

Effect of Exercise and Physical Activity Participation on Happiness of Adolescents in Korea: Double Mediating Effect of Cooperation and Friendship and Moderated Mediating Effect of Grit

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Abstract

Background Exercise and physical activity during adolescence are essential developmental assets for physical, psychological and social development. However, there is a lack of exercise and physical activity among young people worldwide. It is reported that exercise/physical activity contributes not only to the physical health of adolescents, but also to psychological well-being, human relationship formation, and holistic development. Conversely, lack of exercise and physical activity deteriorates physical and mental health and social and emotional development. In this regard, academic interest and in-depth research on the participation of adolescents in exercise and physical activity and related variables are needed. **Objectives** The purpose of this study was to verify the moderated mediating effect of grit in the effects of youth participation in exercise and physical activity on happiness through cooperation and friendship, and to propose a model for the promotion of youth happiness. **Methods** This study used data from 『Korean Children and Youth Panel 2018 (KCYPS 2018)』 Among them, data from the 3rd year (2020), the most recent data, were used for analysis, and the 3rd grade of middle school was selected. This data was downloaded from the website of the Korea Youth Policy Institute. For the data analysis, frequency analysis, reliability analysis, descriptive statistical analysis, Pearson's bivariate correlation analysis, and moderated mediating effect analysis were applied. **Results** First, there was a positive correlation between exercise and physical Activity participation, cooperation, grit, friendship, and happiness. Second, grit has a moderated mediating effect in the effect of participation in exercise and physical activity on happiness through cooperation and friendship sequentially. **Conclusions** This study investigated the influence that adolescents' participation in exercise and physical activity increases their cooperation, improves their friendship, and increases their happiness, and it was verified that grit strengthens this influence. That is, even if participation in exercise and physical activity is somewhat low, it suggests that happiness can be improved by enhancing grit, cooperation, and friendship.

Keywords: exercise and physical activity participation, happiness, cooperation, friendship, grit, moderated mediating effect

Introduction

Lack of exercise and physical activity among adolescents is a universal phenomenon that appears all over the world. According to the World Health Organization research report conducted on 16 million youths in 146 countries around the world, 81% of the world's youth did not meet the WHO's recommended standard for physical activity, among them, Korea was the lowest among 146 countries, with about 94% of them falling short of the standard [1]. Adolescents' exercise and physical activity are very important because they are developmental assets for the physical, psychological, and social development of adolescents [2].

Various studies have been conducted on the effects of youth exercise and physical activity in physical education. Specifically, exercise and physical activity not only affect the physical health of adolescents, but also reduce depression and aggression [3]. In addition, they form and maintain a sense of psychological well-being and human relationships [4] and holistic development [5]. Conversely, lack of exercise and physical activity has been reported to impair physical and mental health and socio-emotional development [1]. In this regard, an in-depth study on the participation of adolescents in exercise and physical activity is necessary.

Happiness is a variable closely related to exercise and physical activity participation. Happiness can be defined as the universally pursued value of life [6]. Looking at the studies related to exercise and physical activity participation and happiness, the happiness of adolescents who participated in sports activities was relatively high [7], and sports activities directly affected subjective happiness and indirectly affected them through self-esteem. Regular physical activity helps to reduce stress [8], and physical activity contributes to happiness [9]. In addition, adolescent exercise was effective in reducing stress and promoting well-being [10], and it was found that adolescents who participated in school sports clubs felt 1.19 times higher in happiness than those who did not [11].

On the other hand, it was reported that the participation of adolescents in exercise and physical activity affects their cooperation and friendship satisfaction. First, considering the previous studies on the cooperation, the OECD has suggested social and emotional abilities as one of the core competencies required for young people who will live in 2030, and this includes the cooperation [12]. Cooperation generally refers to the ability of each member to fulfill his/her role and to solve problems by cooperating with others in order to achieve a common goal of the organization [13]. Cooperation can be enhanced through participation in sports activities [14], and it has been verified as a major factor in successful friendships [15].

Next, friendship is one of the major social relationships among adolescents, and forming and maintaining friendship relationships is an important developmental task during adolescence [16]. Adolescent friendship is defined as a relationship with an object of similar gender, age, grade, etc. [17], which occurs mainly in a school environment, has a similar developmental level physically and mentally, and is capable of social interaction. Positive friendships were reported to increase adolescent self-esteem [18], self-resilience, school adaptation, and life satisfaction [19]. As revealed in previous studies, exercise and physical activity targeting adolescents was based on the fact that participation in sports activities affects cooperation, cooperation affects friendship, and thus friendship affects life satisfaction. In the relationship between exercise and physical activity participation and happiness, I want to empirically verify the double mediating effect of cooperation and friendship.

