

## Original Research

# Evaluating process and outcomes of interventions for promoting sport participation among South Korean university students

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## Abstract

**Background:** Based on previous research that identified salient beliefs with regard to sport participation among university students, four types of interventions (i.e., social dance class, social dance video, poster, and e-mail) were developed to promote sport participation among the target population. The main purpose of this study is to evaluate the process and outcomes of interventions for promoting sport participation among university students.

**Methods:** The number of views registered on social dance videos and acknowledgements through e-mail were computed to evaluate reach and dose received. Three process evaluators also responded to a 22-item survey and expressed their conceptions on each intervention. Primary and secondary outcomes were analyzed using paired *t*-tests to assess changes in beliefs and sport participation pre- to post-intervention.

**Results:** Social dance video and poster interventions were relatively more effective in changing target behavior compared to the other two interventions. Following the interventions, students participating in sports less than 150 minutes per week at one-month follow-up were more likely to believe that participating in sports helps them build social relationships, less likely to perceive being tired is bad, and less likely to acknowledge that participating in sports takes too much time. Importantly, the mean duration of sport participation per week increased by 78.49 minutes among students who participated in sport less than 150 minutes per week.

**Conclusions:** The findings of this study suggest that sport participation programs involving video and poster interventions may effectively promote involvement in sporting activities among university students. Future research should implement these interventions in a larger population.

## Keywords

Sport participation intervention; Process evaluation; Outcome evaluation; Program evaluation; Health promotion

## 1. Introduction

Participating in regular physical activity has many health benefits, such as maintaining bone health and preventing type 2 diabetes and obesity [1–3]. There is irrefutable evidence that physical activity helps alleviate anxiety and depressive

symptoms [4–6]. However, only 20.8% of university students in South Korea perform the recommended level of physical activity, which is considerably lower than the 52% of their US counterparts who participate in moderate-to-vigorous physical activity [7, 8]. Recent recommendations highlight the therapeutic value of moderate-to-vigorous physical activ-

ity for improving health [9]. Physiologically, these levels of physical activity intensity are defined as three to six metabolic equivalents, and many sporting activities meet this standard [10]. Moreover, participating in sports is positively associated with greater academic achievements [11] and higher future wage gains [12]. Given these benefits of participating in sports, there should be greater focus on programs for college and university students promoting sport participation because the level of physical activity decreases critically from high school to college and the patterns of physical activity among college-aged students are insufficient to improve their health [13]. Programs implemented in colleges or universities are cost-effective for increasing physical activity in terms of ease of access, using existing facilities, and the potential to include many students [14]. Accordingly, targeting university students may be ideal for promoting sport participation.

Physical activity programs have been developed for various populations as a public health strategy. Increasingly, studies have focused on implementing physical activity interventions in colleges or universities [15, 16]. However, not all programs targeting college or university students have reported the details of intervention implementation [17–19]. Studies that involve both assessing the intervention process and evaluating outcomes often have greater effects on the degree or fidelity of implementation [20]. Since various factors can influence intervention components [21], measuring why the programs were or were not successful is as important as outcome analysis [22]. Undoubtedly, outcome evaluation is essential for academic researchers, practitioners, and policymakers to identify effective programs and to understand how to improve those that are not; however, if the outcome is evaluated without assessing the implementation process, many unanswered questions will remain [23].

Process evaluation is important for assessing the effects of health-promotion programs and for inspecting and monitoring program implementation [20, 24]. Process evaluation should document the intervention quantity and quality in terms of how the programs are being delivered [25]. Specifically, it includes the reach, dose, and fidelity of the intervention [22, 26, 27]. Reach refers to the characteristics of the participants and the proportion of the intended audience participating. Dose is what is actually delivered to participants and what they receive in effect. Fidelity refers to the quality of the intervention as conceived by the intervention providers and measures the degree to which the intervention was delivered as intended. Despite the importance of process evaluation, few studies have examined this [20]. A recent review of programs promoting physical activity among university students reported that only 1 of the 27 studies examined process evaluation [16]. That study used semi-structured interviews to identify barriers to the interventions [28]. Such an approach provides qualitative data that give insights into how the interventions were delivered to the participants and which interventions best improved the target behavior [16]. Therefore, this study focuses on both the process and outcome evaluation of a program to provide evidence that can be used to improve health-promoting interventions.

