

Basic Psychological Need-Satisfying Activities During the COVID-19 Outbreak

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Author contributions

The corresponding author (B.B) come up with the idea for the paper, and invited co-author to collaborate, acquire the data, analysed the data, and wrote and edited the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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Abstract

Background: Rapidly spreading the novel coronavirus outbreak (COVID-19) worldwide may increase fear and stress, and cost to people's well-being and their motivation toward activities. In this study, we applied principles from Self-Determination Theory, to develop and test activities to satisfy basic psychological needs (autonomy, competence, and relatedness) to enhance the experience of need satisfaction, autonomous self-regulation, and subjective vitality, and to decrease the experience of need frustration, controlled self-regulation, amotivation, and perceived stress.

Method: Through a ten-days-long experimental research design among an Iranian sample ($N = 208$, $M_{age} = 23.52$, $SD = 5.00$), we randomly allocated participants to either an experimental (basic psychological need-satisfying activities intervention, $n = 98$) or a control (neutral comparison group, $n = 110$) condition.

Results: Repeated measure ANCOVA showed that participants in the experimental condition reported greater psychological need satisfaction, autonomous self-regulation, subjective vitality, and lesser psychological need frustration, amotivation, and perceived stress than did participants in the control condition.

Conclusion: We conclude that the intervention was successful in helping participants enhance their motives and well-being and reduce their stress when life is surrounded by uncertainty and during social distancing restrictions.

Keywords: Need satisfaction, motivational self-regulation, vitality, stressful situation.

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Introduction

Since December 2019 in China, the novel coronavirus (COVID-19) pandemic has spread across the world. As of April 27, 2020, more than three million cases confirmed in 210 countries, and the World Health Organization (WHO) made an international alarm to fight with COVID-19 ([WHO, 2020a](#)). Rapidly spreading the COVID-19 that could infect people with no symptoms and transmitting simply to others has created a fearful and stressful climate among all people (e.g., [Beaumont, Boseley, & Davidson, 2020](#); [Broom, Chongwang, & Castilhos, 2020](#)). During the COVID-19 times of crisis, to not infected and break chains of transmission and prevent the spread of disease, WHO emphasizes the importance of physical distances, while at the same time it has recommended social supports to all people ([WHO, 2020a, 2020b](#)). Although these recommendations are necessary to save lives and break the transmission of the disease, it may result in an emerging feeling of loneliness and cost to people's psychological well-being ([Brooks et al., 2020](#)). In this stressful situation, it is important to provide psychological interventions to cope with stress and help reproduce daily routine works ([Duan & Zhu, 2020](#)), as well as maintain people's motivation toward their activities. Moreover, psychological interventions would be most important in countries that are at a high level of infection and people may experience higher stress like Iran. In the current study, therefore, we employed self-determination theory ([SDT; Ryan & Deci, 2017](#)), to develop and test basic psychological need-satisfying (i.e., autonomy, competence, and relatedness) activities (e.g., try to do some activities to get basic psychological needs to fulfill, try to do something that makes you feel like you can help someone, and try to make a meaningful choice about what matters to you) to enhance the satisfaction of basic psychological needs, motivation toward activities, and subjective vitality and reduce stress.

Basic Psychological Needs

SDT is a macro-theory of motivation and well-being, which its prepositions received empirical supports in many countries ([Deci & Ryan, 1985](#); [Ryan & Deci, 2017](#)). Based on SDT, the satisfaction of basic psychological needs for *autonomy* (feeling volition and act with choice), *competence* (feeling effective and capable in doing things and influencing the environment), and *relatedness* (feeling significant and connected to others) are essential nutrients for high quality motivation and well-being. Research has shown that the satisfaction of these basic needs results in positive outcomes, such as engagement at activity, behavior change, and greater performance ([Ntoumanis et al., 2020](#); [Ryan, Patrick, Deci, & Williams, 2008](#)). The satisfaction of basic needs would most likely result from need-supportive environments across the lifespan, where people feel that social agents (e.g., teachers, coaches, and managers) support their basic needs ([Vansteenkiste & Ryan, 2013](#)). In contrast, when social environments would not create a need-supportive climate or thwart basic needs, it results in need frustration and negative outcomes. That is, need frustration would result from need-thwarting or need-indifference environments, and thus, it related to negative behaviors, such as depression and stress, and lower self-esteem ([Bhavsar et al., 2019](#); [Mageau et al., 2015](#); [Weinstein & Ryan, 2011](#)).

Basic psychological need-satisfying activities

According to SDT, social environments by supporting versus thwarting these basic needs would affect people's well-being versus ill-being, respectively ([Ryan & Deci, 2017](#)). In stressful situations like the current COVID-19, officials should provide a clear rationale, information, and altruistic choice to participate citizens voluntarily in programs recommended by health organizations (e.g., physical distance) and for understanding the situation ([Brooks et al., 2020](#)). However, in this difficult time, officials themselves and their nations are unprepared to deal with

un-predicting situations, thus, people may feel frustration and suffer from the stressor and subsequently may cost to their well-being ([Brooks et al., 2020](#); [Wang et al., 2020](#)). Therefore, an important question is how people can create a condition to satisfy their basic needs and motivate themselves, and subsequently cope with their stress during this difficult time of uncertainly? To do this, we tested an exploratory and easy to implement intervention to encourage individuals to satisfy their basic psychological needs through some activities ([Weinstein, Khabbaz, & Legate, 2016](#)) with samples from Iran. Moreover, the aim of providing activities was to encourage individuals to create a self-support climate for themselves to seek out activities to satisfy their basic psychological needs.

Based on SDT the satisfaction of basic needs result in intrinsically motivate toward the activities and greater wellness ([Ryan & Deci, 2017](#)). Rather than supporting from social agents, anyone can help himself or herself by thinking about how to get his or her needs satisfied, and can think about what to do to get their needs satisfied. To do this, one can develop relationships with others, focus on learning how to do things that one thinks is important for him or herself, and take responsibility for himself or herself ([Deci & Flaste, 1995](#); [Ryan & Deci, 2017](#); [Weinstein et al., 2016](#)). When people feel that their behaviors are truly chosen by themselves, feel a sense of autonomy; believe that their behaviors will lead to something desire and feel effective in doing that, feel a sense of competence; and volitionally engage in relationships, and giving and receiving support from others, feel a sense of relatedness ([Ryan & Deci, 2017](#)).

Motivational Self-Regulations

Based on SDT, when people feel that their basic needs are satisfied, they experience greater well-being and decrease ill-being, and this relation mediates by motivational self-regulation ([Ryan & Deci, 2017](#)). Within SDT, motivational self-regulation described in a continuum that

spans from amotivation (lack of any motivation and control) and controlled self-regulation (evade from a feeling of pride and guilt, and to avoid from external punishment and request) to autonomous self-regulation (personally value the activity, fully self-endorsed, and act base on interests and preferences). Research has shown that need-supportive environments related to the experience of need satisfaction and autonomous self-regulation, contrary, need-thwarting environments related to the experience of need frustration and controlled self-regulation and amotivation. Moreover, generally, autonomously regulating behaviors associated with positive outcomes, such as greater performance, persist at activities, and well-being, whereas, controlling behaviors and amotivation associated with less well-being and higher psychological distress ([e.g., Ntoumanis et al., 2020](#)).

The Present Study

In the current study, along with the experience of basic needs and motivations, we aimed to examine two outcome variables of subjective vitality and perceived stress. Subjective vitality refers to the feeling of being alert and vital, and having energy ([Ryan & Frederick, 1997](#)) that has been widely used as a measure of psychological well-being and fully functioning ([e.g., Behzadnia & Ryan, 2018](#)). Perceived stress, generally, refers to a combination of a stressor, stress reactivity, and the interaction between them, which is concern with the perceptions of the stressful events and the degree to which events and conditions in one's life appraised as stressful ([Greenberg, 2012](#)). Recent research has also found that stress plays as an important driver of behavior during the pandemic outbreak of COVID-19 ([Vindegaard & Benros, 2020](#)).

In this study, we investigated the effects of an easy-to-implement of a psychosocial intervention to encourage individuals to do need-satisfying activities during the COVID-19 stressful situation. This intervention is nonclinical in nature, but it offers a framework by which

people can do activities to satisfying their basic needs even when they are not receiving supports from others in a stressful situation. That is, we provided some need-satisfying activities for participants in the experimental condition, and we asked them to be creative in doing these activities. It was designed to help people to satisfy and re-discover their basic needs in order to autonomously motivate toward daily activities, increase vitality, and reduce stress during the difficult times of uncertainty of the COVID-19 spreading outbreak. Moreover, we aimed to help the individuals learn how to satisfy their basic psychological needs in a way that is achievable for them ([Weinstein et al., 2016](#)) while they must stay at home. That is, the interventions were small acts to enhance the experience of satisfying basic needs that is also achievable by them during social distancing restrictions at home. We, therefore, hypothesized that participants in the experimental condition (basic psychological need-satisfying activities intervention) would increase their experience of basic need satisfaction (H1a), autonomous self-regulation (H1b), and subjective vitality (H1c) than would participants in the no-intervention control condition. We also hypothesized that participants in the experimental condition would decrease their experience of need frustration (H2a), controlled self-regulation (H2b), amotivation (H2c), and perceived stress (H2d) than would participants in the no-intervention control condition.

