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The Effectiveness of a Smoking Cessation Intervention Program Based upon a Process Model of Health Motivation

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ABSTRACT

The purpose of the present study was to investigate the effect of participation in a health motivation-based intervention program on college students' smoking behavior. One hundred and seventy smokers (mean age = 19.0 years, 151 males) from nine colleges and universities in Chengdu, China were randomly assigned to one of 5 groups that received between one and four sessions of the intervention, or no intervention. The intervention sessions included sequential activities based on the stages of the process model of health motivation. Each group completed questionnaires assessing health motivation and smoking behaviors at pre-test, immediately post-intervention, and at one month follow-up. Analyses indicated that the intervention program did improve participants' health motivation, and that was associated with reduced levels of smoking relative to baseline. The greater the number of sessions, the greater the reduction in smoking.

1. Introduction

Tobacco hazard is one of the most serious public health issues in the world, as exemplified by the prediction that by 2020 10 million people will die annually from smoking-related diseases, of whom 7 million will be smokers from developing countries^[1]. This is greater than the number of predicted deaths resulting from malaria, maternal and major childhood conditions, and tuberculosis combined. However, while this hazard is preventable, the risk is unevenly distributed across the world, with research suggesting that about 30% of smokers in developed countries like the USA and Netherland can quit smoking successfully but less than 11% of smokers in China are able to do so^[2-5].

Health motivation is a key factor influencing smoking cessation. For example, McCaul et al. analyzed 30 data sets from the past 50 years and found that the avoidance of acknowledgement of the negative influence of smoking on health is a decisive factor for individuals to not quit smoking^[6]. On the other hand, motivation for health is the main reason and facilitator of individuals' successful attempts to cease smoking^[7-10].

To date, various, health behavior theories including the Health Belief Model (HBM), Protection Motivation Theory (PMT), Theory of Planning Behavior (TPB), Health Action Process Approach (HAPA), Transtheoretical Model and Stage of Change (TTM) have underpinned research into smoking cessation. Xu has recently proposed an alternative

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model of health motivation that provides a new framework for research on smoking cessation^[11]. According to the Process Model of Health Motivation, health motivation affects health behaviors such as smoking cessation within four sequential stages: generation of intention to cease smoking, establishment of a smoking cessation plan, adoption of smoking cessation action, and persistence in smoking cessation. The rationality of this approach is reflected in two aspects: first, the influence of health motivation on smoking cessation is divided into different stages according to the actual conditions; second, the model does not treat health motivation in isolation. Instead, the influence of internal and external factors on individuals' health motivation are fully considered. For example, although many people express a desire to quit smoking, they fail to establish a relevant smoking cessation plan or to adopt any smoking cessation actions that will help them to realize their health goals. Such individuals do have health motivation, but their health motivation is not strong enough to help them quit smoking successfully.

Since being put forward by Xu^[11], the Process Model of Health Motivation has already been empirically studied in relation to healthy diet and physical exercise^[12]. However, empirical evidence for the models application to smoking cessation is lacking. The present study therefore aims to develop an intervention program for smoking cessation based upon the health motivation process model and to examine its effectiveness.

2. Method

2.1 Participants

Two hundred participants were initially recruited from nine colleges and universities in Chengdu, China. They were randomly assigned to one of 5 groups (4 experimental groups and 1 control group), with 40 participants in each group. Due to multiple times of intervention, long duration, as well as frequent assessments, 30 participants withdrew. Therefore, 170 participants (Mean age =19.0, SD=) with effective data were retained, including 151 males and 19 females. Among them, 67 participants were completing majors in arts and sports, 47 participants were majoring in literature and history, and 56 participants were majoring in science and engineering. Fifty-eight were freshmen, 81 sophomores, 22 junior students, and 9 senior students.

