

The Effects of Laughter Therapy Interventions for Smartphone Addicts

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Abstract

Laughter or humor is a beneficial intervention among healthy individuals for general health. Laughter therapy is one of preventive medicine, which is important strategy help to promote wellness or relieve emotional stresses. This study aimed to investigate the effects of laughter therapy on autonomic nervous system activity, stress, and emotions in smartphone addict. The participants with addict or addict risk of smartphone were recruited and randomly allocated into laughter therapy group (n=30) and control group (n=12). Laughter therapy group were conducted laughter therapy program which is comprise of opening, experiencing laughter and closure for 60 min per a day, 3 times a week, for 4 weeks. The assessments were completed before and after the program. The heart rate variability analysis was used to assess the autonomic nervous system activity and stress, University of Rhode Island change assessment for readiness for change, and positive and negative affect scale for current mood state. Laughter therapy group improved significantly to the autonomic nervous system activity and stress compared with control group ($p<0.05$). And positive affect scale scores were improved significantly after conducting laughter therapy ($p<0.05$). Thus, these founds suggest that laughter therapy can improve the autonomic nervous system activity and positive affect scale scores, and relieve emotional stress for smartphone addict. Further study should consider applying of long-term laughter therapy for relieve of addict.

Keywords: *Laughter therapy, Autonomic nervous system activity, Stress, Emotions, Smartphone*

1. Introduction

Recently, the concept of addiction has extended beyond drugs to the concept of “behavioral addiction” to include addictions to gambling, internet, games and smartphones. New forms of behavioral addiction relating to media usage such as rapidly developing internet and smartphone technologies have attracted global attention [1].

A smartphone has various internet-based functions. Besides voice calls, people can use messenger services, social networking, games and the like to communicate with their friends, and conveniently and rapidly search for information [2]. Due to these functions, it was said that there were more than 1 billion smartphone users all over the world in 2012 [3]. Apparently, there are more than 20 million smartphone users in Korea [4]. While a smartphone makes life more convenient, usage can result in many adverse effects. Due to an increase in the amount of time spent using smartphones, attention is distracted, or in the long term, physical problems may occur, such as stiff neck, eyesight problems, wrist or back pain, and sleep disorders [5]. A study on the use of smartphones showed that 45.8% of smartphone users felt anxious when they did not have access to a smartphone. Additionally, there have been claims that efficiency has decreased in schools and workplaces due to the excessive use of smartphones for 21% of people who attend them. Furthermore, people in their teens and twenties accounted for the highest percentage of users [6]. This rapid spread of smartphones causes various adverse effects apart from the convenience of using such devices. Accordingly, the seriousness of the problem recently has come to the fore with the concept of smartphone addiction [7].

Laughter therapy started in the 1970s and is a noninvasive, complementary and alternative therapy [8]. Laughter therapy, which uses humor to reduce stress decrease pain, and improve quality of life, has become a therapy trend according to recent studies [9-12]. The merits of laughter therapy are that it is easy to prescribe and does not cause adverse effects with respect to allergies, dose, and side effects [13]. Around the world, there are several laughter therapy clinics operated with the purpose of releasing anti-stress and increasing happiness by practicing laughter [14]. Laughter has positive effects on mental and physical health. Studies have found many benefits of laughter therapy on depression, tension, anxiety, rage, and insomnia [15-17]. Many researchers have suggested that energetic laughing exercise and the resulting relaxing of muscles stimulates circulation, improves respiration, increases production of pain inhibitors, decreases stress-related hormones and enhances the immune system [18]. Stress has been considered as an inhibiting factor of the immune system and increases risk of heart disease through the continuous production of stress related hormones such as catecholamines and cortisol [19].

However, not much is known about the association between laughter and addiction. The aim of the present study was to identify the effect of laughter therapy on smartphone addiction as determined by assessing autonomic nervous system (ANS) activity, stress, and emotions.

2. Methods

2.1. Participants

This study was designed as a randomized control trial and was carried out with students at S university located in Seoul from September 2015 to December 2015. Using convenience sampling, all physiotherapy majors and nursing majors were tested with the smartphone addiction proneness scale for adults: self-report. Students belonging to the addiction risk group (a score of 40 or higher) and the addicted group (a score of 44 or higher) were recruited. As a result of setting the number of groups to 2 (allocation ratio 3/1), specifying an effect size of 1.10, power of 0.80, and a significance level of 0.05 using the G*power 3.1.9.2 program, the minimum sample size necessary for analysis was calculated to be 28 persons and 10 persons respectively. Assuming a dropout rate of 10%, 30 persons and 12 persons were allocated to the groups respectively.

