導と運動のみ、②生活指導と運動+温泉入浴群、③対照群の効果の比較を行ったが、温泉を組み合わせることに由来した特異的な効果として、中性脂肪と総コレステロール、動脈硬化指数の有意な改善、及び不安・緊張の低下を挙げている。これらは、温泉のリラクゼーション効果が副交感神経の活動レベルを向上させて、生活指導と運動のみの介入以上の効果につながったものと推察している。本研究の対象である働き盛りの男性は、仕事において精神的・肉体的に過度なストレスがかかっている状況が想定され、中高年女性を対象とした場合と同様の効果が得られるならば、温泉を組み合わせることの有効性がより明確に示されることが期待される。

また、温泉の転地効果とは通常、滞在型で日常的な環境から場を移すことを指すが、働き盛りの男性にとっては、仕事と家庭という日常的な環境から、短時間でも場を移すことの効果、という点でも期待できるかもしれない。

ただし、こうした効果も、定期的な実践を継続しなければ得られにくいものである。本研究においても、対象者は現実的に日々の仕事等の都合と折り合いをつけつつ参加しており、継続の障害となる様々な状況に直面しているのも事実である。対象者がそれぞれの生活実態に応じて、「テラーメイド」の実践プログラムを身につけて、継続できるよう支援することが、本研究においても、今後の応用的な実践においても重要な課題になると考えられる。

E. 結論

ブルーカラー男性を対象とした温泉入浴と生活・運動・食事指導を組み合わせた介入が事前に予定したとおりに進行中である。2007年6月と1年の観察期間後の2008年6月の最終評価をもって研究が完了し、結論づける予定である。

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- 2) 大西一男. 肉体労働と血圧. 日本災害医学会会誌. 46(5);283-289,1998.
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F. 健康危険情報

