

# The Effects of Teacher's Safety Control on Safety Accident Perception and Safety Implementation - Physical Education Classes of Middle School-

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## ABSTRACT

The purpose of this study was to empirically analyze the effect of teachers' safety control on students' perception of safety accidents and safety performance, focusing on middle school physical education classes. To this end, questionnaires were distributed to middle school students in Guro-gu and Yeongdeungpo-gu, Seoul, and a total of 208 questionnaires were used for actual analysis, except for non-response and non-response questionnaires. Data were processed using statistical programs SPSS 23 and Amos 23, and frequency analysis was conducted to analyze the demographic characteristics of the study subjects. After an exploratory factor analysis for job search validity of the collected data and a reliability analysis using the Cronbach's coefficient, Pear-son's correlation analysis was conducted to confirm the correlation between sub-factors. In addition, a structural equation model analysis was conducted to verify the established hypothesis. Finally, an independent-sample test and one-way ANOVA were conducted to analyze the difference according to the demographic and sociological characteristics.

*Keywords: safety control, safety accidents, safety implementation, safety implementation, physical education classes*

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## 1. Introduction

Due to the rapid development of industries with scientific development, we are enjoying many benefits in convenience, but the risk of safety accidents is also increasing.

Risk, a relative concept of safety, has a dictionary meaning, which means the possibility or risk of loss or injury (Park Hye-yeon, Lee Jae-eun, 2010:1). Therefore, the word "safety first" is no longer only used in crisis situations such as industries, construction sites, and traffic accidents, but also in our educational field, safety is one of the important things (Seo Hee-won, 2007:2). In particular, the Ministry of Education's "2017-2019 School Safety Accident Status" submitted to the National Assembly Education Committee in November 2020 showed that school safety accidents were increasing (Yoo Sun-joon, July 17, 2021). Physical education programs, which are very important for human development in schools, are often in danger of damaging health or not being able to expect the effectiveness of education due to more safety accidents than other subjects (Seok Je-bong, 2001:1) Statistically, many

school safety accidents occurred during physical education every year, especially 2,229 safety accidents occurred in middle and high schools in the first quarter of 2021 (Lee Do-yeon, May 23, 2021). Safety education should continue to take the lead in selecting leisure life as a sports activity by enhancing students' safety awareness and preventing safety accidents through continuous research and management of field teachers and experts (Lee Dong-hoon, 2017: 2). For the safety of students during class, it is necessary to control teachers, recognize students' safety, and implement safety matters. For this reason, it is judged that their role is important to secure the safety of not only students but also teachers. Therefore, the main purpose of this study is to analyze and investigate the effect of teachers' perceived safety control on students' perception of safety accidents and safety performance by students taking secondary physical education classes. In addition, the derived results contribute to the safety of students in physical education classes at school sites and are expected to be meaningful information that can be referred to in class for safety.

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## 2. Materials and Methods

This study was analyzed through a survey on the safety control of teachers perceived by middle school students in Seoul, the perception of students' safety accidents, and safety implementation. Specifically, first, a theoretical review was conducted through literature review and research data related to safety control, safety accident recognition, and safety implementation of school sports classes. Specifically, data were searched and collected on the academic research information service ([www.riss.kr](http://www.riss.kr)) site, focusing on keywords such as 'school safety accident', 'sports class safety accident', 'safety control', 'safety accident recognition', and 'safety implementation'. Based on the collected data, the trend and research method of prior research were explored along with understanding the research topic and establishing a research plan. In addition, for the survey tool, the survey questions used in previous studies were searched at the same time. An expert council was held to secure the validity of the survey tools before the survey. The council was composed of a total of five experts, including one crisis management professor, three secondary physical education teachers, and this researcher, to complete the questionnaire. The researcher visited the school himself after adjusting the surveyable schedule by fully explaining the purpose of the study in advance and seeking cooperation from middle school teachers who are close to the researcher. According to the COVID-19 prevention rules, the researcher's body temperature was checked before visiting the school. After being introduced to the study subjects by the teacher who contacted them in advance, they moved to a classroom without a teacher and a place where they could provide comfort, explained the purpose of the survey so that students could understand it, and distributed the questionnaire. In the entire process of the questionnaire conducted, all the researchers and subjects were wearing masks, and they were written using a self-evaluation technique. The prepared questionnaire was collected by the researcher immediately after completion, and based on the survey, the effect of safety control on safety accident recognition and safety performance was analyzed.

