

Article

Role of the Flow In Physical Education Class Between School Life Stress and Aggressiveness Among Adolescents

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Abstract: This study examines the relationships between the flow in physical education (P.E.) class, school life stress, and aggression in adolescents. A total of 470 surveys collected from five different high schools in Daejeon, South Korea, were analyzed using structural equation modeling. Study results indicated that the flow in P.E. class had a significant negative direct effect on school life stress, but did not have a significant direct effect on aggression. Furthermore, school life stress had a significant positive direct effect on aggression. Finally, flow in P.E. class had a significant negative indirect effect on aggression mediated by school life stress. The findings of this study are valuable for education experts to establish more effective P.E. curriculums in reducing school life stress and aggression.

Keywords: physical education; flow; stress; aggression

1. Introduction

1.1. Needs of Study

Bullying and physical violence have continually increased, affecting almost one in three children globally [1]. Over 32% of students have been bullied or have experienced physical attacks by peers at school [1]. Now, bullying behavior in schools has been one of the most important social issues in public education. According to prior studies [2], the bullying behavior of adolescents in school is significantly related to aggression [2]. In other words, the likelihood of engaging in bullying behavior increases as the adolescent's aggression level increases, or adolescents do not properly regulate their aggression. Meanwhile, we need to focus on two important factors affecting aggression, including stress and physical activity, since stress is positively related to aggression, while physical activity is inversely related to aggression [3–6]. Moreover, physical activity reduces stress as well [7,8]. In this context, participating in physical activity might be a key factor in reducing both stress and aggression, and, in turn, decreasing bullying behavior among adolescents. However, 62% of adolescents aged 13 to 18 do not participate in regular physical activity except in physical education (P.E.) class in school [9]. For many adolescents, P.E. class in school is the only chance to participate in physical activity. Therefore, it would be meaningful to identify the relationships between physical activity through P.E. classes in school, stress, and aggression based on the following literature review.

1.2. Literature Review

1.2.1. Characteristics of School Life in Korea

According to the PISA 2015 (Program for International Student Assessment), Korean adolescents placed 7th in mathematics and reading among 35 OECD (Organization for Economic Cooperation

and Development) countries [10]. Former U.S. President Barrack Obama [11] stated that Korea's education system is strong, and students and parents dedicate more time and money to education compared to the U.S. However, underneath this success, there are various social and psychological issues that affect students, such as excessive stress of school life and aggression. In Korea, about 50% of people aged 13 to 18 experience stress in school life [9]. Since only 29% of students experience stress outside of schools, most of the stress is rooted in school [9]. Especially, Korean adolescents are under pressure to achieve a high academic record. This excessive school-related stress causes social problems, including committing suicide or aggressive bullying behavior. Adolescent suicide is the number one cause of adolescent death, greater than traffic accidents and disease [9]. In addition, adolescents express their aggression, both verbally and physically, to fellow students in school. Specifically, verbal violence accounts for the biggest share of school violence, followed by bullying, stalking, and physical assaults. Although physical assaults are decreasing, verbal violence is increasing [12]. Recently, aggressive behavior in schools has become a serious problem in Korea. The Korean Ministry of Education introduced the Character Education Promotion Act in 2015, in response to increased levels of aggressive behavior in schools [13]. Thus, it is meaningful to study stress in school life and school aggression focusing on Korean adolescents.

1.2.2. Flow in Physical Activity

Flow is an optimal psychological state that occurs when people perform a certain activity that matches their level of skill and level of the task [14]. When people are in a flow state, they could feel positive emotional experiences such as freedom from self-consciousness and deep enjoyment by being consumed in an activity [15]. The flow state could occur when certain conditions are present, including clarity of goals, knowledge of performance, complete concentration, feelings of control, and feelings of being totally in tune with the performance [15]. The concept of flow has been applied across a wide range of social science research fields. In sports, the flow has also been examined in various prior studies [16,17]. Athletes also experience flow because the best performance in sports can be done when athletes totally focus on their movement, both physically and mentally [16]. Since sports features the positive psychological characteristics that are similar to the concept of enjoyment in flow, people are more likely to experience flow in sports [16,17]. Jackson [18] explained athletes' flow experience is caused by the challenge–skill balance, action–awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, the transformation of time, and the autotelic experience. Specifically, the concept of flow has also been adopted in physical education classes in school [19]. Physical education class is one of the most influential ways that youth obtain information about physical exercise and a healthy life since adolescents spend much of their time in school. In addition, physical activity habits that form during adolescent years through physical education classes might remain through one's life [20]. Therefore, lifelong physical activity habits could be developed through physical education classes for youths [20]. Thus, this study analyzes adolescents' flow experience by focusing on P.E. classes in schools. In addition, this study focuses on flow as a "state" in which specific activities foster an optimal experience in participants.