Applying theory can help identify the determinants of behavior change and ensure adequate intervention implementation [29]. In this regard, Lee et al. identified factors influencing sport participation by South Korean university students using an elicitation procedure based on the theory of planned behavior (TPB). Ten salient beliefs were extracted from the elicitation study and used to develop the main survey questionnaire. Of these 10 salient beliefs, 5 significantly affected the intention to participate in sports, and 4 (i.e., “sport participation can build social relationship”, “friends think that I should participate in sports”, “sport participation takes too much time”, and “sport participation makes me tired”) indirectly influenced sport participation behavior through intention among South Korean university students [30]. Based on these four salient beliefs and TPB research procedures, a sport participation program was developed and implemented at a South Korean university. A theory-oriented approach helps to understand the mechanisms and processes regarding what has been changed within the program and may therefore be easier to evaluate [31]. Although the sport participation program was implemented approximately 2 years ago, its process and effectiveness have not been evaluated. Therefore, this study assessed intervention implementation and evaluated whether the program could lead to changes in the sport participation rates of South Korean university students. In this regard, this study will address intervention procedures, process evaluation, and outcome analysis of the sport participation program in the next section.

## 2. Methods

### 2.1 Participants

The participants were undergraduate students who were registered in a university located in Seoul, South Korea. The students were recruited only if they had registered in either the school of business or the college of social sciences. Overall, 234 students (91 females and 143 males) participated in the main survey, and 182 responded to the one-month follow-up survey (response rate: 63.9%). Three trained graduate students provided consent forms to the participants, and the students provided the written assents. These surveys were conducted in 2018 before the sport participation programs were delivered [30]. After the programs were completed, a one-year follow-up survey was conducted via phone calls or text messages. However, there were a large number of dropouts because some of the students had graduated and left for military service by the time the interventions were being implemented, and some of them did not answer phone calls. Accordingly, 39 students (response rate: 21.4%) participated in the one-year follow-up survey in 2019. Meanwhile, 541 students from the same university were recruited for another intervention study.

Ten social dance instructors were recruited and all of them were professional dancers. Additionally, a video editor was recruited to film and edit the social dance videos. This study was approved by the Institutional Review Board of Seoul National University in South Korea.

## 2.2 Intervention

The sport participation program which was specifically designed based on the aforementioned four salient beliefs consisted of four intervention materials: social dance classes, video tutorials, posters, and e-mail. First, Korean dance, modern dance, and ballet lessons were opened to the target students. Under the supervision of a research administrator and assistants, the three social dance classes were conducted by professional dancers, and the classes were available for students once a week for six months. Considering that "sport participation can build social relationship" and "friends think that I should participate in sports" were the key factors influencing sport participation among the study population, the social dance classes were composed of group lessons. Moreover, since "sport participation makes me tired" and "sport participation takes too much time" were also important beliefs affecting students' sport participation, each class was run for not more than one hour. Second, social dance tutorials were filmed by professional dancers, and the research assistants uploaded the video clips on YouTube. Four messages (i.e., "I thought it would be difficult, but it was so much fun to dance", "I can dance with friends, so it is more fun", "it does not take long, so it does not interfere with my daily routine", and "I heard social dance is the trend these days and a lot of celebrities are dancing. I want to try it too.") related to the four salient beliefs were included in each video clip. Third, posters were designed to provide information about social dance classes and video tutorials. The four messages contained in the social dance videos were also included in a written form, and the Quick Response (QR) code of YouTube videos was also included on the poster. Research assistants affixed the intervention posters on the board of the college building. Fourth, the posters were sent to participants using group e-mail to ensure that all the students receive information about the program.

