The Effect of Environment Protection Intervention on Promoting Stair Use

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Abstract: People use stairs for vertical movement. Stair use is a convenient way to exercise and has a special meaning for energy conservation. Much research has been done on how to encourage the public to use stairs more through health educational messages. Most of those studies focus on the numbers of using stairs changes after the promotion but not describe whether the behavior changed resulted from the promotion. In this study, we investigated 55 respondents’ daily stair use and elevator use for four weeks and focused our interest on the effects of stair use by the environmental protection interventions. The study results showed that the respondents increased their stair use after receiving e-mail messages about environmental protection. The study also found out that environmental protection promotion had longer lasting effects on respondents who counted their daily carbon reduction from decreasing elevator use every day than those who did not.

Key Words: environmental protection intervention, stair-use, ratio of stair use.

1. INTRODUCTION

According to the study results of Department of Health (Executive Yuan, Taiwan, 2007), more than 40% of the adults aged over 18 years in Taiwan were overweight and lack of exercise. Stair use is an easy way to exercise and can be applied to reduce energy consumption. Therefore, the Department of Health has started to encourage people to use stairs instead of elevator. To make the public exercise more and be healthier, the department has started to encourage the public to use stairs because stair use is a convenient method to exercise and make the busy people healthier in the modern life. Stair use can make people athletic and decrease the energy consumption if people use stairs instead of elevators. Energy consumption is an important environment issue in the world. So, many countries develop their policy for it. Decreasing the elevators using can reduce energy consumption and carbon emission. Therefore, it’s helpful to environmental protection and slow down the global warming effects.

Many studies have been conducted to explore the effect of promoting strategies on stair use.
Eves et al. (2006) found that sending specific messages concerning stair use is more effective than general slogan. Ross et al. (2007) found that the effect of promotion on stair use would be determined by whether the messages contain the evidence. Kerr et. al. (2001) found that flags are more effective than posters on stair use promotion. Posters were commonly used on stair use promotion and whether the posters contain health education messages would affect people’s choices between stairs and elevators. Brownell et al. (1980) observed more than 20,000 stair users in a shopping mall, a railway station, and a bus transfer station and found that the number of stair users increased 8% after pasting the posters, however, the number of stair users returned to the same level of no posters before after RSUE. Brownell et al. (1980) repeated Brownell’s experiment in Glasgow subway station in British and found that the effects of posters exist after RSUE. Brownell et al. (1980) repeated Brownell’s experiment in the shopping mall in United States and found that posters containing messages with health and fitness could increase 8% stair users in their study of 17,000 observations. Kerr et al. (2001a) tested the effect of health educational posters to two accounting companies and found that the numbers of employees down the stairs increase but those of up-stairs are the same in the two companies. Titze et al. (2001) sent the messages containing health educational messages to all employees in a company and found the amount of stair use increase 5.3% significantly after four month. To sum up, the past studies usually used healthy messages to promote stair use and compared which way is more effective. They wanted to find the best way to increase the amount of stair use. However, to confirm the promotion effects should be through finding the reasons for using stairs but not only observing the stair use numbers. Because the stair-use people in the observed place each day may be different, we might not know whether the people changed their behaviors or not. We have to consider how the stair use reasons of the public changed and check the promotion change the participants’ reasons actually.

People use stairs and elevators for vertical movements and choose one of the tools they want to use for different consideration. The most reasons people use elevators are as follows: (1) the moving speed of elevators is faster than that of stairs. (2) people may feel tired after using stairs to move. In contrast, the reasons people use elevators are: (1) people think that using stairs could be exercise. (2) using stairs consume less energy than using elevators. (3) using stairs make less emission than using elevators. (4) when the elevator is full, people would think that using stairs could attend the destination more quickly. In conclusion, we could summarize three reasons for using stairs or elevators: the first reason is “environmental protection”, the second is “health”, and the other is “efficiency.” To confirm the promotion effects, we should know that whether the people changed their behaviors because of the promotion. We think that the environmental protection promotion should only increase the environmental protection consideration of stair-use reasons but not change the health consideration. The efficiency reason of stair use is related with elevators and should decrease after environmental protection promotion. Environmental protection conception would make people think of using stairs is better to environment first but not to consider using elevators before vertical movements. Thus, we postulate the following hypotheses.