1.2.3. School Life Stress

Stress that adolescents face in everyday life causes numerous negative mental and emotional outcomes accompanied by delinquency, substance use, alcohol use, and even suicide risk [21–25]. Especially, school is one of the most influential places for adolescents in which social relationships and student duties exist. In school, adolescents need to deal with large groups of people while defining the self [26]. In addition, adolescents need to deal with a higher level of academic content and higher expectations for academic achievement as they progress in school [27]. When the demands in school are higher than their capacity, adolescents may feel stress. For this reason, an adolescent may face a lot of stressful events in school. Especially, school-related stress could lead to depression, a lower GPA, or delinquent activity [28]. Meanwhile, stress can be widely divided into two concepts.

The first concept views stress as discrete environmental events, while the second concept focuses on the consequences of environmental events that are perceived by the individual [6,29]. Therefore, the first concept is mainly interested in the occurrence of major changes in the individual's life, while the second concept tries to explain the individual's interaction with their environment [6,29]. This study focuses on school-related stress that recognizes stress as a consequence of environmental events that are perceived by the individual.

1.2.4. Aggression

Aggression can be broadly divided into two factors, including positive aggression and negative aggression [30–33]. First, negative aggression can be explained as the attitude or behavior that is reflected in acts either physically, verbally, or gesturally that causes injury [31]. Aggression is usually directed outward to others, hurting them physically or psychologically. Aggression is also directed inward to oneself, damaging oneself as well [32]. Second, positive aggression might be beneficial when it promotes the basic values of survival, positive emotion, social relationship, and competitive activities with one's peers [30,33]. In addition, a certain degree of aggression might be required in life since it promotes the formation of autonomy, identity, and makes a person self-assertive and independent [30,33]. Meanwhile, this study focuses on the negative side of aggression among adolescents. Since verbal aggression accounts for the greatest percentage of school violence in Korea [12], this study specifically focuses on verbal aggression over the other dimensions of aggression, such as physical aggression, anger, and hostility.

1.2.5. Relationships Among Flow, Stress, and Aggression

This study identifies the effects of the flow in physical education classes between school life stress and aggression among adolescents. Research hypotheses were established based on previous studies. First, prior studies [7,8] indicated an inverse relationship between flow and stress. Therefore, flow could decrease stress. Second, previous studies [3] have suggested an inverse relationship between flow and aggression. Kim [3] identified the relationships between flow, verbal aggression, and physical aggression and found inverse relationships between flow and both verbal and physical aggression. In detail, the flow of physical activity had negative effects on verbal aggression, physical aggression, and anger [3]. Third, based on prior studies [4–6], stress has a positive effect on aggression. Stress could increase aggression. Fourth, according to Baron and Kenny's [34] four-step approach, there might be a mediating effect of stress between flow in P.E. classes and aggression. The four-step approach explains that if an independent variable directly affects both the outcome variable and mediator, and the mediator also directly affects the outcome variable, the mediating effect can be verified. In other words, prior studies suggested that flow in P.E. classes has a direct influence on both stress [7,8] and aggression [3], and stress has a direct influence on aggression [4–6]. Therefore, this study posits a mediating effect of stress between flow in P.E. classes and aggression.

Research hypothesis1: Flow in P.E. classes will have a negative effect on stress.

Research hypothesis2: Flow in P.E. classes will have a negative effect on aggression.

Research hypothesis3: Stress will have a positive effect on aggression.

Research hypothesis4: Flow in P.E. classes will have an indirect effect on aggression mediated by stress.

2. Materials and Methods

2.1. Participants

Convenience sampling was used to select participants for this study. A total of 600 surveys were distributed to 5 different high schools in Daejeon, South Korea, between April 2 and 27, 2019. A total of 537 surveys were returned. Of 537 surveys, 67 were excluded since they contained missing values,

resulting in 470 usable surveys. Of the participants, 42.8% were male, and 57.2% were female. Table 1 presents the participants' demographic information.

Table 1. Demographic information.

