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# Impact of wearing Comfiknit Atopic Eczema® T-shirts on patients with atopic dermatitis: An open-label pilot study

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## Abstract

**Objectives:** Atopic dermatitis (AD) is aggravated by various factors, including perspiration and heat. Thus, it is recommended that AD patients wear breathable clothing to maintain disease remission. Japan has four seasons, so the ideal clothing for individuals with AD may differ throughout the year. The aim of this study was to evaluate the impact of wearing a newly developed performance fabric, named the Comfiknit Atopic Eczema® T-shirt, which absorbs excess perspiration from the skin surface and retains moisture within the fabric. We evaluated the effects of the T-shirts on the clinical characteristics of AD and compared the effects in summer and winter.

**Methods:** Ten adult outpatients with AD took part in an open-label pilot study for 4 weeks during the summer and for 4 weeks during the winter. The Eczema Area and Severity Index (EASI), the Patient-Oriented Eczema Measure (POEM), the itch Visual Analogue Scale (VAS), the stratum corneum water content (SCWC), skin pH, and skin bacterial cultures were evaluated. A Treatment Satisfaction Questionnaire for Medication-9 (TSQM-9) was filled out only after the intervention.

**Results:** The mean EASI, POEM, and itch VAS scores in both summer and winter fell after wearing the Comfiknit Atopic Eczema® T-shirts, whereas the SCWC increased. There was no significant difference in the skin surface pH or bacterial cultures before and after the intervention.

**Conclusions:** Wearing Comfiknit Atopic Eczema® T-shirts helped to prevent exacerbation of AD in summer and winter. Thus, wearing T-shirts made from performance fabric may help to maintain skin homeostasis.

KEYWORDS
atopic dermatitis, EASI, functional fabric, itch VAS, POEM

Naoko Hattori and Hitomi Morisaki contributed equally to this manuscript.

## 1 | INTRODUCTION

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by relapsing eczema and recurrent exacerbations.[1,2] In general, AD develops in infancy and childhood, with some patients expected to transition to adult-type AD. In Japan, the cumulative onset rate up to 3 years of age is >30%.[1] Many children achieve spontaneous remission from 2 to 3 years of age, and 50% achieve spontaneous remission at the age of 8–9 years.[1] However, 10.2% of adults in their 20s and 8.3% in their 30s are affected by AD.[1] Therefore, AD is a common disease that requires long-term treatment. AD patients suffer from cutaneous barrier dysfunction, alloknesis, chronic inflammation, and dysbiosis.[1,3] There are three main strategies to treat AD: (i) topical corticosteroids and tacrolimus ointment, which suppress inflammation; (ii) topical emollients to treat cutaneous physiologic abnormalities; and (iii) identification and avoidance of exacerbating factors and advice about daily life.[1]

For long-term control, countermeasures against aggravating factors, and advice about the practicalities of daily life, are particularly important. Exacerbating factors include high temperature, perspiration, clothing fabrics, stress, food, alcohol, and poor body conditioning.[1] Of these, temperature, perspiration, and clothing fabrics can be changed or ameliorated. Moreover, fabrics are in prolonged contact with the human skin, making them an important component of the skin environment.[4] Therefore, fabric selection is a crucial approach to AD management.[5] With respect to clothing fabrics, seasonal changes of temperature and humidity are an important problem. In Japan, humidity and temperature are high in summer and low in winter.[6] Therefore, clothing should be appropriate for either of these climates. The ideal fabric for AD patients is smooth, nonirritating, temperature-regulating, breathable, and absorbent. In addition, antimicrobial activity is preferred.[1,7] Traditionally, cotton and silk are recommended for AD patients.[4,8] However, in recent years, many manufactured fibers have been developed, and many reports on functional clothing have been published.[5] For example, a randomized, single-blind, controlled trial comparing the effects of silver-loaded seaweed-based cellulose fiber (SeaCell® Active) T-shirts with cotton T-shirts found a significant reduction in *Staphylococcus aureus* colony formation in those wearing the silver T-shirts.[9] In addition, a study in AD children compared clothes that combined ethylene vinyl alcohol (bottom layer) and cotton (top layer) with clothes made of cotton alone. The results showed that the ethylene vinyl alcohol/cotton-clothing was more effective at preventing sleep disturbance and itching.[10] The ideal characteristics of manufactured fibers are antimicrobial activity and anti-inflammatory, moisture-wicking, and skin-soothing properties.[5] Such materials may augment conventional management strategies for AD.[5] We assumed that combining multiple fibers, rather than a single fiber, would produce a material that would have a more positive outcome for AD patients. Hence, we focused on a variety of combined synthetic fibers.