Method

Participants and Procedures

Two hundred and fifty five participants (212 female and 43 male), age range 18 to 46 years old ($M_{\text{age}} = 23.98$, $SD = 5.22$) took part in this research during the last days of March, 2020, during the COVID-19 times of crisis in the North-Western of Iran. Participants were mostly university students and were recruited through their teachers, most of them were single (78.82%), and lived with their parents or spouse (98.00%).

One week before the beginning of the intervention, we contacted 6 teachers to ask students or people around them to attend the study, and then created two groups in WhatsApp mobile application to participate in the ten-days-long study (one group created for all participants of the experimental condition and one group created for all participants of the control condition). After that, 255 of the participants who were eligible and accepted to attend the study were allocated to the conditions (experimental condition, $n = 126$, control condition, $n = 129$). These 6 teachers were firstly randomly allocated to either the experimental or control condition by researchers (authors). Then, the students of the teachers who allocated to the experimental condition only must attend the experimental condition, and the students of the teachers who allocated to the control condition only must attend the control condition (see Figure 1). That means we tried to deliver the intervention only to the participants in the experimental condition. Participants in both conditions were informed that the study aimed to assess their psychological states during the COVID-19 time in general. Participants were asked to provide a consent form to attend the study, and they got assured about the anonymity and confidentiality of their responses. The inclusion criterion was being 18 years old or above, and the exclusion criteria were not having psychological symptoms (i.e., previously diagnosed with a psychological illness such as depression and psychotic disorders¹), infected with the COVID-19, and no background in attending with basic psychological needs activity programs (such as the one that we applied to this study). The Regional Research Ethics Committee of the University of Tabriz has approved the study protocol (IR.TABRIZU.REC.1399.014).

Please insert Figure 1 here

¹ Participants were asked to provide whether they previously diagnosed with a psychological illness or not.

Participants completed the study questionnaires over all three-wave of data collection. At Time 1 (the beginning of the study, *Pretest*), 255 participants completed all the questionnaires (need satisfaction and frustration, motivational self-regulation, subjective vitality, perceived stress, physical activity behaviors, and demographic information). At Time 2 (five days after the first day, *Mid-test*), 229 participants completed the questionnaires (subjective vitality and perceived stress), while 26 did not. The Time 2 dropout participants did not differ from autonomous and controlled self-regulation, but they scored higher on Time 1 need frustration, amotivation, and stress, and scored lower on Time 1 need satisfaction, subjective vitality, and physical activity behaviors. At Time 3 (ten days after the first day, *Posttest*), 208 of the participants completed all the questionnaires (need satisfaction and frustration, motivational self-regulation, subjective vitality, and perceived stress), while 21 of the Time 2 persisting participants did not. The Time 3 dropout participants did not differ from the persisting participants in the experimental condition on autonomous and controlled self-regulation and physical activity behaviors, but did score higher on Time 1 need frustration, amotivation, and perceived stress, and did score lower on Time 1 need satisfaction and subjective vitality. The Time 3 dropout participants also did differ from the persisting participants in the experimental condition on Time 2, they scored higher on perceived stress, and scored lower on subjective vitality. The dropout analyses were conducted through MANOVAs to examine the mean differences in study variables between dropout and persistent participants (see Supplementary file 1). Thus, the final sample of 208 participants represented a retention rate of 81.57% (255/208). This final sample consisted of 181 (87.02%) females and 27 (12.98%) males, and 98 (47.12%) in the experimental condition and 110 (52.88%) in the control condition. All participants were asked to complete online surveys designed in Google Docs and delivered via

WhatsApp groups. Also, all questions required to be answered by participants before submitting surveys, thus, there were no missing values.

Basic Psychological Need-Satisfying Activities Intervention

Based on SDT ([Ryan & Deci, 2017](#); [Weinstein et al., 2016](#)), ten suggested activities were provided for participants in the experimental condition (intervention), and they were instructed to follow the activities each day morning. That is, we send one activity each morning to the participants in the experimental condition (Table 1). Participants were provided some options on how to do the activities on each day, including, volitionally do the activities, choose different activities based on their interests or preferences that were also based on the main theme on that day, do the activities with family members (if possible), feel free to do the activity whenever they would prefer to do during the day, and they were provided some examples of activities to achieve their tasks. If they had any questions regarding the activities, they could ask Research Assistant (RA). We were also provided a general suggestion regarding health recommendations provided by WHO (e.g., washing hands). Participants in the control condition were only asked to complete online surveys three times as did participants in the intervention condition.

Please insert Table 1, here

Manipulation Checks

We assessed the fidelity of the need-satisfy activities intervention in two ways. First, participants were asked to complete a survey regarding doing daily activities each day, which included (1) “Have you done the activities yesterday?” (short answer “yes” or “no”), (2) “Have you felt that the activity was useful for you?” (range from 1 *un-useful*, to 5 *useful*), and (3) “What are your opinions about the activities? You can provide some feedback if you like”. Second, participants

reported their experiences of need satisfaction and need frustration at two times, beginning of the program (*pretest*) and at the end of the program (*posttest*).

Measures

Demographic information: To better assess the relations between variables and the influence of need-satisfying activities on study variables, we collected some demographic information of age, gender, marital status, living status, education level, and socioeconomic status. Socioeconomic status was assessed through the MacArthur Scale of Subjective Social Status ([Adler, Epel, Castellazzo, & Ickovics, 2000](#)), that assess individual socioeconomic status through a numbered stepladder image. We asked participants to choose the step where they located in their social community in terms of income, education, and occupation ranged from 1 (*lowest level*) to 10 (*highest level*).

Experience of basic psychological needs: Participants responded to the twelve-item shortened version ([Behzadnia, Adachi, Deci, & Mohammadzadeh, 2018](#)) of the basic psychological need satisfaction and need frustration scale ([BPNSNFS; Chen et al., 2015](#)). Each need was assessed with four items, of which two items tapped into the satisfaction of basic needs and two items tapped into the frustration of basic needs. Sample items included, “I felt a sense of choice and freedom in the things I undertook” (autonomy satisfaction), “I felt confident that I could do things well” (competence satisfaction), “I experienced a warm feeling with the people I spent time with” (relatedness satisfaction), “Most of the things I did felt like ‘I had to’ ” (autonomy frustration), “I felt insecure about my abilities” (competence frustration), and “I had the impression that people I spend time with disliked me” (relatedness frustration). For the present study, the stem of BPNSNF slightly adjusted to “During my daily activities...”. We measured a composite score of need satisfaction and need frustration by averaging the sum of the three

needs. Participants rated responses on a scale ranging from 1 (*not at all true*) to 7 (*completely true*). The shortened version of the BPNSNF had been translated and validated in Iranian samples by [Behzadnia et al. \(2018\)](#). The results of the internal structure of the BPNSNF were examined through the Confirmatory Factor Analysis (CFA). In the current study, with two higher-order factors of need satisfaction and need frustration, the model fitted the data reasonably well, $\chi^2 = (51) 123.54$; $p < .001$; RMSEA = .075; RMSEA 90% CI = .058 to .092; CFI = .95; SRMR = .05. All items were above .52, $p < .001$.

Motivational self-regulation: Participants' types of motivational self-regulation were assessed through the Perceived Locus of Causality ([PLC; Ryan & Connell, 1989](#)), that [Waterschoot, Vermote, Soenens, and Vansteenkiste \(in progress\)](#) adapted it to a specific activity. For the present study, we added items to assess amotivation ([Goudas, Biddle, & Fox, 1994](#)), and we slightly reworded some items to better reflect the current crisis (COVID-19), by adding the stem "When you are performing your activities during this crisis time of the novel coronavirus, how you try to motivate yourself?". Autonomous self-regulation was assessed by five items (e.g., "Discovering somethings small in my daily activities that is interesting for me"), controlled self-regulation was assessed by four items (e.g., "Thinking I will feel bad in the case I cannot bring my daily works to a close"), and amotivation was assessed by three items (e.g., "I used to have good reasons for doing my daily works, but now I am asking myself if I should continue doing it"). Participants responded to a scale ranging from 1 (*not at all true*) to 7 (*very true*). The original version of the PLC had been translated and validated in Iranian samples by [Behzadnia, Ahmadi, and Amani \(2017\)](#). Internal structure of this scale through the CFA with the proposed three higher-order factors of autonomous self-regulation, controlled self-regulation, and

amotivation, yielded a good fit to data, $\chi^2 = (49) 96.97$; $p < .001$; RMSEA = .06; RMSEA 90% CI = .04 to .08; CFI = .96; SRMR = .06. All items were above .40, $p < .001$.

