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Analysis of Latent profiles and Inter-individual Differences in Disaster Safety Awareness of High school

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Abstract

In this study, by classifying latent groups for disaster safety awareness focusing on the four sub-factors of the developed disaster awareness scale of high school students, the characteristics of each group were examined, and the differences between latent classes according to inter-individual differences were investigated. As a result of analysis based on the data of a total of 1054 high school students, the disaster safety awareness of high school students was classified into three latent groups. Each latent group was named 'High Safety Awareness Type(SAT)', 'Normal SAT', and 'Low SAT' according to its characteristics. In all four fire safety awareness sub-factors, 'High SAT', which had a high score, accounted for 56.5% of the total, and 'Normal SAT', which had a moderate score in the sub-factors, had the lowest ratio at 20.3%. There were no significant differences by gender, grade, and academic achievement of the latent group. These results are not only meaningful as the first study of the latent profile analysis of high school students on disaster safety awareness, but also help to identify the characteristics of individuals in each latent group with more subdivisions and provide useful data for disaster safety awareness education according to individual differences. The implications of this study and suggestions for follow-up studies were discussed.

Keywords: *Latent Profile Analysis, disaster safety awareness, inter-individual differences high school*

1. INTRODUCTION

A change in awareness of disaster safety at the national and social level is taking place due to the Sewol ferry accident and the impact of COVID-19. In order to raise people's awareness of disaster safety and to strengthen safety capacity, it is necessary to develop a capacity building plan that takes into account the contextuality of safe life and develops practical skills. At this point, it is necessary to change a safe lifestyle and promote a school safety culture so that there is no confusion, danger and damage caused by disasters for students who are the main agents of change in disaster safety awareness. The concerns and attitudes of the education community to meet the national and social demands for a safe life are clearly reflected in the curriculum. The 2015 revised curriculum made it possible to repeatedly provide experience-oriented safety education from the lower grades through creative experiential activities and subjects [1]. The UN also attaches great importance

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to school-centered safety education in order to secure future safety in the global village and spread it to society.

The UN emphasized the importance of disaster-safety school education in the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, saying, " As Schools are a representative institution that can effectively share and disseminate safety knowledge and technology, school disaster safety education is very important in terms of not only spreading it to families and society but also securing the safety of future generations."[2] The UN's assertion that "all disaster safety comes from school" emphasizes that strengthening the national disaster safety capacity can start with school safety education and safe living.

In particular, it is necessary to strengthen systematic disaster safety education in kindergarten, elementary, and secondary schools because natural disasters are difficult to predict and are easy to neglect [1]. To increase the effectiveness of school disaster safety education, it is first necessary to measure whether students' safety awareness belongs to safety or danger. In addition, self-measurement of one's own disaster safety awareness can predict safety accidents, prevent accidents in advance, and correct one's lack of safety habits [3]. In this respect, the development of the first scale of high school students' disaster safety awareness, whose reliability and validity has been verified in the previous study [3], is meaningful as a prior study because it can be used as useful data for disaster safety awareness diagnosis and safety education. But disaster safety awareness is a multi-dimensional concept that includes various knowledge, skills, and attitudes about disasters such as , emergency rescue, disaster recovery, evacuating to a safe place, familiarizing yourself with evacuation tips, preparing emergency supplies for disasters, managing gas and electric appliances, checking the safety of dangerous objects and household items, safety action tips in case of disaster, safety evacuation plan, installing and using disaster system applications. In order to not only measure disaster safety awareness, but also to identify the characteristics according to individual differences, it is necessary to conduct systematic research in various aspects considering the multidimensionality of safety awareness.

