Introduction

In South Korea, the frequency of heavy rains and typhoons caused by global warming is increasing. Climate change now affects many people, some of whom suffer health problems due to a harsh life environment that features high humidity. Humidity and human health have a close relationship. The temperature may be comfortable, but various adverse effects and diseases can result from excessive humidity. This study explores the importance of localization in product design. My current work examines characteristics unique to the Korean living environment. In addition, we seek to clarify the role of individual characteristics and identify problems that occur when people use a dehumidifier.

2. Korean dehumidifier market research

2.1 Trends in dehumidifier demand

In the Republic of South Korea (below, "Korea"), the increased importance of humidity control has spurred a rapid increase in the demand for dehumidifiers. It's expected new user needs will be generated as a result of this increased demand. Surveys of marketed products have shown that units in the 6 liter (L) to 20L-size price range have the highest sales numbers for the home-use market. Especially widely distributed are products priced from \10,000 to \20,000. Most products with an 11L to 18L capacity cost between \30,000 and \50,000. Dehumidifiers focused on basic dehumidifying functions are generally low cost, while those with added functions such as mold-block, humidification, air cleaner, etc., functions have high prices. A majority of compact products of 6L or less have the water tank at the backside of the main unit. Most of these units are also simplified models, with no handle or lid. Units of capacities of 10L or more have the water tank at the bottom portion of the front panel, and most have handles and lids. These aspects are thought to increase the ease-of-use of such dehumidifiers.

2.2. Questionnaire survey on usage status

Questionnaire-survey subjects were divided into two groups: consumers (total 24 persons) with experience of using dehumidifiers, and potential customers (total 128 persons) who want to purchase a dehumidifier in the future.

2.2.1 Questionnaire survey of users with dehumidifier usage experience

Fig 1. Questionnaire survey
We surveyed persons who had used dehumidifiers in the past, or who were currently using a dehumidifier. Subjects were 6 males and 18 females, of whom 12 were housewives, 12 were workers at companies, and 2 were "Others." As for type-of-residence of the total 24 persons, 12 persons lived in apartments, 8 persons in private houses, and 4 persons were "Others." While demand for dehumidifiers is expected to increase in Korea, the tendency seen in this survey was to have more subject persons who had no experience using a unit than those who had experience using a dehumidifier.

2.2.2 Questionnaire survey results

Subjects were asked under what conditions they used (or had used) a dehumidifier. Dehumidifiers are equipped with a variety of functions besides the basic "dehumidifying function," including "mold-block," "air cleaning," "clothing drying," "cooled air," "disinfecting," etc. Among these, the function is most widely used is "humidity reduction." The next is clothing drying. We found that functions other than the basic dehumidifier function of "dehumidifying" are not used often. We consider these results to show that the development of humidifiers with reinforced basic "dehumidifying" functions is needed. Next was the item regarding placement sites of dehumidifiers when in use. Of the total 24 persons, 10 persons replied "the living room." It is thought that in this space shared by the whole family where the longest amount of time is spent, the control of humidity in the living room is desired for a comfortable daily life. "Dress room" was answered at an unexpectedly high rate. In Korea, a small room is set aside for use as a "dress room." Humidifier use in this space is thought to be less for humidity control, and mostly for quick and effective laundry drying in this narrow space. We believe that these results show a need to consider portability (ease-of-movement) for a dehumidifier, from the living room to this dress room, for example.

3. Persona Analysis for the dehumidifier usage process over time

3.1 Analysis method

Analysis performed from October 21 though October 25, 2013. Observed subjects totaled 8 persons, divided largely by 5 criteria: whether or not said subjects had experience using a dehumidifier, age, family composition, sex, and job type.

Observations were made with division of dehumidifier usage-process "touch points" into five stages: "movement," "placement," "operating-portion control," "unit operation," "water-tank removal." Researchers stayed closely with users to directly observe actual dehumidifier usage practices, and, after interviews, performed analyses based on the acquired data. "Movement" means the movement of the dehumidifier to a usage site. "Placement" means all actions from plugging the unit into a socket to determining the best site and direction for the dehumidifier, until the unit is securely set. The "operating-portion control" stage comprises the actions of turning on the unit power source, controlling air-output direction and strength, pressing buttons for usage-time control, desired humidification settings, and/or time-reservations. The "unit operation" stage is when the dehumidifying function of the unit is operating, and also includes water-tank checks. "Water-tank removal" means the stage involving physical removal of the water tank from the main unit, carrying the tank to the water-disposal site, pouring out the water, returning to the unit, and reattaching the water tank to the main unit.