Subjective Vitality: Participants' subjective vitality was assessed by the recommended five-item version of the Subjective Vitality Scale ([SVS; Ryan & Frederick, 1997](#)). Participants were asked, "To what degree do you typically feel each of the following...". The sample item includes "I Feel alive and vital". Participants responded to a scale ranging from 1 (*not at all true*) to 7 (*very much true*). This five-item version of the SVS had been previously used among Iranian samples ([Behzadnia & Ryan, 2018](#)). Internal structure of the SVS through CFA yielded a good fit to data, $\chi^2 = (4) 8.23$; $p = .08$; RMSEA = .065; RMSEA 90% CI = .00 to .13; CFI = 1.00; SRMR = .02. All items were above .60, $p < .001$.

Perceived stress: To measure participants' perceived stress, we used six negative items (i.e., negative stress) from the original Perceived Stress Scale ([Cohen, Kamarck, & Mermelstein, 1983](#)) that has been validated in several cultures, such as Iranian samples ([Safaei & Shokri, 2014](#)). Participants were asked, "During the past days, how much did you feel each of the following...". The sample item includes "Unable to control the important things in my life". Participants responded to a scale ranging from 1 (*never*) to 7 (*very often*). Internal structure of the scale through CFA yielded a satisfactory fit to data, $\chi^2 = (7) 19.70$; $p = .006$; RMSEA = .085; RMSEA 90% CI = .04 to .13; CFI = .98; SRMR = .04. All items were above .46, $p < .001$.

Physical activity behaviors: Through a brief two-questions physical activity assessment tool we evaluated participants' physical activity behaviors ([Marshall, Smith, Bauman, & Kaur, 2005](#)). Questions included: "How many times a week, do you usually do 20 min of vigorous physical activity that makes you sweat or puff and pant?", and "How many times a week, do you usually do 30 min of moderate physical activity or walking that increases your heart rate or makes you

breath harder than normal?”. This score shows sufficiently (score ≥ 4) or insufficiently (score 0–3) active participants. In the present study, we aimed to control for participants’ physical activity behaviors because previous research, generally, showed that physical activity behaviors related to both outcome variables evaluated in this study – that is, positively related to vitality (e.g., [Ju, 2017](#)) and negatively related to perceived stress (e.g., [McKenzie et al., 2012](#)).

Data Analysis

To assess the effects of the need-satisfying activities on participants’ experience of need satisfaction and need frustration, we conducted a pair of 2 (experimental and control conditions) \times 2 (time of assessment) repeated measures ANCOVAs (one for the experience of need satisfaction and one for the experience of need frustration). In these analyses, experimental and control conditions were served as the between-group independent variable and the time of assessment was the repeated within-group independent variables. The same processes in analyzing participants’ experience of need satisfaction and need frustration were used to test participants’ motivational self-regulation. To assess the effects of the need-satisfying activities on participants’ well-being (subjective vitality) and ill-being (perceived stress), we conducted a pair of 2 (experimental and control conditions) \times 3 (time of assessment) repeated measures ANCOVAs (one for subjective vitality and one for perceived stress).

As recommended by [Li, Stuart, and Allison \(2015\)](#), missing values were handled through multiple imputation method. To prevent multiple testing problem and inflation of Type I error in the pairwise comparisons, we used the Bonferroni post-hoc corrected t test and an alpha of $p = .007$ (family-wise error rate $\alpha = .05/7 = .007$). The comparisons along with 95% confidence interval (CI) for differences were reported. Mean scores adjusted for the covariates are shown in Figure 2 based on two conditions and time of assessment. The three covariates were gender,

physical activity behaviors, and SES. Before testing hypotheses, power analysis for two-condition repeated measures analysis was computed using G*Power version 3.1.9.2 ([Faul, Erdfelder, Buchner, & Lang, 2014](#)). Using $p = .05$ (power = .95), and an expected medium effect size (Cohen's d) of $d = .40$ among a set of 7 variables (plus the 3 statistical controls), determined that the minimal sample size would be 157. Because our sample size was $N = 255$ (at Time 1), we determined that we had sufficient statistical power to test our hypotheses.

Results

Based on the recommendation by [Tabachnick and Fidell \(2013\)](#), the univariate distributions of the study variables were examined, and they were normality distributed (Skewness and Kurtosis > 2). Table 2 presents the participants' demographic information at baseline (Time 1). Table 3 presents the descriptive statistics and internal consistency of the variables employed in the study in three waves, as well as the results of inter-correlations among the experimental condition and the major study variables.

Please insert Table 2 & 3, here

Preliminary analyses showed that age was not related to the study variables. The results showed that socioeconomic status (SES, $Mean = 5.49$, $SD = 1.59$), and physical activity behaviors ($Mean = 1.77$, $SD = 1.29$) were related to most of the study variables. Next, we conducted a MANOVA to examine the mean differences for gender, marital status (single and married), education level (high school graduate, undergraduate, master, and PhD) and physical activity behaviors. Because of the unequal sample sizes on participants' gender (female = 83.14%), marital status (single = 78.82%), and education levels (undergraduate = 79.61%), the assumptions of equality of variances were checked through Levene's test. The results showed that there were differences between males and females, $F(18, 178) = 2.21$, $p = .004$, $\eta_p^2 = .18$.

Female reported higher controlled self-regulation at *pretest*, $F(1, 196) = 5.49, p = .02, \eta_p^2 = .03$, compared to males. Further, females were lower on stress, $F(1, 196) = 3.97, p = .048, \eta_p^2 = .02$, and need frustration at *posttest*, $F(1, 196) = 6.41, p = .012, \eta_p^2 = .03$, than males. The results also showed that participants were not different based on their marital status, $F(18, 178) = .76, p = .7, \eta_p^2 = .07$, and education level ($F(18, 178) = 1.24, p = .12, \eta_p^2 = .11$), on the study variables. Giving these results, we included gender, physical activity behaviors, and SES as covariates in the main analyses.

Participants' Experience of Need Satisfaction and Need Frustration (Manipulation Check)

For *participants' experience of need satisfaction*, as expected, the interaction of time \times condition, $F(1, 203) = 7.72, p = .006, \eta_p^2 = .04$, the main effect for time, $F(1, 203) = 8.95, p = .003, \eta_p^2 = .04$, and the main effect for condition $F(1, 203) = 20.85, p < .001, \eta_p^2 = .09$, were significant. As illustrated in Figure 2 (a), the experience of need satisfaction increased significantly for the participants in the experimental condition from Time 1 (*pretest*) to Time 3 (*posttest*) ($p = .001, d = .30, 95\% \text{ CI } [0.12, 0.46]$), whereas it remained unchanged for the participants in the control condition from *pretest* to *posttest*. Moreover, the two conditions did not differ at *pretest*, but participants in the experimental condition showed significantly higher need satisfaction than participants in the control condition at *posttest* ($p < .001, d = .78, 95\% \text{ CI } [0.50, 1.07]$).

For *participants' experience of need frustration*, the main effect for time, $F(1, 203) = 5.11, p = .025, \eta_p^2 = .03$, and the main effect for condition, $F(1, 203) = 9.21, p = .003, \eta_p^2 = .04$, were significant, but the main effect for interaction of time \times condition was not significant. As illustrated in Figure 2 (b), the experience of need frustration decreased for the participants in the experimental condition from *pretest* to *posttest*, but it was not significant, whereas it remained unchanged for the participants in the control condition from *pretest* to *posttest*. Moreover, the

two conditions did not differ at *pretest*, but participants in the experimental condition showed significantly lesser need frustration than participants in the control condition at *posttest* ($p < .001$, $d = .49$, 95% CI [-0.90, -0.26]).

In addition, the next way to assess the fidelity of the intervention showed that participants in the experimental condition reported that, generally, they actively participated in the activities more than 91%, and they reported that the activities were useful for them. They also noted some positive opinions, such as “It was really good for me” and “I would like to continue activities even after the program end”, which details are presented in Supplementary file 2.

Please insert Figure 2, here

Participants' Motivational Self-Regulation

For *participants' autonomous self-regulation*, the interaction of time \times condition, $F(1, 203) = 8.54$, $p = .004$, $\eta_p^2 = .04$, and the main effect for condition, $F(1, 203) = 21.64$, $p < .001$, $\eta_p^2 = .10$, were significant, but the main effect for time was not significant. As illustrated in Figure 2 (c), autonomous self-regulation increased significantly for the participants in the experimental condition from *pretest* to *posttest* ($p < .001$, $d = .43$, 95% CI [0.24, 0.63]), whereas it remained unchanged for the participants in the control condition from *pretest* to *posttest*. Moreover, the two conditions did not differ at *pretest*, but participants in the experimental condition showed significantly higher autonomous self-regulation than participants in the control condition at *posttest* ($p < .001$, $d = .85$, 95% CI [0.58, 1.19]).