Previous studies on the diagnosis of disaster safety awareness [3, 4, 5] took a variable-centered approach that focused on finding the correlation between study variables through the overall score in the scale. It was not possible to find latent group types for disaster safety awareness and to provide information on the differences in the characteristics of individuals belonging to each group. Even within the same group, there are individual differences, so the approach to safety education needs to be different. Therefore, the latent groups need to be explored through a person-centered approach that emphasizes the characteristics and qualitative differences of the research target group, which shows the factors working prominently in each group, as well as the characteristics of the individuals belonging to each group.

In previous studies by the National Fire Service [5], which analyzed the actual state of public safety awareness, and Kim Hye-won and Lee Myeong-seon [4], who developed the safety awareness scale for middle school students, it was found that there is a difference in the level of safety awareness due to interindividual differences. It is necessary to investigate whether there is a difference in the awareness of disaster safety between latent groups according to inter-individual differences such as gender, grade level, and academic achievement of students. This will be able to provide basic data for customized disaster safety education considering individual differences.

In this context, this study classifies latent groups based on the disaster safety awareness scale of high school students to examine the characteristics of each group and the characteristics the individuals belonging to the group show. And it will be also checked whether there is a difference in the awareness of disaster safety among latent groups according to interindividual differences. Therefore, the research questions set in this study are as follows.

First, how many groups of high school students' disaster safety awareness latent profile are classified, and what are the characteristics of each group?

Second, is there any difference by gender, grade level, and academic achievement among latent groups of high school students' disaster safety awareness?

2. METHODS

2.1. Latent Profile and Interindividual Difference Analysis Model

This study aims to analyze latent profiles and interindividual differences by applying the pre-developed disaster safety awareness scale of high school students [3]. For this, two issues can be considered: categorizing the latent profile of disaster safety awareness and revealing the characteristics of individual differences according to it. In the latent profile analysis, the latent group classification and group characteristics of the awareness of disaster safety were identified, and the individual difference analysis was analyzed separately by gender, grade level and academic achievement that directly or indirectly affect the awareness of disaster safety. The structure of the analysis model is shown in Figure 1.

