

The role of psychological adaptations in the forming of students behavioral adaptations in dealing with volcano eruptions in disaster-prone areas of Mount Merapi

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Abstract

Students' psychological ability to adapt to disaster conditions will be determined by their location in places prone to eruption disasters. However, psychological abilities are often forgotten because their effects are not directly visible. This study aims to find out the role of psychological adaptation on student behavior in disaster-prone areas of Mount Merapi. This is a quantitative correlational research and the subjects are high school students who live in Mount Merapi's disaster-prone area III. In this study, data was collected using questionnaires, interviews and observations and data was analyzed using regression analysis.

The results showed that psychological abilities affect students' behavior in adapting to the conditions of the Mount Merapi eruption. In addition, adaptation is unrelated to gender; female and male students should have equal knowledge and awareness of the Mount Merapi eruption disaster. Female students also need to be involved in every process of disaster adaptation in order to create a resilient generation in the future.

Keywords: Adaptation, behavioral, Mount Merapi, psychological, volcano.

Introduction

A natural disaster is not new to our society. It demands us always to be prepared, no matter where or when it occurs. One of the natural disasters that our society is familiar with and has a definite cycle, is volcano eruption. The eruption occurs when the bursts of gas, magma and volcanic ash are released into the atmosphere from a volcanic mountain.²⁸ Volcanic eruption is categorized under geophysics.

Because of its location at the intersection of three tectonic plates, Indonesia ranks fourth after China, India and the Philippines in geophysical risk.^{19,42}

Eruption is the most dangerous natural disaster.¹¹ It is because the eruption's aftereffects affect individuals directly or indirectly and take a long time to recover from, particularly for those who live near the volcano.^{31,54} Besides, an eruption can trigger other disasters such as tsunami, climate change and the effects of the aerosol increase in the

atmosphere.^{23,24} These impacts demand extra precautions in dealing with eruption.

Indonesia is one of the countries with a high potential for eruption.⁹ This fact expects us as the society to have a good knowledge and understanding of the prone location to prevent huge damages from the eruption. One of the active volcanoes with a definite cycle of eruption is Mount Merapi.^{16,43} Mount Merapi, with its high eruption potential, does not appear to have an impact on society; in fact, there is a growth in the number of people living on Merapi's slopes (more than 1 million people reside on Merapi's slopes) due to other considerations.¹⁶ Those who live on Merapi's slopes must, without a doubt, make some adjustments in order to survive and adapt to their surroundings.²⁰

One way to prepare the civilization for the eruption of Merapi is to make good adaptations to the situation. Of course, this is not easy because it needs time to adapt to a natural disaster.⁴⁹ However, in the end, this lengthy process is what makes a better resilience for the society towards disasters.^{6,33} Adaptation to disaster is a process of anticipating and responding to every change that occurs to prevent more damage by using opportunities for effective adaptive action.^{3,13,60} A society that can adapt successfully to the environment, indicates that it is already aware of and prepared for any possibilities.

Children and teenagers of school age are a group of people who are particularly vulnerable to natural disasters, particularly volcano eruptions.³⁵ The fact shows that this group of age has a lower level of safety than other groups of age.³⁴ It usually affects them psychologically and emotionally when the disaster occurs.^{7,36} In the end, the damage causes trauma for these students. Trauma in school-age children has the same characteristics as that in adults.¹² The trauma certainly will affect them negatively.

Watanabe et al⁵⁵ explained that trauma from natural disasters will affect children's blood pressure until four years after the accident. Therefore, students need to have good adaptation abilities to natural disaster in order to be better prepared for future disasters.

There are two aspects that influence the adaptation skills to natural disasters which are behavioral and psychological.³⁸ Behavioral adaptation is human's first response in dealing with changes.^{30,58} It shows what action should be taken to

change someone's behaviour to minimize the damages caused by disaster.³⁸ Behavioral adaptations lead to a broader understanding of the dependencies and fragility of surrounding systems.^{30,47} On the other hand, psychological adaptations are closely related to individual psychological adjustment in dealing with disaster.³⁸ Psychological adaptations help someone describe and explain the cause of a disaster and then inform what they have to do to prevent a huge damage.⁵¹ According to Proulx and Aboud⁴¹ and Torani et al,⁵³ psychological adaptations aim to increase children's psychological skills as their psychological conditions can be easily affected when a disaster occurs.