This study was approved by the Institutional Review Board, S university. At the outset, participants were provided with an explanation of the purpose of the study were informed

that collected data would be processed anonymously, and would never be used except for the purpose of study, and told that they could withdraw from the study at any time.

2.2. Experimental Procedure

A week before the start of the intervention, participants who met the inclusion criteria were assessed on ANS activity, stress index, and stress resistance. Additionally, their current emotional status was measured with the Positive and Negative Affect Scale. Participants then picked out cards from an envelope that were numbered either “1” or “2”, and they were allocated to either the laughter therapy group ($n=30$) or the control group ($n=10$). The laughter therapy group had 4 weeks of laughter therapy (3 sessions per week, and 60 minutes per session), comprising a total of 12 sessions of therapy (Figure 1). There was no special treatment for the control group. After the end of laughter therapy, a post-test measurement was made using the same methods as for the pre-test measurement.

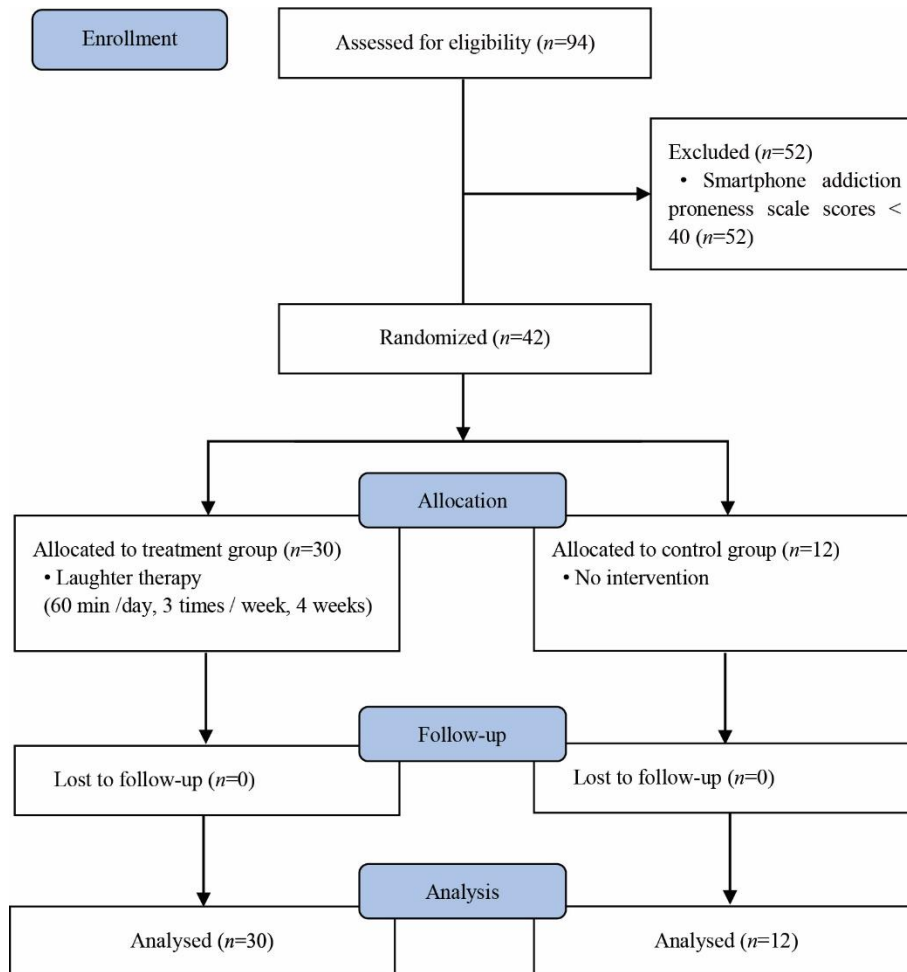


Figure 1. Flow Chart According to CONSORT

2.3. Outcome Measure

2.3.1. Smartphone Addiction Proneness Scale for adults: The smartphone addiction proneness scale for adults is a self-report that was developed by the National Information Society Agency (2011) with tested reliability and validity as a measure for smartphone addiction. The scale consists of a total of 15 items and 4 sub-domains: disturbance of