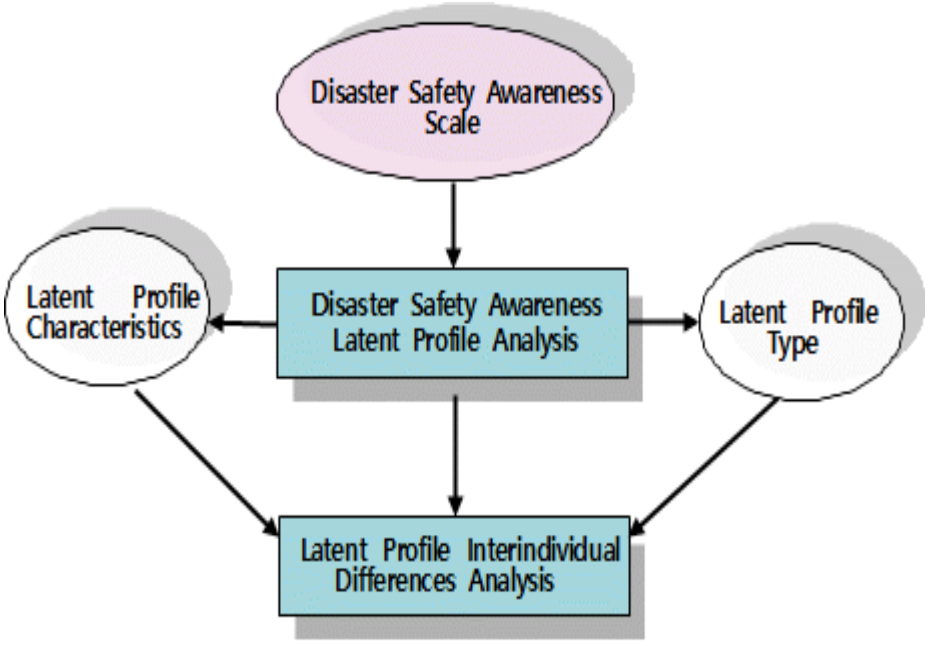

Figure 1. Research Model

2.2. Research Subjects and Measurement Tools

In this study, to analyze the latent profile of disaster safety awareness, the pre-developed disaster safety awareness scale [3] was used, which had been developed based on 1054 high school students (male: 569, female: 485). As shown in Table 2, the disaster safety awareness scale consists of 4 sub-factors and 24 items. The four sub-factors consisted of 9 items of ‘prevention · preparedness’, 6 items of ‘direct response’, 5 items of ‘indirect response’, and 4 items of ‘recovery’. The disaster safety awareness scale was in 4-point Likert-scale format. The options are: 4 points for ‘strongly agree’, 3 points for ‘agree’, 2 points for ‘disagree’, and 1 point for ‘not at all’. The lower the score, the lower the level of disaster safety awareness.

Table 2. Contents of Each Factor of 24 Items on the Disaster Safety Awareness Scale

Factor	Item No.	Item Content
Prevention · Preparedness	1	Prepare medicines and daily necessities for emergency use.
	2	Know in advance where you can evacuate in case of a disaster.
	3	To prevent disasters, install and use the disaster guidance system application on your mobile phone.
	4	You must know how to use the National Disaster Safety Portal to utilize disaster information by type.
	5	Prepare rain gear (umbrella, raincoat, boots, etc.) in advance.
	6	Find a safe indoor location in case of an earthquake.
	7	Check for objects that may fall or break in strong winds.
	8	To prevent disasters, check the weather information through the mass media or the Internet and go out.
	9	To prevent electric shock in the event of a flood or lightning, unplug the power plug after using electrical appliances.
Direct Response	10	In the event of an earthquake, cover your head to protect it and evacuate quickly under a desk, table or bed.
	11	After an earthquake and shaking, turn off the power and close the gas valve.
	12	Do not ride in elevators or cars during earthquakes.
	13	Avoid underground facilities or low-lying areas that are expected to be flooded l flooding and ascend to a higher place.
	14	In case of flooding or isolation, evacuate to a safe place such as a rooftop and wait for rescue.
	15	In the event of an earthquake, the door may be twisted and cannot be opened, so leave the door open in advance.
Indirect Response	16	In case of yellow dust, wear a mask, protective glasses, and long-sleeved clothing.
	17	Disaster messages received through the smartphone app are shared with people around them.
	18	After it snows, clear the snow in front of the house.
	19	When a disaster occurs, listen to the broadcast and follow the instructions of the disaster broadcast.
	20	In case of an emergency, report it to 119 or a safety stepping stone.
Recovery	21	In the event of a flood or heavy rain, tap water or stored drinking water should be checked for contamination before drinking.
	22	Discard flooded food or ingredients as there is a risk of food poisoning.
	23	When returning home after evacuation, check whether it is safe before entering.
	24	The damaged house may have a gas leak, so be sure to ventilate it sufficiently.

Table 3 shows the item characteristics examined by reliability, mean, and standard deviation of the 24 items of disaster safety awareness scale. The overall mean reliability of the factors was .87, which was high.

Table 3. Item Characteristics and Reliability of the Final Disaster Safety Awareness Scale

Factor	M	SD	Item No.	M	SD	Cronbach's α
Prevention · Preparedness	3.47	.69	1	3.48	.688	.912
			2	3.44	.701	
			3	3.17	.908	
			4	3.37	.747	
			5	3.51	.652	
			6	3.54	.612	
			7	3.57	.587	
			8	3.55	.65	
			9	3.56	.632	
Direct Response	3.61	.52	10	3.71	.488	.868
			11	3.37	.487	
			12	3.68	.52	
			13	3.67	.523	
			14	3.64	.534	
			15	3.61	.586	
Indirect Response	3.54	.65	16	3.53	.651	.848
			17	3.5	.674	
			18	3.46	.729	
			19	3.62	.555	
			20	3.57	.638	
Recovery	3.63	.56	21	3.61	.596	.835
			22	3.61	.597	
			23	3.64	.525	
			24	3.67	.525	
Overall Average				3.55	.62	.87