To generalize the program, the same intervention materials were planned to be delivered to all university students in 2020. However, in light of the COVID-19 pandemic, only posters, including the QR code of YouTube videos, were sent through e-mail to all undergraduate students.

## 2.3 Data collection

The number of views on YouTube videos and email acknowledgements were verified to measure the reach and dose received. This information was collected online (i.e., YouTube channel and email account) after the interventions. Moreover, a process evaluation questionnaire for assessing sport participation promotion programs was developed based on the existing literature [32, 33]. Total 22 items were included to evaluate social dance classes, YouTube videos, and posters (Table 1). Three graduate students who supervised the program responded to the evaluation questions about the overall process of each intervention. The responses were rated on a four-point Likert scale ranging from "totally disagree" to "totally agree".

Outcomes of the interventions were measured in November 2019. Behavioral, normative, control beliefs, and intentions regarding sport participation were measured using a seven-point Likert scale. To assess the level of sport participation, the students were asked the following questions: "How many days per week did you participate in sports during the past month?" and "How many minutes per day did you spend on sporting activities?". The number of days engaged in sports per week was multiplied by the total daily minutes spent performing sporting activities to calculate the total time spent on sport participation per week during the past month. Overall, 45 students who had answered phone calls or text messages visited a sport participation laboratory to answer a self-administered paper questionnaire. Three trained graduate students remained near the students and answered any questions they had during the survey. The number of views on YouTube videos and email confirmations were checked to evaluate whether the program materials were delivered to the target population as intended.

A self-administered online survey was conducted in July 2020. The students were asked the following questions: "How many days per week did you participate in sports during the past month?", "How many minutes per day did you spend on sporting activities?", "Have you seen a social dance poster?", and "Have you watched social dance videos on YouTube?". The number of days engaged in sports per week was calculated in a similar manner as described above.

## 2.4 Data analysis

All analyses were performed using SAS version 9.4 (SAS Institute Inc., SAS Campus Drive, Cary, NC, USA). The means and standard deviations of process evaluation items were calculated. For outcome evaluation, a paired *t*-test was used to examine mean differences in primary outcomes between one-month and one-year follow-up. Mean differences in secondary outcomes, such as four salient beliefs and intention to participate in sports, were also examined using a paired *t*-test. Since a guideline for physical activity for adults recommends at least 150 minutes of moderate-intensity physical activity [34], the participants were divided into two groups according to the total duration of sport participation per week at the one-month follow-up (i.e., 150 minutes or more and less than 150 minutes). In addition, a mean comparison was used to assess the difference in sport participation between the intervention and control groups in 2020. *p*-values of less than 0.05 level were considered as significant.

## 3. Results

### 3.1 Reach and dose received

Reach and dose received were evaluated based on the number of views on YouTube videos and email confirmation. Ballet, Korean, and modern dance videos were viewed 531, 357, and 394 times, respectively. In terms of email acknowledgement, 935 of 2952 students (31.67%) checked the email. The number of views was also evaluated in 2020. The Korean dance which was the most viewed video (1600 views) among the three video clips, followed by ballet (1400 views) and modern dance (1300 views) videos.

**TABLE 1. Process evaluators' responses to questions asking whether interventions were implemented as planned (n = 3).**