To increase students' adaption skills, each school should begin actions such as safety promotion,³³ calming fearful students, developing self-efficacy, strengthening emotional relationships and giving hope to students who have given up.⁵⁰ With good adaptation skills, the students who live near the disaster-prone area will not be affected and can keep their good grades. Sakız and Aftab⁴⁴ stated that when the students who live near the disaster-prone area start to adapt well, will significantly affect their academic grades.

Adaptation to disaster is important for the students who live near the disaster-prone area of Mount Merapi as most of them, with around 0-25 km from the top of Merapi, still have low disaster alertness.²⁷ Merapi's disaster-prone areas are classified as I, II and III. Disaster-prone area I has the least impact from the eruption, disaster-prone area II has a moderate impact from the eruption and disaster-prone area III has the most impact from the eruption. The smaller is the distance from the top of Merapi, the more dangerous the area is. Therefore, the students in disaster-prone area III must be able to adapt to the conditions. With adaptation to disaster, the students will be more prepared to deal with the disaster and schools can help provide safety and comfort for the students. With how important it is for the students in the Mount Merapi area to have good adaptation to disaster, the researchers focus on analyzing the relation between psychological and behavioral adaptations in students in disaster-prone area III Mount Merapi.

Material and Methods

The type of this research is an explanatory sequential mixed method. Mixed method research is frequently used by disaster experts. This method allows the experts to know for sure the impacts and practices of a disaster so that they understand society's behaviour, perception and response towards the disaster that occurred in their area²⁹. The aim of this method in this research is to find out deeper about the role of psychological adaptation to the behaviour of students living in disaster-prone area III Mount Merapi.

Explanatory sequential mixed method research shows that the researcher does quantitative research before explaining the results qualitatively for more detail.^{14,45} The qualitative approach is made to get a detailed understanding of the influence found in the quantitative analysis.^{45,57} The

qualitative approach is also used to understand more about the social phenomenon through the perspective of the directly involved respondents. Qualitative analysis is also needed to understand the social phenomenon that is still unknown through quantitative analysis.³⁷

The data were collected through questionnaire, interview and observation. The questionnaire is to find out how much is the influence of psychological adaptations on the behaviour of the students living in disaster-prone area III Mount Merapi (Table 1).

The interview is to analyze more of each respondent's psychological and behavioral adaptation skills. In addition, the observation is done to directly observe adaptation to disaster activities done by the respondents. The total of respondents in quantitative stage of this research were 85 students from three senior high schools in disaster-prone area III Mount Merapi. They are SMA Sunan Kalijogo, SMK Kanisius 1 Pakem and dan SMK Muhammadiyah Cangkringan. Of the 85 respondents, 36 were boys and 49 were girls. At qualitative stage of this research, the researcher took three students from each schools in qualitative stage.

The quantitative analysis technique used in this research is regression. This technique is used to predict significant dependency between independent and dependent variables.⁸

Thus, regression in this research aims to find out the influence of psychological adaptations on students' behaviour in dealing with the Merapi eruption and also the influence of gender on disaster adaptation skills of the students in disaster-prone area III Mount Merapi. On the other hand, qualitative analysis in this research is a thematic one. Thematic analysis helps provide various hypotheses that are ready to be tested based on the literature studies¹⁴. This thematic analysis will deepen the results related to psychological and behavioral adaptation skills to eruption for students living in disaster-prone area III Mount Merapi.

Results

Psychological adaptations on the forming of students' behavioral adaptations: Psychological adaptations are something related to psychological aspects of each individual. Frequently, students who directly become victims of a disaster will experience psychological problem for quite a long time. On the other hand, behavioral adaptations are related to individual response to the conditions of the surroundings. Table 2 shows the categories of psychological and behavioral adaptations of the high school students in disaster-prone area III Mount Merapi.