The validity of the disaster safety awareness scale was reviewed in terms of content validity, construct validity and cross validity. Content validity was thoroughly reviewed in the first stage of scale development, item development and selection, and in the second stage, preliminary testing [3]. To verify construct validity, confirmatory factor analysis was performed in the order of convergence and discriminant validity, correlation matrix, and measurement model fit of the search and crossover groups. A confirmatory factor analysis was conducted to confirm the validity of the relational structure between the factors of the disaster safety awareness scale and the items [3]. Table 4 shows the fit analysis results of the disaster safety awareness measurement model of the search group and the cross over group.

Table 4. Disaster Safety Awareness Measurement Model Fit of Search and Cross over Group

Group	χ^2	*df*	*p*	TLI	CFI	RMSEA	SRMR
Search	778.772	245	<.001	.900	.911	.074	.047
Cross over	594.780	239	<.001	.900	.913	.075	0.48

To determine the cross-validation of disaster safety awareness among high school students, the groups were divided into a search group and a crossover group and conducted crossover group analysis. When the fitness of the measurement models of the search group and the crossover group presented in Table 4 was compared, the search group was χ^2=778.772(p<.001), CFI=.911, TLI=.900, RMSEA=.074 and SRMR=.047. The crossover group showed χ^2=594.780(p<.001), CFI=.913, TLI=.900, RMSEA=.075 and SRMR=.048 indicating that the cross-validation between the search group and the crossover group was good [3].

2.3. Latent Profile Analysis

Mplus 8.4 was used to find out how many latent groups the study subjects could be classified into based on the four sub-factors of the pre-developed scale [3]: prevention · preparedness, direct response, indirect response, and recovery. In latent profile analysis, information criterion indices and a special type of likelihood ratio test statistical indicators can be used as auxiliary means for the researcher's judgment, thereby reducing the bias caused by the researcher's subjective judgment. For the latent profile analysis procedure, previous studies [6,7,8] were referred to. In this study, the optimal number of latent groups was determined by applying four fitness indices: information index, model comparison test, classification quality, and intragroup classification ratio.

First, to determine the number of potential groups, model fit is verified through the information reference indexes: Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Sample-size Adjusted BIC (SABIC). The smaller the fit indices AIC, BIC, and SABIC, the better the model with the optimal number of latent types [7].

Second, how accurately an individual case is classified in a group is checked through the Relative Entropy (REN) value. The functional range of REN is from 0 to 1, and a value closer to 1 means that the classification accuracy is high. To be properly classified more than 90%, it must be 0.8 or higher [9].

Third, for model comparison verification, LMRT (Lo-Mendell-Rubin Adjusted Likelihood Ratio Test) likelihood ratio verification and bootstrap likelihood ratio verification BLRT (Bootstrap Likelihood Ration Test) are performed. In the likelihood ratio test, if the k-1 latent profile model is statistically significant by comparing the case with k and k-1, the model of the k-1 latent group is rejected, and k potential groups are judged to be suitable [10].

Fourth, care should be taken not to include less than 5% of the sample by checking the classification ratio within the latent group [11,12]. Next, the SPSS 26 statistical program was used to examine whether there was a difference in the awareness of disaster safety by gender, grade, and achievement according to latent groups.

3. RESULTS

3.1. Number and Characteristics of Disaster Safety Awareness Latent Groups

In the pre-developed disaster safety awareness scale, in order to find out how many prominent profile groups in relation to the four sub-factors: prevention · preparedness, direct response, indirect response, and recovery. By increasing the number one by one, the information index, model comparison, classification quality, and classification ratio verification statistics within the groups were compared. The results are presented in Table 5.