2.2 Measures

2.2.1 Scale of Health Motivation for Smoking Cessation

This scale is based on the Health Motivation Scale in

Physical Activity^[12] and contains 18 questions, and includes four dimensions: intention, planning, action, and persistence. Each dimension contains 4-6 questions. For example, one question in the dimension of "intention" is: "I intend to quit smoking, for it can reduce the harm to my health"; one question in the dimension of "planning" is: "I plan to reduce the daily cigarette consumption, for I hope to maintain health"; one question in the dimension of "action" is: "I have started to quit smoking"; one question in the dimension of "persistence" is: "I will stick to smoking cessation until I realize the goal of becoming healthy". The participants were requested to respond to each item, based on their own similarity, with response options ranging from "completely like me" (2) to "completely not like me" (-2). Six items are reverse scored. Higher total scores indicate higher health motivation. The internal consistency of the scale was high, with Cronbach's $\alpha = .87$. The internal consistency of the four subscales corresponding to the four dimensions mentioned above (intention, planning, action and persistence) were $\alpha = .79, .68, .73$ and $.81$ respectively.

2.2.2 Questionnaire of Smoking Behaviors

This questionnaire was developed for this study to record demographic variables and smoking-related behavior. There are 9 questions in total, including: "How old were you when you began to smoke?" "How long have you been smoking?" and "How many cigarettes did you smoke every day in the past week?". In the present study, the number of cigarettes per day (CPD) before and after intervention was used to operationalise the dependent variable (smoking cessation behaviors).

2.2.3 Feedback measures

An open-ended questionnaire asked participants what they liked about the intervention program and what they disliked about the intervention program. Another questionnaire assessed their perceived gains during the entire study on a 5-point scale (hardly, some, moderate, much, very much). An item example is "I am more confident to quit smoking."

2.3 Intervention Program

An intervention consisting of four levels was developed for the study (see Table 1). According to Xu's dynamic process theory of health motivation, the health motivation of smokers to quit includes four continuous dynamic stages: smokers generate the intention to quit smoking in order to obtain/maintain health; they make smoking cessation plans; they begin to implement smoking cessation action; and they stick to smoking cessation actions. Based upon this theory,

four intervention activities related to the four sequential stages of health motivation were developed (see Table 2). These four activities were: Activity 1 (inspiring smokers to generate the intention to quit smoking in order to obtain better health by providing a PowerPoint-based lecture on “Tobacco and Health” and providing a “Tobacco and Health” Information Manual); Activity 2 (helping smokers to make a smoking cessation plan); Activity 3 (helping smokers to implement their smoking cessation action and overcome withdrawal symptoms; and Activity 4 (helping ex-smokers stick to smoking cessation to prevent relapse”).

Table 1. Intervention Scheme

| Group | Intervention activities | Measurement arrangement |
|---------|---|--|
| Group A | Activity 1 | Base line measurement→ 1 intervention activity→ Post-test 1→ Post-test 2 |
| Group B | Activity 1 and Activity 2 | Base line measurement→ 2 intervention activities→ Post-test 1→ Post-test 2 |
| Group C | Activity 1, Activity 2 and Activity 3 | Base line measurement→ 3 intervention activities→ Post-test 1→ Post-test 2 |
| Group D | Activity 1, Activity 2, Activity 3 and Activity 4 | Base line measurement→ 4 intervention activities→ Post-test 1→ Post-test 2 |
| Group E | None | Base line measurement→ Post-test 1→ Post-test 2 |

Table 2. Intervention Activities

| Activity | Theme | Intervention activities | Intervention approaches |
|------------|---|---|-------------------------|
| Activity 1 | Health knowledge education related to smoking | Publicize smoking hazards for college student smokers and inspire them to quit smoking for their physical health. | PPT & leaflet |
| Activity 2 | Establish a reasonable smoking cessation plan | Help college student smokers identify smoking cessation methods and establish smoking cessation plans according to their smoking characteristics. Document plans by means of “Letter of Commitment to Smoking Cessation”. | Group counseling |
| Activity 3 | Implement smoking cessation action and overcome withdrawal symptoms | Provide techniques to college student smokers to overcome withdrawal symptoms and help them to appropriately adjust the planning of diet and sports (e.g. “smoking cessation exercise) during the withdrawal period to ease unfavorable symptoms. | Group counseling |
| Activity 4 | Stick to smoking cessation and prevent relapse | Assist college student smokers to practice smoke-refusing skills in groups, help the relapsing participants to analyze the cause of relapse, and pass on some skills to them to stick to smoking cessation. | Group counseling |

The Information Manual for Activity 1 was derived from the Guide Book of Hospital Smoking Control jointly compiled by Chinese Association on Tobacco Control and the Chinese Hospital Association in 2009. It includes five parts, namely, “overview of prevalence of tobacco smoking”, “injurious ingredients of tobacco smoking”, “main diseases resulting from smoking”, “harms of smoking to women and children” and “harms of second-hand tobacco smoking for health”^[13]. The contents of “Tobacco and Health” lecture and PowerPoint presentation were consistent with the Information Manual. However, the presentation uses visual images with additional written elaboration.