Meanwhile, grit is a variable that has been frequently highlighted in relation to success and achievement. Grit is defined as 'persistence and passion for long-term goals' and is a common trait of people who have achieved outstanding achievements in a variety of fields [20]. High-grit individuals maintain a consistency and interest in long-term goals and strive to achieve them consistently, while low-grit individuals change their goals or interests frequently, have low interest in long-term goals, and don't strive to achieve them. When encountering obstacles in the process of making an effort, there is a high tendency to give up or become frustrated [20]. In particular, grit has been reported in many studies to make a significant contribution to sports-related achievement [21-23]

Grit was reported to moderate the relationship of various variables. Grit moderated the relationship between gratitude and life satisfaction. In the high grit group, life satisfaction increased relatively when the gratitude increased, but in the low grit group, life satisfaction was relatively less when the gratitude increased [24]. The path from job stress to happiness through a growth mindset was found to be moderated by grit [25]. Also, the relationship between problem behavior and life satisfaction of adolescents was found to depend on grit [26].

By applying the moderating effect of grit verified in previous studies, it was attempted to verify whether grit moderates the mediating role of cooperation and friendship in the relationship between exercise and physical activity and happiness of adolescents.

Looking at previous studies so far, there are no studies analyzing the double mediating effect of cooperation and friendship in the relationship between exercise and physical activity participation and happiness of adolescents, or studies dealing with the moderated mediating role of grit between these variables. .

Therefore, It is intended to investigate whether participation in exercise and physical activity of youth directly affects happiness, and indirectly affects happiness by promoting cooperation and friendship, and grit plays a moderated mediation role in elevating the mediation effect of cooperation and friendship.

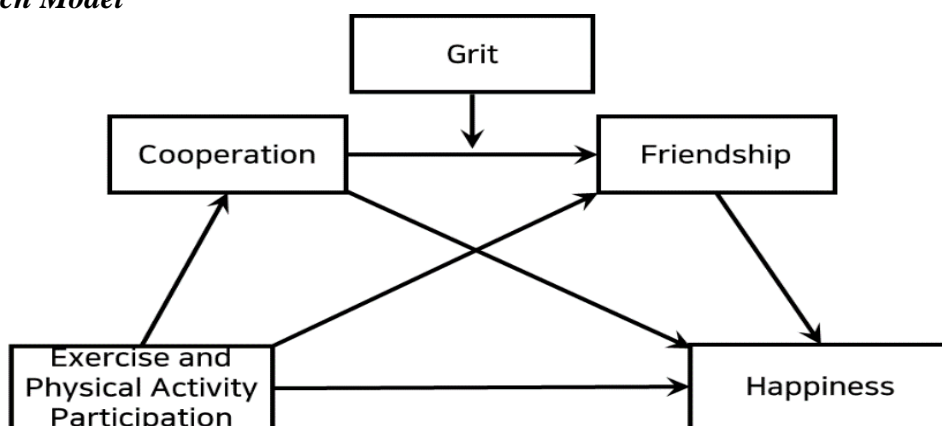
Objectives

The purpose of this study was to verify the moderated mediating effect of grit in the effects of youth participation in exercise and physical activity on happiness through cooperation and friendship, and to propose a model for the promotion of youth happiness.

To achieve this purpose, the following research questions were established. First, what is the correlation between exercise and physical activity participation, cooperation, friendship, grit, and happiness? Second, does grit moderate the mediating effect of cooperation and friendship between exercise and physical activity participation and happiness?

Methods

Research Model



[Figure 1] Research model

This research model is PROCESS macro model 91 proposed by Hayes [27], and it is to verify the moderated mediating effect of grit on the path from exercise and physical activity participation to happiness through cooperation and friendship, like [Figure 1].