Table 5. Comparison of Fit of Latent Profile Analysis Model

Classification Criteria		Number of Latent Profile Models			
		2	3	4	5
Information Standard Index	AIC	1929.932	1583.730	1403.041	1235.965
	BIC	1988.448	1664.753	1506.571	1362.001
	SABIC	1947.173	1607.602	1433.545	1273.100
Classification Quality	Entropy	.933	.905	.927	.933
Model Comparison Test (*p*)	LMRT	.0001	**.0018**	.0115	.1162
	BLRT	.0001	**.0001**	.0001	.0001
Classification Ratio (%)	1	34.5	**20.3**	21	2.1
	2	65.5	**23.3**	21.5	6.8
	3		**56.5**	2.1	22.1
	4			55.4	54.5
	5				14.6

Looking at the information reference index of each model presented in Table 5, it can be seen that as the number of groups increases, all information reference indexes such as AIC, BIC, and SABIC decrease. The relative entropy (REN) value of all models was greater than .9, indicating high classification accuracy. The LMRT validation statistic was not significant starting with the 4 potential group models (p>.01), but the BLRT satisfies the information criterion with a significance probability of less than .01 in all types. Looking at the latent class classification ratio, less than 5% of the total in the 4 latent group models and the 5 latent group models did not meet the criteria of the model. Therefore, in this study, the model with three latent groups was determined as the most suitable model by comprehensively judging the satisfaction of the information criterion and simplicity.

Table 6 and Figure 2 show the results of the one-way ANOVA conducted to examine the difference between the three potential groups, which are the measurement variables. The estimated mean and standard deviation of each latent group for the sub-factors of disaster safety awareness are presented. As a result of confirming the F-value and p-value of the potential group, both of them were significant, confirming the difference between the latent groups in disaster safety awareness.

Table 6. Estimated Mean and Standard Deviation for Each Latent Group

Factor	Low SAT (N=135)		Normal SAT (N=155)		High SAT (N=376)		*F*	*p*
	M	SD	M	SD	M	SD		
Prevention · Preparedness	2.85	.41	3.13	.41	3.83	.24	556.547	<.001
Direct Response	3.01	.22	3.59	.25	3.94	.12	1342.491	<.001
Indirect Response	2.89	.35	3.23	.41	3.90	.19	720.81	<.001
Recovery	2.97	.28	3.47	.37	3.93	.18	744.693	<.001
Total Average	2.93	.32	3.36	.36	3.90	.18		