現在のところなし

G. 研究発表

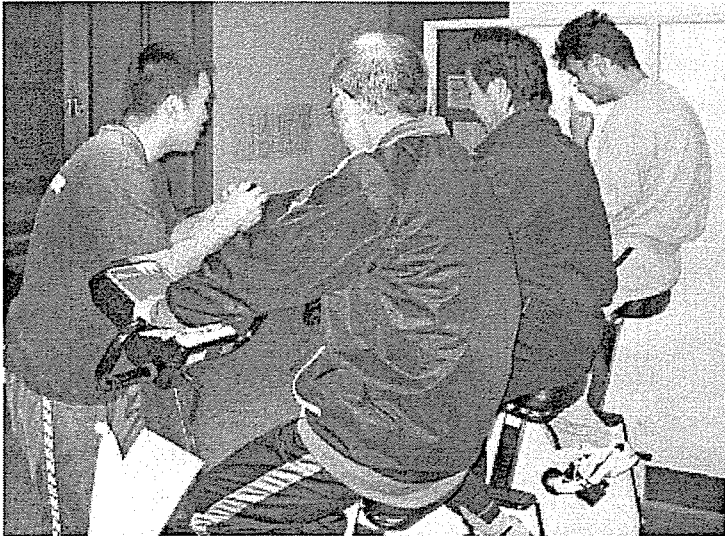
第66回日本公衆衛生学会(愛媛)にて発表する予定。

H. 知的所有権の取得状況

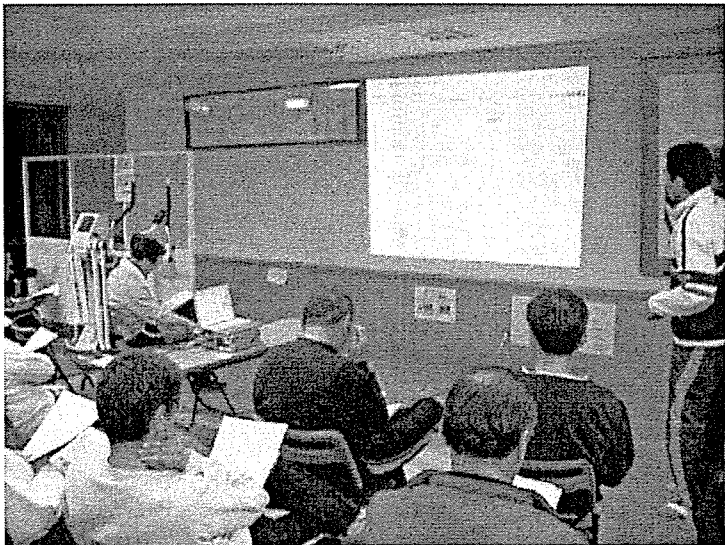
なし



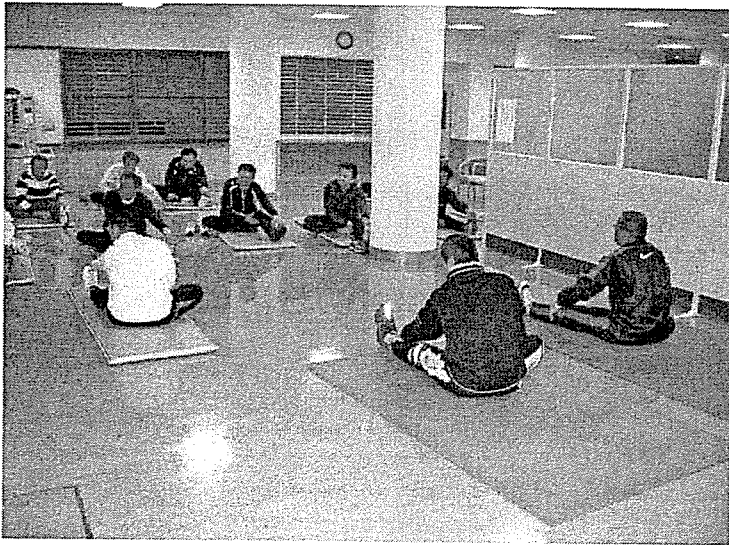
研究参加への説明と同意



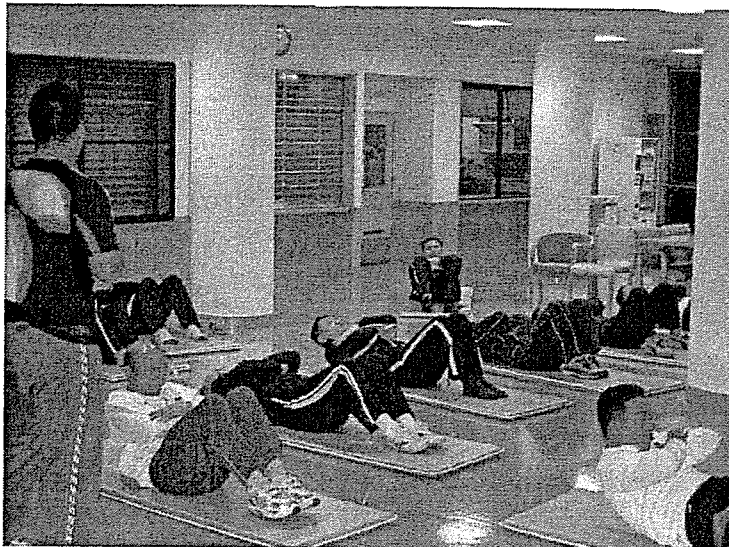
体力測定（初期評価）



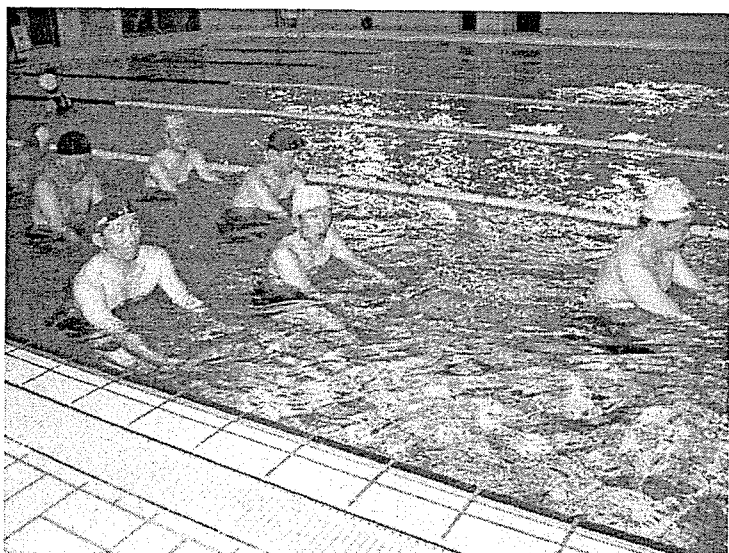
初期評価の結果報告



運動前の準備体操



自宅でできる筋力増強運動



水中運動プログラム

III. 研究成果の刊行に関する一覧表

1. 学術雑誌

掲載予定誌：Jpn Assoc Phys Med Balneol Climatol 題目：A cross-sectional study on the present state of spa bathing and related factors in male white- and blue-collar employees 著者：Kamioka H, Okada S, Kitayuguchi J, et al

掲載予定誌：レジャー・レクリエーション研究 題目：レジャー活動とレクリエーションに関するランダム化比較試験のシステムティック・レビュー 著者：上岡洋晴,津谷喜一郎,高橋美絵ら

2. 学会発表

学会名：第36回日本レジャー・レクリエーション学会学術集会 題目：レジャー活動とレクリエーションに関するランダム化比較試験のシステムティック・レビュー 演者：上岡洋晴,津谷喜一郎,高橋美絵ら

発表予定学会名：第72回日本温泉気候物理医学会学術集会（シンポジウム） 平成19年5月19日（土） 於：箱根小涌園 題目：エビデンス・グレーディングの流れと温泉研究 演者：上岡洋晴



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有限責任中間法人
日本温泉気候物理医学会
雑誌編集委員会



前略

先にご投稿いただきました下記論文を査読致しました結果、この程修正後の採用が決定いたしましたのでお知らせ申し上げます。(念のため再査読を要しませんが)

掲載につきましては恐縮ですが、平成19年5月の学会雑誌第70巻3号の掲載予定となります。

別紙査読者のご意見を加味し、訂正した上で、お手数ですが(入稿を急いでおりますので、)できればメール添付で全文(図表とも)再送付して下さいますようお願い致します。

草々

記

論文: No. 2147

「A Cross-Sectional Study on the Present State of
Spa Bathing and Related Factors in Male
White-and blue-collar male employees」

A Cross-Sectional Study on the Present State of Spa Bathing and Health Condition in Male White- and Blue-Collar Employees

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Short Running Title: Present State of Spa Bathing and Health Condition

SUMMARY