adaptive functions, virtual life orientation, withdrawal, and tolerance. With regard to each item, 1 point is assigned to “strongly disagree” and 4 points are assigned to “strongly agree” using a 4-point Likert scale. A higher score means more severe smartphone addiction. Users are classified into a high-risk user group (a score of 44 or higher), an at-risk user group (a score of 40~43), and a normal user group (a score of 39 or lower) according to the total score. At the time the smartphone addiction proneness scale was developed, good reliability was demonstrated (Cronbach’s $\alpha=0.814$).

2.3.2. ANS activity and Stress: Analysis of heart rate variability (HRV) is the method used to understand the state of the overall ANS by observing the pattern (variation of interval between R-R) of the heart beat rhythms. HRV analysis can provide information about physiological response in estimating ANS activity since its reliability and reproducibility quantify the activity of the ANS.

This study analyzed electrocardiogram signal with a non-invasive HRV measuring instrument (SA6000, Medcore, Seoul, Korea) for ANS activity, and then recorded the electrical activity state of the heart caused by the effect of sympathetic and parasympathetic nerves on the sinoatrial node. HRV means the minute variation between one cardiac cycle and the next cardiac cycle. HRV is measured by recording the interval between R-R of the normal sinoatrial node rhythm for 5 minutes, to analyze the R-wave signal, and then to analyze time and frequency domains [20].

In this study, after the subject rested lying for 5 minutes to achieve a state of relaxation, HRV was measured while the subject was lying with positive poles of the lead of the measuring instrument attached to the right wrist, the negative pole to the left wrist, and with the ground connection to the left ankle.

2.3.3. University of Rhode Island Change Assessment (URICA): In order to examine participants’ readiness for change, a scale was adapted from the URICA, developed by the University of Rhode Island, was used. It is composed of a total of 32 items and the following 4 subscales: precontemplation stage, contemplation stage, action stage, and maintenance stage. Each subscale includes 8 items. Among the 4 subscales showing the stages of change, the one with the highest score represents the respondent’s stage of change. The stage of change signifies the respondent’s level of motivation for change.

2.3.4. Positive and Negative Affect Scale (PANAS): The PANAS [21] is a scale to measure temporary mood, and is composed of two subscales, measuring positive affect scale and negative affect respectively, with 10 items each. A Korean version (standard scale) by Lee et al (2003), was used. How frequently participants experienced both positive and negative affect was measured using a 5-point Likert scale, where 0 points are assigned to “very slightly or not at all” and 5 points are assigned to “extremely”. When the PANAS was developed, Cronbach’s alpha was 0.84 for the positive affect scale, 0.87 for the negative affect scale, and 0.84 for the total scale.

2.4. Intervention

2.3.1. Laughter Therapy: Laughter therapy consists of opening, experiencing laughter and closure. Opening is a warm-up time, and reduces aversion to laughter by having people laughing together (Table 1). Experiencing laughter is subdivided into laughter, affirmation, thanks and concentration. Laughter is practiced according to each type. Checking exercises is to examine the assignment which laughing at home as an individual for 15 min. With regard to affirmation, find my strengths, and an acrostic poem is made, and nonviolent communication is carried out. With regard to thanks, participants take time for making and reading a thank-you note. Finally, with regard to concentration, by using materials for drawing and painting, participants are assisted in breaking out of their

complicated daily lives for a while through concentration on a simple task. In the closure stage, individuals set a time limit on how long they will spend using their smartphones. Finally, they are induced to attain their goal and to make a friend to exchange a smile with (Figure 2).