The Comfiknit Atopic Eczema® is a prototype functional fabric T-shirt that retains moisture in the fabric by absorbing excess perspiration from the skin.

Here, we report the first clinical pilot study, which was conducted in summer and winter, comparing the efficacy of functional T-shirts for AD patients.

## 2 | MATERIALS AND METHODS

### 2.1 | Fabric comprising three fibers

Fabrics that absorb excess perspiration from the skin surface and retain moisture were examined. Focus was placed on a T-shirt developed by Wealthy Step International (the Comfiknit Atopic Eczema® T-shirt), which comprises three types of yarn. The T-shirt has three layers: the bottom layer, which is in contact with the skin, is made of polylactic acid (PLA), a hydrophobic fiber[11] with a cross-shaped cross-section that absorbs excess perspiration from the skin; the middle layer is Spandex, which provides elasticity[12]; and the outermost (top) layer is made of Modal, a hydrophilic fiber[13] that retains absorbed perspiration (Figure 1A,B, and Table 1). The T-shirts for winter or summer had different designs. Both had the

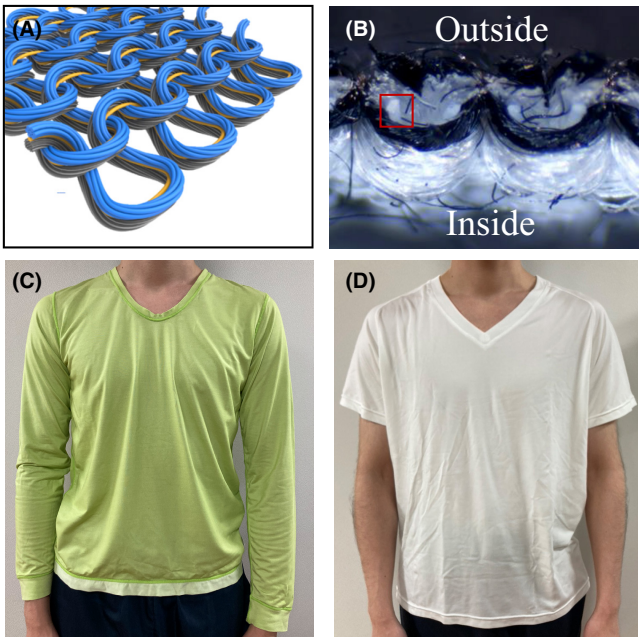


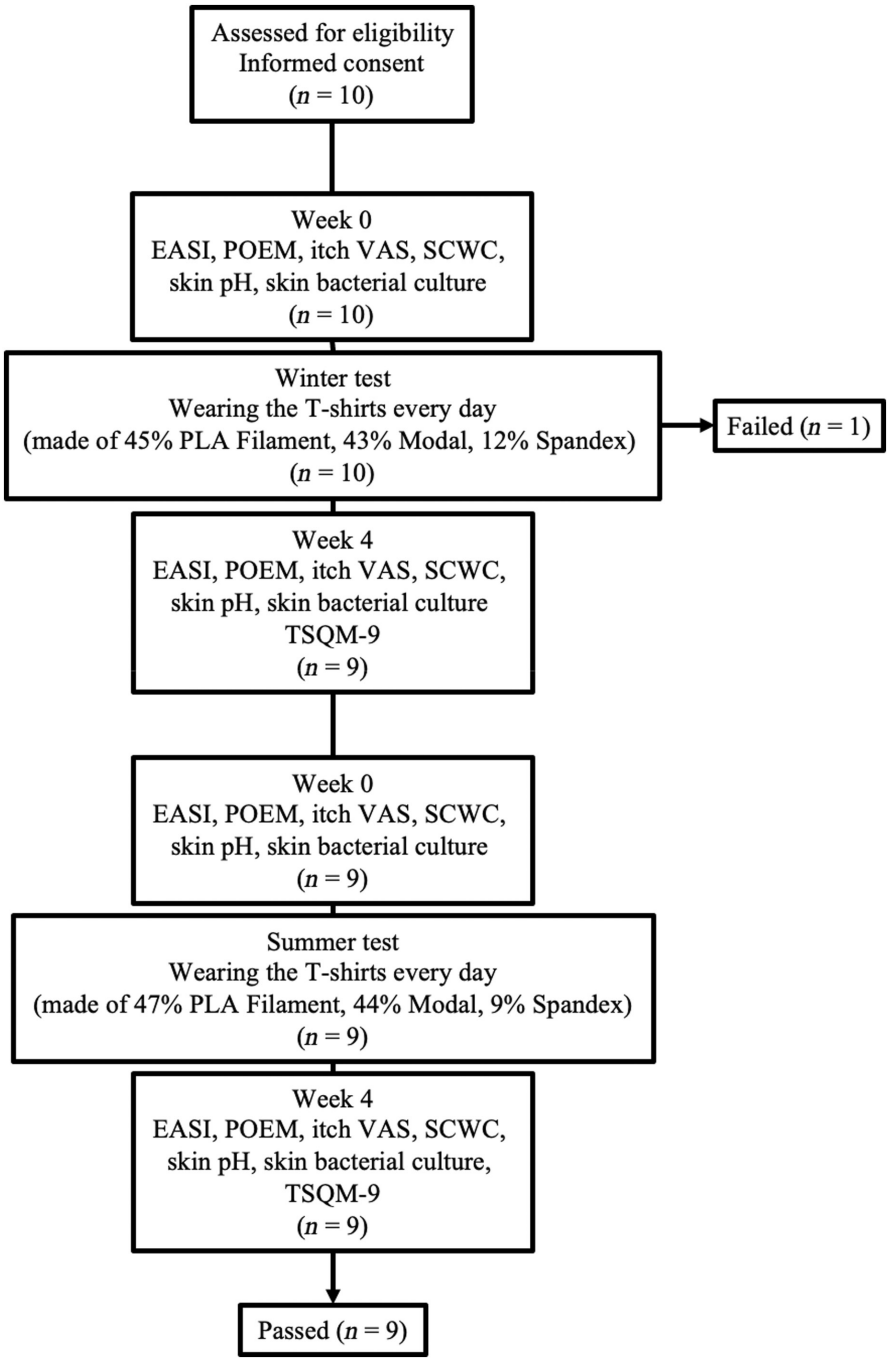

FIGURE 1 Overview of the fabric and the T-shirt for this study. (A) Schema showing the three-layered fabric of the T-shirt. The blue thread represents the top layer (Modal), the orange thread the middle layer (Spandex), and the gray thread the bottom layer (PLA). (B) Cross-section of the fabric: the black thread represents the top layer (Modal), the white thread (circled in red) the middle layer (Spandex), and the white threads (not circled in red) the bottom layer (PLA). (C) T-shirts prepared for the winter test. (D) T-shirts prepared for the summer test. PLA, polylactic acid.

**TABLE 1** Structure of Comfiknit Atopic Eczema® T-shirts.

| Layer | Yarn | Yarn density ($g/cm^3$) | Yarn diameter (μm) | Yarn blending ratio | |
|---|---|---|---|---|---|
| | | | | Winter | Summer |
| Top | 80S/1 Modal | 1.52 | 78.64 | 43% | 44% |
| Middle | 33D Spandex | 0.881 | 72.8 | 12% | 9% |
| Bottom | 75D/72F PLA | 1.27 | 91.4 | 45% | 47% |

Abbreviation: PLA, polylactic acid.

**FIGURE 2** Study schedule.




stitching on the outside to prevent contact with the skin; however, the winter T-shirt was green, with long sleeves and a crew neck, whereas the summer T-shirt was white, with short sleeves and a V-neck (Figure 1C,D). The yarns used in these T-shirts were the same, although the thickness was different because of the different yarn blends (Table 1).

### 2.2 | Study protocol

The study enrolled adult outpatients with AD who did not show symptom improvement after receiving the same treatment over the past 2 months. No exclusion criteria were set. WBC (/μL), Eo (%), Eo (/μL), TARC (pg/mL), and IgE (IU/mL) were assessed at baseline. The study was approved by the institutional review board of Nagasaki University (reference number: 20101902) and registered in the University Hospital Medical Information Network Clinical Trial Registry (UMIN-CTR; UMIN000042252).