2.4 Research Procedures

Smokers who were willing to participate in this study were recruited by way of advertisements announced by lecturers in class. Participants were then randomly allocated to one of the five groups. One Group (A) received the first activity in the intervention only, another (Group B) the first and second activities, another (Group C) received the first, second and third activities, and a fourth group (D) received each of the four activities (see Tables 1 and 2). The interval between activities for Groups B, C and D was one week. The control group (E) received no activities. The experimenter, one of the authors, delivered the intervention in small groups every second week with the assistance of two graduate students.

All participants completed measures three times: pre-intervention (T0), one week after completion of all intervention sessions (T1), and at follow-up (T2), one month after completion of post-test. After the intervention, participants in the intervention groups completed two feedback questionnaires.

2.5 Statistical Analyses

Primary analysis was directed at comparing smoking cessation behaviors of the control and treatment groups following intervention. Multilevel Poisson regression with random intercepts was used to compare the groups on the number of cigarettes smoked per day at time 2 and time 3, controlling for smoking behavior at baseline, as well as baseline and concurrent health motivation. Strength of association between the dependent variable and the predictors in the Poisson model was assessed with incremental risk ratios (IRR). IRR are exponential regression coefficients that represent percentage increase in the mean number of “events” (cigarettes smoked per day) for a one unit increase in the values of a predictor.

3. Results

3.1 Health Motivation

For health motivation, test of homogeneity of variance showed that the variances across the five groups were equal, with $F = .98, p = .419$. Repeated measures MANOVA for the health motivation scores, revealed that there was no significant interaction between time and group, $F(8, 258) = 1.40, p = .199$, partial Eta squared = .41. However, analysis within and between groups indicated that at pre-test Group B had higher health motivation than all other groups except Group E (Group A, $p = .026$; Group C, $p = .03$; and Group D, $p = .028$). By post-test, Group B's health motivation, was significantly higher than that of all other groups ($p = .017, .004, .027$ and $.034$ for Groups A, C, D and E respectively). At follow-up, Group B's health motivation was higher than that of Group A ($p = .001$) (see Table 3).

Table 3. Means of Health Motivation scores by Group (Standard deviations in brackets)

| Group | n | Pre-test T ₀ | One-way ANOVA for Pre-test To | Post-test T ₁ | Follow-up T ₂ | Repeated measures ANOVA | Tukey comparison |
|-------|----|-------------------------|-------------------------------|--------------------------|--------------------------|-------------------------|------------------|
| A | 37 | 7.21 (12.44) | $F = 1.94, p = .107$ | 10.82 (11.75) | 7.18 (12.22) | $F = 7.96, p < .001$ | 1<2*, 2>3* |
| B | 35 | 13.71 (11.53) | | 17.71 (9.80) | 17.00 (7.78) | | 1<2*, 1<3* |
| C | 33 | 7.04 (11.75) | | 9.61 (9.86) | 11.22 (10.39) | | 1<2*, 1<3* |
| D | 31 | 6.35 (12.45) | | 11.83 (10.24) | 13.67 (11.13) | | 1<2*, 1<3* |
| E | 34 | 9.32 (9.27) | | 10.84 (10.77) | 9.81 (10.74) | | |

Note: * $p < .05$

Within groups, Group A experienced an increase in health motivation from pre-test to post-test ($p = .023$) but this increase was not maintained as health motivation decreased to baseline level by follow-up. Group B's health motivation increased between pre-test and post-test ($p = .028$) and this increase was maintained at follow-up. Group C's health motivation did not increase significantly between pre- and post-test, but by follow-up it had increased significantly compared to baseline ($p = .05$). Group D demonstrated a steady rise in health motivation from pre-test to post-test ($p = .047$) which was maintained at follow-up ($p = .027$). Finally, Group E exhibited no change in health motivation over the course of the study.