The purpose of this study was to clarify the relationship between frequency of bathing in a spa and at home and the characteristics of the body, blood, and lifestyle of white-collar and blue-collar male employees.

To recruit subjects, two baseline data for randomized controlled trials in two places in Shimane Prefecture and in Nagano Prefecture were used. In the two-month period between August and September 2006, 43 of 311 white-collar male employees aged between 30 and 57 years in the Unnan municipal office volunteered to participate in this study. Similarly, 44 blue-collar workers in Nagano Prefecture volunteered to be involved in this study as a result of an appeal for volunteers in local newspapers and public information journals published by large local enterprises from September through November 2006. A total of 87 men were subjects of this study.

Items evaluated in this study with respect to physique included height, weight, body mass

index, waist circumference, hip circumference, and percent of body fat. With respect to strength, they were grip strength, abdominal strength, back strength, and anteflexion. With respect to characteristics of the blood, they were serum glucose, hemoglobin A1c, fructosamine, lactic acid, total cholesterol, triglyceride, HDL cholesterol, LDL cholesterol, free fatty acid, GOT, GPT, γ -GTP, cholinesterase, natural killer cell activity, T cell, B cell, CD4+, CD8+, CD4/8 and uric acid. With respect to mood, Profile of Mood States was evaluated. With respect to lifestyle, the frequency of monthly bathing in a spa and at home was evaluated.