Patients were given three of each type (summer and winter) of Comfiknit Atopic Eczema® T-shirts at the start of the study and instructed to wear them as undergarments throughout the study period. T-shirt sizes were selected by the patients by trial fitting or visual examination. The patients were not allowed to wash the T-shirts using fabric softener; otherwise, they could be washed and ironed as usual. Patients wore the T-shirts for 4 weeks each during the winter and summer seasons. One patient failed the study during the winter period because of itching caused by the fabric. The other nine patients completed the trial during both periods. EASI, POEM, itch VAS, SCWC, skin pH, and skin bacterial cultures were evaluated before and after the 4-week trial period (Figure 2, Table 3).

The SCWC was determined using SKICON-200EX-USB (YAYOI Co., Ltd.), which measures hydration (μS). Skin pH was measured using LAQUA F-74 (HORIBA, Advanced Techno, Co., Ltd.). SCWC and skin pH were measured at the middle of the chest. Swabs for bacterial cultures were taken from the middle of the back. SCWC, skin pH, and bacterial cultures were investigated in the area covered by the T-shirts.

The licensed TSQM-9 was used (with permission) to assess satisfaction with the T-shirts.[14] The TSQM-9 has been validated for use by patients receiving drug treatments, although its validity for assessing satisfaction with T-shirts has not been assessed. Therefore, the TSQM-9 results in this study were considered to be an indirect indicator of satisfaction. AD treatments did not change during the winter or summer trials.

### 2.3 | Statistical analysis

No statistical analysis was performed because the effect size was difficult to estimate and the sample size could not be determined in advance. Comfiknit Atopic Eczema® T-shirts are a new development by Wealthy Step International, and therefore the impact on patients could not be predicted and there are no related previous studies.

## 3 | RESULTS

### 3.1 | Patient characteristics

Nine of the enrolled patients completed the trial (Table 2). No history of sweating exacerbations or seasonal exacerbations was investigated at the study entry. One patient dropped out of the study because of itching caused by the fabric. Therefore, their characteristics are not shown in the table. There were six males and three females, with an average age of 39.3 years. All patients attended hospital to receive treatment for AD. All were receiving standard AD treatments; in addition, four were taking dupilumab, two were receiving ultraviolet light treatment, and one was taking oral cyclosporine. The mean pretest blood test results were as follows: WBC, 6578/μL; Eo, 4.4%; Eo, 275/μL; TARC, 1990 pg/mL; and IgE, 8767 IU/mL.

### 3.2 | Outcomes

The outcome measures are presented in Tables 3 and 4, and in Figure 3. In both winter and summer, the average EASI scores after 4 weeks of wearing the Comfiknit Atopic Eczema® T-shirts were lower than those at Week 0 (baseline). In particular, patients with EASI scores >21 at Week 0, and classified as having severe AD, tended to have lower scores after 4 weeks of wearing this T-shirt in both winter and summer (Table 3, Figure 3A). To compare the EASI scores of areas covered and not covered by the T-shirts, the EASI scores of the trunk and upper extremities and the head, neck, and lower extremities were determined. The EASI scores did not increase after the intervention in either area in summer or winter (Figure S1). The average POEM score after 4 weeks of wearing the T-shirt was also lower than that at Week 0 (in both winter and summer). Regarding case-specific characteristics, patients with higher POEM scores at Week 0 had lower scores at Week 4, although patient A in winter, and patients G and H in summer, had higher POEM scores at Week 4 (Table 3, Figure 3B). The mean VAS score after wearing the T-shirts for 4 weeks was lower than that at Week 0 (for both winter and summer). However, changes in the itch VAS scores varied among individuals. There was no association between itchiness and AD severity (Table 3, Figure 3C). For most patients, skin pH remained slightly acidic throughout summer and winter. In winter, patient E recorded a skin pH of 10.73 at Week 0; this was likely an outlier or measurement error (Table 3, Figure 3D). For most patients, SCWC at Week 0 was lower in winter and higher in summer. In winter and summer, the average SCWC after 4 weeks of wearing the T-shirt was higher than at Week 0, but individual scores for about half of the patients were lower after 4 weeks (Table 3, Figure 3E). The mean TSQM-9 scores were as follows: winter, 63.0 for effectiveness; 72.2 for convenience; and 62.7 for global satisfaction; summer, 73.5 for effectiveness; 87.0 for convenience; and 69.8 for global satisfaction (Table 3, Figure 3F). There was no apparent impact on bacterial cultures taken at weeks 0 and 4 in summer or winter (Table 4).