Hypothesis 1: People use more stairs after environmental protection promotion.
Hypothesis 2: People use stairs for environmental protection consideration raises after environmental protection promotion.
Hypothesis 3: People use stairs for health consideration is constant after environmental protection promotion.
Hypothesis 4: People use stairs for efficient consideration decreases after environmental protection promotion.
The purposes of this study are as follows: first, we make sure that sending environmental protection messages could be an effective promotion way to make the public use stairs more. Second, we confirm that electronic mail (e-mail) is an effective promotion method because e-mail could save more cost than before in the future research. Finally, we tested whether the respondents counted daily carbon reduction would affect their stair use or not. The findings of this study will provide valuable information to make people do more environmental protection activities.

2. METHODS

2.1 Participants
We used observational approach to evaluate the promotion effect of environmental protection intervention on stair use. Participants in this study were college students recruited from one university in Hsinchu City, Taiwan. The 55 participant college students were then divided into two groups randomly. The Group A, including 12 female students (44.4%) and 15 male students (55.6%), were asked to record the required information about their daily stair and elevator trips during the period of experiment. The Group B had 12 female students (42.9%) and 16 male students (57.1%), who were asked to record the same information as Group A and got their daily carbon reduction information due to stair use after finishing their reporting. The experiment period was undertaken for four weeks.

2.2 Procedure of experiment
The experiment was conducted for four weeks following the 6 steps in Figure 1. These six steps are introduced as follows:

Step 1: In week1, all the participants were asked to return their daily stair and elevator use through e-mail at the end of each day during experiment period.

Step 2: On the last day of week1, all the participants received the e-mail messages concerning environmental protection and were asked to reply for ensuring their receiving and reading.

Step 3: In week2, the participants in Group A continued to record their stair and elevator use as week1. The participants in Group B also recorded their stair and elevator use, but they would additionally receive the information about the amount of their daily carbon reduction due to stair use other than elevator use whenever they finishing their reporting.

Step 4: At the night before week3, we pasted the posters containing environmental protection messages next to the elevators in all the buildings in which all the participants might appear. The participants were required to report the same information as they did in week2.

Step 5: The participants of Group A and B stopped their daily reports and the posters in all buildings were taken away since week4.

Step 6: Two months after week3, we asked all the participants to report their daily stair and elevator use again. All the participants did not receive any promotion intervention, and no carbon deduction information was returned any more.
2.3 Data collection
During the experiment, the participants were asked to record all the trips taken by stair use and elevator and their corresponding information. The characteristics of those up-stair and down-stair trips are:
(1) Trip destination: the places or rooms to be visit.
(2) Trip purpose: the activity and its purpose for each recorded trip.
(3) The floors of origin and destination: it helps us to identify the number of floors to be traveled up or down.
(4) Stair or elevator use: to identify that each vertical movement trip was traveled by foot or by elevator.
(5) Reasons for using stairs: four types of reasons for using stairs were provided, including (1) environmental protection consideration; (2) health consideration; (3) efficiency consideration; and (4) the others. The participants were required to select at least one reason for each stair-use trip.

2.4 Intervention to the experiment
Two kinds of intervention were used in this study to arouse the participants to care environment protection. The first intervention is to deliver the messages concerning environmental pollution and energy exhaustion issues to the participants. Some reports related to fuel consumption and air pollution as well as posters containing elevators’ power consumption and carbon emission were used as the first type of intervention in this experiment. It is believed that providing environmental protection messages will enforce participants’ belief and responsibilities to take actions for environment protection.

The second intervention used in this experiment was to calculate the amount of daily carbon reduction due to daily stair-use trips for participants. It provided the solid information about the carbon reduction contributed by each individual participant’s stair use.

The promotion message of the first poster are “to use more stairs and decreasing daily carbon footprint.” The other one is “the carbon emissions of using elevators to move one floor are equal to driving for 1 kilometer”. In this study, we used the information about the carbon emission from using elevators and driving. Moving an elevator up or down one floor would
make 0.218 kilogram Carbon dioxide emissions. Driving for 1 kilometer would make 0.22 kilogram Carbon dioxide emissions. (Environmental Protection Administration Executive Yuan, R.O.C (Taiwan)). These two posters are sent through e-mails to the participants in week2 and pasted next to the elevators in the academic building in week3.