No significant correlation was revealed between frequency of monthly spa bathing and the health indices in the white and blue-collar male workers. The items that were significantly correlated ($p < 0.05$) with frequency of monthly bathing at home were GOT (positive), CD8+ (positive), and mental stress (negative).

In this study, frequency of monthly spa bathing was found to have no significant correlation with the health indices.

Key words: spa, bathing, white-collar employees, male

I INTRODUCTION

Hot spas exert a thermal action, hydrostatic pressure action, a chemical action, and a general conditioning action¹, all of which are known to affect humans favorably or unfavorably.

Wang et al² reviewed spa's health promotion effects on health or slightly unhealthy persons published over the past two decades in Japan. The probable effects were suggested from 32 studies (55.2%), but findings from the rest (26 papers, 44.8%) showed little evidence to support this consideration.

A systematic review³ of randomized controlled trials on the therapeutic and health-promoting effects of spas showed improvement among patients with rheumatism, osteoarthritis, or lumbago.

The effect of short-term balneotherapy on subjects staying in a spa facility was previously studied. When health indices before and after balneotherapy were compared, significant improvements in one or more indices were found when balneotherapy was carried out for 3-7 days⁴, for 6 days⁵, or for 3 days⁶. Beneficial effects of regular one-day visits to a spa once a week for bathing and lifestyle education did not persist after the visit had been repeated for only 3 months, but did remain for more than one year after the visit had been repeated for 6 months⁷.

Are there any significant differences in health indices between people who have regular and frequent spa bathing in daily life and those who do not? This was the key question of this study.

Sekine et al⁸ reported the use of spa resorts may have a beneficial effect on the maintenance of physical and mental health in Japanese employees in a cross-sectional study. With respect to the use of a resort, the subjects were asked to score using one of

the four response categories (never; once or twice; three or four times; five times or more) when questioned as to whether they went to spa resorts for the purpose of relaxation in the last 3 years. However, no studies were carried out under such a detailed condition as one-day visits to spa facilities for bathing in a one-month period, in which the relationship was examined between frequency of spa bathing and characteristics of the blood and physical strength. In addition, there were no studies in which not only the bathing habit in the spa but also that in the home was examined.

The purpose of this study was to clarify the relationship between frequency of bathing in a spa and at home and the characteristics of the body, blood, and lifestyle in white- and blue-collar male employees in Japan.

II METHODS

1. Subjects

The baseline data for two randomized controlled trials in two places in Shimane Prefecture and Nagano Prefecture were used for this study (Fig. 1). This study was announced on a web site for the exclusive use of Unnan Municipal Office Personnel between August and September 2006. Of 311 male workers aged between 30 and 57 years, 43 volunteered to participate in this study. After explanatory meetings held September 25-26, all 43 volunteers (white-collar employees) agreed to be included in this study (participation rate of 14%).

Next, a call for volunteers was made via public information news in local newspapers in Nagano Prefecture and public information journals published by large local enterprises from September through November 2006. As a result, 44 blue-collar employees volunteered to participate in this study. After explanatory meetings between

14th and 27th November, all 44 agreed to participate in this study.

The spa facilities that could be visited on a one-day trip were scattered in both prefectures. All participants could visit one of the spa facilities by car within 10 minutes from their homes or workplaces.