3.2 Smoking Behavior

Repeated measures MANOVA for smoking behaviour revealed that there was a significant interaction between

time and group, $F(8, 330) = 1.40, p < .001$, partial Eta squared = .34. Analysis within and between groups indicated that at pre-test Group B smoked fewer cigarettes per day than all other groups except Group E (Group A, $p = .026$; Group C, $p = .002$; and Group D, $p < .001$). Group E smoked fewer cigarettes per day than Group D. By post-test, Group A was smoking fewer cigarettes than Groups C ($p = .037$) and E ($p = .008$). Group B's cigarette smoking was less than that of Groups C ($p = .001$), D ($p = .003$), and E ($p < .001$). At follow-up, Group A's smoking was more than Group B's ($p = .004$) and Group D's ($p = .041$). Group B was also smoking less than Group C ($p = .021$) and Group E ($p < .001$). Group D was smoking less than Group E ($p = .001$) (see Table 4).

Table 4. Means and Standard Deviation of Smoking Behavior

| Group(N) | Pretest | | Posttest1 | | Posttest2 | |
|----------|---------|------|-----------|------|-----------|------|
| | Mean | SD | Mean | SD | Mean | SD |
| A(37) | 6.57 | 3.88 | 3.76 | 2.63 | 4.89 | 2.91 |
| B(35) | 4.49 | 4.39 | 2.80 | 2.67 | 2.86 | 2.78 |
| C(33) | 7.48 | 2.69 | 5.30 | 2.64 | 4.52 | 2.65 |
| D(31) | 7.97 | 4.62 | 5.06 | 3.71 | 3.42 | 2.62 |
| E(34) | 5.68 | 3.67 | 5.71 | 3.61 | 5.85 | 3.56 |

Within groups, Groups C and D experienced significant decreases in smoking between baseline and posttest and then between posttest and follow-up (Group D $p < .001$ in each case; Group C $p < .001$, and $p = .001$). Group A decreased smoking behaviour between baseline and posttest ($p < .001$) and maintained the improvement relative to baseline at follow-up ($p < .001$), despite an increase from posttest to follow-up ($p < .001$). Group B reduced smoking between baseline and posttest ($p < .001$), and maintained this reduction at follow-up. Group E exhibited no change in smoking over the course of the study.

An alternative way to consider the smoking rates reported by the five groups is to consider the "decrement rate", or the percentage reduction in smoking from pre-intervention smoking level. As shown in Table 5 and Figure 1, the decrement rates of cigarettes per day (CPD) of the groups from pretest to posttest were different, and the extent of change is ordered as follows: Group A > Group D > Group C > Group B > Group E. The CPD of Group A, Group B, Group C and Group D declined significantly over this time. From baseline to follow-up, the decrement rates of CPD of the 4 intervention groups also varied. The extent of change was ordered as follows: Group D > Group C > Group B > Group A > Group E. The CPD of Group C and Group D continued declining. However, the CPD of Group A and Group B rose again,

with Group A having the lowest maintenance despite its relatively favorable initial intervention effect. The control group CPD remained basically unchanged over the three time points (see Figure 1).

Table 5. CPD Decrement Rate of Each Group

| Group | n | Pre-test (T ₀) | | | Post-test (T ₁) | | Follow-up (T ₂) | |
|---------|----|----------------------------|-----------|---------|-----------------------------|---------|-----------------------------|---------|
| | | CPD (PCS) | CPD (PCS) | DCR (%) | CPD (PCS) | DCR (%) | CPD (PCS) | DCR (%) |
| Group A | 37 | 6.57±3.88 | 3.76±2.62 | 43.61 | 4.89±2.91 | 24.44 | | |
| Group B | 35 | 4.49±4.39 | 2.80±2.67 | 25.64 | 2.86±2.78 | 25.33 | | |
| Group C | 33 | 7.48±2.69 | 5.30±2.64 | 29.57 | 4.52±2.65 | 39.97 | | |
| Group D | 31 | 7.97±4.62 | 5.06±3.71 | 38.99 | 3.42±2.618 | 55.82 | | |
| Group E | 34 | 5.68±3.67 | 5.71±3.61 | -5.22 | 5.85±3.56 | -14.99 | | |