We asked part of participants to record their carbon emissions from their daily activities. The participants might review how much the environment impacts they made in one day and changed their life style. Besides, they calculated and reported the carbon deductions resulted from their used stairs substituting for elevators. We tested whether the carbon deduction calculations could increase the environment promotion effects or not.

2.5 Measuring the ratio of stair-use trips and reasons for stair use

The frequencies of stair-use trips in one week are determined by the frequencies of activities in each week. It is reasonable to present participants’ tendency for stair-use by the ratio of stair-use trips to total trips. Thus, we created “the ratio of stair-use trips (RSUT) to all trips in a week” as an index to reflect participants’ proneness of stair-use.

\[
RSUT = \frac{\text{stair - use trips in a week}}{\text{stair - use trips in a week} + \text{elevator - use trips in a week}}
\]  

Participants are likely to use elevators when taking a vertical movement with a higher number of stories. Though all the buildings in this study university have less than eleven stories, stair-use is seldom chosen by the participants for vertical movement with more than six stories. Therefore, the trips moving more than six stories vertically are not counted in this study. Besides, the trips taken to undertake some activities which could only be achieved by elevators are also excluded in this study.

We also calculated the ratio of a specific reason for participants’ stair-use trips. That is, we calculated the ratio of stair-use for environmental protection (RSUEP) consideration, the ratio of stair-use for health (RSUH) consideration, the ratio of stair-use for efficiency consideration (RSUE). These indexes are calculated as follows:

\[
\text{RSUEP} = \frac{\text{stair - use trips by environmental protection consideration}}{\text{total stair - use trips}}
\]

\[
\text{RSUH} = \frac{\text{stair - use trips by health consideration}}{\text{total stair - use trips}}
\]

\[
\text{RSUE} = \frac{\text{stair - use trips by efficient consideration}}{\text{total stair - use trips}}
\]

These indexes could help us observe how the participants’ thinking changed. The participants’ ratio in the two groups might be different in week1 because of sampling error. However, whether the participants change their mind to use stairs after intervention is the most important issue in this study. We focus on the ratio change in the same group but not to compare the two groups.

3. STUDY RESULTS
After the experiment, we got the participants’ elevator-use and stair-use trips data. The participants’ record data in the four weeks was listed in Table 1 and Table 2. We also described the mean and standard deviation about the trips from the two groups. Data about group A is in Table 1 and group B is in Table 2.

<p>| Table 1 Elevator-use and stair-use trips from group A in the experiment period |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>310</td>
<td>452</td>
<td>291</td>
<td>509</td>
<td>267</td>
<td>486</td>
<td>251</td>
<td>351</td>
</tr>
<tr>
<td>Mean</td>
<td>11.48</td>
<td>16.74</td>
<td>10.78</td>
<td>18.85</td>
<td>9.89</td>
<td>18.00</td>
<td>9.30</td>
<td>13.00</td>
</tr>
<tr>
<td>S.D.</td>
<td>10.05</td>
<td>11.67</td>
<td>10.82</td>
<td>13.58</td>
<td>12.10</td>
<td>12.66</td>
<td>11.45</td>
<td>9.57</td>
</tr>
</tbody>
</table>

<p>| Table 2 Elevator-use and stair-use trips from group B in the experiment period |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
<th>Elevator (Total)</th>
<th>Stair (Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>330</td>
<td>409</td>
<td>274</td>
<td>502</td>
<td>307</td>
<td>521</td>
<td>291</td>
<td>577</td>
</tr>
<tr>
<td>Mean</td>
<td>12.07</td>
<td>15.04</td>
<td>9.96</td>
<td>18.22</td>
<td>11.30</td>
<td>19.00</td>
<td>10.30</td>
<td>20.89</td>
</tr>
</tbody>
</table>