Participants

This study used data from 『Korean Children and Youth Panel 2018 (KCYPS 2018)』 [28]. The Korea Children and Youth Panel Survey is an annual data set by the Korea Youth Policy Institute to investigate systematically and multi-faceted complex changes in the growth and development of children and adolescents. This panel has the advantage of being representative as the number of samples is sufficiently secured through a nationwide longitudinal cross-sectional survey. In this study, data from the 3rd year, the most recent data from the 『Korean Children and Youth Panel 2018』 [28], was used for analysis. In present study 2384 subjects were analysed. The gender of the study subjects was 53.6% male and 46.4% female. As for the size of the city based on school, small and medium-sized cities accounted for 43.2%, followed by large cities with 41.9% and townships with 14.9%.

Since this study is a study using panel data, which is secondary data, and is subject to IRB examination exemption, the study was conducted after receiving IRB examination exemption approval (Hanseon University IRB 2022-0528-05).

Research tools

Exercise and physical activity participation

The exercise and physical activity participation scale used in this study was measured with a scale developed by the Korea Youth Policy Institute. This scale consists of weekdays and weekends of exercise and physical activity hours excluding school classes, and each item is on a 7-point Likert scale, ranging from “1 point = not at all” to “7 points = 4 hours or more”. A higher score means a better level of exercise and physical activity participation.

Cooperation

For the cooperation scale, 14 items in the cooperation area were used among the youth social participation competency measurement tools developed by Kim et al. [29]. This scale consists of 6 items on group promotion, such as 'I am willing to help my friends when they are having difficulties in group activities' and 3 items on followership, such as 'I want to be helpful in group activities by doing more than I am assigned to, even if I am not a leader in the group', and 5 questions about conflict resolution, such as 'I try to solve problems in the group rather than trying to figure out what's wrong'. Each item is on a 4-point Likert scale ranging from “1 point = not at all” to “4 points = strongly agree”, and the higher the score, the higher the cooperation. In this study, the reliability of cooperation Cronbach's α was high at .920.

Friendship

As for the friendship scale, ‘friendship quality’ developed by Bae et al. [30] was used. On this scale, there are 8 items of positive friendship such as 'my friends help me when I do something' and 5 items of negative friendship such as 'I often have conflicts of opinion with my friends' and a total of 13 items. Negative friendship items were reversed. Each item is on a 4-point Likert scale ranging from “1 point = not at all” to “4 points = strongly agree”, and the higher the score, the better the friendship. In this study, Cronbach's α of friendship reliability was .826.

Grit

Grit scale which was developed by Duckworth and Quinn [31] (Grit-S) and validated by Kim et al. [32] was used in the present study. This scale consists of 4 items on continuation of effort, such as 'if I start, I finish it unconditionally', and 4 items on maintaining interest, such as 'I once focused on a problem for a while and soon lost interest'. Negative items were counted backwards, and in this study, it was a 4-point Likert scale ranging from “1 point = not at all”

to “4 points = strongly agree”, with a higher score indicating a higher level of grit. Cronbach's α of grit reliability in this study was .710.

Happiness

In this study, happiness was measured using the happiness index scale developed and validated by Lee et al. [33]. This scale consists of a total of 4 items including 'I am a very happy person overall', and it is a 4-point Likert scale ranging from “1 = not at all” to “4 = strongly agree”. A higher score means a high level of happiness. In this study, the Cronbach's α for happiness was .728.

Data analysis

In this study, the following analysis methods were used using SPSS PC+ Window Ver. 25.0 and PROCESS macro Ver. 4.1. First, frequency analysis and descriptive statistical analysis were performed to identify trends of major variables, and Cronbach's α was calculated to determine reliability. Second, Pearson's correlation analysis was performed to determine the correlation between variables, and the correlation coefficient was calculated. Third, in order to understand the moderated mediating effect, model 91 of the PROCESS macro was applied and analyzed. In the effect analysis, the confidence level was 95%, the number of bootstrap samples was set to 5,000, and the conditions for identifying conditional direct and indirect effects were set as mean (M) and mean \pm standard deviation (M \pm 1SD), and the independent and moderating variables constituting the interaction term were mean centered.

Results

Correlation between main variables

The results of Pearson's correlation analysis of major variables are presented in <Table 1>. There were all positively significant correlations between exercise and physical activity participation, cooperation, grit, friendship, and happiness. Friendship and happiness had the highest correlation (.415, $p < .01$), and friendship and cooperation had the second highest correlation (.409, $p < .01$).

