

Physical activity distribution and differences in its related processes of change strategies in adolescents

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DISTRIBUCIÓN DE LA ACTIVIDAD FÍSICA Y DIFERENCIAS EN SUS PROCESOS RELACIONADOS DE ESTRATEGIAS DE CAMBIO EN ADOLESCENTES

KEYWORDS: Physical activity, processes of change, transtheoretical model, adolescents.

ABSTRACT: The purpose of the present study was to identify physical activity distribution of Korean adolescents and explore differences in cognitive and behavioral processes of change by the stages of physical activity among Korean adolescents. A total of 988 adolescents randomly selected from junior high and high schools in Seoul were surveyed. Stage of physical activity change questionnaire and processes of change questionnaire were used to identify the stages of physical activity and the processes of change construct of adolescents. Results indicated that physical activity pattern of Korean adolescents were different by each stage of physical activity. Female adolescents were more likely to be in the contemplation stage, whereas males were more likely to be in the maintenance. In addition, significant differences were revealed in use of processes of change constructs through stages of physical activity. The use of cognitive and behavioral strategies increased from precontemplation through maintenance. This study provides some insights into the physical activity habits and the TTM components of increasing physical activity levels in the adolescent populations.

Despite the dissemination of health information promoting the benefits of regular participation in physical activity, a large volume of studies indicated that the majority of adolescents around the world either engage in physical activity on an irregular basis or are completely sedentary (Korea Ministry of Health and Welfare, 2015; World Health Organization, 2017).

Although many studies have been investigated to identify factors why many adolescents do not engage in physical activity, a majority of them have been carried out without fully considering the psychological factors associated with adolescent physical inactivity (Kim, 2007). Recently, based on the lack of understanding of the correlates of physical activity, concerted efforts have been directed towards behavioral and cognitive strategies that might be useful for promoting and maintaining physical activity based on the transtheoretical model (TTM) (Prochaska and DiClemente, 1983). The TTM consisted of four key constructs: (1) the stage of change, which attempts to

capture the motivational, behavioral, and temporal aspects of change; (2) the processes of change, which are the activities, events, and strategies that lead to successful behavior change; (3) decisional balance, which is a weighting of the real or perceived pros and cons associated with taking action; and (4) self-efficacy, which is situation-specific self-confidence (Cardinal, Lee, Kim, Lee, Li, and Si, 2009). The full descriptions of the TTM and its components have been found elsewhere (Kim, 2007; Nigg and Courneya, 1998).

In this regard, studies based on the TTM in the physical activity domain have been significantly supported across a variety of populations and settings (Levy and Cardinal, 2006; Plotnikoff, Hotz, Birkett, and Courneya, 2001). However, most of the previous studies have mainly applied self-efficacy and decisional balance as the constructs (Kosma and Cardinal, 2016; Nunes, Silva, and de Andrade Goncalves, 2017; Kim, 2004), and little attention has been devoted to exploring the possible

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relationship between physical activity and the processes of change. Therefore, it is imperative to identify the association of the processes of change with physical activity before disseminating the effectiveness of the TTM across nations and cultures. The purpose of the present study was to identify physical activity distribution and explore differences in cognitive and behavioral processes of change by the stages of physical activity among a random sample of Korean adolescents.

Method

Participants

988 students (male: 544, female: 444, $M_{age} = 14.92$ years, $SD = 0.98$) ranged from 7th to 11th grade who attended junior high and high schools in Seoul, Korea were asked to participate in a survey designed to assess the stage of physical activity and processes of change constructs. In the initial stage of this study, a total of 1014 students were randomly selected from three junior high schools. The consent forms were then given to the parents or guardians of all eligible participants. Of the 1,014 students with parental permission, 988 (97.4%) gave their consent and completed the survey. This study was approved by institutional review board of a Seoul National University of Science and Technology.