Item	Mean (SD)
Social dance classes	
(1) Did students appear to like the classes?	3.67 (0.58)
(2) Did students appear to like the instructors?	3.67 (0.58)
(3) Did students actively participate in the classes?	3.67 (0.58)
(4) Did students stay on task during the classes?	4.00 (0.00)
(5) Did instructors seem enthusiastic about the classes?	4.00 (0.00)
(6) Did instructors give clear instructions about the Korean/Modern dance/ballet classes?	4.00 (0.00)
(7) Did instructors appear to lead the classes?	3.00 (0.00)
(8) Were group sizes appropriate for the classes?	3.67 (0.58)
(9) Did instructors help students increase social dance skills?	3.67 (0.58)
(10) Was equipment ratio appropriate for the classes?	4.00 (0.00)
(11) Did instructors help students feel connected to others in the classes?	3.67 (0.58)
(12) Did instructors use positive praise to reinforce good performance/behavior?	4.00 (0.00)
(13) Did instructors make the classes fun?	3.67 (0.58)
Social dance videos	
(1) Did instructors give clear instructions about the Korean/Modern dance/ballet in the videos?	4.00 (0.00)
(2) Did students appear to like the videos?	4.00 (0.00)
(3) Did instructors make the videos fun?	3.67 (0.58)
(4) Did instructors seem enthusiastic in the videos?	4.00 (0.00)
Poster	
(1) Were the posters securely affixed in appropriate places?	4.00 (0.00)
(2) Did students appear to like the posters?	3.67 (0.58)
(3) Did students look at the posters carefully?	4.00 (0.00)
(4) Were sizes of the posters appropriate?	4.00 (0.00)
(5) Was the number of posters appropriate?	4.00 (0.00)

Ratings = 1 (totally disagree), 2 (disagree), 3 (agree), 4 (totally agree).

### 3.2 Dose delivered and fidelity

Dose delivered and fidelity were assessed using a process evaluation questionnaire (Table 1). As presented in Table 1, all the intervention materials, except email, were delivered with high fidelity. The mean score of all items was 3.82, and the lowest mean score among all items was 3.00. There were comments left by the evaluators on each question and they tended to have similar points of view.

### 3.3 Outcomes

The differences in salient beliefs, intentions, and sport participation between the pre- and post-intervention periods are presented in Tables 2,3. Students participating in sports for more than 150 minutes at the one-month follow-up were more likely to believe that participating in sports is good for building social relationships after interventions ( $p < 0.01$ ). However, there were no significant changes in the remainder of the outcomes from pre- to post-intervention (see Table 2). As demonstrated in Table 3, students not meeting the guidelines of 150 minutes of moderate physical activity at one-month follow-up were more likely to believe that participating in sports helps build social relationships ( $p < 0.05$ ), less likely to perceive being tired is bad for sport participation ( $p < 0.01$ ), and less likely to consider participating in sports takes too much time ( $p < 0.05$ ) after interventions. Essentially, they participated an additional 78.49 minutes in sporting activities after the intervention ( $p < 0.01$ ).

**TABLE 2. The mean differences in primary and secondary outcomes from pre- to post-interventions among university students participating in sport more than 150 minutes per week (n = 26).**

Outcomes	Pre	Post	Difference
	Mean (SD)	Mean (SD)	Mean (SD)
Sport participation	349.61 (242.34)	334.23 (233.81)	-15.38 (216.40)
Intention	2.06 (1.00)	2.35 (1.02)	0.29 (0.99)
Belief 1 <sup>a</sup>	2.21 (0.77)	2.31 (0.68)	0.10 (0.82)
OE of belief 1	2.02 (0.76)	2.54 (0.51)	0.52 (0.71)**
Belief 2 <sup>b</sup>	1.87 (1.03)	2.04 (1.11)	0.17 (1.52)
MC with belief 2	4.23 (1.39)	4.23 (1.30)	0.00 (1.84)
Belief 3 <sup>a</sup>	1.52 (0.79)	1.46 (1.17)	0.06 (1.20)
OE of belief 3	-0.15 (1.29)	0.54 (1.24)	-0.69 (1.49)
Belief 4 <sup>a</sup>	0.67 (1.25)	0.69 (1.54)	-0.02 (1.08)
OE of belief 4	-1.10 (1.01)	-1.27 (1.08)	0.17 (1.22)

<sup>a</sup> responses ranged from -3 to 3. <sup>b</sup> responses ranged from 0 to 6.

SD, standard deviation; Belief 1, Participating in sport can build social relationship; Belief 2, Friends think that I should participate in sport; Belief 3, Participating in sport makes me tired; Belief 4, Participating in sport takes too much time; OE, Outcome evaluation; MC, Motivation to comply.