## 3. Theoretical discussion

### 3.1. Safety control sense

Safety control can be defined as having control over a given environment and behavior. This can be said to be an important variable for safety control that gives decision-making, safety awareness, and safety concepts to the sense of control that requires finding various measures to safely implement them if there is a factor that hinders the execution of

safety actions. Increasing this sense of safety control is an important factor for safety performance, including predictive factors that reduce negative consequences and facilitate safe sports activities, and active education and support for managers' safety (Kwak Sung-young, 2019: 34). It can be seen that the increase in safety control is absolutely necessary for the manager's support role, and the safety control can be further improved when safety training is conducted. It can also have a positive effect on safety performance. In addition, it was reported that negative safety outcome indicators decreased, contributing to a positive effect on safety performance as a result (Kim Ki-kyung et al., 2012: 18). In this respect, the sense of safety control is expected to affect safety implementation. Factors related to safety culture, one of the ways to reach the goal of safety control and safety, include safety culture, safety understanding, safety competency, communication, teamwork, career, safety motivation, safety management system, safety values, safety knowledge, safety attitude, safety performance (Kim Seo-hyun, 2017; Kim Seung-joo, 2016; Jeong, 2009). In this respect, it was reported that understanding of safety through understanding unsafe behavior and communicating with managers through communication was an important factor in safety control, teamwork leadership and mutual support, safety culture communication and safety management system (Jeong Soo-kyung, 2009, Synder et al., 2011). In addition, according to a previous study by (Lee Jung-ja, 2019), as an individual's cognitive ability to produce safe results when performing a nurse's job, it can be said that hospitals execute desirable and undesirable actions regarding patient safety. It was argued that the higher the sense of safety control, the better the safety performance (Lee Jeong-ja, 2019: 32). As such, accident and safety are conflicting concepts, and accidents are a consequential phenomenon, and safety is a precautionary measure in preparation for accidents (Jeong Jun, 2006:5).

This increased sense of safety control can reduce the negative consequences of students by preventing teachers from controlling them in case of accidents in the field during physical education classes, as well as safe school life. In addition, securing safety can increase expectations for safety and increase students' participation in classes, so it is judged that the sense of safety control of physical education teachers during class can have a positive effect on students. In this way, the safety control is not a reflex of the process of controlling students' personal behavior when participating in physical education classes, but a process of anticipating students' behavior in advance and preventing and controlling them. According to this control of teachers, safe physical education curriculum classes will be

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conducted, which will contribute greatly to the safety of students.

### 3.2. *Safety accident recognition*

Safety accidents at school are not clearly defined. In a broad concept, there is a term called school accident, which can be said to be all accidents that occur around schools (Lee Dong-hoon, 2017: 20). In other words, a school accident refers to a person related to a school, such as a student and a faculty member, being killed or injured at school. It also includes theft or topic accidents, which in a broad sense can be said to be a generic term for all accidents that occur around schools (Lee Hee-kwan, 2002:5). Among the safety accidents that occur in school, the most occurrence rate is probably physical education class. The reason is that physical activity is an important educational content due to the nature of the subject, and it can be said that the frequency of unexpected safety accidents is high. As a result of the study on the frequency of safety accidents according to class types, the incidence of safety accidents during physical education classes was 72%, and the damage rate of subjects was more than 48% in elementary, middle, and high schools (Song Yong-ho, 2003:8). Factors that cause safety accidents during physical education classes include lack of warm-up exercises, lack of skills, excessive training and fatigue, excessive tension, and defects in equipment facilities. Prevention of safety accidents and prevention of safety accidents in physical education classes include warm-up and clean-up exercises, equipment and tools, and psychological and environmental preparation (Lee Dong-hoon, 2017: 25). In addition, whether the competitor is human, nature, or himself, in order to achieve victory and satisfaction in competition, human beings can act excessively while ignoring their abilities or surroundings, so there is always a risk of accidents (Sports Safety Foundation, 2015). In light of these contents, students should always be aware of the risk of safety accidents during physical education classes. Teachers shall endeavor to prevent safety accidents. In particular, it is judged that continuous safety education is necessary so that students can be aware of safety accidents during physical education classes with the highest accident rate.