## 4 | DISCUSSION

In this study, the intervention effect of the Comfiknit Atopic Eczema® T-shirts was examined during summer and winter. These T-shirts are designed to absorb excess perspiration from the surface

**TABLE 2** Clinical characteristics of study subjects at baseline.

| | Age | Gender | WBC (/μL) | Eo (%) | Eo (/μL) | TARC (pg/mL) | IgE (IU/mL) | Treatment |
|---|---|---|---|---|---|---|---|---|
| A | 21 | M | 6100 | 2 | 122 | 811 | 10,700 | Topical treatments: moisturizer/tacrolimus[a]/corticosteroids/JAK inhibitors, oral treatments: antihistamine |
| B | 42 | F | 2700 | 8 | 216 | 332 | 1460 | Topical treatments: moisturizer/JAK inhibitors[b], other treatments: dupilumab |
| C | 49 | M | 6300 | 4 | 252 | 3944 | 19,400 | Topical treatments: moisturizer/tacrolimus[b]/corticosteroids/JAK inhibitors[a], systemic treatments: antihistamine[a]/jumihaidokuto[a], other treatments: PUVA-bath |
| D | 23 | M | 13,100 | 4 | 524 | 5863 | >40,000 | Topical treatments: moisturizer/corticosteroids/JAK inhibitors, systemic treatments: antihistamine/cyclosporin[a], other treatments: PUVA-bath[b] |
| E | 59 | M | 8600 | 5 | 430 | 3987 | 17,200 | Topical treatments: corticosteroids/glyteer, oral treatments: antihistamine |
| F | 30 | M | 4800 | 1 | 48 | 705 | 205 | Topical treatments: moisturizer/corticosteroids/JAK inhibitors[b], systemic treatments: antihistamine, other treatments: dupilumab |
| G | 51 | F | 5700 | 9 | 513 | 193 | 1020 | Internal medicine: antihistamine, other treatments: dupilumab |
| H | 38 | F | 5000 | 6 | 300 | 1014 | 7250 | Topical treatments: moisturizer/corticosteroids/JAK inhibitors, other treatments: antihistamine |
| I | 41 | M | 6900 | 1 | 69 | 1064 | 12,900 | Topical treatments: moisturizer/corticosteroids/JAK inhibitors[b], systemic treatments: antihistamine, other treatments: dupilumab[a] |

Abbreviations: Eo, eosinophilic cells; IgE, immunoglobulin E; PUVA, psoralen ultraviolet A; TARC, thymus and activation regulated chemokine; WBC, white blood cells.

[a]Only in summer.

[b]Only in winter.

of the skin and then retain it within the garment. The hypothesis was that the moisture absorption and quick-drying properties of these T-shirts would prevent disease exacerbation.

To compare the EASI scores of areas covered and not covered by the T-shirts, the EASI scores of the trunk and upper extremities and the head, neck, and lower extremities were determined. The EASI scores did not increase after the intervention in either area in summer or winter. It is possible that the T-shirt prevented exacerbating factors such as sweating and dryness, which may have improved general symptoms, or there may have been a placebo effect due to participation in the study. Although we did not perform statistical analysis, the mean SCWC after 4 weeks of the intervention was higher for both summer and winter, indicating that the shirts prevented skin dryness.

The skin pH remained slightly acidic during the tests (Table 3, Figure 3E). In addition, there was no apparent impact on the skin bacterial culture results (Table 4). The pH of normal skin is 4.5–6.0.[15,16] This mildly acidic pH protects the skin by providing a favorable environment for normal microbiota[15,17] and maintains the stratum corneum barrier structure.[18] Exacerbations of AD are associated with growth of *S. aureus*, which is optimal at neutral skin pH.[19,20] Therefore, skin pH and bacterial culture results suggest that the T-shirts prevent AD exacerbation.