For *participants' controlled self-regulation*, none of the main effect for the interaction of time \times condition, $F(1, 203) = 2.58$, $p = .11$, $\eta_p^2 = .01$, the main effect for time, $F(1, 203) = .09$, $p = .7$, $\eta_p^2 = .00$, and the main effect for condition, $F(1, 203) = 2.47$, $p = .12$, $\eta_p^2 = .01$, were significant (Figure 2 (d)). Therefore, based on these non-significant results, and to reduce Type 1

error, we could not analysis changes over time, and compare means of controlled self-regulation between two conditions.

For *participants' amotivation*, the interaction of time \times condition was significant, $F(1, 203) = 4.80, p = .03, \eta_p^2 = .02$. The main effect for condition was marginally significant, $F(1, 203) = 3.30, p = .071, \eta_p^2 = .02$, but the main effect for time was not significant. As illustrated in Figure 2 (e), amotivation decreased for the participants in the experimental condition from *pretest* to *posttest* ($p = .042, d = .29, 95\% \text{ CI } [-0.64, -0.01]$), but it was not significant based on the Bonferroni correction ($p < .007$), whereas it remained unchanged for the participants in the control condition from *pretest* to *posttest*. Moreover, the two conditions did not differ at *pretest*, but participants in the experimental condition showed significantly lesser amotivation than participants in the control condition at *posttest* ($p = .006, d = .40, 95\% \text{ CI } [-0.92, -0.16]$).

Participants' Well-Being and Ill-Being

For *participants' subjective vitality*, the interaction of time \times condition, $F(2, 202) = 4.71, p = .009, \eta_p^2 = .02$, and the main effect for condition was significant, $F(1, 203) = 31.54, p < .001, \eta_p^2 = .13$, but the main effect for time was not significant. As illustrated in Figure 2 (f), subjective vitality increased significantly for the participants in the experimental condition from Time 1 (*pretest*) to Time 2 (*mid-test*) ($p = .006, d = .31, 95\% \text{ CI } [0.08, 0.64]$), and from Time 1 (*pretest*) to Time 3 (*posttest*) ($p < .001, d = .36, 95\% \text{ CI } [0.16, 0.67]$), but remained unchanged from *mid-test* to *posttest*, whereas it remained unchanged for the participants in the control condition from *pretest* to *mid-test*, from *mid-test* to *posttest*, and from *pretest* to *posttest*. Moreover, the two conditions did not differ at *pretest*, but participants in the experimental condition showed significantly higher subjective vitality than participants in the control condition at *mid-test* ($p < .001, d = .75, 95\% \text{ CI } [0.60, 1.23]$), and at *posttest* ($p < .001, d = .77, 95\% \text{ CI } [0.59, 1.24]$).

For *participants' perceived stress*, the interaction of time \times condition, $F(2, 202) = 7.34, p = .001, \eta_p^2 = .04$, the main effect for time, $F(2, 202) = 5.48, p = .005, \eta_p^2 = .03$, and the main effect for condition, $F(1, 203) = 14.32, p < .001, \eta_p^2 = .07$, were significant. As illustrated in Figure 2 (g), perceived stress decreased significantly from *pretest* to *mid-test* ($p = .006, d = .45, 95\% \text{ CI } [-0.96, -0.28]$), and from *pretest* to *posttest* ($p < .001, d = .48, 95\% \text{ CI } [-1.03, -0.34]$), but it was remained unchanged from *mid-test* to *posttest*, whereas it remained unchanged for the participants in the control condition from *pretest* to *mid-test*, from *mid-test* to *posttest*, and from *pretest* to *posttest*. Moreover, the two conditions did not differ at *pretest*, but participants in the experimental condition showed significantly lesser perceived stress than participants in the control condition at *mid-test* ($p < .001, d = .73, 95\% \text{ CI } [-1.38, -0.65]$), and at *posttest* ($p < .001, d = .53, 95\% \text{ CI } [-1.21, -0.38]$).

Discussion

Helping people learn how to satisfy their basic psychological needs represents a key element in coping with and manage stress and maintain their vitality in stressful situations. In this research, we aimed to use activities that facilitate the experience of need satisfaction and implement an intervention fulfilling this objective, in accord with SDT recommendations ([Ryan & Deci, 2017](#)). With this objective in mind, we pursued two goals during the stressful situation of the novel coronavirus outbreak spreading. First, we hypothesized the effectiveness of basic psychological need-satisfying activities intervention to increase the experience of need satisfaction, autonomous self-regulation, and subjective vitality of the participants in the experimental condition relative to the participants in the no-intervention control condition. Second, we hypothesized that participants in the experimental condition decrease their experience of need frustration, controlled self-regulation, amotivation, and perceived stress than the participants in

the control condition. Consistent with expectations, generally, the effects of the activities to satisfy basic needs were successful. The results showed that participants in the experimental condition displayed significantly higher need satisfaction and lesser need frustration, than were participants in the control condition. These results are consistent with the SDT proposition ([Ryan & Deci, 2017](#)) – that is, activities that create a climate to fulfill basic needs for autonomy, competence, and relatedness result in positive outcomes in two ways, first, it can result in the experience of need satisfaction and, second, it can prevent or decrease the experience of need frustration. We found that the satisfaction of basic needs is essential for greater well-being, and reduces stress, in a stressful situation. Thus, the activities that help individuals to satisfy their basic needs not only decrease the experience of need frustration and psychological distress ([Weinstein et al., 2016](#)), but also help to experience need satisfaction and greater well-being.

The results showed that autonomous self-regulation increased from pretest to posttest in the experimental condition. Participants in the experimental condition also reported higher autonomous self-regulation relative to participants in the control condition. The interpretation is, generally, the effect of need-satisfying activities or somewhat a self-support approach to satisfy basic needs was similar with previous research that has found support from social agents (e.g., teachers and managers) positively affect people's autonomous regulation and positive outcomes (e.g., [Behzadnia, Mohammadzadeh, & Ahmadi, 2019](#); [Slemp, Kern, Patrick, & Ryan, 2018](#)). In other words, when individuals feel that they could choose an activity and freely make decisions about it, feel effective in doing that, and help others in doing the activities, they enjoy the activity and put importance on doing that activity, and thus, they experience greater vitality. It is also worth noting that autonomously reasons for doing activities would prevent people from negative affects and stress, even during social distancing. If people volitionally chose to be alone, they can

feel relaxed and reduce stress ([Nguyen, Ryan, & Deci, 2018](#)). It means that people still can experience vitality and reduce stress when they are alone and during social distance restrictions if they actively chose what to do. Thus, autonomously regulating behaviors would associate with greater vitality and lesser stress during social distancing.

The results also showed that, unexpectedly, controlled self-regulation did not change among participants. Previous research in the area of physical activity found that controlled regulation neither changed results from need-supportive interventions nor related to positive outcomes ([Aelterman et al., 2012](#); [Behzadnia et al., 2019](#)). In the current study, we asked participants to do some activities each day, and this might be interpreted by participants as an external voice or suggestion, so that they may push themselves to do things based on the activities that were provided for them. They may see the activities either as an external contingency to be included in the group or as a way to experience greater vitality and lesser stress. So, that is why controlled self-regulation has remained unchanged among participants, as well as related positively to their subjective vitality and related negatively to stress at the posttest.

Moreover, during social isolation enforcement participants may experience the frustration of their basic needs, and to prevent this, they may find the activities interesting and important. For example, they might force themselves to do some hard works, such as waking up early morning to follow and do things in a way that was provided for them in the group. By doing this, they actually could control themselves to thrive to get those goals. However, this finding needs to be replaced by future research, through longitudinal research or long-term intervention design.

Participants in the experimental condition also reported that their amotivation decreased from pretest to posttest (marginally), and it was lower than the participants in the control

condition at posttest. In line with SDT's notion that the experience of need satisfaction associates with a decrease in amotivation ([Ryan & Deci, 2017](#)), suggesting that need-satisfying activities effectively reduce individuals' amotivation. Thus, these findings represent an effective approach to individuals' motivational regulations, as it increased autonomous motivation, and decreased amotivation.

We believe that the most important contribution of the current study is that need-satisfying activities increased subjective vitality and decreased perceived stress. These results suggest that need-satisfying activities are important for people during difficult times, and specifically during the current novel coronavirus outbreak. In this study, we assessed subjective vitality because it has some important implications, first, when one feels energized and vitality in doing an activity, he or she most likely persist at that activity ([Deci & Ryan, 2008](#)), second, higher subjective vitality relates to healthier physiological and immunological functioning of the human body ([Ryan & Deci, 2008](#)) and, third, the more one has subjective vitality, the less experience psychological distress and the higher resilience in coping with stress ([Ryan & Deci, 2008](#)). Perceived stress was also assessed with the same level of importance. That is, research has shown that higher stress may have major influences upon both psychological and physical well-being, for example, higher stress decreases immunological functioning ([Greenberg, 2012](#)).