2. Examination

The outcomes of health status were physical indices (height, weight, and body mass index [BMI], waist circumference, and hip circumference, percent body fat), blood profiles (serum glucose, hemoglobin A1c [Hb_{A1c}], fructosamine, lactic acid, total cholesterol [T-C], triglyceride [TG], HDL cholesterol [HDL-C], LDL cholesterol [LDL-C], free fatty acid [FFA], GOT, GPT, γ -GTP, cholinesterase [ChE], natural killer cell activity, T cell, B cell, CD4+, CD8+, CD4/8, and uric acid [UA]), strength (grip strength, abdominal strength, back strength, and anteflexion). The Profile of Mood States [POMS]^{9,10} was used for the questionnaires on the psychological aspects. The lifestyle items were from JALSPAQ¹¹ along with some questions (e.g., frequency of bathing in the spa and at home per month) on behavior pattern.

Blood profiles were examined between 9 to 12 a.m. after fasting longer than 12 hours. For POMS and lifestyle, subjects were asked in a quiet room to reply frankly about their mood states and lifestyle. Evaluation of other indices was made between 6 and 8 p.m. before supper on a day when blood samples were not obtained.

The methodology (including items of survey and measurement) of this project was approved by the Ethical Board of Tokyo University of Agriculture in May 2006. There were no adverse events on the examination.

3. Statistical analysis

A two-sample *t* test (Welch test) was employed for comparisons between groups

with continuous variables in the analysis. The χ^2 test and Fisher's exact probability test were performed with discrete variables. One-way analysis of variance (ANOVA) and Kruskal-Wallis test were used to investigate the differences among groups. Differences among groups were judged significant when significance levels were 5% or less. The SPSS® 11.0J for Windows was used for statistical analysis.

III RESULTS

Table 1 shows the frequency of monthly hot spa bathing. Forty subjects (46%) did not engage in spa bathing at all. Table 2 shows the frequency of monthly bathing at home. Thirty-five (40%) subjects took a bath every day and 5(5.7%) took no baths or showers.

Table 3 and table 4 show no relationship between the frequency of spa bathing and physique, strength, and blood profile. Table 5 shows the relationship between the frequency of spa bathing and mood status. Table 6 shows the relationship between the frequency of spa bathing and lifestyle. No variables were significantly correlated with the frequency of monthly hot spa bathing.

Table 7 shows no relationship between frequency of home-bathing and physique and strength. Table 8 shows the relationship between frequency of home-bathing and blood profile. The GOT and the CD8+ were significantly higher in a group with frequencies of monthly bathing below 21 than in a group taking baths every day.

Table 9 shows no relationship between frequency of home-bathing and mood status. Table 10 shows the relationship between frequency of home-bathing and lifestyle. The lower the frequency of monthly bathing was, the greater the mental stress was.

Results of subgroup analysis between white-collar and blue-collar employees

showed that right hand grip, abdominal and back strength were significantly higher ($p < 0.05$) in blue-collar employees than in white-collar employees, whereas anteflexion strength was significantly higher in white-collar employees than in blue-collar employees (data not shown). With regard to blood profiles, the GOT, GPT, T-C, and LDL-C were significantly higher ($p < 0.05$) in blue-collar employees than in white-collar employees. Concerning the mood status, the score representing intensity of anger was significantly higher ($p < 0.05$) in blue-collar employees, whereas that representing intensity of vigor was significantly lower ($p < 0.05$) in white-collar employees. There were no significant differences between the two groups in terms of frequencies of monthly bathing in hot spa and at home.

IV DISCUSSION

In this study, no significant correlation was found between the frequency of monthly hot spa bathing and health indices.

Kagamimori et al.¹² made a large-scale investigation of the relationship between the frequency of spa bathing and WHO-QOL, and found that scores reflecting WHO-QOL were higher in subjects bathing in the spa more frequently. They pointed out that QOL was a self-selection bias, and a confounding factor influencing spa bathing.

Although a bias associated with QOL was conceivably present in our study as well, no parameters were available to adjust this bias. The preceding study was conducted by means of a complete enumeration taking all the people at eligible ages in the basic resident's registration as subjects, and accordingly had a sufficient sample size. On the other hand, the present study had shortcomings in terms of sample size and the

sampling method, although there were parameters concerning blood, physique, and bodily strength. It might be possible that the shortcomings of this study resulted in the failure to detect a significant correlation between the frequency of monthly spa bathing and the health indices.