Although the TSQM-9 is not validated for assessment of T-shirts or clothing, the TSQM-9 scores suggest that patients were happy with the shirts in both the winter and summer. Furthermore, although we did not perform statistical analysis, the mean TSQM-9 score was higher for all items in the summer than in the winter. A functional T-shirt can be worn in place of regular undergarments, which is convenient and has the potential to increase adherence. The Comfiknit Atopic Eczema® T-shirts are designed in Hong Kong, and their characteristics are in keeping with Hong Kong's lifestyle. Therefore, lifestyle differences between Hong Kong and Japan may have affected the study outcomes. For example, Hong Kong's climate is subtropical, with average July and January temperatures of 29°C and 16°C, respectively, and relative humidity levels of 84% and 75%, respectively.[6] The Hong Kong government recommends indoor temperature settings of 25.5°C in summer, and it is common to turn off the heating system during winter in Hong Kong.[21] A study found that the average room temperature and relative humidity of the living room of 12 houses in Hong Kong were 29.2°C/69.2%, respectively, in summer and 20.1°C/53.8%, respectively, in winter.[22]

**TABLE 3** Results for EASI, POEM, itch VAS, pH, SCWC, and TSQM-9.

| | EASI | | | | POEM | | | | Itch VAS | | | | pH (chest) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Winter | | Summer | | Winter | | Summer | | Winter | | Summer | | Winter | | Summer | |
| | Before | After | Before | After | Before | After | Before | After | Before | After | Before | After | Before | After | Before | After |
| A | 21.4 | 10.2 | 37.2 | 17.0 | 3.0 | 6.0 | 20.0 | 12.0 | 1.5 | 2.5 | 3.0 | 1.0 | 3.3 | 5.1 | 5.1 | 4.9 |
| B | 5.8 | 5.5 | 7.8 | 6.0 | 5.0 | 4.0 | 2.0 | 2.0 | 1.5 | 1.0 | 2.5 | 2.0 | 5.0 | 4.3 | 5.1 | 4.9 |
| C | 8.0 | 8.0 | 35.4 | 14.7 | 21.0 | 9.0 | 27.0 | 11.0 | 5.0 | 2.5 | 8.5 | 5.5 | 5.1 | 5.2 | 5.1 | 4.9 |
| D | 48.6 | 24.9 | 34.3 | 12.6 | 21.0 | 10.0 | 12.0 | 6.0 | 3.5 | 3.5 | 5.0 | 4.5 | 5.1 | 4.9 | 4.9 | 4.5 |
| E | 12.4 | 5.5 | 11.4 | 7.4 | 21.0 | 12.0 | 20.0 | 8.0 | 4.5 | 6.0 | 4.0 | 2.0 | 10.7 | 4.9 | 4.8 | 6.4 |
| F | 10.0 | 6.3 | 7.2 | 6.3 | 5.0 | 5.0 | 4.0 | 3.0 | 5.0 | 4.0 | 3.0 | 5.0 | 4.4 | 4.9 | 4.6 | 4.7 |
| G | 0.6 | 0.6 | 3.8 | 0.6 | 6.0 | 6.0 | 2.0 | 4.0 | 2.0 | 1.5 | 1.5 | 1.0 | 5.6 | 6.2 | 4.8 | 4.6 |
| H | 10.8 | 7.2 | 6.3 | 6.8 | 5.0 | 5.0 | 5.0 | 9.0 | 1.5 | 1.5 | 0.0 | 1.5 | 4.9 | 4.0 | 5.5 | 5.1 |
| I | 4.2 | 2.2 | 9.0 | 3.7 | 12.0 | 13.0 | 6.0 | 6.0 | 7.0 | 5.0 | 4.0 | 3.0 | 4.7 | 4.7 | 5.0 | 5.0 |

| | SCWC (chest) (μS) | | | | TSQM-9 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Winter | | Summer | | Winter | | | Summer | | |
| | Before | After | Before | After | Effectiveness | Convenience | Global satisfaction | Effectiveness | Convenience | Global satisfaction |
| A | 34.0 | 27.0 | 89.0 | 549.0 | 33.3 | 27.8 | 28.6 | 66.7 | 88.9 | 57.1 |
| B | 279.0 | 524.0 | 259.0 | 970.0 | 50.0 | 83.3 | 57.1 | 44.4 | 100.0 | 50.0 |
| C | 65.0 | 96.0 | 370.0 | 4720.0 | 66.7 | 100.0 | 85.7 | 100.0 | 100.0 | 100.0 |
| D | 123.0 | 51.0 | 524.0 | 373.0 | 72.2 | 72.2 | 57.1 | 88.9 | 100.0 | 78.6 |
| E | 46.0 | 135.0 | 74.0 | 146.0 | 50.0 | 83.3 | 57.1 | 66.7 | 83.3 | 50.0 |
| F | 422.0 | 283.0 | 955.0 | 2489.0 | 83.3 | 72.2 | 78.6 | 66.7 | 72.2 | 57.1 |
| G | 206.0 | 343.0 | 935.0 | 370.0 | 77.8 | 66.7 | 71.4 | 66.7 | 55.6 | 64.3 |
| H | 126.0 | 163.0 | 257.0 | 81.0 | 83.3 | 77.8 | 78.6 | 83.3 | 100.0 | 85.7 |
| I | 210.0 | 86.0 | 149.0 | 681.0 | 50.0 | 66.7 | 50.0 | 77.8 | 83.3 | 85.7 |