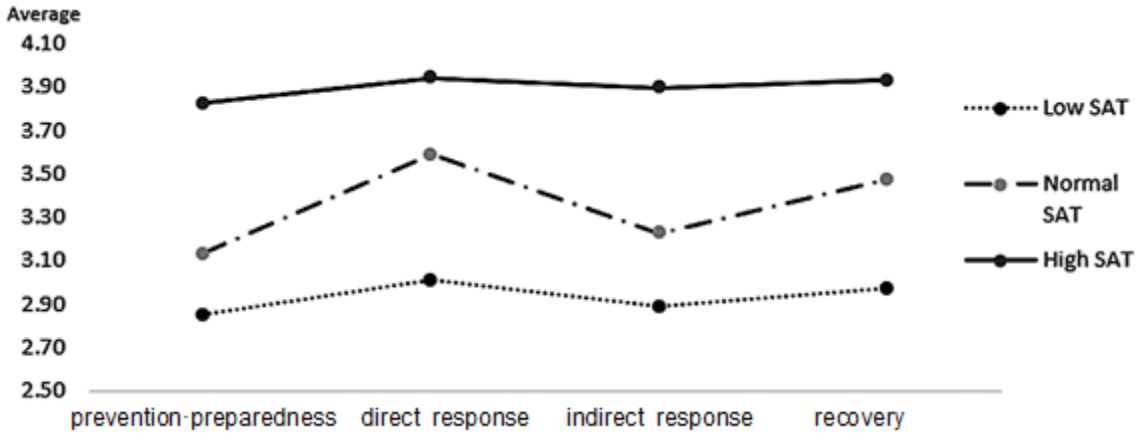

Figure 2. Estimated Average Chart for Each Latent Group

As for the overall characteristics of the three latent groups, the score of the prevention factor was the lowest among the four sub-factors, and the score of the direct response was the highest. The difference in scores between indirect response and recovery was relatively low. The three latent groups were classified into the lowest group, the middle group, and the highest group according to the scores for each sub-factor. Accordingly, the low group with the lowest score for prevention · preparedness, direct response, indirect response, and recovery was named 'Low Safety Awareness Type (Low SAT)', the middle group 'Normal Safety Awareness Type (Normal SAT)', and the highest group 'High Safety Awareness Type (High SAT)'. All of the latent groups showed a similar pattern with the highest score for the direct response factor within each group and the low score in the order of recovery, indirect response, and prevention · preparedness. The proportion of students classified as Low SAT was 20.3%, Normal SAT 23.3%, and High SAT 56.5%. The average score of each factor in Low SAT was much higher than the reference average score, and the ratio of High SAT also exceeded 55%, indicating that the study subjects generally showed a high level of disaster safety awareness.

3.2. Analysis of Interindividual Differences between Latent Groups in Disaster Safety Awareness

A cross-analysis was conducted to investigate the individual differences between latent groups in the awareness of disaster safety. As a result, as shown in Table 7, 8 and 9, it can be seen that there is no difference between the latent profiles by gender, grade, and academic achievement. Table 7 presents the results of cross-analysis between latent profiles according to gender of disaster safety awareness.

Table 7. Gender Latent Group Difference Verification N(%)

Sex	Latent Group			Total
	Low SAT	Normal SAT	High SAT	
male	66(21.2)	72(23.2)	173(55.6)	311
female	69(19.4)	83(23.4)	203(57.2)	355
total	135(20.3)	155(23.3)	376(56.5)	666

In Table 7, the cross-analysis results between the gender latent classes of disaster safety awareness showed insignificant $\chi^2(2)=.335$, $p=.846$, indicating that there was no difference. In men, Low SAT was the lowest in 66(21.2%), Normal SAT in 72(23.2%), and High SAT in 173(55.6%). Women had a higher percentage of High SAT than men with 69(19.4%) of Low SAT, 83(23.4%) of Normal SAT, and 203(57.2%) of High SAT.

Table 8 presents the results of cross-analysis among latent profiles by grade of disaster safety awareness. Table 7 presents the results of cross-analysis among latent profiles by grade of disaster safety awareness.

Table 8. Validation of Latent Group Differences by Grade Level N(%)

Grade	Latent Group			Total
	Low SAT	Normal SAT	High SAT	
1st grade	52(22.1)	53(22.6)	130(55.3)	235
2nd grade	56(25.1)	42(18.8)	125(56.1)	223
3rd grade	47(22.6)	40(19.2)	121(58.2)	208
total	155(23.3)	135(20.3)	376(56.5)	666

In Table 8, the cross-analysis results between the gender latent classes of disaster safety awareness showed insignificant $\chi^2(4)=1.608$, $p=.807$, indicating that there was no difference. In the 1st grade, Low SAT was the lowest in 52(22.1%), Normal SAT in 53(22.6%), and High SAT in 130(55.3%). In the 2nd grade, Normal SAT was the lowest in 42(18.8%), Low SAT in 56(25.1%), and High SAT in 125(56.1%). In the 3rd grade, 47 students (22.6%) were in the Low SAT, 40 (19.2%) in the Normal SAT, and 121 (58.2%) in the High SAT. Each grade had the highest percentage of High SAT among the three latent classes. On the other hand, the Normal SAT showed a higher rate with lower grades.