### 3.1 Participants’ stair uses and their reasons for stair-use

The ratio of stair-use trips (RSUT), ratio of stair-use by environmental protection consideration (RSUEP), ratio of stair-use by health consideration (RSUH), and ratio of stair-use by efficiency consideration (RSUE) for both Group A and Group B are shown in Table 3. For the participants in Group A, 59.3% of all their vertical movement trips were accomplished by stair-use in week1. Among these stair-use trips in week1, 15% were considered by environmental protection, 34.7% by health consideration, and 89.8% by efficiency consideration. After sending the promotion messages through e-mails to all the participants, we found that 63.6% of Group A's vertical movement trips were accomplished by stair-use in week2 of experiment; and among these stair-use trips, 22.4% were considered by environmental protection, 37.5% by health consideration, and 83.5% by efficiency consideration. After pasting the posters in week3, we observed that 64.5% of Group A’s vertical movement trips were undertaken by stair-use; and among these stair-use trips, 25.5% were considered by environmental protection, 38.5% by health consideration, and 82.9% by efficiency consideration. Finally, two months later, it indicated that 58.3% of Group A’s vertical movement trips were taken by stair-use; and among these stair-use trips, 13.7% were considered by environmental protection, 29.3% by health consideration, and 86.0% by efficiency consideration.

The ratios of stair-use and the reasons of stair-use for Group A during the experiment periods are summarized in Figure 2. We can find that the ratios of stair use for Group A rose up in the second and third weeks but went down in the fourth experiment week. The ratios for the reasons of stair use for Group A also have the similar trends over the experiment periods.

For the participants in Group B, 55.3% of all their vertical movement trips were accomplished by stair-use in week1. Among these stair-use trips in week1, 9.0% were considered by environmental protection, 22.0% by health consideration, and 94.1% by efficiency
consideration. After sending the promotion messages and carbon reduction through e-mails to all the participants, we found that 64.7% of Group B’s vertical movement trips were accomplished by stair-use in week2 of experiment; and among these stair-use trips, 14.7% were considered by environmental protection, 26.9% by health consideration, and 85.3% by efficiency consideration. After pasting the posters in week3, we observed that 62.9% of Group B’s vertical movement trips were undertaken by stair-use; and among these stair-use trips, 20.7% were considered by environmental protection, 24.4% by health consideration, and 82.3% by efficiency consideration. Finally, two months later, it indicated that 66.5% of Group B’s vertical movement trips were taken by stair-use; and among these stair-use trips, 14.4% were considered by environmental protection, 22.0% by health consideration, and 84.6% by efficiency consideration.

Table 3 Ratios of stair-use trips and reasons for stair-use in each week for two groups

<table>
<thead>
<tr>
<th></th>
<th>RSUT</th>
<th>RSUEP</th>
<th>RSUH</th>
<th>RSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Group B</td>
<td>Group A</td>
<td>Group B</td>
<td>Group A</td>
</tr>
<tr>
<td>Week 1</td>
<td>59.3%</td>
<td>55.3%</td>
<td>15.0%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Week 2</td>
<td>63.6%</td>
<td>64.7%</td>
<td>22.4%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Week 3</td>
<td>64.5%</td>
<td>62.9%</td>
<td>25.5%</td>
<td>20.7%</td>
</tr>
<tr>
<td>Week 4</td>
<td>58.3%</td>
<td>66.5%</td>
<td>13.7%</td>
<td>14.4%</td>
</tr>
</tbody>
</table>

Figure 2 The ratios of stair use and their reasons for Group A

The ratios of stair-use and the reasons of stair-use for Group B during the experiment periods are summarized in Figure 3. We can find that the ratio of stair use for Group B rose up in week2, went down a little in week3, and went up again in the fourth experiment week. As to the ratios of reasons for stair use for Group B, the ratios of stair use for environmental protection rose up in both the second and third weeks, but went down in the fourth experiment week.
3.2 The effect of intervention on stair use
The pair-t tests are used to investigate the effect of intervention on participants’ stair uses over the experiment periods.

(1) The effects of interventions on stair use for Group A
For Group A, the ratios of stair-use trips (RSUT) of both week2 and week3 were significantly higher than that in week1, but the same phenomenon did not happen in week4 (see Table2). The RSUT of week3 was not significantly different from that in week2 at \( \alpha =0.05 \), but the RSUT of week4 was found significantly lower than those in week2 and week3. According to above study results, it indicates that providing the messages concerning environmental protection really increased the ratio of stair-use trips for Group A but pasting the promotion posters next to the elevators seemed not to bring significantly extra effect on stair use for Group A. Furthermore, stopping the intervention promotion seemed to make the ratio of stair-use trips return to its original situation before experiment.