Abbreviations: EASI, Eczema Area and Severity Index; POEM, Patient-Oriented Eczema Measure; SCWC, stratum corneum water content; TSQM-9, Treatment Satisfaction Questionnaire for Medication 9; VAS, Visual Analog Scale.

TABLE 4 Results of bacterial culture.

| | Winter | | Summer | |
|---|---|---|---|---|
| Name | Before | After | Before | After |
| A | CNS(1+) | CNS(1+) | SA(1+) | SA(1+) |
| B | ND | ND | CNS(1+) | ND |
| C | SA(1+) | CNS(1+) | SA(1+) | SA(1+), GGS(1+) |
| D | SA(1+) | SA(3+) | SA(1+) | SA(1+) |
| E | ND | SA(1+) | SA(1+) | SA(1+) |
| F | CNS(1+) | ND | CNS(1+) | CNS(1+) |
| G | ND | ND | CNS(1+) | ND |
| H | SA(1+) | ND | SA(1+) | CNS(1+), SA(1+) |
| I | CNS(1+) | CNS(1+) | ND | ND |

Abbreviations: GGS, group G *Streptococcus*; CNS, coagulase negative staphylococci; SA, *Staphylococcus aureus*.

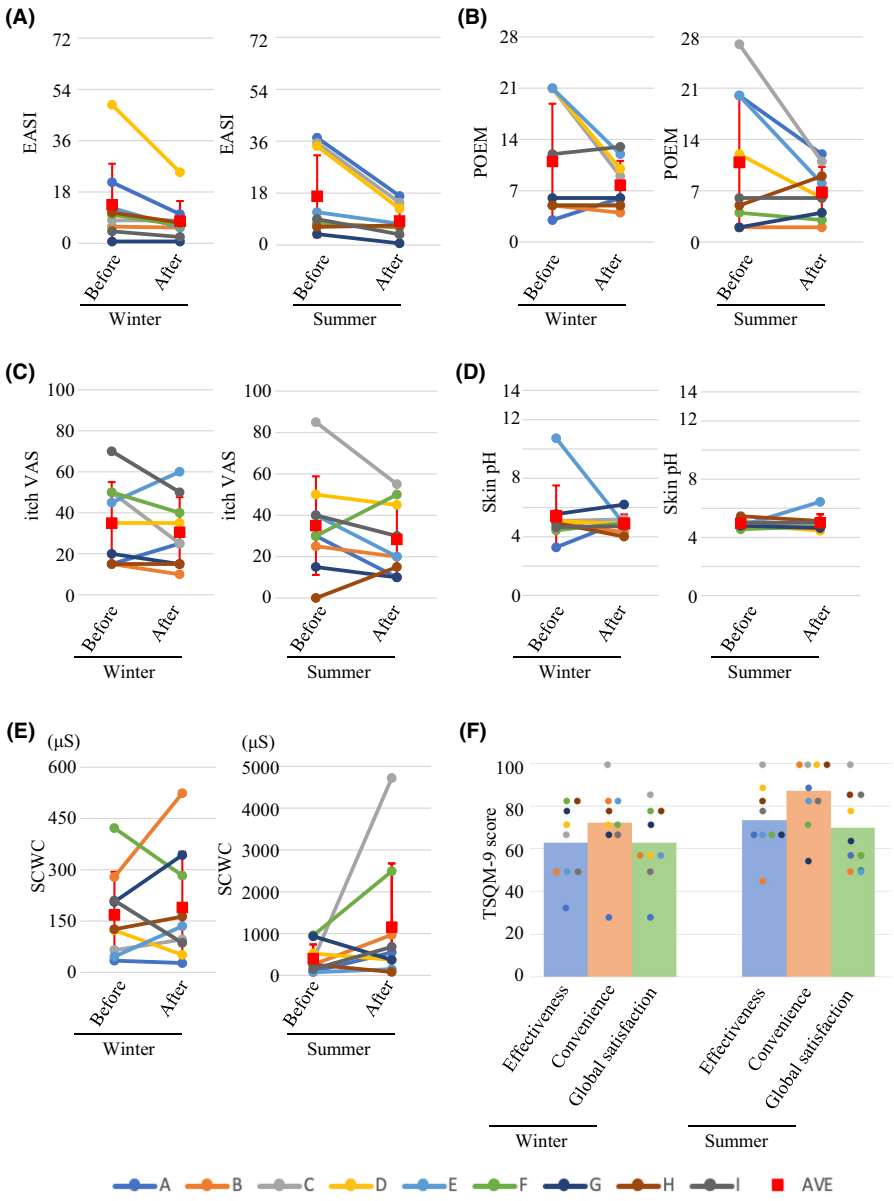



FIGURE 3 Study results. (A) EASI score, (B) POEM score, (C) itch VAS score, (D) skin pH, and (E) SCWC results before and after wearing Comfiknit Atopic Eczema® T-shirts for 4 weeks during the winter and summer. (F) TSQM-9 after wearing Comfiknit Atopic Eczema® T-shirts for 4 weeks. EASI, Eczema Area and Severity Index; POEM, Patient-Oriented Eczema Measure; SCWC, stratum corneum water content; TSQM-9, Treatment Satisfaction Questionnaire for Medication 9; VAS, Visual Analogue Scale.

Therefore, the T-shirts have different blends for the summer and the winter seasons, and the winter T-shirts are thicker. In general, Japan's climate is temperate. All houses in Japan have a heating system.[23] The average July and January temperatures in Tokyo are 25.8°C and 6.1°C, respectively, and the average relative humidity is 73% and 49%, respectively.[6] In Japan, it is customary to turn on the air-conditioner during summer and the heating system during winter. The Ministry of the environment recommends indoor temperatures of 28°C and 20°C for summer and winter, respectively. The average room temperature and relative humidity in the living room of 12 houses in the Kanto region were 27.3°C/67.0%, respectively, in summer and 17.6°C/48.1%, respectively, in winter.[24] Therefore, the climates of Hong Kong and Japan are quite different. However, the room temperature and relative humidity inside houses are similar. In modern life, we spend 87% of our time indoors.