Variables	Categories	N	%
Gender	Male	201	42.8
	Female	269	57.2
School year (age)	1 (17)	163	34.7
	2 (18)	161	34.3
	3 (19)	146	31.1

2.2. Procedure

This study was approved by the Daegu University research office, and trained research assistants administered the survey. Prior to the survey, participants were presented with the purpose of the study, potential risks of the study, and contact information of the researchers. In addition, participants could refuse to participate at any point during the survey.

2.3. Instruments

The survey consisted of four sections, including flow in P.E., school life stress, aggression, and demographic information. Five items for flow in P.E. were derived from Seo's [35] study. Seo [35] developed items based on prior studies in Korea [36–38] that ensured reliability and validity. Example items are, "This semester, I am totally involved in P.E. class"; "This semester, it feels like everything clicks when I participate in P.E. class"; and "This semester, I am totally focused on what I am doing when I participate in P.E. class". A five-point Likert scale was used for survey responses, ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates that the respondent experienced a higher level of flow in P.E. class. School life stress was measured using five items from Jwa's [39] study. Jwa's study developed items based on the Korean youth panel survey [40] administered by the Korea National Youth Policy Institute. In Jwa's [39] study, items showed acceptable reliability of 0.846. A five-point Likert scale was used ranging from 1 (strongly disagree) to 5 (strongly agree). Example items are, "This semester, my parents put a lot of pressure on me concerning my grades"; "This semester, I feel a lot of pressure in my daily studying"; "This semester, I feel that there are too many tests in school". A higher score indicates that the respondent experienced a higher level of school life stress. Five items measuring aggression were adopted from Moon, Kim, Lee, and Gwak's [41] study. They [41] developed items by translating and modifying items from Buss and Perry's [42] aggression questionnaire. This study specifically focuses on a verbal aggression dimension. Example items are, "This semester, I tell my friends openly when I disagree with them"; "This semester, I tell people what I think when they annoy me"; "This semester, I couldn't help getting into arguments when people disagree with me". A five-point Likert scale was used for survey responses, ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates that the respondent experienced a higher level of aggression.

2.4. Data Analysis

For descriptive statistics, Cronbach's alpha and squared correlations were computed using SPSS Version 20.0. According to Anderson and Gerbing's [43] suggestion, the two-step approach for structural equation modeling (SEM) was employed. In the first step, confirmatory factor analysis (CFA) was performed to assess the psychometric properties of the measurement model. In the second step, the SEM is examined to investigate the relationship among variables using AMOS version 20.0. The following fit indices were used to assess the overall model fit [44]: chi square (χ^2), chi square/degrees of freedom (χ^2/df) (<5.0), comparative fit index (CFI) (>.90), root mean square error of approximation (RMSEA) (<.08), root mean square residual (RMR) (<.08), and the standardized root

mean square residual (SRMR) (<.08). The reliability of constructs and their corresponding indicators were evaluated using Cronbach's alpha [45]. The convergent validity was evaluated by the construct reliability (CR) with a 0.70 threshold and average variance extracted (AVE) with a cutoff value of 0.50 [45]. Discriminant validity was evaluated based on Lichtenstein, Netemeyer, and Burton's [46] recommendation. Therefore, discriminant validity is ensured if the AVE for all latent variables are larger than its squared correlations. The mediating effect of school life stress between flow in P.E. and aggression (Table 2) was tested through a bootstrapping procedure using 5000 bootstrap samples with a 95% confidence interval (CI) [47].

Table 2. Summary of mean, factor loadings, Cronbach's alpha, CR, and AVE, and squared correlations.

Items	M	λ	α	CR	AVE	ρ^2
Flow in P.E.			0.90	0.95	0.82	0.58-0.73
FPE1	2.96	0.76				
FPE2	2.81	0.78				
FPE3	2.85	0.78				
FPE4	2.83	0.85				
FPE5	3.02	0.85				
School life stress			0.79	0.97	0.90	0.35-0.48
STR1	3.39	0.73				
STR2	2.95	0.69				
STR3	2.93	0.69				
STR4	2.80	0.62				
STR5	3.70	0.59				
Aggression			0.76	0.97	0.88	0.17-0.47
AGR1	1.66	0.68				
AGR2	2.01	0.72				
AGR3	1.93	0.71				
AGR4	1.63	0.41				
AGR5	2.25	0.63				

Note. M = mean λ = factor loadings, α = Cronbach's alpha, CR = construct reliability, AVE = average variance extracted.

