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## Research Article

## Transtheoretical Model Based Exercise Counseling Combined with Music Skipping Rope Exercise on Childhood Obesity

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## SUMMARY

**Purpose:** The purpose was to evaluate the effects of a transtheoretical model (TTM) based exercise counseling offered with music skipping rope exercise on components of the TTM (stages of change, decisional balance, and self-efficacy), body mass index, glucose, and lipid profile of overweight/obese children in Korea.**Methods:** This study used a nonequivalent pretest and posttest experimental study design. A total of 75 overweight/obese children participated in the study. Eight sessions of exercise counseling combined with music skipping rope exercise for 12 weeks were offered for children in the experimental group, while one session of exercise counseling with music skipping rope exercise for 12 weeks was offered for children in the control group. Outcomes were measured at baseline, and 6 months after the intervention. **Results:** After the intervention, self-efficacy significantly improved among children in the experimental group ( $p = .049$ ), while these children maintained their baseline BMI at 6-month follow-up ( $p > .05$ ). Among children in the control group, BMI significantly increased ( $p < .05$ ). Fasting blood sugar significantly increased for both groups after the intervention ( $p < .05$ ). However, a greater increase was observed for the control group.**Conclusions:** Our study partially supports the hypothesis that a TTM-based exercise intervention is effective in maintaining BMI and improving self-efficacy of overweight/obese children. The TTM-based counseling combined with exercise classes has potential to control weight among overweight/obese children, while involvement of parents and children in the development of the theory-based intervention may generate further benefits regarding health and well-being of overweight/obese children.Copyright © 2016, Korean Society of Nursing Science. Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Childhood obesity is a serious public health concern in that it has increased two-fold during the last decade in Korea [1]. Obese school-age children are vulnerable to multiple health problems including high blood pressure, high cholesterol, impaired glucose tolerance, asthma, and joint problems, as well as greater risk of psychological problems, such as poor self-esteem [2,3]. In addition, obese children are more likely to become obese adults, leading to a number of serious health problems, including cardiovascular

disease, diabetes mellitus, and cancer [2]. Genetics, unhealthy dietary patterns, physical inactivity, and food and physical activity environments are some of the contributing factors of childhood obesity [2]. Physical activity has metabolic effects on childhood obesity including decreasing fat stores, increasing caloric expenditure, and increasing tolerance to glucose use, while improving lipid profile. Accordingly, exercise attenuates the damage associated with childhood obesity [4].

Despite efforts made to curtail increasing obesity among school-age children in Korea, intervention effects seem limited [3,8]. Researchers have offered school-based counseling programs for promotion of physical activity targeting overweight/obese school-age children, and found that the interventions were effective in decreasing body mass index (BMI) or body fat [3,5]. Oh [6], who evaluated a music rope-jumping exercise program offered to

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overweight/obese school-age children, reported a significant decrease in BMI and body fat after the intervention. However, in these studies, only the short-term intervention effects were evaluated, while the combined effects of counseling and music skipping rope exercise have not been evaluated. In addition, theory-based programs have rarely been conducted, while the needs of participating children and their parents were not incorporated into development of the interventions [5].

Among the cognitive behavioral factors associated with physical activity, attitudes and perceptions about physical activity, lack of motivation, and perceived barriers contribute to reduced physical activity, while parental and social support increase physical activity in school-age children [7]. Former studies reported that physical activity interventions based on the transtheoretical model (TTM) were effective in decreasing BMI of obese school-age children [5], and promoting physical activity among young adults [8]. Thus, based on the TTM and a needs assessment of children and their parents, an intervention incorporating tailored exercise counseling combined with music skipping rope exercise was developed and administered to overweight/obese school-age children. The current study was designed to evaluate the long-term effects of the intervention using multiple dimensions of indicators to measure program outcomes.