Measures

The stages-of-change scale for physical activity developed by Marcus, Selby, Niaura, and Rossi (1992) was translated into Korean (Kim, 2004), and used in the present study to measure participant current stage of physical activity. In this scale, stage of physical activity was assessed using a five-item, dichotomous scale ("yes"/"no") related to regular physical activity and intentions. The participants were categorized into one of the five stages of physical activity: (1) precontemplation, (2) contemplation, (3) preparation, (4) action, and (5) maintenance. A two-week, test-retest reliability was conducted, resulting in a reliability coefficient of .85. Processes of Change Questionnaire developed by Nigg, Norman, Rossi, and Benisovich (1998) was revised for the Korean version (Kim, 2004), and applied to assess processes of physical activity change. The Korean version of processes of change questionnaire contains 24 items that measure the 8 processes of change. In this revised questionnaire, individuals were asked to recall the past month and to rate the frequency of occurrence of each item, on a 5-point Likert-type scale (ranging from 1, "never" to 5, "repeatedly"), how

frequently each of the processes were used. Test-retest reliability measures were performed as a measure of instrument stability, and obtained reliabilities from .69 to .89.

Data analysis

Frequency analysis was conducted to examine the physical activity distribution of adolescents. In addition, multivariate F-tests along with post-hoc analyses were performed to identify the differences in processes of change of adolescents within the hypothesized stages of physical activity.

Results

Stage of physical activity distribution overall and as a function of gender were presented in Table 1. The following stages of physical activity emerged overall: precontemplation ($n=180$, 19.0%), contemplation ($n=156$, 17.1%), preparation ($n=189$, 18.5%), action ($n=267$, 26.8%), and maintenance ($n=195$, 18.6%). Especially, considering the fact that overall 54.6% of the participants reported being inactive (precontemplation or contemplation) or exercise irregularly (preparation), a lack of exercise in the adolescents is a crucial factor that might adversely affect their health. Female adolescents were more likely to be in the contemplation stage ($\chi^2 = 94.6$, $df = 4$, $p < .001$), whereas males were more likely to be in the maintenance stage ($\chi^2 = 109.71$, $df = 4$, $p < .001$).

Table 2 shows the means, standard deviations, the results of F-tests and Tukey post hoc contrasts for the cognitive and behavioral processes of change across the five stages of physical activity. Adolescents in precontemplation significantly less used most of eight processes of change than those in other stages of physical activity. In the cognitive processes conscious raising [$F(4, 983)=4.55$, $p < .001$] and environmental reevaluation [$F(4, 983)=2.49$, $p < .05$] statistically differentiated across stages of physical activity. Turkey's post hoc tests revealed such mean differences in conscious raising and environmental reevaluation emerged between adolescents in precontemplation, contemplation, and preparation and those in maintenance. A more stable pattern of process of change use emerged for the behavioral strategies. Adolescents in precontemplation and contemplation used these processes less than those in more advanced stages of change. Especially, adolescents in the action and maintenance stages used these processes more habitually as compared with those in preparation. Using the criteria (η^2) a large effect size observed for conscious raising, helping relationships, and counter-conditioning. Medium effect sizes

were noted for environmental reevaluation, reinforcement management, and stimulus control. Dramatic relief and self reevaluation yielded large effect sizes.

Discussion

The present study identified that physical inactivity of Korean adolescents could seriously affect their health status in the future, considering the findings that overall 54.6% of the participants reported being inactive (precontemplation or contemplation) or exercise irregularly (preparation). These findings agree with previous studies (Kim, 2004; Pinto and Marcus, 1995). The high rates of physical inactivity among Korean adolescents might be extensively caused by the social and environmental limitations such as a lack of available facilities and times for exercise, a social context neglecting exercise and Physical Education, and excessive schoolwork due to dominance of academic-centered curriculum.

In addition, male adolescents showed a high proportion in the maintenance stage, whereas a high proportion of females were in contemplation as compared with their counterparts. This finding is not surprising in light of the consistent relationship between gender and exercise behavior. There was approximately a 17.3% difference in the proportion of male and female adolescents in the maintenance stage and 20.4% in contemplation. This finding was supported by one study, demonstrating that males were significantly more likely to be in the action or maintenance stages compared with their female counterparts (Wyse, Mercer, Ashford, Buxton and Gleeson, 1995).