### 3.3. *Safety implementation*

Major safety activities required to be carried out by individuals in order to maintain safe work, which are active activities that prevent the degree of compliance with mandatory safety regulations and safety threats (Choi Dong-won, 2003: 13). It is a concept that includes safety participation and safety

conformity, and it is a safety compliance act for individuals to follow standard work procedures for maintaining safety in the workplace, such as wearing personal protective equipment, and indirect safety activities (Neal & Griffin, 2000:5). Safety implementation plays a key role in reducing safety accident rates, which play a role in enhancing the level of safety-related behavioral norms to a higher level, and can reduce losses due to emotional problems such as guilt, stress, lack of confidence, and loss of morality (Hwang Mi-sook, 2014:7). According to the analysis of the cause of industrial accidents conducted in 2009 in Korea, 70% were found to be caused by human behavior, and 94% were found to be caused by behavior, including indirect parts by environment and behavior (Korea Occupational Safety and Health Corporation, 2009). In other words, failure to comply with safety procedures or engage in activities that promote the safety of others creates dangerous situations in the future and increases the risk factors of the organization as the proportion of members who do not comply with safety actions increases (Hang Jeong-won, Lee, Park, Young-woo, Son, etc.). In addition, in the event of a safety accident, not only direct costs such as medical expenses and compensation expenses, but also hidden costs such as reduced productivity due to the accident (Hwang Mi-sook, 2014:8). In particular, if a safety accident occurs during the subject class, students' participation in the class may also decrease, which may make it difficult to obtain the effect of education. In this respect, this researcher feels the importance of research on safety implementation for middle school students participating in secondary physical education classes and attempts to explore the impact on safety implementation for students' safety and active participation in classes.

### 3.4. *Prior study on safety control*

Factors related to safety control in Korea include safety culture, safety understanding, safety competency, communication, teamwork, career, safety motivation, safety management system, safety value, safety knowledge, safety attitude, safety performance (Kwak Sung-young, 2019, Kim Ki-kyung, 2012, etc.). In this respect, an understanding of safety is an important factor in safety control for managers through understanding unsafe behavior and communication (Synder et al., 2011: 40). Since the Ferry Sewol incident in 2014, research on school safety and physical education subject safety has been steadily increasing, but research on safety control is actively conducted in medicine, but research on school sports or school safety is currently insufficient. Therefore, it is expected that research related to safety control will continue to prepare

various policies related to school safety after this study.

3.5. A prior study on the perception of safety accidents Prior studies on safety accidents were conducted on the perception of school safety accidents (Yoon Beom-gyu, 2004; Yoon Hong-yeol, 2015), and studies were conducted mainly on secondary school physical education subjects (Kim Seok-yong, 2010; Lee Dong-hoon, 2017). In addition, studies on safety accidents and school safety accidents (Kim Tae-rim, 2017; Song Yong-ho, 2003; Seo Hee-won, 2007; Yoon Hong-yeol, 2015) were conducted. In addition, the factors of previous domestic studies on sports-related safety accidents were safety education, safety awareness, safety culture, safety management, sports safety behavior (Goseok, Chosunryeong, 2016; Kim Seok-yong, 2010; Lee Dong-hoon, 2017; Won Young-shin, Park Hu-kyung, 2019). In sum, the concept of safety and accident can be said to be an unexpected event that causes death or injury or property loss by failing to remove risks and accidents physically, mentally, and socially (Lee Seung-han, 2017:4), so various studies related to safety accident recognition are required.

### 3.6. Previous studies on safety implementation

Many previous studies on safety transition have been conducted in the field of industrial safety, and in nursing, various studies on safety transition of medical institutions (Kim Kyung-ja, 2012; Kim Young-hee, 2014; Son Myung-ji, 2012; Hwang Mi-sook, 2014) are underway. In addition, factors related to safety transition in Korea were safety atmosphere, patient safety culture awareness, safety culture climate, safety knowledge, safety motivation (Young-hee Kim, 2014; Myung-ji Son, 2012; Jeong Soo-kyung, 2009; Ji-sook Hwang, 2014). As such, research related to safety implementation is being actively conducted in the medical field, but previous studies related to safety implementation in the sports field are safety motivation, safety attitude, and safety culture perception (Kwak Sung-young, 2020; Kim Kyung-sik, Kwak Sung-young, 2020).