Table 1. Laughter Therapy Program

Progress	Program 1	Program 2	Program 3
Opening	Laughter exercise together Laughter exercise by group	Laughter exercise together Laughter exercise by group	Laughter exercise together Laughter exercise by group
Experiencing laughter			
Laughter	Checking exercises Effect of laughter (Video) Laughter practice by type	Checking exercises Laughter practice by type Laughter training	Checking exercises Laughter training Find my own laughter
Affirmation	Acrostic poem with name Find my strengths practice & communication	Acrostic poem with other's name Mind map drawing (Presenting key words)	Acrostic poem with stress title Non-violent communication
Thank	Make a thank-you note	Make a thank-you note	Read a thank-you note
Concentration	Draw a lion and lamb	Copy from emoticon	Painting
Closure	Laughter exercises Set an individual goal (Time spent using smartphone)	Prepare personal protection against addiction	Make 1 laughter friend

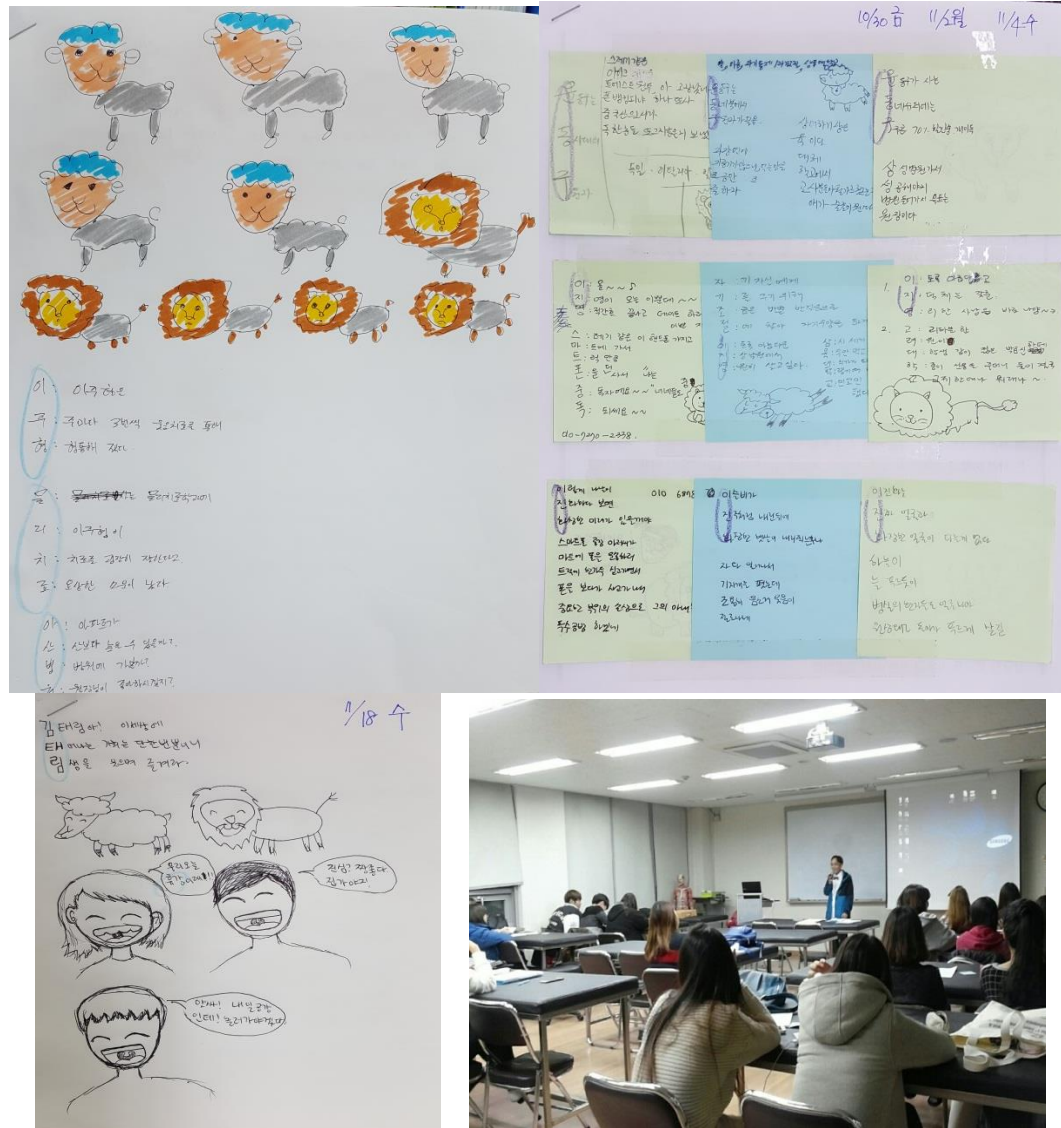


Figure 2. Laughter Therapy

2.5. Data Analysis

Data obtained through the survey and evaluation was analyzed by using SPSS ver. 19.0 program. Categorical scales were recorded using frequencies and continuous scales using means and standard deviations. In order to check the homogeneity of the two groups, a chi-square test and independent t-test were carried out. In order to compare the changes of each group between pre-test and post-test, a paired t-test was performed. In order to compare between the groups, an independent t-test was carried out. With regard to the Friedman test, baseline data for the questionnaire and post-test measurement were compared. ANS activity, stress index and stress resistance were analyzed through ANCOVA. The significance level of all statistics was set at 0.05.

3. Results

The demographic and other characteristics of both groups were assessed regarding sex, age, heart rate, major, grade, duration of smartphone usage, mean time of using smartphone, the smartphone addiction proneness scale, and the self-addiction

questionnaire (Table 2). There were no significant differences between the laughter therapy group and the control group ($p>0.05$) at baseline.

Table 2. Demographic Characteristics of Subjects

Variables	Laughter therapy group (n=30)	Control group (n=12)
Sex (male/female)	11 / 19	3 / 9
Age (year)	20.33 \pm 1.80	20.33 \pm 1.72
Heart rate (bpm)	79.47 \pm 10.53	81.74 \pm 10.27
