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The Relationship between the Attitudes to Physical Exercise and Exercise Habit under Competitive Situation

Atsunari Suzuki[1], Mai Nakamura[2], Akane Mikura[3], Junya Kitagawa[2], Yuko Sakurama[2], Etsuko Ogasawara[2], Naoki Takahashi[4], Takashi Sakamoto[5], Fumitake Sakaori[4], and Toshikazu Kato[4]

[1]Graduate School of Chuo University 1-13-27 Kasuga, Bunkyo-ku, Tokyo 112-8551, Japan
[2]Juntendo University 2-1-1 Hongo, Bunkyo-ku, Tokyo 113-8421, Japan
[3]Kanazawa Medical University 1-1 Daigaku, Uchinada, Kahoku, Ishikawa 920-0293, Japan
[4]Chuo University 1-13-27 Kasuga, Bunkyo-ku, Tokyo 112-8551, Japan
[5]National Institute of Advanced Industrial Science and Technology 1-1-1 Umezono, Tsukuba, Ibaraki 305-8560, Japan

ABSTRACT

As a first step toward supporting physical exercise habituation suitable for individual personalities, we investigated the values and attitudes toward exercise that are effective in motivating people to exercise, when competition with others is stimulated. We developed an experiment, wherein agents posed as competitors to the participants, so that the competition among the participants could be controlled. The results of the experiments show that competition with others and the difference in exercise performance between others and oneself influences motivation. The relationship between the user's attitude factors, especially confidence, and motivation were also discussed.

Keywords: Motivation, Competition, Agent

INTRODUCTION

Exercise is widely known as one of the means to maintain not only physical health, such as the prevention of lifestyle-related diseases, but also mental health. In Japan, physical education is included in primary and secondary education—a period during which students exercise regularly. However, after that, the number of people who exercise decreases significantly, excepting those who are sports-oriented. Therefore, it is necessary to encourage such individuals to engage in daily physical exercise.

RELATED RESEARCH

Sport England classified young people into six personality groups based on gender and age as well as lifestyle and sport-related factors, showing that people have different attitudes toward exercise and promoting sports for

each personality group (Sport England, 2014, 2015, 2015, 2016). Nagai et al. applied the abovementioned classification to Japanese high school students, showing that the degree of one's desire to win differs among personality groups, which suggests that competition with others is effective in motivating some individuals to exercise and not others (Nagai et al. 2018).

Furthermore, various methods of promoting exercise have been studied; among them, many exercise motivation systems have been proposed that use a sense of competition to make people compare their records with those of others. This study investigated the relationship between attitudes toward exercise and the motivational effect of competition with others.

THE EXPERIMENT

The study participants comprised Japanese high school students, who were classified into seven clusters using the questionnaire on attitudinal factors etc. and latent class analysis used in the study by Nagai et al. (Nagai et al. 2018). Eight participants were selected from each of the seven clusters in the order of increasing probability of attribution. When there were several subjects with the same probability of belonging, the ratio of males to females in the clusters was chosen to be close to 1:1. If the number of participants in a cluster was less than eight, all individuals belonging to that cluster were selected.

To investigate the timing of high motivation levels for exercise, we included the questionnaire items used by Toriba et al. and surveyed them using a 7-point Likert-type scale (Toriba et al. 2018).

We asked the participants to perform "Radio Calisthenics No.1", one of the well-known exercises among Japanese people, once or twice a day for three weeks and to input their performance status into our web application (Japan Post Insurance Co., Ltd). In the application, along with the participants' records, different information was presented every week: no agent, agent A's record, and agent B's record. The order in which the information about the agents was presented was assigned to each participant in six different patterns.

As the participants were high school students, the system used in this experiment was designed as a web application that can be accessed using both smartphones and PCs. The user's and the agent's exercise records are superimposed as a line graph to enable comparison.

We prepared two types of agents, A and B, with different ways of determining the score.

U_n : Cumulative value of the user for the nth day
U_n : Score of the user for the nth day
A_n : Cumulative value of agent A for day n
a_n : Score of agent A on day n
$Da_n = A_{n-1} - (U_{n-1} + u_n)$
B_n : Cumulative value of agent B on day n
b_n : Score of agent B on day n
$Db_n = B_{n-1} - (U_{n-1} + u_n)$

We assume that the scores of agent A and agent B are defined as follows:
Day 1–6
$a_n = \max(0,\min(2,(\mathrm{rand}(2,4) - Da_n)))$
$b_n = \min(2,\max(0,(\mathrm{rand}(-4,-2)) - Db_n))$
Day 7
$a_n = \max(0,\min(2,(3 - Da_n)))$
$b_n = \min(2,\max(0,(-3 - Db_n)))$

Analysis of variance was used to test the mean number of times each cluster responded to the stimuli presented by no agent, agent A, and agent B.