Table 9 presents the results of cross-analysis between latent profiles by academic achievement in disaster safety awareness.

Table 9. Validation of Latent Group Differences by Academic Achievement N(%)

Achievement	Latent Group			Total
	Low SAT	Normal SAT	High SAT	
High	69(25.9)	47(17.7)	150(56.4)	266
Middle	73(21.8)	71(21.2)	191(57.0)	335
Low	13(20.0)	17(26.2)	35(53.8)	65
total	155(23.3)	135(20.3)	376(56.5)	666

In Table 9, the cross-analysis results between latent profiles by academic achievement of disaster safety awareness showed insignificant $\chi^2(4)=3.664$, $p=.453$, indicating that there was no difference. 69(25.9%) of Low SAT, 47(17.7%) Normal SAT, and 150(56.4%) High SAT of achievement are shown. The Normal SAT rate was the lowest. In the middle achievement level, the Normal SAT rate was the lowest with 71(21.2%), compared with Low SAT 73(21.8%) and High SAT 191(57%) students. In the low achievement level, 13(20%) of Low SAT, 17(26.2%) of Normal SAT, and 35(53.8%) of High SAT, showed the highest rate of High SAT. When comparing the proportions of each latent group by academic achievement, the Normal SAT ratio was the lowest in high and middle groups by achievement, and the Low SAT ratio was the lowest in the low group by achievement. However, the High SAT rate of each group by achievement was the highest.

4. DISCUSSION AND CONCLUSION

Diagnosing the level of safety awareness of subjects of safety education, analyzing their characteristics, and composing appropriate educational contents is the starting stage of safety education and is one of the basic

procedures of teaching and learning. Disaster safety awareness is a multi-dimensional concept that is combined with elements of various knowledge, skills, and attitudes related to disaster prevention, preparedness, response and recovery. Therefore, to measure and characterize disaster safety awareness, it is necessary to conduct research from various fields considering the multi dimensionality of safety awareness. With this in mind, this study tried to find out whether there are differences between latent profiles according to individual differences, and which characteristics are grouped into groups through latent profile analysis. Considering this, in this study, through latent profile analysis, high school students were classified into groups with what characteristics in their awareness of disaster safety and whether there were differences between latent profiles according to individual differences. The disaster safety awareness scale developed by Lee & Kong (2021) [3] with reliability and validity was applied to the research analysis. The discussion of the analysis results according to the research question is as follows.

As a first research question, the latent profile of high school students' disaster safety awareness was classified into three groups. The level of disaster safety awareness of the three latent groups was high in the order of direct response, recovery, indirect response, and prevention · preparedness, respectively, showing a similar pattern. First, the ‘Low SAT’ shows the lowest average value in the sub-factors of disaster safety awareness among the three groups. It is a group that shows little interest in disaster safety and is less willing to change behavior. There is a lack of interest in changing desirable habits for disaster safety. However, considering the number of 'Low SAT' groups, it may be easy to provide customized disaster safety awareness education for each level of students. Considering the inner identity of the ‘Low Perception Type’, it is a group that requires special attention and guidance from teachers. It is necessary to be aware of the dangers of disasters caused by minor negligence and insensitivity to safety, and to urge concern for the safety of the community that my own negligence can become a disaster for not only my family and friends but also my own. Safety education at schools emphasizes the connection of creative experience activities and curriculum [1]. A role play in which all students can participate in the safety education class related to the subject can be considered. It is necessary to develop a task-oriented safety education program considering the low safety awareness group because one can have the confidence to successfully perform a certain task when a task is accomplished, It is necessary to recognize the danger of disaster due to insensitivity to safety, and to have a sense of community and empathy that one's own carelessness can become a disaster for not only oneself but also family and friends.