The products used in this research were "d'ete" dehumidifiers (DK Industrial Co., Ltd.), models DDH-060 and DDH-120.

3.2 Analysis results

Satisfaction levels for usability were expressed as graphs for each stage of progress in the five touchpoint stages. Here, data for 5 persons (among the 8 subject persons) showing clearly distinct characteristics are introduced. First we will explain the analysis results for a female [university] student in her 20s; this woman had experience using a dehumidifier. In the first stage, "Movement," she notes that she felt inconvenienced—she felt the dehumidifier main unit was too heavy, and she had to bend at her waist when moving the dehumidifier, all of which actions she found troublesome. She also felt inconvenienced when disposing the water that had collected in the water tank. Her opinion was that it was hard to carry the tank to the toilet while holding the tank with her right hand and supporting it with her left hand.

Fig 3. Graphs of satisfaction levels regarding dehumidifier usability (1)

Next are results for a housewife in her 30s who had no experience using a dehumidifier. One can observe that...
her graph patterns are similar to those for the female student in her 20s described above. She felt moving the dehumidifier in the same manner as described above involved a load on her lower back. She also felt inconvenienced by the act of bending her knees when removing the water tank from the main unit. The reason therefore—which holds true for most dehumidifiers—was the fact that the water unit was situated at the bottom portion of the main unit. It is also thought that the weight of the water is burdensome for an "ordinary" female.

Next we introduce the results of a Persona Analysis for persons with no experience using a dehumidifier. First are the results for a subject housewife in her 40s, analyzed in her residence. This woman felt inconvenienced in the stages of "movement," "placement," and "water-tank removal." Comments that this subject made expressing her opinions included: "When I was pulling the unit with the handle located in the upper portion, the casters got caught on the door": "I heard a strange noise when I was removing the water tank, and it surprised me."

Next are the results for a businessperson in her 20s, who was analyzed at her company. She felt unpleasantness in the stages "operating-portion control" and "water tank removal" stages. She said that when touching the operating panel, hot air and heat from the winged portion (air-outlet portion) went directly into her face. She also stated that she had to bend at the waist when checking the accumulated-water level through the window at the bottom portion of the main unit.

3.3 Considerations

Our survey results show that when using a dehumidifier, users experience a variety of dissatisfactions. Common opinions among the 8 persons serving as subjects for our Persona Analyses were especially the inconveniences felt in performing the actions for "movement," "operation controls," and "water tank." Representative opinions regarding "inconveniences" expressed by subjects in the Personal Analyses were "heavy and hard to move," "direct contact to the body by blowing dry air and heat," and "difficulty in removing the water tank." Thus we consider as user needs the ability to move the dehumidifier smoothly and without trouble, and the ease-of-use of the control panels for operations. Another point is arranging so that the water tank can be easily opened and closed.

Conclusion

This study entailed research centering on a questionnaire-based survey, on design processes to be proposed for dehumidifiers that take into account factors in the Korean environment. Specifically, we
made survey of the user environment in Korea, and learned that in recent years, climate changes have increased interest in humidity control among Koreans. This has led to a rapid increase in the sale of dehumidifiers, with a corresponding rise in consumer needs regarding dehumidifiers. We especially thought from our survey results that, inasmuch as there are more women than men who are dehumidifier users, designs targeting women are needed, and we analyzed market surveys and characteristics regarding the use of dehumidifiers. Our results showed that there is a large need for smaller-sized models with reinforced dehumidifying functions. Characteristic of the opinions expressed by persons with no experience using dehumidifiers was that their most important priority when purchasing a dehumidifier is its interior-design characteristics, such that the unit should harmonize with the other furniture, etc., in their place of residence. We also surveyed change trends for air conditioners in light of the design trend for curved forms in Korean electronic products, and attempted the application of such in exterior designs for dehumidifiers. In our proposals for improvements of water-tank removal methods and of air-output wing directions, we have considered the Korean environment, enabling us to propose dehumidifiers that match user needs. Our aim is to foster an environment suited for more pleasant and convenient humidity control, by reducing, if only somewhat, the dissatisfactions and inconveniences of users.

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