RESULTS

Responses to the questionnaire were obtained from 371 people, who were then classified into seven clusters. Table 1 presents the variables used in the classification of each cluster, based on Nagai et al (Nagai et al. 2018).

Among the attitudinal factors, the item "desire to win" showed the largest variation among the clusters.

Table 2 reports the additional questionnaire items by cluster, based on Toriba et al.

Clusters 2, 4, and 6 in Table 2 have relatively high scores for involvement in sports. Moreover, the variance among the clusters was the largest for item 7.

Based on the results of the questionnaire survey, 51 people were asked to participate in the experiment, out of which 17 participated. Table 3 summarizes the number of implementation in each cluster.

No statistically significant difference was found at a significance level of 5% between no agent, agent A, and agent B in the mean number of implementations. Cluster 2 was excluded from the test due to lack of sufficient number of participants to test. Therefore, we investigated the correlation between the change in the number of implementations of each user when the presented stimuli were changed and each attitude factor. The correlation coefficient between the amount of change in the number of implementations when the stimulus was changed from no agent to agent A and the self-confidence of the attitude factor was −0.46, indicating a slightly negative correlation. Figure 1 depicts the scatter plot. No significant correlations were found for any of the other items.

DISCUSSION

First, with regard to the additional questionnaire items, the participants with high sports involvement scores were considered to have relatively high motivation to exercise in all situations because they experience low hurdles to exercise. Furthermore, the large variability in item 7, "When you are stressed out" suggests that those with a high sport involvement score believe that exercise can relieve stress, while those with a low sport involvement score feel stressed by the act of exercising itself.

With regard to the experiment, although there seems to be a difference in the average number of times each cluster was performed, no statistically significant difference could be detected, which may be because the sample size was quite small.

Table 1. Overview of classified clusters.

		Cluster1 (n=12)	Cluster2 (n=3)	Cluster3 (n=199)	Cluster4 (n=49)	Cluster5 (n=22)	Cluster6 (n=63)	Cluster7 (n=23)
Percentage of boys (%)		41.7	66.7	38.2	30.6	9.1	60.3	65.2
Percentage of girls (%)		58.3	33.3	61.8	69.4	90.9	39.7	34.8
Sport involvement score	M	43.19	64.75	39.13	57.08	13.77	87.10	18.93
	SD	12.12	4.60	22.07	20.26	9.40	9.66	19.81
Attitude factor								
Self-confidence	M	2.96	3.42	3.30	3.80	2.68	3.94	2.77
	SD	0.46	0.38	0.73	0.63	0.51	0.66	0.91
Self-contentment		2.78	2.33	2.75	3.52	2.62	3.21	3.22
		0.46	0.88	0.91	0.88	0.79	0.95	1.08
Being productive		3.06	4.00	4.05	4.20	3.47	4.53	3.38
		0.58	1.00	0.74	0.56	0.69	0.50	1.18
Sense of freedom		3.25	3.89	3.92	4.32	3.55	4.40	3.70
		0.35	0.19	0.59	0.60	0.71	0.49	0.93
Desire to win		3.11	3.78	3.60	3.99	2.33	4.61	2.03
		0.64	0.69	0.89	0.63	0.74	0.37	0.98
Family influence		3.33	3.78	3.84	5.00	3.41	4.22	2.87
		0.72	0.51	0.72	0.00	0.96	0.72	0.90
Perception of sport		2.68	3.47	2.80	3.26	2.37	3.90	1.73
		0.35	0.31	0.58	0.73	0.30	0.55	0.59
Fear of judgment		2.98	2.75	3.16	2.98	3.47	3.03	2.24
		0.42	0.75	0.71	0.70	0.51	0.89	0.59
Motivations in life (% of respondents who answered yes)								
Achieving goals (%)		50	0	90	96	45	98	26
Being successful (%)		17	0	91	88	45	98	26
Competing (%)		0	0	48	55	0	90	4
Developing myself as a person (%)		67	100	97	100	77	100	57
Doing something worthwhile (%)		50	33	86	96	73	98	61
Improving appearance (%)		42	0	79	71	77	87	22
Staying healthy (%)		58	33	86	90	59	95	39

Table 2. Overview of additional questionnaire items by cluster.