(2) The effects of interventions on stair use for Group B
For Group B, all the RSUT of week2, week3, and week4 were significantly higher than that in week1 (see Table 4). The RSUT of week3 was not significantly different from that of week2 at \( \alpha =0.05 \), and the RSUT of week4 was found significantly lower than those of week2 and week3. From above results, it reveals that providing the messages concerning environmental protection really increased the RSUT for Group B and pasting the promotion posters next to the elevators seemed not to bring significantly extra effect on stair use for Group B. Furthermore, the RSUT seem not return to its original situation before experiment even stopping the intervention promotion. The reason for the different results with Group A might be due to the participants in Group B count their daily carbon reduction.

<table>
<thead>
<tr>
<th>Table 4 RSUT Differences Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
</tr>
<tr>
<td>Difference</td>
</tr>
<tr>
<td>Week2-Week1</td>
</tr>
<tr>
<td>Week3-Week1</td>
</tr>
</tbody>
</table>
(3) The effects of interventions on reasons for stair-use for Group A
After confirming the participants in both groups have higher RSUT, we have to know whether the rise resulted from the intervention. So, we tested the differences of stair use due to environmental protection consideration (see Table 5). The RSUEP of week2 and week3 were significantly higher than that in week1 for Group A at $\alpha =0.05$ and could support Hypothesis2. The results may mean that the participants knew more environmental protection implication of stairs replacing elevators. In another point, RSUEP of week2 and week3 were higher than that in week4 and RSUEP of week4 was not significantly different from that in week1. Stopping the intervention promotion seemed to make the ratio of stair-use trips return to its original situation before experiment. However, only the rise of RSUEP could not represent that the promotion method is effective. We had to know how the ratio of stair use for the other reasons changed. RSUH of week1 was not different with those of week2, week3, and week4 (see Table 6) and this result support Hypothesis3. The RSUE of week2 and week3 were smaller than that of week1 (see Table 7) and could support Hypothesis4. To compare the RSUEP, we could find that RSUE and RSUEP have relationships between growth and decline.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td>p-value</td>
<td>Difference</td>
<td>p-value</td>
</tr>
<tr>
<td>Week2-Week1</td>
<td>7.35%</td>
<td>0.002</td>
<td>5.69%</td>
<td>0.000</td>
</tr>
<tr>
<td>Week3-Week1</td>
<td>10.47%</td>
<td>0.000</td>
<td>11.68%</td>
<td>0.000</td>
</tr>
<tr>
<td>Week4-Week1</td>
<td>-1.37%</td>
<td>0.292</td>
<td>5.34%</td>
<td>0.005</td>
</tr>
<tr>
<td>Week3-Week2</td>
<td>3.12%</td>
<td>0.125</td>
<td>5.99%</td>
<td>0.020</td>
</tr>
<tr>
<td>Week4-Week2</td>
<td>-8.72%</td>
<td>0.000</td>
<td>-0.36%</td>
<td>0.048</td>
</tr>
<tr>
<td>Week4-Week3</td>
<td>-11.84%</td>
<td>0.000</td>
<td>-6.34%</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Table 5 RSUEP Differences Test

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td>p-value</td>
<td>Difference</td>
<td>p-value</td>
</tr>
<tr>
<td>Week2-Week1</td>
<td>2.79%</td>
<td>0.186</td>
<td>4.89%</td>
<td>0.203</td>
</tr>
<tr>
<td>Week3-Week1</td>
<td>3.74%</td>
<td>0.118</td>
<td>2.37%</td>
<td>0.198</td>
</tr>
<tr>
<td>Week4-Week1</td>
<td>-5.39%</td>
<td>0.053</td>
<td>0.01%</td>
<td>0.500</td>
</tr>
<tr>
<td>Week3-Week2</td>
<td>0.95%</td>
<td>0.379</td>
<td>-2.52%</td>
<td>0.179</td>
</tr>
<tr>
<td>Week4-Week2</td>
<td>-8.18%</td>
<td>0.007</td>
<td>-4.88%</td>
<td>0.031</td>
</tr>
<tr>
<td>Week4-Week3</td>
<td>-9.13%</td>
<td>0.003</td>
<td>-2.37%</td>
<td>0.179</td>
</tr>
</tbody>
</table>