<Table 1> *Analysis of Correlation and descriptive statistics of major variables*

	Exercise and physical activity participation	Cooperation	Grit	Friendship	Happiness
Exercise and physical activity participation	1				
Cooperation	.135**	1			
Grit	.150**	.356**	1		
Friendship	.084**	.409**	.276**	1	
Happiness	.115**	.315**	.357**	.415**	1
M	2.6938	2.9218	2.5712	3.1085	3.0534
SD	1.3788	0.4718	0.4185	0.3897	0.4551

** $p < .01$

As a result of descriptive statistical analysis, the average of exercise and physical activity participation (out of 7 points) was lower than the median value, and cooperation, grit, friendship, and happiness (out of 4 points) were all higher than the median value. Among them, the average of friendship was the highest with 3.1085 points, and happiness was the second highest with 3.0534 points.

2) Moderated mediating effect of grit in the relationship of exercise and physical activity participation, cooperation, friendship, and happiness

The PROCESS macro model 91 was applied and analyzed to determine whether grit moderated the mediating effect of cooperation and friendship in the effect of exercise and physical activity participation on happiness, and the results are shown in <Table 2>. In the analysis, the bootstrap confidence level was 95.0%, the number of samples was 5,000, and gender was input as a control variable.

Participation in exercise and physical activity had a significant positive effect on cooperation ($B=.0551$, $p<.001$). However, in exercise and physical activity participation, cooperation did not affect friendship ($B=.0093$, $p>.05$) and happiness ($B=.0107$, $p>.05$). Cooperation had a positively significant effect on friendship ($B=.2885$, $p<.001$), and the interaction between cooperation and grit also had a positively significant effect on friendship ($B=.1348$, $p<.001$). And cooperation ($B=.1681$, $p<.001$) and friendship ($B=.4101$, $p<.001$) positively and significantly affected happiness.

In order to understand the conditional effect of cooperation in the moderated mediation model, three conditions (M , $M\pm 1SD$) were set and analyzed according to the grit value. As a result, the moderating effect of grit was significant in all three conditions. Specifically, the conditional effect of cooperation on friendship was significant from $-.4185$ when the grit was low to $.4185$ when the grit was high, and as the grit increased, the effect of cooperation on friendship increased.

Analyzing Johnson-Neyman was applied to identify the significance area of the conditional effect. As a result of the analysis, the conditional effect was not significant in the area where the grit value was -1.4635 or less, but the moderating effect was significant in the area higher than -1.4635 , and 99.9581% of the study subjects fell into this area. In other words, if the grit was below -1.4635 , the relationship between cooperation and friendship was not moderated.

Since grit moderated the relationship between cooperation and friendship in the moderated mediation model, the visualization of the moderating effect is as shown in <Figure 2>. Three conditions (M , $M\pm 1SD$) were set according to the grit value of moderating variable. As cooperation increased, friendship also increased, and the gradient of the group with high grit was steeper. In other words, as cooperation improves, friendship also improves, and the high-grit youths are more likely to do so.

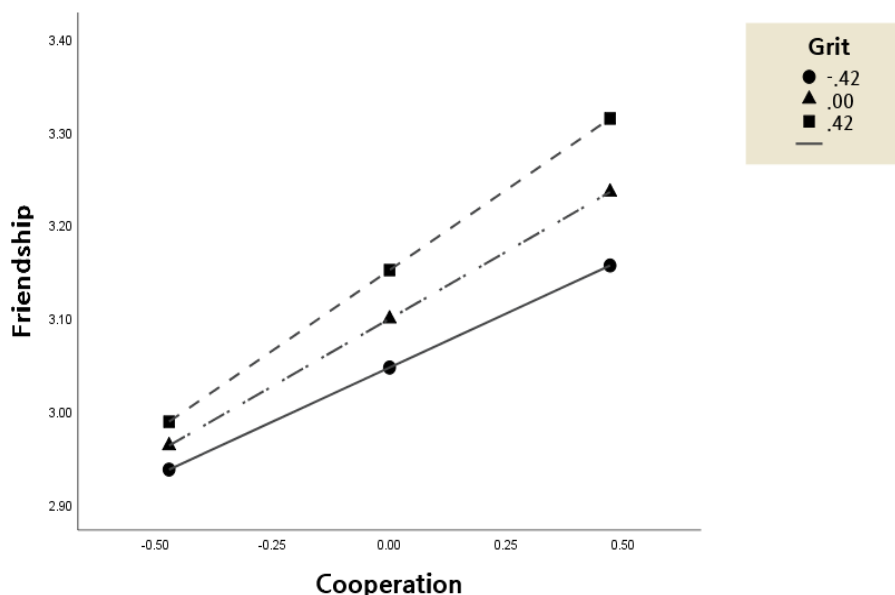
The direct effects, non-conditional and conditional indirect effects of exercise and physical activity participation on the path to happiness were analyzed, and the results are shown in <Table 3>.