Practical Implications and Study Limitations

The current research suggests that need-satisfying activities help individuals' needs get fulfilled, autonomously motivated toward daily activities, and experience greater well-being, and cope with stress. Psychologists or mental health professionals would encourage their clients or people to use these need-satisfying activities to cope with and reduce stress and enhance their subjective vitality. That is, while people during the current difficult time of the novel coronavirus outbreak

need to stay at home or maintain social distancing even after the government breaks up restrictions, they can still thrive to get their basic needs fulfilled, and doing so help them to experience greater well-being and reduce stress. This intervention provides an opportunity for psychologists or clinicians and mental health professionals to even deliver it to those infected by the novel coronavirus that may suffer from psychological distress, so, it might help them to back to their normal life, meanwhile, this needs future consideration. Moreover, these need-satisfying activities may help individuals to be self-orientated to support him/herself to satisfy basic needs during difficult times. When people are learned how to do the activities that help them satisfy their basic needs, that activities may also enhance their awareness in choosing and doing activities. So, future research would examine how need-satisfying activities contribute to their awareness or mindfulness. It is also important to examine the relations of this approach to well-being and ill-being through the structural equation modeling or growth curve models. In this study, we could not examine the relations through this approach because of the relatively small sample size for it. Because of rapidly spreading the novel coronavirus, we preferred to not wait for a long time for more participants to attend the study.

It is also important to note that we tried to provide the intervention only to the participants in the experimental condition. To control that participants in the no-intervention control condition have not engaged in need-satisfying activities outside the study, we asked them to report their need satisfaction and need frustration; and their experience of need satisfaction was lesser than participants in the experimental condition.

The current study is among the first to apply a motivational approach through need-satisfying activities during the difficult time of the novel coronavirus. Findings show casual support for the link between basic needs, motivational self-regulation, and well-being. This study

highlighted an encouraging approach in this stressful situation. Rapidly growing the novel coronavirus pandemic makes people psychologically vulnerable and fearful of that in all regions. Thus, these promising results can help people to engage in their activities and energize them to find ways to thrive.

Besides, as the results of correlations have shown, age was not related to the study variables, so, we can generalize these findings to all ages, especially age range from 18 to 46 years old, and rely on this intervention to enhance vitality and reduce stress. However, while we tried to ensure and maximize the generalizability of this intervention and we sampled individuals from the different age range, the majority of participants were student and female, and they were a self-selected sample. Therefore, we must cautious in generalizing these findings to the broader population. It would be good to replace these findings with samples from different age ranges, for example among school students, older population, or employees as well as investigate less educated samples to test the effectiveness of this intervention. It would also be interesting to test the applicability and generalizability of this intervention among different cultures.

Conclusion

In the current study, we took an SDT-based approach to test activities to satisfy basic psychological needs during the novel coronavirus spreading outbreak among an Iranian sample. By doing so, individuals could experience greater vitality and cope with and reduce stress. Overall, our hypotheses received support, as the results showed that this intervention positively increased the experience of need satisfaction, autonomous self-regulation, and subjective vitality, whereas it decreased the experience of need frustration, amotivation, and perceived stress.

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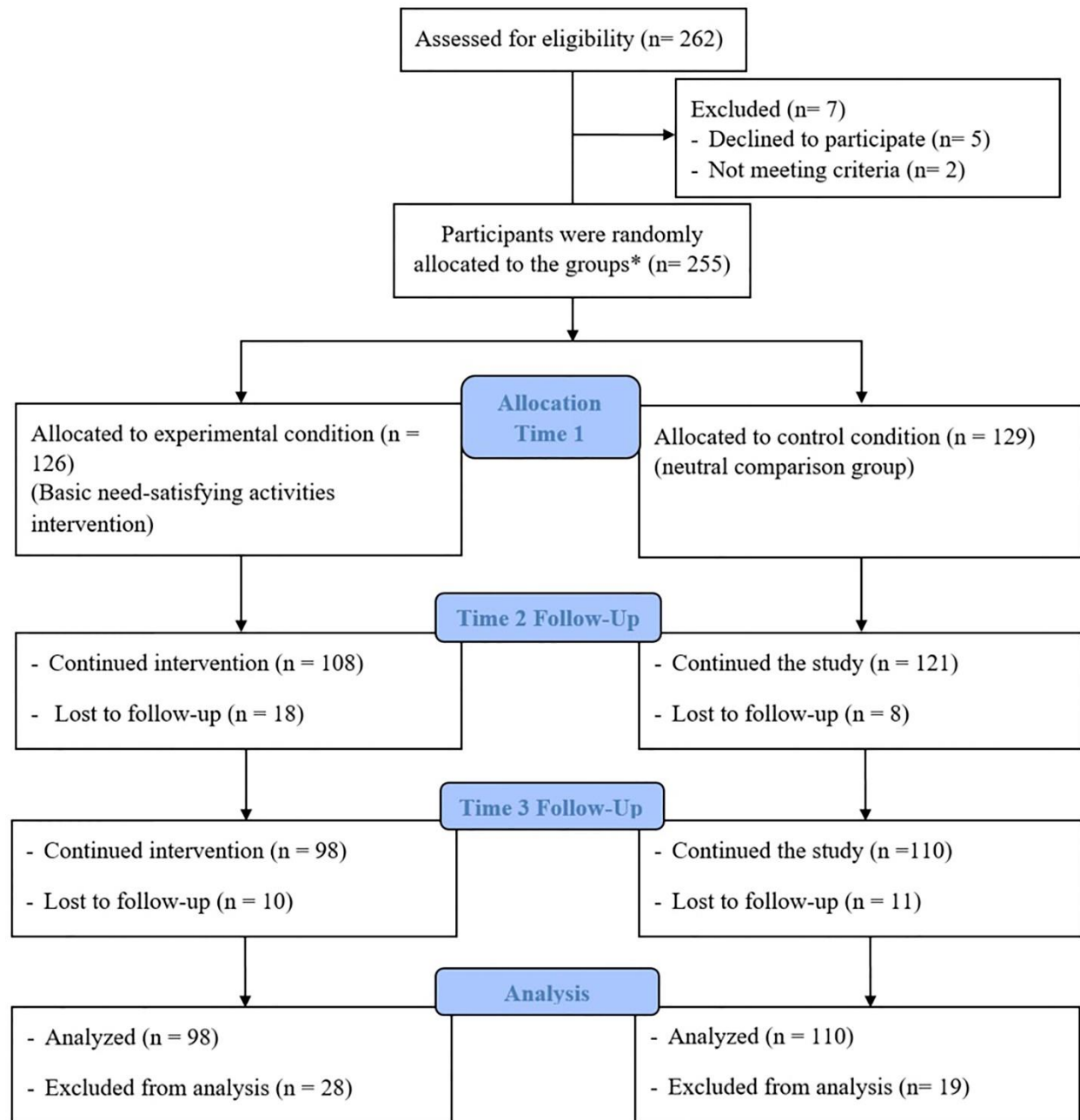


Figure 1, Participants flowchart. * Teachers of the participants were randomly allocated to groups.

Table 1, Instructions of basic psychological need-satisfying activities intervention

| Days | Interventions |
|---|--|
| Day 1 (Autonomy, competence, relatedness) | Today, try to do something that you have done before that has been a challenge for you, but something that you feel you can do it successfully (e.g. doing a specific exercise, or making a special dish or cake). To do this, firstly try to do yourself, create a condition for those around you (e.g., family members and your friends) to able to do this, and then encourage and support surroundings to do that. |
| Day 2 (Autonomy, relatedness) | Today, try to do something that makes you feel like you can help someone (e.g. teaching someone an important task though a simple thing). To do this, try to feel responsible for teaching it today, and encourage and support those around you (or even yourself), to teach that to others, and try to create a condition for your family members (or your friends) to make effort and perform that. |
| Day 3 (Relatedness) | Today do something that makes you feel good in connection with nature, and inspiring from it to do your daily activities (such as making a pot or flower at home, or arranging pots). To do this, try to make a good connection with nature, and encourage/support those around you (e.g., like family members or friends) to perform it; meanwhile, try to be less in touch with artificial things like television and mobile. |
| Day 4 (Autonomy, relatedness) | Today, try to use positive dialogues with others, so that speak positively about your feelings and thoughts (e.g., using words like “How good is that you are here”, or appreciating others). To fulfill this, try to use only positive words in your daily interaction with others, and encourage/support those around you to do so, in the meantime, neither try to think about negative events and dialogues nor judge them. |
| Day 5 (Autonomy, competence, relatedness) | Today, try to make a meaningful choice about what matters to you, even if it is a very small thing (e.g., the decision to attain a goal like a healthy lifestyle or learning a foreign language, or make a plan or a framework for your works). To do this, try both to make meaningful choices for yourself, and to encourage/support those around you. Try to create a condition to fulfill it for those around you (e.g., family members and friends). |
| Day 6 (Competence) | Today, try to come up with creative work or ideas for the first time. Let yourself to enjoy and surprise with the result (e.g., making something or a device with your extras at home, or any other creative stuff). To fulfill this, both do it yourself and encourage/ support those around you to do so. Try to create a condition for those around you (e.g., family members and friends) to perform it well. |
| Day 7 (Autonomy, competence, relatedness) | Today, try to do joyful exercise with family members. At the same time have a smile during exercise. Don't think about anything else than exercise and just smiling and think about your breathing. Try to encourage/support those around you, regardless of whether they perform well or poor the exercise. If you are alone at home, try to do this online by creating a group via social media applications, such as Skype or WhatsApp. |
| Day 8 (Competence, relatedness) | Try to share an experience or an event with others that have directed your life, and made it meaningful. Share your compelling experiences with others so they may be useful and positive for them too. |
| Day 9 (Autonomy, competence, relatedness) | Today, try to do your favorite personal activities, things that you would like to do, but remember to be active and transfer your positive energy to the people around you, and in the meantime try to focus on your daily activities (e.g., like studying, job stuffs, doing exercises, or help your family members). |
| Day 10 (Autonomy, competence, relatedness) | Today, try to write a paragraph (or how much you want) about your emotions, thoughts, and experiences during these ten-days and share it with ones you love or whomever you think that it can be useful for them in such days. Always keep in your mind that: one of the greatest and most beautiful feelings in the world is to be compassionate and kind; There is always time to live well, so you can just start it and remind it to others as well; Determine the best things in your life by yourself, and finally try to be the best within yourself. |