[25] Although more research is needed to tailor functional T-shirts for AD patients in different countries (each with different customs, climates, and races), our data suggest that these functional T-shirts are suited to the Japanese lifestyle. The mean TSQM-9 scores for effectiveness, convenience, and global satisfaction were 10.5, 14.8, and 7.1 points higher in summer than in winter, respectively. These results indicate that the T-shirts are likely suitable for the Japanese climate, especially in summer.

The study has several limitations, including the small number of subjects, the lack of a control group, the fact that it was open-label, and the lack of statistical analysis. Patients and physicians may also be influenced by the placebo effect. In this study, patients were allowed to continue using their medical treatments for AD; therefore, it is possible that it was the treatment that improved their symptoms. However, the side effects of the T-shirts were minimal, and the patients continued to wear the T-shirts without difficulty.

In conclusion, wearing Comfiknit Atopic Eczema® T-shirts helped to prevent exacerbation of AD in a Japanese cohort. This study did not compare T-shirt-covered and exposed skin conditions, which is a major limitation. However, the results presented herein, along with those from other similar studies, suggest that wearing functional T-shirts might help to maintain skin homeostasis and can be adjusted to any season by changing the blend ratio or thickness.

## AUTHOR CONTRIBUTIONS

H.M. conceptualized and planned the research; N.H. performed analyses.

## ACKNOWLEDGMENTS

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## CONFLICT OF INTEREST STATEMENT

N. Hattori, H. Morisaki, M. Matsumoto, M. Takenaka, and H. Murota receive research funding from Wealthy Step International Ltd. K. Lau and Y. Oniwa are involved in the manufacture and sale of Comfiknit Atopic Eczema® T-shirts.

## DATA AVAILABILITY STATEMENT

The data for this study are available from the corresponding author upon reasonable request.

## ETHICS STATEMENT

Approval of the research protocol: This study was approved by the ethics committee of the Clinical Research Review Board of Nagasaki University (Reference number: 20101902).

Informed Consent: All patients provided informed consent to participate.

Registry and the Registration No.: UMIN000042252.

Animal Studies: N/A.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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