Next, the ‘Normal SAT’ had a slightly lower average score for prevention · preparedness compared to disaster response and recovery. Looking at the questions of the safety awareness factor for disaster prevention, 'Prepare medicines and daily necessities to use in an emergency', 'Know where you can evacuate in case of a disaster in advance', 'Install a disaster information system application on your mobile phone to prevent disasters.', 'You need to know how to use the National Disaster Safety Portal so that you can use disaster information by type', 'Check for items that may fall or be damaged by strong winds', it can be found that preparedness and evacuation items are converged in disaster prevention. This reflects the results of analysis of convergent validity and scree chart factors during the scale development process. Therefore, considering the average of the disaster prevention factors is lower than the average of the potential group, it can be seen that the safety awareness for disaster preparedness and evacuation as well as disaster prevention is low. The ‘Normal SAT’ is a more positive group for the change of disaster safety awareness than the ‘Low SAT’. Through repetitive and experience-oriented education, it is possible to gradually raise awareness of disaster prevention and safety. From the lower grades, repeated disaster prevention education centered on video media and experiences is necessary. In addition, it is necessary to actively promote the importance of safety education that places more importance on evacuation in the event of a disaster and the importance of an evacuation plan at home. In particular, awareness of disaster prevention, preparedness and evacuation safety can increase the educational effect when school education and home education are combined.

Lastly, ‘High SAT’ has the highest distribution among the entire group and has the highest average score in all sub-factors such as prevention · preparedness, direct response, indirect response, and recovery. It is positive that the distribution of 'High SAT' is significantly higher than that of other potential groups. A ‘High SAT’ responds positively and sensitively to disaster situations based on sufficient knowledge on disaster safety, a positive attitude, and excellent skills, and has a high willingness to intervene. This can be interpreted as the effect of continuous and repeated disaster safety education and publicity through the media.

In the disaster safety awareness of high school students presented as the second research question, it was confirmed that there was no difference between latent groups by gender, grade level, and academic achievement. These results are significant in providing evidence that disaster safety education is possible for high school students without considering individual differences.

Based on the major implications of this study, suggestions for follow-up studies are as follows. First, it is necessary to develop a disaster safety education program in which knowledge and experience are appropriately fused to cultivate unconscious safety habits through continuous repeated learning for groups with low level of disaster safety awareness among the profiles found. As a member of a community culture that practices learning and sharing, it is necessary to cultivate empathy to empathize with the importance of the safety of not only oneself but also others. Disaster safety awareness can be cultivated and internalized when knowledge, behavior and empathy grow together.

Second, the 'Normal SAT', which has an average level of disaster safety awareness among high school students, has only a low will to participate in the improvement of safety awareness compared to the 'High Perception Type' group, but there is sufficient potential for gradual improvement. Considering that mastery experiences are an important source of contributing to the formation of self-efficacy [13], it is necessary to develop a program that can plan task-oriented safety education and put it into practice.

Third, in the results of this study, the safety awareness of the three latent profiles for disaster prevention · preparedness was lower than the overall safety awareness average and lower than other safety awareness factors. By applying the principle of systematic repetitive learning, more effective guidance methods are needed on the causes and prevention methods for each type of disaster.

This study revealed that the latent profile of high school students' disaster safety awareness can be classified into three groups by using a scale whose reliability and validity have been verified. Furthermore, it is meaningful in that it reveals the factors of disaster safety awareness that high school students belonging to each latent profile need to improve and provides the basis for providing disaster safety education without much consideration of gender, grade level, academic achievement.

Despite the various significances of this study, the results of analyzing the latent profile of high school students' disaster safety awareness using a scale whose reliability and validity have been verified is difficult to apply to elementary and middle school students. There is still insufficient development of a disaster safety awareness scale with proven reliability and validity applicable to elementary and middle school students. It is expected that the disaster safety awareness scale and latent profile analysis of high school students developed for this study will be actively used and modified and supplemented, so that the disaster safety awareness scale that will have been verified for its validity by school level, such as elementary and middle schools, will be developed and latent profile analysis will be carried out.

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