Table 2. Demographic characteristics of participants at baseline

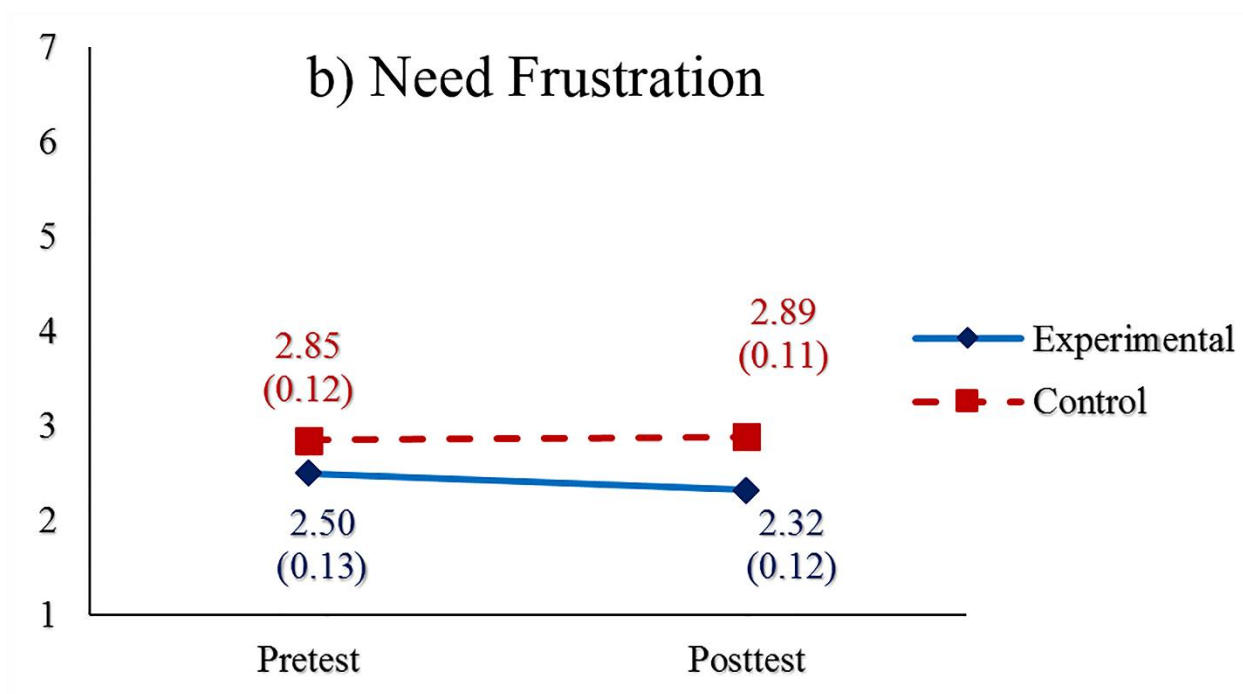
| | Experimental condition (<i>n</i> = 126) | Control condition (<i>n</i> = 129) | Total sample (<i>n</i> = 255) |
|---------------------------------------|---|--|-----------------------------------|
| Age, year (<i>M</i> ± <i>SD</i>) | 23.53 ± 5.05 | 24.42 ± 5.36 | 23.98 ± 5.22 |
| Gender (Female, <i>n</i> (%)) | 107 (84.92%) | 105 (81.40%) | 212 (83.14%) |
| Marital (Single, <i>n</i> (%)) | 104 (82.54%) | 97 (75.19%) | 201 (78.82%) |
| SES (<i>M</i> ± <i>SD</i>) | 5.63 ± 1.60 | 5.34 ± 1.57 | 5.49 ± 1.59 |
| Education (<i>n</i> (%)) | | | |
| High school graduate | 1 (.79) | 1 (.78) | 2 (.78%) |
| Collage degree | 104 (82.54%) | 99 (76.74%) | 203 (79.61%) |
| Master degree | 16 (12.70%) | 20 (15.50%) | 36 (14.12%) |
| PhD | 5 (3.97%) | 9 (6.98%) | 14 (5.49%) |
| Physical activity behaviors, <i>M</i> | 1.81 | 1.73 | 1.77 |

Note: SES = Socioeconomic status.

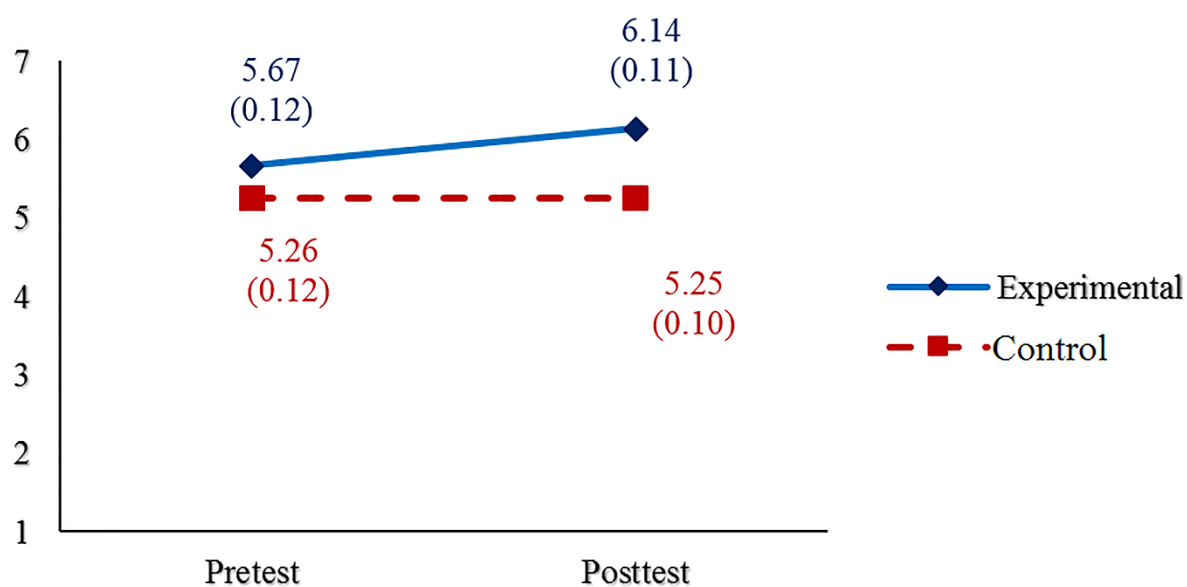
Table 3, Descriptive statistics, internal consistency, and correlation among experimental condition and the study variables in three waves