Duration (month)	49.83 \pm 21.88	50.67 \pm 17.07
Mean time of using smartphone (min)	378.97 \pm 186.94	357.75 \pm 62.47
Smartphone addiction proneness scale	40.97 \pm 1.71	41.75 \pm 3.25
Self-addiction questionnaire (yes/no)	22 / 8	6 / 6

With regard to ANS activity after laughter therapy, the sympathetic nervous system and parasympathetic nervous system activity was 50.32 nu% and 49.68 nu% respectively, which were significantly improved by 9.22% and 11.47% respectively ($p<0.05$). The control group was also improved by 5.82% and 6.53% respectively. However, these changes were not significant. The stress index significantly decreased in the laughter therapy group from 46.75 to 38.1 ($p<0.05$). However, there was no significant difference in stress resistance. On the other hand, with regard to the control group, there were no significant differences in the stress index and stress resistance (Table 3).

Table 3. Changes in ANS Activity and Stress between the Laughter Therapy Group and the Control Group

Variables	Laughter therapy group (n=30)		Control group (n=12)		F	p
	Pre-test	Post-test	Pre-test	Post-test		
SN activity (nu%)	55.43 \pm 20.31	50.32 \pm 20.58	52.90 \pm 24.36	49.82 \pm 18.78	4.34	0.045
PSN activity (nu%)	44.57 \pm 20.31	49.68 \pm 20.58	47.10 \pm 24.36	50.18 \pm 18.78	4.34	0.045
Stress index	46.75 \pm 39.95	38.13 \pm 25.14	53.16 \pm 35.32	53.89 \pm 33.64	6.06	0.020
Stress resistance (ms)	44.96 \pm 16.19	44.92 \pm 14.81	37.66 \pm 9.37	37.65 \pm 9.13	6.09	0.019

Values are presented as mean \pm SD. ANS=autonomic nervous system; SN=sympathetic nerve; PSN=parasympathetic nerve

* $p<0.05$, significant differences between the pre-test and the post-test.

With regard to the readiness for change test (URICA), in the laughter therapy group, the number of individuals in each of the pre-contemplation, contemplation, action and maintenance stages changed from 1, 28, 0, and 1 persons, to 1, 21, 6, and 2 persons respectively. However, no significant differences were shown (Table 4).

According to the results for changes in the PANAS, the laughter therapy group showed a significant improvement in positive affect scale scores (14.63 versus 18.93, pre-test

versus post-test, $p < 0.05$). However, there was no significant change in their negative affect scale scores. The control group showed no significant changes in positive affect and negative scale scores (Table 4).

