Systematic Development of Theory-Based Physical Activity Program Using Mobile Application

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Abstract: This article describes the systematic development of the WOW program that provides stage-matching physical activity intervention with smartphone application for university student. Intervention Mapping (IM) protocol was used to develop the WOW Program by integrating health behavior change theories and motivational interviewing in mobile application. According to the six steps of IM, the methods and the content of the WOW program were described from needs assessment and defining goals, matrix formation by determinants, performance objectives, change objectives, choosing intervention strategies and methods, designing contents and materials, adoption and implementation to evaluation. The smartphone walking application with self-monitoring and social community was selected for implementation. Eight session intervention program with smartphone application will be implemented and evaluated of the participant's result and program formation. The intervention designed by matching the stage of the subject might encourage both in terms of intervention effectiveness and participant's satisfaction.

Index terms: Intervention mapping, Motivation, Physical activity, Telehealth

I. INTRODUCTION

In the healthcare industry, it has long been a paradigm shift to personalized form. Young adults have a desire to take time out of themselves instead of consultations and to make health management fun, also [1]. Many health programs are inevitable for both the clients and researchers using smartphone apps recently [1]-[2]. Physical activity program and research has suggested that physical activity promotion programs use technology based interventions [3]-[4]. In health programs, online intervention alone is not enough to ensure a stable effect or safety. So the program is developed by combining off-line and on-line contexts. IM has been used to develop systematic health programs [5]-[6].

II. METHODOLOGY

'Walk on With, WOW' program was systematically developed and it provides stage-matching physical activity intervention with smartphone application for university student. Intervention Mapping (IM) protocol [5] was used to develop the program by integrating health behavior change theories [7]-[8] and motivational interviewing [9] in mobile application.

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IM provide a systematic guide to develop the theory based health program step by step [5]. IM consists of six steps; (1) need assessment and defining goals, (2) matrix formation by determinants, performance objectives, change objectives, (3) choosing theory-based intervention strategies and methods, (4) design contents and produce materials, (5) design Adoption and implementation and (6) evaluation plan

III. DEVELOPMENT PROCESS AND RESULTS

In the first step, the needs for the physical activity program using smartphone applications was identified by planning group from literatures and the focus group interview in the university students. Needs for the motivator and continuous empowerment elements were identified.

Step2; The outcomes of behavior and interpersonal goal was defined as increasing physical activity of university student in the semester. For matrix formation, 5 personal determinants and 6 performance objectives were selected in health behavior change theories. The matrix of 23 change objectives was created by determinants and performance objectives. The determinants were information, expectation, decisional balance, self- efficacy, social support from the behavior change theory, results of needs assessment. Six performance objectives, recognition, understanding emotions, overcoming barriers, action planning, performing plan, maintain activity were selected from self-management contexts for health (Figure 1).

Step3; From the transtheoretical model (TTM) to self-management contexts and social support theory for health, they were applied and adopted to the methods in each session. was applied and adopted to in each session. The smartphone walking application with self-monitoring and social community was selected for implementation. Specially, understanding the interaction relationship of the subject with the smartphone app is required for applying mobile application [10,11,12,13,14,15,16,17,18] (Figure 2). Specific methods were selected to achieve each performance objective such as self-evaluation, action plan, group talk, rewards, and mission game.

Step4; The program chose several strategies and channels in various material forms in each sessions. For example, newspaper script, video, feedback message, panning form, bud mission, etc

intervention. The subject chooses his or her readiness for

Outcomes for behavior: University students Increase physical activity during the semester
Interpersonal Outcomes : Social network and the groups support them to increase physical activity

Personal & Environmental(interpersonal) dimension

Performance Objectives (university students/social network)	Personal Determinants				
	A. Information	**B. Expectation**	**C. Decisional balance**	**D. Self-efficacy and skills**	**E. Social support**
1. Recognition	1.A. Identify the amount of physical activity and my level of physical activity	1.B. Awareness of the health benefits of promoting physical activity			
2. Understanding emotions			2.C. Recognition of ambivalence between negative consequences and discomfort due to physical activity		
3. Overcoming barriers	3.A. Understanding the disturbance factors of physical activity			3.D. Plan how to overcome your obstacles	3.E. Sharing information about other people's barriers
4. Action planning	4.A. Understanding of physical activity methods			4.D-1. Establish appropriate goals and practices for you / 4.D-2. Awareness of the importance and confidence of the goal / 4.D-3. Utilize nearby resources	4.E-1. Share my physical activity goal / 4.E-2. Get feedback and praise on goals and strategies / 4.E-3. Selected co-workers to work together
5. Performing plan		5.B. Expectation of change due to practice of physical activity	5.C. Reduced sense of discomfort	5.D. How to make a daily log, compensation plan and correction strategy according to physical activity	5.E. Receive feedback / rewards from the group
6. Maintain activity	6.A. Information about healthy lifestyle	6.B. Recognizing the benefits of health through physical activity		6.D-1. Evaluate and reset goal achievement rate / 6.D-2. Stress management and time management / 6.D-3. How to solve the problem situation	6.E.Becomes a role model for others

Fig. 1. Matrix Frame for Increasing Physical Activity of University Students using Intervention Mapping

Fig. 2. Usecase Diagram for Physical Activity Smartphone App

Step5; Personalized intervention were provided according to the stage of changes of the subject. As a results, total 8 session program with smartphone application for 2 months for university students was designed. The stage evaluation of the subject is required every week for stage matching physical activity among five stages. The stages of change are pre-contemplation, contemplation, preparation, action, maintenance. A variety of strategies are provided for each stage week based on TTM [7]. For implementation, 75 university students were recruited and assigned in each groups randomly.

Step6; Upon completion of the implementation, the final intervention program is finalized after evaluation. The level of physical activity as a program goal, health outcomes, and also formation evaluations of the program were evaluated [5, 10].

IV.CONCLUSION

Using Intervention Mapping protocol can make health program with smartphone application more systematic and include various dimensions. Stage matching intervention might make change in physical activity. And the health behavior program using smartphone app has the advantage of making young people feel fun and utilizing existing social network.

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