The originality of this study is its attempt to find a relationship between the frequency of spa bathing and blood profiles (particularly immune functions). However, no significant relationship was found.

Ohtsuka et al¹³ reported that six-week balneotherapy with a simple thermals has the potential for augmenting immunological functions and also providing release from stress. In their study, subjects had spa bathing every day for 6 weeks. In the present study, the frequency of spa bathing was lower, and thus might have influenced the results.

The frequency of monthly bathing at home was also not significantly correlated with any health indices. However, the GOT and D8+ were significantly higher in the group taking baths 21 times a month or less frequently than in the group taking baths every day. Intensity of mental stress was higher in the former group than in the latter. This seems to be true of people who think frequent bathing poses a considerable problem or prefer a shower to a bath. However, the interpretation of our finding is difficult.

The results of subgroup analysis indicated that the bodily strength of blue-collar employees was greater than that of white-collar employees, and some hematological items had higher values in the blue-collar group. However, there were no significant differences between the two groups in the frequency of monthly bathing in the hot spa and at home. The above mentioned differences are probably attributable to the

differences in their physical activities and food intake in everyday life.

Several methodological limitations affect the interpretation of our findings. First, ours is a cross-sectional study, which makes it difficult to determine the causal nature of the association between frequent spa use and health status.

Second, it is possible that this study had a selection bias. We utilized baseline data for randomized control trials secondarily, and consequently sampling was not random. As a result, the subject group in this study was considered to be intensely interested in health. Employees in a secondary industry engaged in the same type of occupation, whereas those a tertiary industry engaged in various sorts of jobs, including factory workers and caregivers. Since the sample size was relatively small in addition, the presence of the type II error in this study was also conceivable.

Third, another disadvantage of this study was that only the frequency of spa bathing was examined, and the chemical composition of spa water was not analyzed. Kagamimori¹⁴ made a systematic review on balneotherapy related articles published from 1966 to 2005 and classified ten kinds of spas by the chemical composition of the waters. In observational and intervention studies to be made hereafter, the chemical composition of spa water should be examined before further analysis.

V CONCLUSION

No significant correlation was found between the frequency of monthly hot spa bathing and health indices among white- and blue-collar employees. Items significantly correlated with the frequency of monthly bathing at home were GOT (positive), CD8+ (positive), and mental stress (negative). However, this study had several methodological shortcomings. Therefore, interpretation and generalization of the results of this study

should be made with extreme caution.

VI ACKNOWLEDGMENT

This study was supported by a Health and Labor Sciences Research Grant from the Ministry of Health, Labor and Welfare of Japan.

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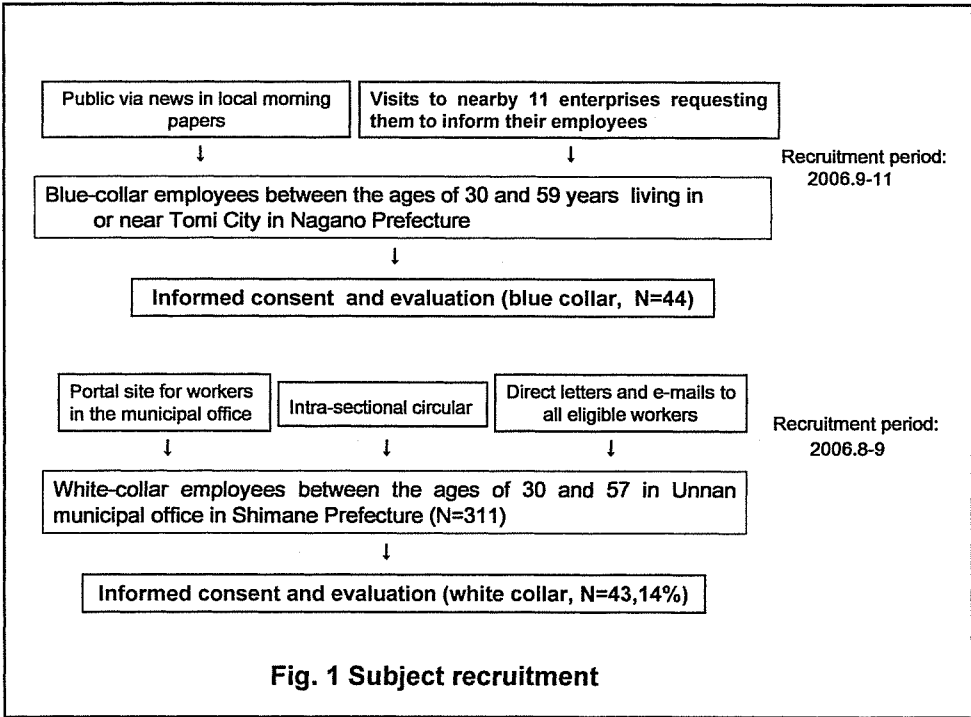