The present study showed significant differences in the use of cognitive and behavioral processes of change, with a clear indication of increased use of processes associated with advancing stage. These findings are similar to those found by previous studies (Hwang & Kim; 2011; Nigg and Courneya,

1998). The use of cognitive strategies increased from precontemplation through maintenance. As demonstrated by the Turkey's post hoc tests, significant differences across stages of exercise behavior were observed in conscious raising and environmental reevaluation. In the cognitive processes, conscious raising was the best discriminator among all stages of exercise behavior. This finding indicates that many adolescents seek new information about exercise. In addition, adolescents in precontemplation, contemplation and preparation used environmental reevaluation less than those in action and maintenance. This result can be interpreted that adolescents who have no intention to initiate exercise or exercise irregularly give little thought to how their inactivity affects their social and environment.

For the behavioral strategies, the overall sub variables of the behavioral processes seemed to be more stable to exercise behavior change, and increased from precontemplation through maintenance. These findings indicate that behavioral strategies are important in exercise adoption and maintenance. All four strategies had statistically significant effect sizes, especially helping relationships and counter-conditioning showed the high effect sizes. This finding implies that as adolescents become more active, they seem to have more significant others who encourage them to consistently maintain exercise habits, and are able to substitute sedentary behaviors more easily with physical activity.

This study provides much needed information about Korean adolescents in terms of their physical activity and aspects of the processes of change constructs which relate directly to physical activity change. More importantly, the present study provides convincing evidence that promoting and maintaining physical activity behavior require the practical application of cognitive and behavioral strategies.

Variables		Stages of Physical activity					Total
		PC	C	P	A	M	
Gender	Male	64(11.8)	36(6.6)	117(21.5)	177(32.6)	150(27.5)	544
	Female	116(26.1)	120(27.0)	72(16.3)	90(20.2)	45(10.2)	444
Total		180(19.0)	156(17.1)	189(18.5)	267(26.8)	195(18.6)	988(100.0)

PC=Precontemplation; C=Contemplation; P=Preparation; A=Action; M=Maintenance. Parentheses are standard deviations.

Table 1. Stages of physical activity distribution by gender

Process of Change	Stages of physical activity					F (4,983)	η^2	Turkey's HSD ¹
	PC	C	P	A	M			

Cognitive Process								
Conscious raising ^a	2.46 (1.02)	2.46 (.99)	2.46 (.91)	2.69 (1.00)	2.89 (1.01)	4.55***	.21	PC,C,P<M
Dramatic relief ^c	2.53 (.98)	2.55 (.95)	2.59 (.88)	2.69 (.86)	2.76 (.91)	1.43	.09	
Environmental reevaluation ^b	2.53 (1.07)	2.54 (1.02)	2.54 (.89)	2.80 (1.00)	2.92 (1.02)	2.49*	.12	PC,C,P<A,M
Self reevaluation ^c	3.21 (1.03)	3.19 (.98)	3.20 (1.04)	3.40 (.96)	3.46 (.95)	1.83	.03	
Behavioral Process								
Helping relationships ^a	2.64 (1.20)	2.74 (1.21)	2.84 (1.22)	3.13 (1.02)	3.15 (1.18)	3.76**	.22	PC,C,P<A,M
Reinforcement management ^b	3.06 (1.00)	3.14 (1.01)	3.14 (1.11)	3.38 (.87)	3.41 (1.05)	2.66*	.16	PC,C,P<A,M PC<A
Stimulus control ^b	2.21 (1.10)	2.38 (1.07)	2.41 (.90)	2.68 (1.02)	2.76 (1.00)	2.52*	.15	PC,C,P<M PC,C<A
Counter-conditioning ^a	2.30 (1.03)	2.37 (.98)	2.38 (.95)	2.69 (.82)	2.82 (1.00)	3.52**	.21	PC,C,P<A,M

*P<.05; **P<.01; ***P<.001.

^aLarge effect size; ^bMedium effect size; ^cSmall effect size

¹Mean differences for the Turkey HSD pairwise comparisons (p<.05).

Parentheses are standard deviations.

PC:Precontemplation; C:Contemplation; P:Preparation; A:Action; M:Maintenance.

Table 2. Comparison of means and standard deviations of the processes of change across the stages of physical activity

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PALABRAS CLAVE: Actividad física, procesos de cambio, modelo transteórico, adolescentes.