The TTM has been used to explain physical activity and diet behavior change in obesity [5,9]. The core constructs of the TTM include stages of change, processes of change, decisional balance, and self-efficacy. Stages of change explain behavior as a continuous process moving through five stages: pre-contemplation (having no intention of changing a behavior within the next 6 months), contemplation, preparation, action, and maintenance (having maintained the behavior for more than 6 months) [10]. The basic premises of the TTM include use of different processes and strategies to move from one stage to another; thus tailored interventions specific to the stages of change are needed. There are ten processes of change that people use to progress through five stages. For those in early stages (precontemplation, contemplation, and preparation stages), cognitive and affective processes (experiential processes) are more effective, while for those in later stages (action and maintenance stages), behavioral processes are useful [10]. Decisional balance is composed of pros and cons of change that weigh into the individual choice of behavior change. Regarding decisional balance, providing information on benefits (pros) will help individuals who are in early stages to foster motivation for behavior change, while learning strategies to overcome barriers (cons) will enable individuals who are in later stages to adopt and/or maintain behavior [10]. Self-efficacy refers to an individual's confidence in changing or maintaining a specific behavior in adverse situations [10]. Self-efficacy mediates the relationship between behavioral processes and stage of change, and between decisional balance and stages of change [11].

Studies using the TTM as the theoretical framework have been criticized in that interventions were tailored only to stages of change, while other components (decisional balance, processes of change, and self-efficacy) were neglected [12]. Other researchers contended that the TTM focuses on individual motivation for behavior change, without considering social and external factors [13]. The TTM-based physical activity intervention studies were primarily conducted with adults or patients in community or clinical settings [8,12], with only a few studies conducted in a school setting targeting overweight/obese children, especially in Korea [5]. TTM-based interventions combined with physical activity and diet interventions can produce significant outcomes in health behavior change [9]. Indeed, although TTM-based exercise counseling was offered to obese school-age children, researchers did not include exercise classes; they combined individualized

counseling with group-based counseling, thus less amenable to stage-matched intervention [5].

The aim of our study was to examine the effects of eight sessions of TTM-based tailored exercise counseling offered with music skipping rope exercise classes in modifying stages of change, decisional balance, self-efficacy, and BMI, whether it would improve the glucose tolerance and lipid profile of overweight and obese school-age children.

## Methods

### Study design

Our study was an experimental study with a nonequivalent pretest and posttest design.

### Setting and Sample

Overweight/obese children were recruited from a convenience sample of four elementary schools in one metropolitan area in South Korea, in which school health teachers and school administrators agreed to participate. Using cluster randomization, schools were randomly assigned to experimental (2 schools) and control groups (2 schools). Overweight/obese children were identified based on health screening results (which is conducted annually in schools by health teachers), and health teachers sent letters to parents of these children. The letters included the purpose of the study, and parental consent forms were attached. A total of 76 parents of overweight/obese children agreed that their children could participate in our study, however one child refused to give a blood sample at baseline data collection. Accordingly, 75 overweight/obese children participated in our study (experimental:  $n = 48$ , control:  $n = 27$ ).

Inclusion criteria were those (a) with values equal to or greater than 85% BMI-for-age according to an age-specific and gender-specific reference growth chart for Korean children [14], (b) whose primary language is Korean, (c) enrolled in the third or upper grades in four participating elementary schools, and (d) without chronic health problems. Exclusion criteria were overweight/obese children (a) who have chronic diseases, (b) who were absent from school on the day of data collection, and (c) who refused to give blood samples.

Power analysis was performed using G\*Power 3.1.9. With an effect size of 1.05, which was determined based on a previous study [5], 50 participants are required to produce 95.0% power ( $\alpha = .05$ ). Allowing for 30.0% attrition, 75 participants were recruited.

### Ethical considerations

This study was approved by the Institutional Review Board of Inha University Hospital located in Incheon, Korea (No. 10-2093). Data were collected anonymously, and confidentiality of the participants was secured. Survey materials with written consent forms were stored in a locked file cabinet located in the principal investigator's office. Participants were informed that they could drop from the study any time they wanted without any consequences. Written consent was obtained from parents who agreed to participate, and verbal assent was obtained from children before pretest data collection.

### Measurements

General characteristics included age and gender of children. BMI ( $\text{kg}/\text{m}^2$ ) was calculated from height (m) and weight (kg) measured using electronic scales (Dong Sahn Jenix, Seoul, Korea [DS-103],

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