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|----|-------------------------------|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| 1 | Experimental condition | - | | | | | | | | | | | | | | | | | |
| | <i>Time 1</i> | | | | | | | | | | | | | | | | | | |
| 2 | Need satisfaction | -.10 | .87 | | | | | | | | | | | | | | | | |
| 3 | Need frustration | .10 | -.57 | .85 | | | | | | | | | | | | | | | |
| 4 | Autonomous SR | -.11 | .48 | -.27 | .85 | | | | | | | | | | | | | | |
| 5 | Controlled SR | -.07 | .41 | -.19 | .43 | .73 | | | | | | | | | | | | | |
| 6 | Amotivation | .02 | -.37 | .50 | -.20 | -.20 | .72 | | | | | | | | | | | | |
| 7 | Vitality | -.10 | .70 | -.52 | .54 | .42 | -.44 | .90 | | | | | | | | | | | |
| 8 | Stress | .09 | -.37 | .64 | -.19 | -.09 | .45 | -.47 | .86 | | | | | | | | | | |
| | <i>Time 2</i> | | | | | | | | | | | | | | | | | | |
| 9 | Vitality | -.38 | .48 | -.34 | .53 | .35 | -.30 | .66 | -.29 | .92 | | | | | | | | | |
| 10 | Stress | .36 | -.31 | .37 | -.18 | -.07 | .26 | -.38 | .50 | -.48 | .89 | | | | | | | | |
| | <i>Time 3</i> | | | | | | | | | | | | | | | | | | |
| 11 | Need satisfaction | -.37 | .66 | -.53 | .36 | .26 | -.21 | .57 | -.34 | .58 | -.36 | .88 | | | | | | | |
| 12 | Need frustration | .27 | -.49 | .66 | -.26 | -.16 | .39 | -.47 | .43 | -.39 | .46 | -.66 | .86 | | | | | | |
| 13 | Autonomous SR | -.39 | .40 | -.30 | .52 | .33 | -.16 | .48 | -.19 | .67 | -.25 | .61 | -.45 | .90 | | | | | |
| 14 | Controlled SR | -.18 | .34 | -.26 | .42 | .61 | -.21 | .45 | -.15 | .51 | -.13 | .44 | -.31 | .58 | .73 | | | | |
| 15 | Amotivation | .21 | -.39 | .39 | -.24 | -.19 | .42 | -.41 | .32 | -.38 | .34 | -.52 | .60 | -.42 | -.36 | .74 | | | |
| 16 | Vitality | -.39 | .50 | -.42 | .45 | .36 | -.26 | .66 | -.33 | .70 | -.37 | .71 | -.58 | .71 | .57 | -.55 | .91 | | |
| 17 | Stress | .28 | -.38 | .48 | -.20 | -.15 | .31 | -.45 | .60 | -.38 | .72 | -.54 | .63 | -.32 | -.21 | .55 | -.55 | .92 | |
| 18 | Physical activity | -.03 | .26 | -.19 | .16 | .15 | -.14 | .30 | -.14 | .19 | -.01 | .12 | -.07 | .08 | .16 | -.09 | .15 | -.02 | .75 |
| 19 | SES | -.09 | .34 | -.26 | .16 | .22 | -.23 | .31 | -.28 | .23 | .20 | .21 | -.22 | .05 | .15 | -.09 | .21 | -.20 | .06 |
| | <i>Descriptive statistics</i> | | | | | | | | | | | | | | | | | | |
| | Experimental condition | <i>M</i> | 5.44 | 2.70 | 5.53 | 4.89 | 2.83 | 5.09 | 3.93 | 5.79 | 3.09 | 6.00 | 2.27 | 6.14 | 5.23 | 2.30 | 5.90 | 3.03 | - |
| | | <i>SD</i> | 1.24 | 1.40 | 1.28 | 1.32 | 1.63 | 1.53 | 1.40 | 1.06 | 1.37 | 0.85 | 1.09 | 0.83 | 1.10 | 1.38 | 1.00 | 1.52 | - |
| | Control condition | <i>M</i> | 5.19 | 2.98 | 5.27 | 4.69 | 2.89 | 4.79 | 4.20 | 4.79 | 4.17 | 5.15 | 2.94 | 5.25 | 4.79 | 2.88 | 4.90 | 3.91 | - |
| | | <i>SD</i> | 1.51 | 1.31 | 1.26 | 1.43 | 1.47 | 1.42 | 1.51 | 1.35 | 1.41 | 1.15 | 1.25 | 1.25 | 1.32 | 1.14 | 1.35 | 1.47 | - |

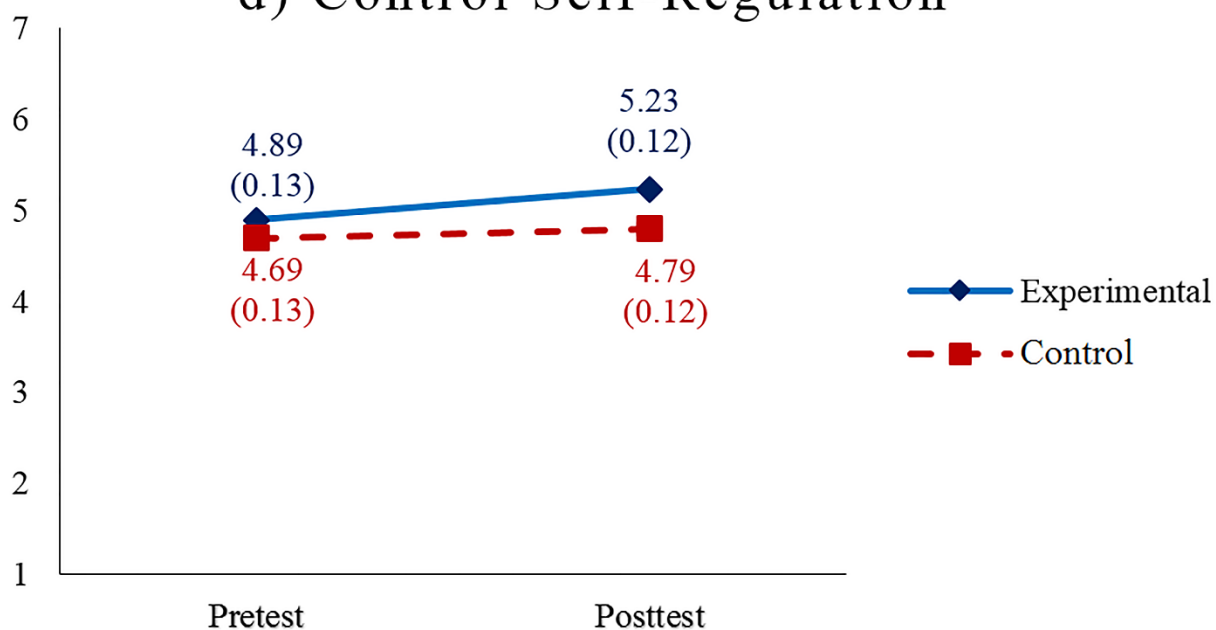
Note: Autonomous SR, autonomous self-regulation. Controlled SR, controlled self-regulation. SES, socioeconomic status. Values equal and above .14 are significant at $p < .05$, values above .18 are significant at $p < .01$, and values above .22 are significant at $p < .001$. Italic values are Cronbach's alpha.

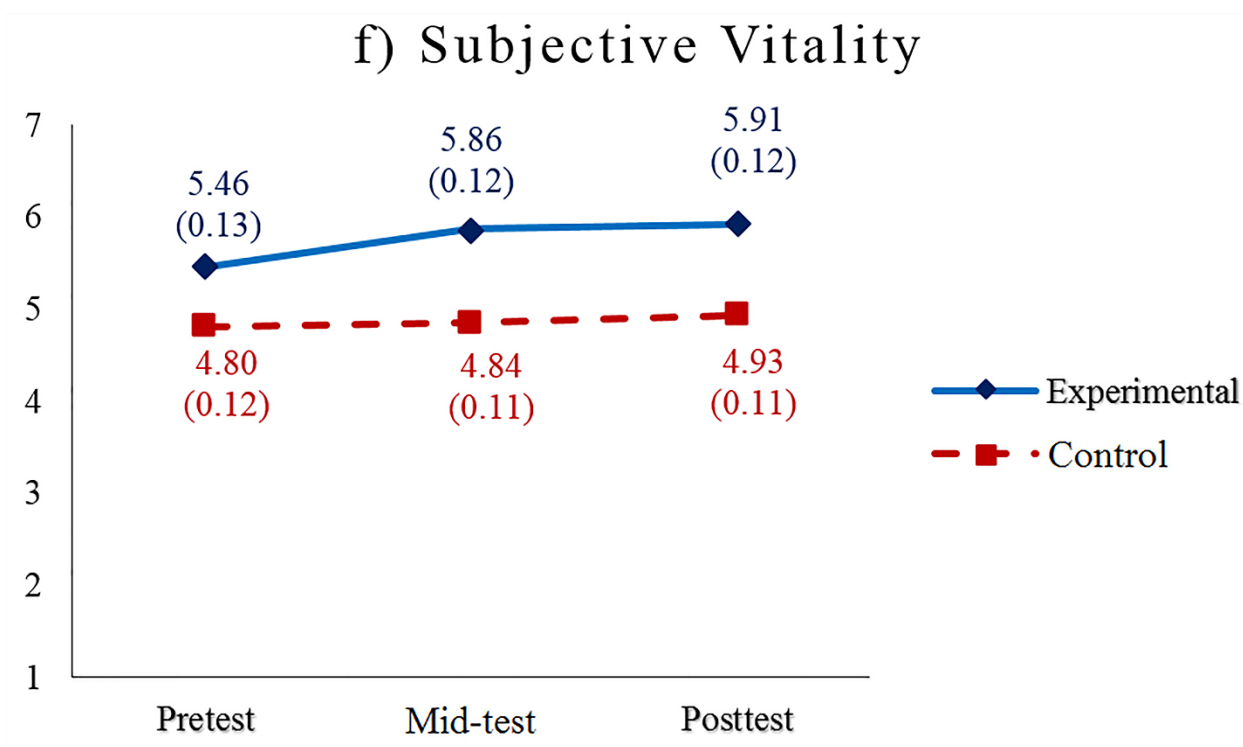
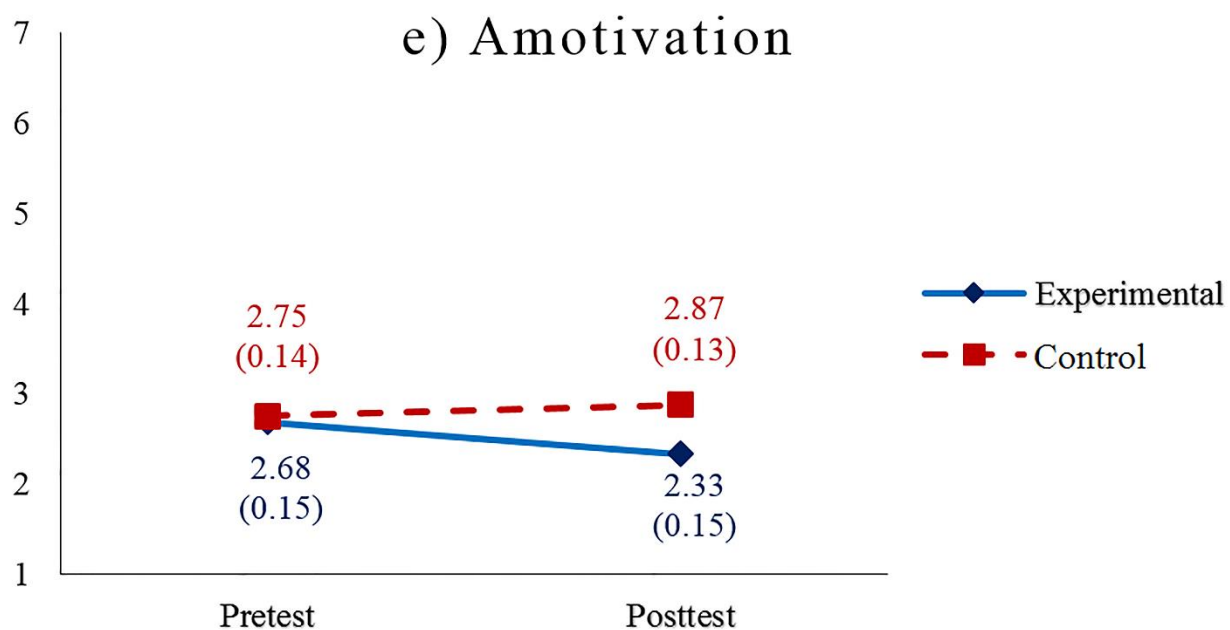