Table 6 RSUH Differences Test

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td>p-value</td>
<td>Difference</td>
<td>p-value</td>
</tr>
<tr>
<td>Week2-Week1</td>
<td>-6.33%</td>
<td>0.002</td>
<td>-8.87%</td>
<td>0.000</td>
</tr>
</tbody>
</table>
(4) The effects of interventions on reasons for stair-use for Group B
For Group B, the RSUEP of week 2, week 3, and week 4 were significantly higher than week 1 at $\alpha=0.05$ (see Table 5) and could support Hypothesis 2. That reveals the e-mail promotion could increase RSUEP and calculating the carbon reduction every day could extend the promotion effects. Besides, the RSUEP of the participants in week 3 was higher than week 2 and week 4. That represented the posters was more effective to the participants for Group B than Group A. We found that there were no significant differences between RSUH of week 1, week 2, and week 3 (see Table 6) and this result support Hypothesis 3. The RSUE of week 2 and week 3 were smaller than that of week 1 (see Table 7) and could support Hypothesis 4. Moreover, the RSUE of week 4 was significantly lower than week 1 for Group B but not for Group A. That pointed calculating the carbon reduction every day could extend the promotion effects.

4. DISCUSSION

The purpose of this study is to test the effects of e-mail and the additional promotion methods. We found that the participants would increase RSUT about 4% after accepting e-mail promotion and 9% with making the daily carbon deduction. Even accepting the invention from the posters after receiving the e-mail promotion, the participants couldn’t increase their RSUT. That means e-mail is an effective method to promote and we may not need to paste posters in buildings or do too many promotion activities when we just promote a conception to the public. We could decrease the promotion costs and achieve our goals. On the other hand, e-mail promotion effects couldn’t continue for a long time, we found that RSUT of the participants descended significantly in the week after two months. However, daily carbon reduction calculation could slow down the promotion effects decreased. That might point that the actual results which the participants understood (carbon reduction) could enforce the participants use stairs. To make the public know what the results their activities caused could increase the participants’ willingness to do.

Second, we made sure that the effects were resulted from the promotion methods. We couldn’t really know whether the promotion way works even the participants used more stairs because that the participants may have different activities in a different week. Using ratio of reasons could avoid this kind of problems and find the reason the participants used stairs. The results in table 4 could support the hypothesis 1. Whether the participants were in group A or B, they all had higher RSUT after e-mail promotion. We also observed the participants’ RSUEP raised, RSUH unchanged, and RSUE decreased after e-mail promotion. The above outcome fitted our study hypothesis 2, 3, and 4 (see table 5, 6, and 7). That might enforce the experimental power because the RSUH is constant. The experimental factor is environmental
protection messages, so we only want to make the participants use more stairs for environment protection consciousness but not for health. That means our promotion method really changed the participants’ consideration. It suggested that environment protection promotion methods are useful.

On the other hand, we could find RSUEP in week 1 is the lowest in the three kinds of reasons (shown in Figure 2 and 3). After the promotion, RSUE decreased and RSUEP increased may mean that the public would choose to use stair actively but not influenced by the elevator factors (ex. waiting, capacity limitation). That might be also the participants didn’t know or feel that stair use is a behavior containing environmental protection meaning. After receiving the messages, the participants knew and changed their behavior to use stairs replacing elevators. It suggested that we should make the public receive the knowledge and some of them would change their behaviors.

Finally, we afforded posters and e-mail cost for promotion cost in this study. The e-mail cost was almost energy cost and the posters cost containing papers and printing cost. Because the poster promotion effects were not significant after e-mail promotion, we could only use e-mails to promote. We find that only using e-mail could increase 4.31% and 9.35% RSUT in the two groups (see table 4). When using 1 floor to replace 1 times in RSUT, we would find at least 0.939 kilogram and 2.0383 kilogram carbon emission decreased in 100 trips in the two groups. To attend the above effects, we could only afford energy cost. The e-mail could save more than using posters or commercial advertisements and have good effects.

5. CONCLUSION

Using e-mail could promote the environmental protection to the public and made them use more stairs. Besides, we have tested our hypothesis and found the environment protection messages could really increase participants’ RSUEP. On the other hand, this kind of method could break the space limitation and save costs. It is a convenient way for the government or companies want to promote the consciousness of energy conservation and carbon deduction. Daily carbon deduction calculation could enhance the promotion effects. In the future, teachers may help students know that how much daily carbon deduction resulted from their daily behaviors. The students may have more willingness to do the environmental protection behaviors.

REFERENCES

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