3. Results

3.1. Confirmatory Factor Analysis

All Cronbach's alpha values exceeded the threshold of 0.70 [45]. All constructs featured convergent validity, with the construct reliability (CR) ranging from 0.95 to 0.97 and the average variance extracted (AVE) estimates ranging from 0.82 to 0.90 for all latent constructs [45]. Discriminant validity is ensured since the AVE for all latent variables was larger than its squared correlations (see Table 2) [46]. Additionally, the measurement model indicated a good fit with the data: $\chi^2 = 187.16$, $p = 0.000$, $\chi^2/df = 2.15$, CFI = 0.96, RMR = 0.04, SRMR = 0.04, and RMSEA = 0.04 [46–48]. Table 2 shows the mean scores, factor loadings, Cronbach's alpha, CR, AVE, and squared correlations for the measurement model.

3.2. Structural Equation Modeling

The final structural model fitted the data well: $\chi^2 = 187.161$, $p = 0.000$; $\chi^2/df = 2.15$; CFI = 0.96; RMR = 0.04; SRMR = 0.04; RMSEA = 0.05. The structural equation model identified the following (see Table 3 and Figure 1).

Table 3. Result of structural equation modeling.

Path	Direct		Indirect	
	B	b	95% CI	
			LL	UL
RH1: Flow → school life stress	-0.12*			
RH2: Flow → aggression	0.09			
RH3: Stress → aggression	0.19*			
RH4: Flow → stress → aggression		-0.02 *	-0.05	-0.00

* $p < 0.05$, b = standardized regression weight.

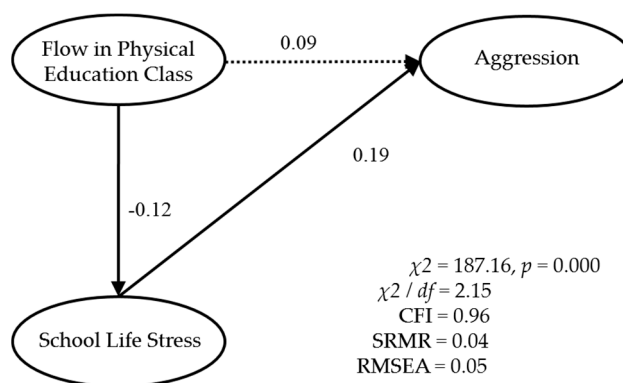


Figure 1. Proposed structural model. Solid lines indicate significant paths at $p < 0.05$. Dotted lines indicate insignificant paths. Values shown next to the solid lines are standardized regression coefficients.

Flow in P.E. classes had a significant direct effect on school life stress ($\beta = -0.12, p < 0.05$), but did not have a significant direct effect on aggression ($\beta = 0.09, p > 0.05$). School life stress had a significant direct effect on aggression ($\beta = 0.19, p < 0.05$). Flow in P.E. classes had a significant indirect effect on aggression, mediated by school life stress ($\beta = -0.2, p < 0.05$).

4. Discussion

The results of this study identified significant effects among flow in P.E., school life stress, and aggression in adolescents. This study suggests the following theoretical implications based on the result of this study and prior studies. First, flow in P.E. class has a significant negative effect on stress, supporting hypothesis 1. In other words, as flow in P.E. level increases, school life stress decreases. This result supports previous studies [7,8]. Moen, Federici, and Abrahamsen [8] analyzed 483 junior athletes in high schools and found that mindfulness decreased stress significantly. Mindfulness is considered a similar concept to flow [8,49]. Mindfulness also helps athletes avoid burnout and perform better in sports [8]. Specifically, Lee [7] analyzed a total of 503 youths who participated in Taekwondo and found that flow in physical activity has the effect of reducing stress by increasing their ability to regulate emotion.

Second, flow in P.E. does not have a significant direct effect on aggression, which does not support hypothesis 2. This result is not consistent with previous studies [3]. This difference might be caused by differences in age. This study included adolescents in high school, with ages ranging from 17 to 19, while Kim [3] included adolescents in middle school, aged from 14 to 16. In addition, this study showed a lower male participant ratio (42.8%) compared to females (57.2%), while Kim’s [3] study showed a higher male participant ratio (51.7%) than females (48.3%). Thus, follow-up studies are required to explain the relationship between flow in P.E. and aggression, including analysis of demographic information.