\*  $p < 0.05$ , \*\*  $p < 0.01$ .

As shown in Table 4, there was a marginal mean difference between the intervention group and control groups in 2020. Specifically, students who had seen a poster or videos through emails participated in sporting activities for 181 minutes

**TABLE 3. The mean differences in primary and secondary outcomes from pre- to post-interventions among university students participating in sport less than 150 minutes per week (n = 13).**

Outcomes	Pre	Post	Difference
	Mean (SD)	Mean (SD)	Mean (SD)
Sport participation	63.82 (52.21)	142.31 (65.60)	78.49 (94.96)**
Intention	1.21 (1.41)	1.60 (1.00)	0.39 (1.52)
Belief 1 <sup>a</sup>	1.82 (0.91)	2.36 (0.50)	0.54 (1.01)*
OE of belief 1	1.91 (0.88)	2.36 (0.63)	0.45 (1.15)
Belief 2 <sup>b</sup>	1.78 (0.96)	2.21 (0.89)	0.43 (0.78)
MC with belief 2	3.82 (1.48)	4.43 (0.85)	0.61 (1.44)
Belief 3 <sup>a</sup>	1.62 (0.99)	1.79 (0.70)	0.17 (0.10)
OE of belief 3	-0.54 (1.29)	0.21 (0.97)	-0.75 (1.23)**
Belief 4 <sup>a</sup>	1.13 (1.04)	0.64 (1.01)	0.49 (0.94)*
OE of belief 4	-1.37 (1.09)	-1.57 (0.51)	0.20 (0.92)

<sup>a</sup> responses ranged from -3 to 3. <sup>b</sup> responses ranged from 0 to 6.

SD, standard deviation; Belief 1, Participating in sport can build social relationship; Belief 2, Friends think that I should participate in sport; Belief 3, Participating in sport makes me tired; Belief 4, Participating in sport takes too much time; OE, Outcome evaluation; MC, Motivation to comply.

\*  $p < 0.05$ , \*\*  $p < 0.01$ .

**TABLE 4. Mean difference between intervention and control groups of sport participation among university students in 2020 (n = 536).**

Outcomes	Intervention (n = 439)	Control (n = 97)
	Mean (SD)	Mean (SD)
Sport participation	181.65 (181.00)	168.79 (185.61)

SD, Standard Deviation.

per week, whereas students who had not seen any of these participated in sports for 168 minutes per week.

#### 4. Discussion

The overall purpose of this study was to evaluate the process and outcomes of four interventions to promote sport participation. Social dance classes, social dance videos, posters, and email interventions were provided for one semester. After interventions, the ballet, Korean, and modern dance videos had been viewed over 500, 360, and 400 times, respectively. As shown in Table 1, process evaluators tended to agree with the four questions about the social dance video intervention. These results are supported by a review suggesting that video-based interventions are effective at modifying several health behaviors [35]. However, it is possible that the channel was watched by people who were not study subjects due to the YouTube algorithm, although the number of views was counted only during the intervention period. Therefore, we cannot confirm that the number of views of the social dance videos involved only the target population. More than 30% of the participants checked the email, but it is uncertain whether the participants actually read the email or simply clicked the check button. Future research should consider these issues regarding YouTube and email interventions if researchers plan to use these programs.

The process evaluators also assessed the social dance class and poster interventions. Only a few students participated in the social dance classes; the process evaluation survey identified one possible reason for the low participation. The lowest mean score ( $3.00 \pm 0.00$ ) demonstrates that the process evaluators tend to agree less with a question regarding whether the instructors appear to lead the classes. The process evaluators also commented that "Although the instructors were good for the classes, they seemed to lack the quality of program staff when it comes to class preparation". Therefore, staff training is required before an intervention. Another possible reason for the low participation may be the social perspective of social dance. Although social dance is for all genders, it has a gender stereotype [36], which may limit the participation of male students in social dance classes. The process evaluators seemed to agree on all five questions regarding the poster intervention.