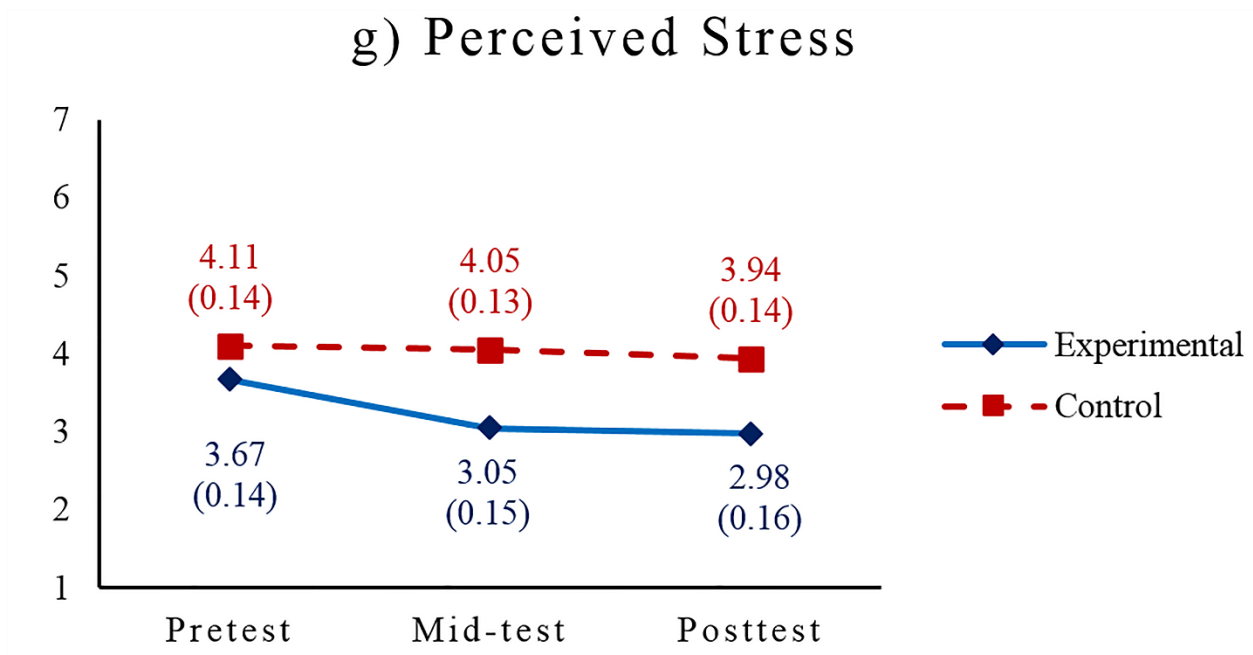
c) Autonomous Self-Regulation



d) Control Self-Regulation







Supplementary files

Supplementary file 1, comparison between dropout and persistent participants on the study variables

| | Time 2 vs. Time 1 | | | Time 3 vs. Time 1 | | | Time 3 vs. Time 2 | | |
|----------------------------|--|--|-------------------|--|---|-------------------|---|---|-------------------|
| | Persistent participants (<i>n</i> = 229) | Dropout participants (<i>n</i> = 26) | <i>F</i> (1, 253) | Persistent participants (<i>n</i> = 208) | Drop out participants (<i>n</i> = 21) | <i>F</i> (1, 253) | Persistent participants (Experimental condition) (<i>n</i> = 98) | Drop out participants (<i>n</i> = 26) | <i>F</i> (1, 122) |
| Need satisfaction | 5.42 (1.18) | 4.40 (1.29) | 16.86*** | 5.41 (1.19) | 4.87 (1.30) | 7.60* | | | |
| Need frustration | 2.69 (1.27) | 4.50 (1.36) | 34.90*** | 2.68 (1.27) | 3.57 (1.53) | 17.20*** | | | |
| Autonomous self-regulation | 5.44 (1.25) | 5.11 (1.44) | 1.55 | 5.45 (1.25) | 5.19 (1.37) | 1.64 | | | |
| Controlled self-regulation | 4.78 (1.37) | 4.86 (1.44) | .12 | 4.76 (1.38) | 4.89 (1.39) | .35 | | | |
| Amotivation | 2.73 (1.47) | 4.04 (1.77) | 17.74*** | 2.72 (1.47) | 3.51 (1.73) | 10.43*** | | | |
| Vitality | 5.08 (1.44) | 3.66 (1.14) | 23.41*** | 5.07 (1.44) | 4.32 (1.50) | 10.23** | 5.88 (0.97) | 4.89 (1.37) | 18.24*** |
| Stress | 3.92 (1.39) | 5.39 (1.44) | 26.15*** | 3.92 (1.41) | 4.74 (1.51) | 12.69*** | 3.08 (1.43) | 4.24 (1.44) | 13.42*** |
| Physical activity | 1.83 (1.30) | 1.21 (1.07) | 5.46* | 1.79 (1.29) | 1.66 (1.30) | .41 | | | |

Supplementary file 2, participants' reports about the activities

| | 1. Have you done the activities yesterday? | 2. Have you felt that the activity was useful for you? | 3. What are your opinions about the activities? |
|--------|--|--|--|
| Day 1 | 91.49 % | 4.06 | e.g., "It was really good for me" "I like it" |
| Day 2 | 94.06 % | 3.83 | e.g., "It was great" "I got a lot of energy" |
| Day 3 | 92.86 % | 4.00 | e.g., "I feel better and I would like to continue this" |
| Day 4 | 90.20 % | 4.03 | e.g., "It helps me to re-continue my daily activities during uncertainly time" "It makes me feel good" |
| Day 5 | 89.33 % | 4.04 | e.g., "It gives me a good mood" |
| Day 6 | 83.58 % | 4.15 | e.g., "It was very effective and amazing" "I have a calm mind now" |
| Day 7 | 92.96 % | 4.35 | e.g., "I wish I could attend in more programs" "I feel good with that" |
| Day 8 | 90.48 % | 4.25 | e.g., "I wake up every morning with the enthusiasm of program" |
| Day 9 | 94.23% | 4. 50 | e.g., "It was incredibly useful for me" |
| Day 10 | 100 % | 4.75 | e.g., "I would like to continue activities even after the program end because it makes me feel good" |
| Total | 91.21 % | 4.11 | |