## 4. Investigation design

### 4.1. Analysis framework and hypothesis of the study

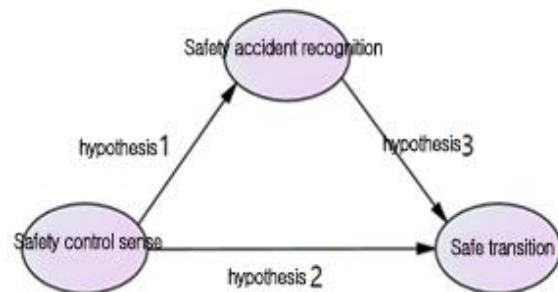
This study is based on the results of analyzing teachers' safety control, students' perception of safety accidents, and safety performance based on the theories and previous studies discussed in the previous chapter. First of all, the investigation was analyzed according to the premise that students' perception of safety accidents may vary through the

teacher's sense of safety control. In addition, the investigation was analyzed according to the premise that students' perception of safety accidents may change through the teacher's sense of safety control. In addition, the investigation was analyzed according to the premise that the safety performance of students may vary through the teacher's sense of safety control, and the investigation was analyzed according to the premise that the safety performance could vary through the recognition of students' safety accidents.

Finally, the survey was analyzed according to the premise that there would be differences according to demographic characteristics. The research hypothesis established to achieve the purpose of this study is as follows, and the research model accordingly is shown in < Table 1-1>. First, the teacher's sense of safety control will affect the student's perception of safety accidents.

Second, the teacher's sense of safety control will affect the student's safety performance. Third, students' perception of safety accidents will affect safety performance. Finally, there will be differences according to demographic and sociological characteristics

<Table 1-1> Research model



### 4.2. Composition of questionnaires

First, in order to secure the content validity of this study questionnaire, a group of 5 or more experts was formed and the questionnaire consisted of a total of 28 questions, 6 questions for safety control, 9 questions for safety performance, and 7 general characteristics of the questionnaire. The specific composition details of the questionnaire are shown in <Table 2-1>.

<Table 2-1> Contents of the questionnaire

person	Compositio n indicator	Configuration	number of questions
		content (question)	

Background variable	general characteristics	Gender (1)	
		Level of athletic ability (1)	
		Safety accident experience (1)	
		Number of safety training (1)	7
		Types of Safety Education (1)	
		Safety training methods (1)	
		Safety training period (1)	
Independent variable	Safety control sense	Single factor (6)	6
		Safety requirements (3)	
parameters	Safety accident recognition	Safety education implementation status (3)	9
		Safety education attitude (3)	
Dependent variable	Safe transition	Single factor (6)	6
Sum			28

#### 4.3. Mark collection and measurement method

This study distributed 250 copies of questionnaires to middle school students in Guro-gu and Yeongdeungpo-gu, Seoul. The survey was conducted for five days from April 4, 2022 (Monday) to April 8, 2022 (Friday), and 228 out of 250 distributed questionnaires were collected to obtain a recovery rate of about 91%, and a total of 208 questionnaires were used for analysis, except for 20 questions that were not answered. Data were processed using statistical programs SPSS 23 and Amos 23, and frequency analysis was conducted to analyze the demographic characteristics of the study subjects. After an exploratory factor analysis and a reliability analysis using the Cronbach's coefficient for job search validity of the collected data, Pearson's correlation analysis was conducted to confirm the correlation between sub-factors. Finally, a structural equation model analysis was conducted to verify the hypothesis set.

## 5. Survey results and discussion

### 5.1. Social Characteristics of Research

First of all, in the case of gender, 101 male students (48.6%) and 107 female students (51.4%) out of the total 208 respondents. In terms of athletic ability level, 71 students (34.1%) were at a high level, 99 students (47.6%) at an intermediate level, and 38 students (18.3%) at a low level. In the case of accident experiences such as injuries and injuries during physical education classes, 81 students (38.9%) said they had accident experience and 127 (61.1%) said they had no accident experience. In the past year, 142 students (68.3%) responded to safety education in physical education classes, 46 students (22.1%) responded to 3-4 times, 13 students (6.3%) responded to 5-6 times, 2 students (1.0%) responded to 7-8 times, and 5 students (2.4%) responded to 9 times or more. In addition, 51 students (24.5%) conducted safety education on a regular basis, 157 students (75.5%) conducted safety education on a regular basis, 97 students (46.6%), 97 city hall education (46.6%), 4 students (1.9%), and 10 students on a practical basis (4.8%) were provided. Lastly, 153 people (73.6%) received safety education during the physical education class, 44 people (21.2%) in the middle of the class, and 11 people (5.3%) in the second half of the class.