Participants engaging in sports for less than 150 minutes at the one-month follow-up were more likely to believe that participating in sports helps them build social relationships, less likely to perceive that being tired is bad, and less likely to consider that participating in sports takes too much time after the intervention. The social dance video and poster interventions may have contributed to these findings because these two interventions had higher scores compared with the social dance class and email interventions in terms of reach, dose, and fidelity. Moreover, belief-targeted messages (i.e., "I thought it would be difficult, but it was so much fun to dance", "I can dance with friends, so it is more fun", "It does not take long so it does not interfere with my daily routine", and "I heard social dance is trend these days and a lot of celebrities are dancing. I want to try too.") included in the social dance and poster interventions may have motivated the students to have more positive attitudes toward sport participation [37].

The most important finding of this study was the significant change in the mean number of minutes of sport participation per week among students participating in sports for less than 150 minutes at the one-month follow-up. Only students who were less active before the intervention participated for a longer time in sports, which can be explained by the intervention effect. A previous review of physical activity interventions targeting tertiary education found significant effects on increasing physical activity minutes [14]; the 78.49 (range 63.82–142.31) minute change was higher than the results of a previous review. Furthermore, since the mechanisms of TPB hold that intention and behavior can change via attitudes, subjective norms, and perceived behavioral control, which are also affected by a combination of behavioral, normative, and control beliefs [38], interventions based on previously elicited salient beliefs may have influenced students to spend more time in sporting activities.

Despite our important findings, several study limitations must be addressed. First, there was a high dropout rate after the intervention period. Although a dropout rate of approximately half of the participants is considered common after a few months of intervention [39–41], readers must exercise caution when interpreting the results. Second, self-reported

surveys are susceptible to recall bias and social desirability. In this regard, future research should use more objective measures, such as heart rate monitors and pedometers. Third, the lack of a control group was another study limitation. Further evaluation using a randomized control design with a larger sample size is recommended. Fourth, this study cannot clarify which intervention contributed the most to increasing the mean minutes of sport participation, as we used four different intervention strategies. Nevertheless, process evaluation can help determine whether social dance videos and poster interventions were more effective at increasing sport participation than social dance classes and email interventions. Finally, the interventions implemented in 2019 were supposed to be delivered to all university students. However, as the COVID-19 pandemic spread rampantly in early 2020 in South Korea, face-to-face program implementation was considered risky; therefore, only emails with program information were sent to all undergraduate students. This failed intervention implementation probably explains why there was only a slight difference in the mean minutes of sport participation between the intervention and control groups. Therefore, further implementation of the program, including all interventions, is recommended.

## 5. Conclusions

Notwithstanding the abovementioned limitations, the findings of the present study demonstrate that social dance video and poster interventions may have positively influenced participants to become more likely to perceive that participating in sporting activities helps them build social relationships, less likely to believe that being tired is bad, and less likely to consider participating in sports takes too much time. In this regard, process evaluation played a key role in providing information about which intervention techniques have been found to be effective and to improve existing program implementation. Assessing intervention implementation can also generate important ideas of future health promotion interventions. Moreover, the significant change in mean minutes of sport participation among university students indicates that future research should implement the program in a larger population.

## Author contributions

JK conceived of the study and drafted the manuscript. JK and CGL performed the statistical analysis. SP, CA, and CGL helped draft the manuscript. SP and CA helped perform the statistical analysis. All authors read and approved the final version of the manuscript.

## Ethics approval and consent to participate

This study was approved by institutional review board of Seoul National University in each 2019 (IRB No. 1810/003-016) and 2020 (IRB No. 2007/003-002). Written consent was obtained from all participants and all methods were conducted according to relevant guidelines and regulations. All participants were informed about the study procedures if they agreed to participate in the study.

## Acknowledgment

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea.

## Funding

This work was supported by the National Research Foundation under Grant number (2017R1CB507448514).

## Conflict of interest

The authors declare no conflict of interest.

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