Note: DCR= Decrement rate in cigarettes per day relative to T₀

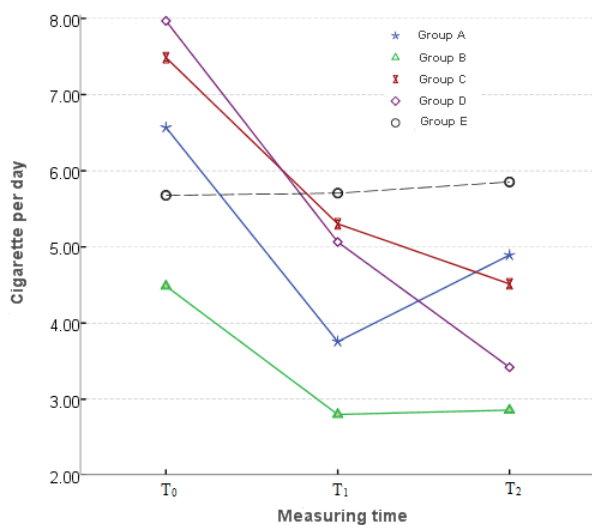


Figure 1. Mean CPD for Participants in Each Group in Three Measurements

Initial Poisson regression analysis comparing experimental groups on smoking behavior at baseline revealed significant differences between the groups in the number of cigarettes smoked (Wald chi-square(4)=18.95, $p=.001$). Groups 5 ($M=4.5$, 95% CI 3.5-5.8) and 2 ($M=4.5$, 95% CI 3.3-6.2) reported the lowest number of cigarettes smoked, followed by group 1 ($M=6.9$, 95% CI 5.7-8.4), and groups 4 ($M=7.4$, 95% CI 5.6-9.6) and 3 ($M=7.4$, 95% CI 6.5-8.4).

Results of Poisson regression analysis comparing smoking cessation behaviors of the control and treatment groups following intervention showed that there was a significant main effect of treatment group ($F(4,255)=13.4$, $p<.001$), indicating that experimental groups differed significantly on the number of cigarettes smoked per day at post intervention, after controlling for the assessment time, time by group interaction,

baseline smoking behavior, and baseline and concurrent health motivation. Compared with the control group, all intervention groups reported significantly lower number of cigarettes smoked per day at post intervention ($p\leq.025$). The results were also generally supportive of the dose-response model of intervention, with greatest decrease in the number of cigarettes smoked per day in group 4 (IRR= 0.48, 95%CI 0.37-0.61) and lowest decrease in group 1 (IRR=0.85, 95%CI 0.73-0.99), although unexpectedly, the decrease in group 2 (IRR=0.68, 95% CI 0.59-0.78) was greater than that in group 3 (IRR=0.75, 95% CI 0.65-0.87). Follow up contrasts showed that amongst the groups that received intervention, there were significant differences between groups 1 and 4 ($p=.003$), 2 and 3 ($p=.001$), and 3 and 4 ($p<.0001$).

Baseline smoking was another significant predictor of the number of cigarettes smoked per day (IRR=1.25, 95%CI 1.23-1.27, $p<.001$). However, neither baseline (IRR=1.00, 95%CI 0.99-1.00, $p=.358$) nor concurrent health motivation (IRR=1.00, 95% CI 1.00-1.01, $p=.219$) was associated with the number of cigarettes smoked per day post intervention. On the other hand, while there were no significant differences in the number of cigarette smoked per day between the 2 follow up occasions (IRR=0.93, 95% CI 0.86-1.01, $p=.079$), there was a significant time by group interaction ($F(4,255)=15.1$, $p<.001$), indicating that the effect of group on the number of cigarettes smoked per day was different at first and second follow ups.