### 5.2. Basic Statistical Analysis

As a descriptive statistical analysis to verify the statistical suitability of the collected data, the mean (M), standard deviation (SD), skewness, and kurtosis for each item were obtained and used as criteria for item screening. According to the results of previous studies (Ha Jung-hoon, Choi Kwan-yong,

2021; 60), items with an average value of 4.5 or more or 1.0 or less, a standard deviation value of 2.0 or less, a skewness value of  $\pm 2$  or more, and a kurtosis value of  $\pm 7$  or more were selected as the target of deletion. The analysis results are as presented in <Table 3-1>, and it was found that there were no items to be deleted as the criteria for item selection.

<Table 3-1> Basic Statistical Analysis

question	(Average)	SD(standard deviation)	(Skewness)	(kurtosis)
SC 1	3.00	1.131	-.071	-.639
SC 2	3.05	1.143	-.085	-.748
SC 3	3.23	1.136	-.204	-.470
SC 4	3.53	1.067	-.605	.026
SC 5	3.42	1.122	-.467	-.247
SC 6	3.51	1.103	-.569	-.014
SA 1	2.92	1.296	.220	-1.021
SA 2	2.55	1.336	.456	.169
SA 3	3.20	1.231	-.250	-.759
SA 4	3.37	1.003	-.263	-.090
SA 5	3.59	.938	-.303	-.012
SA 6	3.68	.946	-.607	.506
SA 7	3.79	.955	-.506	-.036
SA 8	3.70	.993	-.379	-.251
SA 9	3.80	1.006	-.591	.018
SI 1	4.05	.923	-.998	1.010
SI 2	3.87	1.006	-.656	-.244
SI 3	4.01	.914	-.642	-.062
SI 4	3.63	1.216	-.537	-.619
SI 5	3.95	.934	-.434	-.644
SI 6	3.78	1.094	-.623	-.252

### 5.3. Validity and reliability of questionnaires

<Table 4-1> Validity and reliability analysis results of safety control

question	Single factor $h^2$	Cronbach' $a$
SC 3	<b>.904</b>	.817
SC 2	<b>.864</b>	.747
SC 5	<b>.850</b>	.723
SC 1	<b>.797</b>	.704
SC 4	<b>.789</b>	.622
SC 6	<b>.777</b>	.604
eigenvalue	4.149	
% dispersion	69.151	
% accumulate	69.151	
Kaiser-Meyer-Olkin(KMO)	=.858,	$\chi^2=1042.328,$
df	=15,	$p<.001$

<Table 4-2> Results of safety accident recognition validity and reliability analysis

question	about safety demand map	Safety education implementation status	Safety education Attitude	$h^2$	Cronbach' $a$
SA 2	<b>.988</b>	.019	-.106	.931	.772
SA 1	<b>.636</b>	-.007	.101	.452	
SA 5	-.039	<b>.960</b>	-.086	.830	
SA 4	.067	<b>.806</b>	.008	.682	.858
SA 6	-.004	<b>.590</b>	.287	.610	

SA 9	-.028	-.031	<b>.875</b>	.725
SA 7	-.019	.084	<b>.831</b>	.763
SA 8	.078	-.001	<b>.747</b>	.598
eigenvalue	2.619	2.061	.907	
% dispersion	32.738	25.768	11.341	
% accumulate	32.738	58.506	69.848	
Kaiser-Meyer-Olkin(KMO)=.777, $\chi^2=820.073$ , $df=28$ , $p<.001$				

<Table 4-3 Safety implementation validity and reliability analysis results

question	Single factor $h^2$	Cronbach' $\alpha$
SI 5	<b>.795</b>	.632
SI 2	<b>.791</b>	.625
SI 3	<b>.790</b>	.624
SI 1	<b>.752</b>	.565
SI 6	<b>.743</b>	.552
SI 4	<b>.703</b>	.495
eigenvalue	3.493	
% dispersion	58.211	
% accumulate	58.211	
Kaiser-Meyer-Olkin(KMO)=.858, $\chi^2=660.345$ , $df=15$ , $p<.001$		

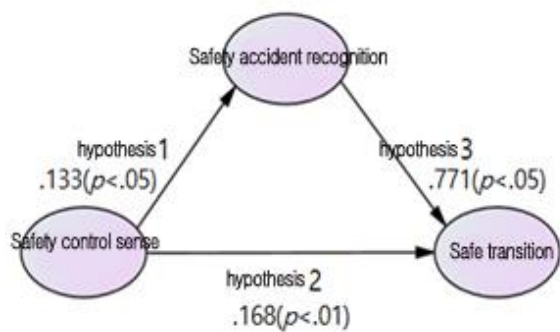
5.4. Verification of suitability of research model and hypothesis verification