Table 1 Frequency and percent of monthly hot spa use

times	Frequency (%)	Blue collar	White collar
0	40 (46.0%)	18 (40.9%)	22 (51.2%)
1	14 (16.1%)	6 (13.6%)	8 (18.6%)
2	16 (18.4%)	12 (27.3%)	4 (9.3%)
3	6 (6.9%)	2 (4.5%)	4 (9.3%)
4	6 (6.9%)	2 (4.5%)	4 (9.3%)
5	4 (4.6%)	4 (9.1%)	0 (0%)
6	0 (0%)	0 (0%)	0 (0%)
7	0 (0%)	0 (0%)	0 (0%)
8	1 (1.1%)	0 (0%)	1 (2.3%)
total	87 (100%)	44 (100%)	43 (100%)
n (%)			

Table 2 Frequency and percent of monthly home-bathing

times	Frequency (%)	Blue collar	White collar
0	5 (5.7%)	3 (6.8%)	2 (4.7%)
1	1 (1.1%)	1 (2.3%)	0 (0%)
2	0 (0%)	0 (0%)	0 (0%)
3	0 (0%)	0 (0%)	0 (0%)
4	0 (0%)	0 (0%)	0 (0%)
5	1 (1.1%)	0 (0%)	1 (2.3%)
6	1 (1.1%)	0 (0%)	1 (2.3%)
7	0 (0%)	0 (0%)	0 (0%)
8	0 (0%)	0 (0%)	0 (0%)
9	0 (0%)	0 (0%)	0 (0%)
10	1 (1.1%)	0 (0%)	1 (2.3%)
11	0 (0%)	0 (0%)	0 (0%)
12	2 (2.3%)	1 (0%)	1 (2.3%)
13	0 (0%)	0 (0%)	0 (0%)
14	1 (1.1%)	0 (0%)	0 (0%)
15	3 (3.4%)	3 (0%)	0 (0%)
16	0 (0%)	0 (0%)	0 (0%)
17	0 (0%)	0 (0%)	0 (0%)
18	0 (0%)	0 (0%)	0 (0%)
19	0 (0%)	0 (0%)	0 (0%)
20	7 (8.0%)	5 (0%)	2 (4.7%)
21	0 (0%)	0 (0%)	0 (0%)
22	1 (1.1%)	1 (0%)	0 (0%)
23	0 (0%)	0 (0%)	0 (0%)
24	3 (3.4%)	0 (0%)	3 (7.0%)
25	9 (10.3%)	6 (13.6%)	3 (7.0%)
26	4 (4.6%)	1 (2.3%)	3 (7.0%)
27	13 (14.9%)	5 (11.4%)	8 (18.6%)
28	35 (40.2%)	18 (40.9%)	17 (39.5%)
total	87 (100%)	44 (100%)	43 (100%)
n (%)			