Table 6. Short-term Effect and Long-term Effect of Different Intervention Schemes

| | | df | F | P |
|-----------------|-----------------------------|----|-----------|-------|
| Within subject | times of measuring | 2 | 163.78*** | <.001 |
| | times of measuring X groups | 8 | 21.80*** | <.001 |
| Between subject | groups | 4 | 3.37* | .011 |

Mean (with 95% confidence interval) number of cigarettes smoked per day for each study group at both follow up times are shown in Figure 2. Follow up contrasts comparing outcomes on treatment groups at each measurement occasion showed that after adjusting for baseline smoking behavior and baseline and concurrent health motivation, at time 2, experimental groups 1 ($p<.001$), 2 ($p<.001$), and 4 ($p=.020$) were smoking significantly fewer cigarettes per day compared with the control group. At time 2, there were also significant differences between groups 1 and 3 ($p<.001$), 1 and 4 ($p=.026$), and 3 and 2 ($p<.001$). At time 3, all 4 experiment groups were smoking significantly fewer cigarettes per day compared with the control group ($p\leq.035$). There were also significant differences

between groups 1 and 2 ($p=.001$), 1 and 4 ($p<.001$), 2 and 4 ($p=.001$), and 3 and 4 ($p<.001$). Within-group comparisons also showed that from time 2 to time 3, there was a significant increase in the number of cigarettes smoked per day in group 1 ($p<.001$) and a significant decrease in groups 3 ($p=.001$) and 4 ($p<.001$), after controlling for baseline smoking behavior, and baseline and concurrent health motivation (see Figure 2).

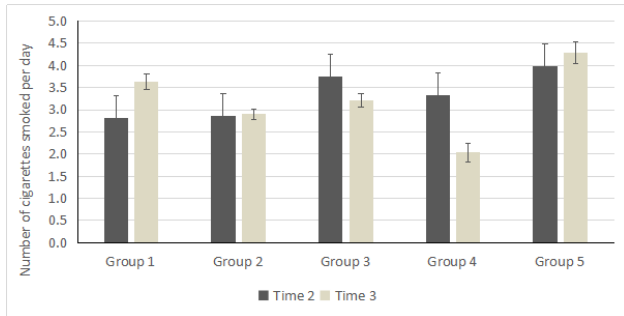


Figure 2. Mean (with 95% confidence interval) number of cigarettes smoked per day for each study group

3.3 Viewpoints of Members of Experimental Groups

The members of experimental groups made relatively positive comments in their general evaluation of the intervention. They reported that the activities included in the intervention were interesting, relaxing and also meaningful. Through the activities, they acquired more knowledge about smoking and smoking cessation, and came to understand their smoking characteristics and how to handle the withdrawal symptoms that occur with smoking cessation. It became easier for them to accept smoking cessation psychologically. On the downside, some participants reported that other members of their groups arrived late or would chat but refuse to speak when it was their turn to voice opinions and feelings, and that this influenced the group’s progress.

Opinions of the 136 members of four experimental groups about the intervention activities are summarized in Table 7. From the table it can be seen that 89.60% of participants found the intervention to be “very helpful for me”. They found the intervention activities for smoking cessation to be meaningful and to provide help to quit smoking. Participants agreed that the intervention had a positive influence on them, with 93.20% of them agreeing strongly with the statement that “I have a new understanding of cigarettes”; 72.80% of students with the statement that “I have a different attitude towards cigarettes”, and 95.70% with the statement “I smoke less”.

Table 7. Feedbacks of Members of Experimental Groups related to Group Activities (% of responses)