Table 4. Changes in Readiness for Change and PANAS between the Laughter Therapy Group and the Control Group

Variables	Laughter therapy group (n=30)		Control group (n=12)		χ^2/t	p
	Pre-test	Post-test	Pre-test	Post-test		
Readiness for change (1 / 2 / 3 / 4 stage)	1 / 28 / 0 / 1	1 / 21 / 6 / 2	2 / 9 / 0 / 1	2 / 5 / 2 / 3	5.715	0.126
Positive affect (point)	14.63 \pm 8.07	18.93 \pm 7.74*	13.75 \pm 5.08	15.92 \pm 7.71	1.155	0.255
Negative affect (point)	10.07 \pm 8.00	10.37 \pm 7.04	10.50 \pm 7.11	10.42 \pm 6.48	0.264	0.794

Values are presented as mean \pm SD. PANAS=positive affect and negative affect scale.

* $p < 0.05$, significant differences between the pre-test and the post-test.

4. Discussion

Our results show that laughter therapy significantly improves ANS activity, stress, and positive affect among students with smartphone addiction. Specially, the favorable effect of laughter therapy was that sympathetic nervous system activity was depressed and the parasympathetic nervous system was facilitated.

Many studies have revealed that laughter therapy positively influences human health. Laughter therapy has very few side effects, so it is well accepted around the world [22]. Research on laughter therapy with various kinds of study participants has suggested that the therapy positively influences not only psychological aspects, such as stress, anxiety, depression, but also physiological and psychosocial aspects, including the immune system, pain threshold, and stress reaction [15, 23-26]. In a study that analyzed changes in viewers of humorous videos, their natural killer cells and growth hormones increased and their serum cortisol and epinephrine levels decreased, thereby indicating that watching humorous videos was effective in reducing stress [27-29].

Stress has been defined as a process that changes psychological and physiological functions. The changes affect not only stress hormones like cortisol, but also other factors including growth hormone and insulin [30]. A study reported that excessive smartphone immersion caused anxiety which developed into stress in daily life. This study found that smartphone addicts had a high stress index prior to testing, and that the experimental group decreased in their stress index significantly after laughter therapy. According to the research of Bennett et al with 33 healthy female adult participants, the experimental group who watched humorous videos reduced their stress index, and increased the number of their natural killer cells. Therefore, the research suggested that laughter was effective in alleviating stress and enhancing immunity [12]. A different study which was conducted with 31 breast cancer patients taking radiation therapy revealed that laughter therapy applied four times for two weeks was effective in reducing stress, depression, and anxiety symptoms as assessed using the Brief Encounter psychosocial instrument scale [17]. These results were consistent with the results of the present study which also found that participants experienced reduced stress after laughter therapy.

Laughing or humor affects ANS activity and mood. Sakuragi et al. (2002) investigated the effects of laughing on mood and HRV by having healthy participants watch comedy videos. The balance between the sympathetic and parasympathetic nerve activities increased immediately after watching comedy videos, and positive emotions increased

significantly. Another study was conducted to investigate the effects of laughter therapy on older adults [31]. The study suggested that laughter therapy can improve general health, somatic symptoms, insomnia, and anxiety. In general, as the smartphone addiction tendency grows stronger, the level of anxiety and depression increases. Depression in particular is a general indicator of mental health status, and acts as a risk factor that increases the likelihood of smartphone addiction. Additionally, problems with egocentrism occur. Hence, people addicted to smartphones come to have difficulty in building relationships with others in the real world [32]. As previous studies have reported, laughter improves mood states, stress, the immune system, circulation, and psychological well-being [22]. The laughter therapy performed in this study was designed as a group program, so the positive effects of laughing significantly improved the stress index and positive affect scale scores of smartphone addicted students and influenced their interactions with each other. Previous studies showed that activity of the sympathetic nervous system decreased immediately after laughing [26, 33], but in this study, activity of the sympathetic nervous system decreased after 4 weeks of training. This means laughing causes vasoconstriction by activating the sympathetic nervous system, and brings about improvement of cardiovascular function by inducing increases in blood circulation [34]. However, while the process of recovering to base level occurs, laughter therapy seems to induce strong activity in the parasympathetic system. There is a need for further study to explore these matters.

5. Conclusion

To the best of our knowledge, this is the first study to investigate the influence of laughter therapy for smartphone addicts. This study shows that laughter therapy can improve ANS activity, stress, and positive emotion. There is a need to develop laughter therapy programs that can change the attitudes of smartphone addicts to treat their addiction, as well as to research the effects of laughter therapy on other kinds of addicts.

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