<Table 4-4 Fittedness and Hypothesis Verification Results>

hypothesis	Standardization coefficient	Standard error	tValue	significance	Result	
H1	Safety control sense $\Rightarrow$ accident recognition	.133	.044	2.564	.011 *	choice
H2	Safety control sense $\Rightarrow$ Safe transition	.168	.054	3.103	.002 **	choice
H3	Safety accident recognition $\Rightarrow$ Safe transition	.771	.307	2.508	.012 *	choice
Research model suitability $\chi^2=254.802$ , $df=85$ , $p<.001$ , SRMR=.054, TLI=.889, CFI=.910, RMSEA=.098						

The results  $\chi^2/df=254.802/85$ , SRMR=, as shown in Table 4-4.054, CFI=.910, TLI=.889, RMSEA=.098. It came out to be 098. In addition, research in the field of social science suggests that the CFI and TLI values are acceptable when they approach .90 (Jeon Yeon-sook, Kang Hye-young, 2010; 11). Therefore, if you combine the results of this study model, the TLI value is .not more than 90 but as mentioned in previous studies It was found that the suitability criterion was met to be close to 90.

<Table 4-5> Structural Equation Model Analysis Results



### 5.5. Hypothesis testing

The results of analyzing the effect of teachers' safety control on students' perception of safety accidents and safety performance are as follows.

First, the standardization coefficient as a result of analyzing the causal relationship between the teacher's sense of safety control and the student's perception of safety accidents. As  $t = 2.564$ , it was found that the teacher's sense of safety control had a statistically significant positive effect on the student's perception of safety accidents ( $p < .05$ ). Second, as a result of analyzing the causal relationship between the teacher's safety control sense and the student's safety performance, the standardization coefficient was  $.168$ ,  $t = 3.103$ , and the teacher's safety control had a statistically significant positive effect on the student's safety performance ( $p < .01$ ). Finally, as a result of analyzing the causal relationship between student safety accident recognition and safety performance, the standardization coefficient was  $.771$ ,  $t = 2.508$ , and it was found that student safety accident recognition had a statistically significant positive effect on safety performance ( $p < .05$ ).

### 6. Conclusion

The purpose of this study was to empirically analyze the effect of teachers' safety control on students' perception of safety accidents and safety performance, focusing on middle school physical education classes. To this end, questionnaires were distributed to middle school students in Guro-gu and Yeongdeungpo-gu, Seoul, and a total of 208 questionnaires were used for actual analysis, except for non-responsive and non-research consent. Data were processed using statistical programs SPSS 23 and Amos 23, and frequency analysis was conducted to analyze the demographic characteristics of the study subjects. After an exploratory factor analysis for job search validity of the collected data and a reliability analysis using the Cronbach's coefficient, Pearson's correlation analysis was conducted to confirm the correlation between sub-factors. In addition, a structural equation model analysis

was conducted to verify the established hypothesis. Finally, an independent-sample test and one-way ANOVA were conducted to analyze the difference according to the demographic and sociological characteristics. By setting the significance level to  $.05$ , the following conclusion was reached. First, the standardization coefficient as a result of analyzing the causal relationship between the teacher's safety control sense and the student's safety accident recognition. As  $t = 2.564$ , it was found that the teacher's sense of safety control had a statistically significant positive effect on the student's perception of safety accidents ( $p < .05$ ). Second, as a result of analyzing the causal relationship between the teacher's safety control sense and the student's safety performance, the standardization coefficient was  $.168$ ,  $t = 3.103$ , and the teacher's safety control had a statistically significant positive effect on the student's safety performance ( $p < .01$ ). Third, as a result of analyzing the causal relationship between student safety accident recognition and safety performance, the standardization coefficient was  $.771$ ,  $t = 2.508$ , and it was found that student safety accident recognition had a statistically significant positive effect on safety performance ( $p < .05$ ). Finally,  $t$ -verification and  $F$ -verification were conducted to find out the differences according to demographic and sociological characteristics, and it was found that there was a statistically significant difference in the need for safety control and safety perception in accident experience such as injury and injury in physical education class ( $p < .001$ ). Specifically, a sense of safety control ( $t = -2.872$ ,  $p < .01$ ) according to accident experience such as injury and injury during physical education curriculum.  $t = 3.428$ ,  $p < .001$ , the safety requirement for safety recognition of safety accidents ( $t = 3.428$ ,  $p < .001$ ). There was a statistically significant difference in  $p < .001$ .

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## Profile

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