| Gains | hardly any | some | moderate | much good | very much |
|---|------------|-------|----------|-----------|-----------|
| I am free to express my views in this group. | 0 | 0 | 0 | 15.40 | 84.60 |
| I have better understanding of my smoking characteristics. | 0 | 13.10 | 23.20 | 33.40 | 30.30 |
| I have acknowledged some problems existing in my smoking quitting process. | 0 | 0 | 25.10 | 26.70 | 48.20 |
| I know how to quit smoking more efficiently. | 7.30 | 18.50 | 32.90 | 29.60 | 11.70 |
| I know better how to refuse others’ cigarettes. | 3.30 | 9.70 | 31.30 | 27.60 | 28.10 |
| I become more confident of quitting smoking. | 8.90 | 17.30 | 29.50 | 23.70 | 20.60 |
| I think I can establish a plan to quit smoking and strive for it. | 5.50 | 19.90 | 21.70 | 24.30 | 28.60 |
| I have learned how to adjust my unhealthy emotions and try to quit smoking. | 34.20 | 21.40 | 22.90 | 13.80 | 7.70 |
| I learn how to get rid of addiction to tobacco. | 12.80 | 33.60 | 25.30 | 17.20 | 11.10 |
| I think this group coaching is very meaningful for me. | 0 | 1.10 | 3.20 | 6.10 | 89.60 |
| I have a new understanding of cigarette. | 0 | 0 | 0.50 | 6.30 | 93.20 |
| I have a different attitude towards cigarette. | 2.30 | 4.10 | 7.20 | 13.60 | 72.80 |
| I smoke less. | 0 | 0 | 0.90 | 3.40 | 95.70 |
| I become healthier after stopping smoking. | 11.20 | 13.50 | 21.50 | 19.10 | 34.70 |

4. Discussion

The current study aimed to evaluate the effectiveness of a smoking cessation intervention that was based on the process model of health motivation. The intervention groups received activities related to the first, first and second, first, second and third, or all four stages of the process model of health motivation. The results indicated that except for Group 3 all intervention groups’ motivation increased by the end of the intervention. This is to be expected since all groups participated in the first activity which was designed to increase motivation. This finding indicates that participants began to attach importance to the harm of smoking to health as a result of this part of intervention program. In contrast, the health motivation of the control group did not change.

It is notable that although the change in Group C’s health motivation did not reach significance by post-test, relative to baseline, by follow-up it did. Groups B maintained its increased health motivation, while Group D extended its improvement. These changes are not surprising since each of these groups received further activities relative to group A (no further activity). Therefore, staged and continuous intervention is superior to one-off or more

limited intervention activities, and may be necessary to lead to and maintain quitting behavior. It is likely that the content of the later activities re-inforces and builds on the motivation that can be developed in the first activity. These results support the findings of Liu, et al. that the greater the dose of intervention, the better the intervention effect will be^[14]. However, the difference between this research and research of Liu, et al. lies in the theoretical model on which the intervention program is based. Our program is designed in accordance with Xu's dynamic process model of health motivation but the Liu et al.'s lacks of strong theoretical base and the intervention implemented focused only on health knowledge.

The intervention also lead to a reduction in smoking behavior, to a degree that was dependent on the level of intervention. The groups that received the greater number of activities (sessions) demonstrated the greatest reduction in cigarettes per day, relative to baseline, both after the intervention and at follow-up. Their smoking behavior at follow up was still decreasing, but they had not stopped smoking. Notably, group A, which received the least intervention, demonstrated an increase in smoking between post-test and follow-up, although their smoking levels remained significantly lower than at baselines. This again suggest that the closer the participants are to receiving the complete program, addressing each stage of the process model of health promotion, the more likely they will be able to reduce their smoking behavior.

Finally, the participants reported that the intervention was a positive experience for them. They found the content meaningful, and the intervention activities for smoking cessation important. They also felt efficacious in regard to quitting smoking. More importantly, they gained a new understanding of cigarettes, and changed both their attitudes to cigarettes and smoking behaviors. Therefore, from the perspective of the participants, the intervention program implemented in this research was useful.

5. Conclusion and Limitations

Sample issues constitute one limitation of this study. Smokers from only nine colleges in Chengdu, in China were included in the sample. The final 170 participants included some "secondary technical school students" who were relatively young. Meanwhile, the distribution of participants in terms of age, grade, major and gender was limited. In addition, self-reporting of smoking behaviors and attitudes may have been unreliable. Some participants may have hidden their true smoking level. Therefore, in future research, other ways to record smoking may need to be considered. Finally, there are many factors influencing smoking cessation behaviors. In this research, due

to a relatively long-time intervention for college student smokers, some influencing factors could not be controlled, (e.g., the influence of important others, other life events and activities that encourage smoking).

In conclusion, the intervention program was effective, which supported the dynamic process model of health motivation. In future, studies can be designed to further investigate the effectiveness of the program, as well as the process model of health motivation.

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