RESUMEN: El propósito del presente estudio fue identificar la distribución de la actividad física de los adolescentes coreanos y explorar las diferencias en los procesos de cambio cognitivo y conductual por las etapas de la actividad física entre los adolescentes coreanos. Se encuestó a un total de 988 adolescentes seleccionados aleatoriamente de las escuelas secundarias y preparatorias de Seúl. Se utilizaron el cuestionario de estadio del cambio de actividad física y el cuestionario de procesos de cambio para identificar las etapas de la actividad física y los procesos de construcción del cambio de los adolescentes. Los resultados indicaron que el patrón de actividad física de los adolescentes coreanos era diferente en cada etapa de la actividad física. Las adolescentes eran más propensas a estar en la etapa de contemplación, mientras que los varones tenían más probabilidades de estar en el mantenimiento. Además, se revelaron diferencias significativas en el uso de procesos de construcción de cambios a través de etapas de actividad física. El uso de estrategias cognitivas y conductuales aumentó desde la precontemplación hasta el mantenimiento. Este estudio proporciona algunas ideas sobre los hábitos de actividad física y los componentes de TTM de los niveles crecientes de actividad física en las poblaciones de adolescentes.

References

- Cardinal, B.J., Lee, J.Y., Kim, Y.H., Lee, H., Li, K.K., and Si, Q. (2009). Behavioral, demographic, psychosocial, and sociocultural concomitants of stage of change for physical activity behavior in a mixed-culture sample. *American Journal of Health Promotion*, 23, 274-278.
- Hwang, J. and Kim, Y.H. (2011). Adolescents' physical activity and its related cognitive and behavioral processes. *Biology of Sport*, 28, 19-22.
- Kim, Y.H. (2007). Application of the transtheoretical model to identify psychological constructs influencing exercise behavior: A questionnaire survey. *International Journal of Nursing Studies*, 44, 936-944.
- Korea Ministry of Health and Welfare (2015). 2013 National Health Statistics. Retrieved from http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=2931
- Kosma, M. and Cardinal, B.J. (2016). The transtheoretical model, physical activity, and falls risks among diverse older adults. *Activities, Adaptation & Aging*, 40, 35-52.
- Levy, S.S. and Cardinal, B.J. (2006). Factors associated with transitional shifts in college students' physical activity behavior. *Research Quarterly for Exercise and Sport*, 77, 476-485.
- Macus B.H, Selby V.C., Niaura R.S., and Rossi J.S. (1992). Self-efficacy and the stage of exercise behavior change. *Research Quarterly for Exercise and Sport*, 63, 60-66.
- Nigg C.R., Norman G.J., Rossi J.S., and Benisovich S.V. (1998). *Processes of exercise behavior change: Redeveloping the scale*. Poster presented at SBM. San Diego, CA, 1998.
- Nigg, C.R. and Courneya, K.S. (1998). Transtheoretical model: Examining adolescent exercise behavior. *Journal of Adolescent Health*, 22, 214-224.
- Nunes, H.E., Silva, D.A., and de Andrade Gonçalves, E.C. (2017). Prevalence and factors associated with stages of behavior change for physical activity in adolescents: a systematic review. *World Journal of Pediatrics*, 1-8.
- Pinto, B.M. and Marcus, B.H. (1995). A stages of change approach to understanding college students' physical activity. *Journal of American College Health*, 44, 27-31.
- Plotnikoff, R.C., Hotz, S.B., Birkett, N.J., and Courneya, K.S. (2001). Exercise and transtheoretical model: A longitudinal test of a population sample. *Preventive Medicine*, 33, 441-452.
- Prochaska, J.O. and DiClemente, C.C. (1983). Stage and processes of self change of smoking: Toward and integrative model. *Journal of Consulting and Clinical Psychology*, 51, 390-395.
- World Health Organization (2017). Prevalence of insufficient physical activity. Retrieved from http://www.who.int/gho/ncd/risk_factors/physical_activity_text/en/
- Wyse, J., Mercer, T., Ashford, B., Buxton, K., and Gleeson, N. (1995). Evidence for the validity and utility of the stages of exercise behavior change scale in young adults. *Health Education Research*, 10, 365-377.