		Cluster1 (n=12)	Cluster2 (n=3)	Cluster3 (n=199)	Cluster4 (n=49)	Cluster5 (n=22)	Cluster6 (n=63)	Cluster7 (n=23)
Situation								
1. After waking up in the morning before going to school	M	1.75	5.33	2.69	2.71	1.32	3.70	1.91
	SD	0.87	1.53	1.82	1.84	0.72	2.17	1.86
2. During lunch break (at school)		2.67	4.00	3.32	3.82	1.95	4.70	2.70
		1.92	2.65	1.95	2.16	1.65	2.27	2.40
3. When there is no one around		3.00	6.33	4.56	5.47	3.64	5.86	3.04
		1.71	1.15	1.98	1.60	1.92	1.42	2.31
4. When there is not much to do		4.08	6.67	4.95	5.92	3.50	6.27	2.57
		1.62	0.58	1.97	1.30	1.92	1.12	2.25
5. After school		3.25	6.00	4.11	5.43	2.05	6.32	2.70
		1.48	1.00	2.11	2.10	1.53	1.06	2.29
6. When there are other people around		3.42	4.00	3.53	4.51	1.82	5.30	1.96
		1.51	2.65	1.89	2.16	1.18	1.92	1.74
7. When you are stressed out		3.00	5.33	4.28	5.33	1.77	6.32	2.78
		1.65	1.53	2.09	2.03	1.31	1.40	2.37
8. Before going to bed		2.42	3.33	3.34	3.78	2.95	4.56	2.13
		1.44	0.58	2.09	2.37	2.32	2.13	1.77
9. When there is a lot to do		2.08	2.67	2.15	2.76	1.27	3.29	2.00
		1.31	0.58	1.58	2.10	1.08	2.03	1.95
10. On holidays		4.00	6.33	4.50	5.51	2.68	6.25	2.87
		1.71	1.15	1.94	1.80	1.94	1.24	2.30
11. When you are with friends		3.33	4.33	4.29	5.27	3.00	5.87	2.48
		2.31	1.15	1.92	1.88	1.72	1.74	2.15
12. When you're not too stressed out		3.17	5.67	4.30	5.51	3.00	6.05	3.04
		1.40	1.53	1.93	1.86	1.88	1.43	2.29

Table 3. Summary of each cluster for number of implementation.

		Cluster1 (n=3)	Cluster2 (n=1)	Cluster3 (n=3)	Cluster4 (n=2)	Cluster5 (n=2)	Cluster6 (n=3)	Cluster7 (n=3)
Presenting stimulus								
No agent	M	3.00	0.00	2.67	5.00	8.50	1.00	2.33
	SD	1.00	-	3.79	2.83	7.78	1.73	2.08
Agent A		3.00	3.00	2.33	0.50	7.50	0.33	3.00
		3.61	-	4.04	0.71	4.95	0.58	5.20
Agent B		1.00	0.00	2.67	0.50	8.00	1.67	3.00
		1.73	-	3.79	0.71	8.49	2.08	3.00

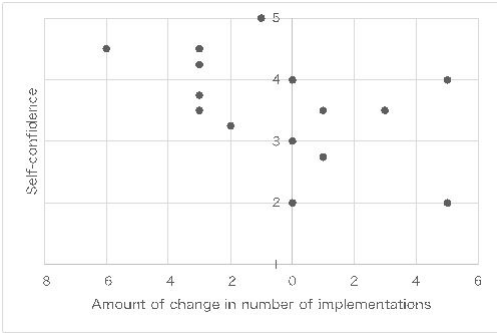

Figure 1: Scatter plot of change in number of times performed and self-confidence items.

The slightly negative correlation between the amount of change in the number of implementations when the stimulus is changed from no agent to agent A and the self-confidence of the attitude factor indicates that people with low self-confidence increase their number of times they exercise in response to agents who exercise more than them. This could be because people with low self-confidence tend to determine the number of times they exercise by comparing themselves with others. In other words, for users with low self-confidence, it may be possible to promote exercise by presenting them with an agent that exercise more than the user.

CONCLUSION

This study revealed the attitudinal factors that are highly related to the motivational effect of competition with others. However, the number of participants in the experiment and the number of actual exercise sessions were small, suggesting that the competition factor may not work effectively for some people who are not active in exercise. Therefore, to encourage these people to exercise, other methods, such as those that appeal to their values, may be necessary. Moreover, in the questionnaire for participants and non-participants, some answered that they already had enough exercise through club activities. Therefore, in future surveys, it is necessary to construct a system that can record exercises performed by methods other than the specified ones.

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