The direct effect between exercise and physical activity participation and happiness was $.0107$ ($-.0016$ to $.0230$), which was not significant because 0 (zero value) was included between the lower and upper bounds of the bootstrap at the 95% confidence interval.

<Table 2> Analysis of moderating effect of grit

Mediating variable model (DV: Cooperation)						
	R	R ²	F	p		
Model Summary	.1683	.0283	34.6911	.0000		
Variables	coefficient	SE	t value	p	LLCI*	ULCI**
Constant	-.2917	.0396	-7.3590	.0000	-.3695	-.2140
Exercise and Physical Activity Participation	.0551	.0071	7.7144	.0000	.0411	.0691
Gender	.0980	.0197	4.9647	.0000	.0593	.1366
Mediating variable model (DV: Friendship)						
	R	R ²	F	p		
Model Summary	.4464	.1993	118.3520	.0000		
Variables	coefficient	SE	t value	p	LLCI*	ULCI**
Constant	2.9845	.0301	99.0055	.0000	2.9254	3.0437
Exercise and Physical Activity Participation	.0093	.0054	1.7080	.0878	-.0014	.0200
Cooperation	.2885	.0164	17.5754	.0000	.2563	.3206
Grit	.1250	.0188	6.6363	.0000	.0880	.1619
Cooperation × Grit	.1348	.0302	4.4616	.0000	.0756	.1941
Gender	.0611	.0149	4.0964	.0000	.0318	.0903
Conditional effects of the academic procrastination at values of hopes:						
Grit	Effect	se	t value	p	LLCI*	ULCI**
-.4185	.2320	.0203	11.4496	.0000	.1923	.2718
.0000	.2885	.0164	17.5754	.0000	.2563	.3206
.4185	.3449	.0212	16.2968	.0000	.3034	.3864
Johnson-Neyman's Conditional Effect Significance Area						
Grit	% below		% above			
-1.4635	.0419		99.9581			
Significance area of conditional effects of the academic procrastination at values of hopes:						
Grit	Effect	F	t value	p	LLCI*	ULCI**
-1.5712	.0766	.0495	1.5470	.1220	-.0205	.1738
-1.4635	.0911	.0465	1.9610	.0500	.0000	.1823
-1.4212	.0969	.0453	2.1388	.0325	.0081	.1857
⋮						
1.4288	.4811	.0469	10.2639	.0000	.3892	.5730
Dependent variable model (DV: Happiness)						
	R	R ²	F	p		
Model Summary	.4638	.2151	163.0257	.0000		
Variables	coefficient	SE	t value	p	LLCI*	ULCI**
Constant	1.9109	.0780	24.4956	.0000	1.7579	2.0639
Exercise and Physical Activity Participation	.0107	.0063	1.6997	.0893	-.0016	.0230
Cooperation	.1681	.0194	8.6854	.0000	.1302	.2061
Friendship	.4101	.0233	17.5863	.0000	.3644	.4558
Gender	-.1100	.0172	-6.3796	.0000	-.1438	-.0762

*LLCI = Low Limit within Confidence Interval
**ULCI=Upper Limit within Confidence Interval



[Figure 2] Moderating effect of grit in the moderated mediation model

<Table 3> Analysis of direct effects, unconditional indirect effects and conditional indirect

Direct effect of X on Y: Exercise and physical activity participation → Happiness					
Effect	se	t value	p	BootLLCI*	BootULCI**
.0107	.0063	1.6997	.0893	-.0016	.0230
Unconditional indirect effects of X on Y					
path	Effect	BootSE	BootLLCI*	BootULCI**	
Exercise and physical activity participation → Cooperation → Happiness	.0093	.0018	.0059	.0131	
Exercise and physical activity participation → Friendship → Happiness	.0038	.0023	-.0006	.0083	
Conditional indirect effects of X on Y					
: Exercise and physical activity participation → Cooperation → Friendship → Happiness					
Grit	Effect	BootSE	BootLLCI*	BootULCI**	
-.4185	.0052	.0010	.0034	.0074	
.0000	.0065	.0011	.0044	.0088	
.4185	.0078	.0013	.0053	.0105	
Index of moderated mediation:					
Gri	Index	BootSE	BootLLCI*	BootULCI**	
	0.0030	.0010	.0013	.0051	