Third, school life stress has a significant direct positive effect on aggression, supporting hypothesis 3. This result further supports the findings in previous studies. Bodenmann, Meuwly, Bradbury, Gmelch, and Ledermann [5] analyzed 317 adults and found a direct effect of stress on both verbal aggression and anger. Verbally aggressive exchanges are more likely during times of stress. Verbal aggression might, in part, be a reflection of the frustration caused by stressful experiences based on the frustration–aggression hypothesis [5,49,50]. Herts, McLaughlin, and Hatzenbuehler [4] found that stressful life events increase adolescent aggressive behavior mediated by emotion dysregulation. Lazarus and Folkman [6] explained coping functions as ways of responding to stressful events. They suggested that if adolescents could not find adequate ways of relieving stress, they might react to an environment that they perceive as stressful through bullying behavior.

Fourth, flow in P.E. class has a significant indirect effect on aggression mediated by school life stress, which supports hypothesis 4. This result is consistent with previous studies that found flow in P.E. class has a direct influence on both stress [7,8] and aggression [3], and stress has a direct influence on aggression [4–6]. This study emphasizes the important role of school life stress in the relationship between flow in P.E. classes and aggression. In this study, flow in P.E. classes has only an indirect effect on aggression mediated by school life stress. Therefore, flow in P.E. class and school life stress needs to be analyzed together for further study on aggression.

Based on the findings of this study, the following practical implications are recommended. The results of this study indicated that flow in P.E. class decreases school life stress, and, in turn, school life stress decreases aggression. Moreover, flow in P.E. classes had an indirect influence on aggression mediated by school life stress. Therefore, maximizing the flow experience in P.E. classes might be a key factor in reducing both stress and aggression. According to [51], a task-involving motivational climate is effective at deriving enjoyment in P.E. classes among students aged 13 to 15. Therefore, P.E. classes need to adopt the task-involving motivational climate that focuses on learning and task orientation, effort, cooperation, and student evaluation on the basis of self-referenced criteria [52,53]. Since the concept of enjoyment is largely related to the concept of flow [54], increasing enjoyment might increase flow as well.

Meanwhile, Wallhead and Buckworth [55] suggested that positive experiences in P.E. classes would lead to increased participation in physical activities outside schools for girls. For girls, physical activity level, perceived benefits of physical activity, and self-efficacy were positively associated with enjoyment of P.E. classes [56]. On the other hand, body mass index (BMI) was inversely related to the enjoyment of P.E. classes [56], in spite of the fact that students with a higher BMI are required to engage in greater amounts of physical activity than students with a lower BMI. Therefore, for girls, P.E. classes need to make students recognize the benefits of physical activity by explaining them theoretically and experiencing them physically. In addition, more varied forms of physical activity are required so all students, regardless of their physical competence or body shape, could enjoy classes in a comfortable environment.

This study identified the relationships among the flow in physical education classes, school life stress, and aggressiveness. However, there are some limitations that follow-up studies need to consider. First, this study used a single dimensional scale instead of a multidimensional scale. Future studies would provide more comprehensive results using a multidimensional scale. In addition, this study specifically focused on verbal aggression. Thus, future studies should adopt additional dimensions of aggression, including physical aggression, anger, and hostility. Second, the participants in this study were Korean. Future studies need to include participants from a wide range of countries for analysis of cross-culture and ethnic differences. Third, further longitudinal study is required to understand the relationships among flow in P.E. class, school life stress, and aggression among adolescents more clearly.

5. Conclusions

The results of this study identified the relationships among flow in P.E. class, school life stress, and aggression. The main contribution of this study is to clarify the theoretical model of flow in P.E.

classes on aggression through school life stress. As previous studies indicated, reducing aggression would effectively decrease the bullying and physical violence in school since these factors are interrelated. This study provides theoretical data for further research and practical data for education experts to apply to P.E. classes. However, P.E. classes and school life stress need to be analyzed together since flow in P.E. classes has an influence on aggression mediated by school life stress. Meanwhile, this study is linked to sustainability such as sustainable psychological well-being and a sustainable educational environment. Based on the concept of sustainable psychological well-being [57], decreasing stress is one of the most important factors maintaining sustainable psychological well-being. This study is also related to a sustainable educational environment since stress and aggression might increase the likelihood of school violence. Therefore, the results of this study would be used for studies in the field of sustainable psychological well-being and a sustainable educational environment as well.

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