*LLCI = Low Limit within Confidence Interval
**ULCI=Upper Limit within Confidence Interval

On the path from exercise and physical activity participation to happiness through cooperation, the non-conditional indirect effect is .0093 (.0059 to .0131), and 0 (zero value) is not included between the lower and upper bounds of the bootstrap in the 95% confidence interval. It was significant. However, on the path from exercise and physical activity participation to happiness through friendship, the unconditional indirect effect is .0038(-.0006 to .0083), with 0 (zero value) between the lower and upper limits of the bootstrap at the 95% confidence interval. It was not significant.

To determine whether grit moderates the effect of exercise and physical activity participation on happiness through cooperation and friendship sequentially, three conditions (M, M±1SD) were set and analyzed according to grit values. From -.4185 when grit was low to .4185 when grit was high, the conditional indirect effect of exercise and physical activity participation on happiness was significant. That is, when grit increases, the effect of exercise and physical activity participation on happiness through cooperation and friendship gradually increases, and grit plays a role in raising this positive relationship.

The moderated mediating effect index of grit was .0030 (.0013 to .0051), and there was no zero (zero value) between the lower limit and the upper limit in the bootstrap confidence interval, so the moderated mediating effect index was statistically significant.

Discussion

This study verified whether grit moderates the double mediating effect of cooperation and friendship in the relationship between youth's exercise and physical activity participation and happiness, and I suggests ways to promote the effect of youth participation in exercise and physical activity on happiness through cooperation and friendship. The discussion based on the research results is as follows.

First, there was a positive correlation between exercise and physical activity participation, cooperation, friendship, grit and happiness. The more participation in exercise and physical activity, the higher the level of cooperation, friendship, grit, and happiness. Adolescents participating in school sports clubs felt 1.19 times happier than adolescents who did not [11], and found that exercise and physical activity affect psychological well-being and the formation and maintenance of human relationships [4], which are in line with the research results. In addition, Studies that the happiness of adolescents who participated in sports activities was relatively high [7], that sports activities directly affected subjective happiness, and that sports activities contributed to happiness [9] support the results.

Second, grit moderated the path of exercise and physical activity participation to happiness through cooperation and friendship. When grit increased, the effect of exercise and physical activity participation on happiness through cooperation and friendship gradually increased, and grit played a role in increasing this positive effect. In the low-grit group (M-SD), average group (M) and high-grit group (M+SD), the effect of exercise and physical activity participation on happiness through cooperation and friendship was significant.

Previous researches shows that cooperation can be promoted through participation in sports activities [14], cooperation is a major factor in successful friendships [15], and positive friendship increases life satisfaction in adolescence [19]. Those studies support the results of this study that participation in exercise and physical activity affects happiness through cooperation and friendship.

Also, a study that grit had a moderating effect by raising the relationship between gratitude and life satisfaction [24], and that grit played a buffering role in the relationship between adolescent problem behavior and life satisfaction [26] support this result. In other words, grit acts as a buffer by reducing negative influence relationships and plays a strengthening role by increasing positive influence relationships. .

In the relationship that cooperation and friendship improve and the level of happiness increases when participation in exercise and physical activity increases, in order to increase happiness, it is necessary to increase participation in exercise and physical activity, an independent variable. However, given the lifestyle of Korean adolescents who are chased by their busy academic schedules, it may be difficult to rapidly promote participation in exercise and physical activity. In this study, grit was selected as an alternative to this and its role was verified. In other words, it was found through this study that, in the case of adolescents with the same exercise and physical activity participation, the happiness of adolescents with high grit was higher than that of those without.

Recommendations for follow-up research are as follows. This study is a cross-sectional study for a single year. Through a longitudinal study, it is necessary to determine whether the model verified in this study is equally applied to multi-year studies.

Despite the limitations of these studies, sequential causal relationships were identified on how exercise and physical activity participation affect happiness, and by verifying that this relationship depends on grit, the results of integrating previous studies were derived. Through this, it is meaningful in that it suggests a new alternative that can improve the happiness of youth. In addition, it will contribute to revitalizing various academic discourses on youth's athletic and physical activities, cooperation, friendship and happiness.

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