Table 2 shows that most respondents already have good psychological and behavioral adaptation skills. The high category of psychological adaptations in senior high school students is 54,12% while the behavioral adaptations is 64,71%.

Table 1
The Indicators of Psychological and Behavioral Adaptations

S.N.	Variable	Indicator
1	Psychological adaptation	- Self confidence
		- Courage
		- Positive feelings
		- Self-composure
		- Social support
		- Anxiety and stress
2	Behavior adaptation	- Mental readiness
		- Disaster understanding
		- Disaster preparedness
		- Network
		- Disaster communication
		- Participation
		- Policy

Table 2
Students' psychological and behavioral adaptation skills to disaster

Category	Psychological adaptation (%)	Behavior adaptation (%)
High	54,12	64,71
Middle	42,35	35,29
Low	3,53	0

Source: Analysis result, 2021

The students' psychological adaptation skills are related to inner aspects from themselves: the feelings of fear, sadness, happiness, stress, or anxiety while behavioral adaptation skills are related to individual response and action when Merapi eruption occurs. Many respondents with good psychological and behavioral adaptations show that the senior high school students know how to adapt themselves to the disaster that may happen in their surroundings. The results are based on the interviews with some research respondents (respondent A and D).

"When the signs occurred, I already knew what I need to do, but at that time I couldn't offer any social support to anyone around me because I was still in my emotional state at that condition," respondent A said.

"I've attended to a disaster socialization in my village and school, so I know what action I should prepare before and after a disaster strikes. Even my family often went on to evacuate ourselves before the government asked us to and I only followed what my family did," respondent D said.

These interviews show that the high school students in disaster-prone area III Mount Merapi already have the knowledge about eruption, so their behavioral adaptations in dealing with the disaster are good.

However, they still have limited psychological adaptations because students frequently only follow what adults say and have not been involved actively in any disaster training yet. For further information, the influence of psychological

adaptations on behavioral adaptations of the students in disaster-prone area III Mount Merapi can be seen in table 3.

Based on table 3, sig. value is 0,0000 which shows that there is an influence between psychological adaptations and behavioral adaptations. With the influence of 7,051 of psychological adaptations on behavioral adaptations, it means an increase of 1 unit of psychological adaptations affects an increase on behavioral adaptations of 7,051.

The percentage of psychological adaptations influence on behavioral adaptations is 63,20% while 36,80% can be influenced by other variables. The result is based on the interview with some research respondents (respondent C, F and D).

"When the eruption occurred, I had to control my emotion not to panic. If I was too panic, I would be too confused to do anything so the first thing I should do when it occurred is controlling my emotion," respondent C said.

"My neighbour has some trauma to eruption and she often feels panic and anxious when a disaster occurs. It makes her too panic to even do anything and waste away any preparation she made," respondent F said.

"The disaster socialization taught me to deal with disaster calmly, especially because I have a younger sibling. If I'm panicing, my younger sibling will panic too and it will make it difficult for my parents to evacuate us," respondent I said.

Table 3
Significant value of psychological adaptations on behavioral adaptations

Indicators	B	Beta	F	Sig	R Square	Std Error
Psychology adaptation	24.736 1.308	.795	142.733	.000 .000	.632	7.051

Source: Analysis result, 2021

Table 4
Disaster adaptation skills on high school students in disaster-prone area III Mount Merapi

Category	Adaptability (%)		Total (%)
	Woman	Man	
High	34,12	30,59	64,71
Middle	23,53	11,76	35,29
Low	0	0	0

Source: Analysis result, 2021

Some respondents did disaster socialization in their village or school, so they already know to keep calm when a disaster strikes. Being calm can also help to calm other people's psychological condition.

When a victim's psychological condition is affected, they will be too confused and do not know what they should do in the middle of a disaster. Besides, a good psychological condition will help them to be more prepared to deal with disaster.

Gender on the students' adaptation skills to disaster:

Gender problem is something that usually arises when a disaster strikes. Differences in roles between men and women in this society often make women more susceptible when a disaster strikes. Women tend to be associated with houseworks, so their roles in dealing with disaster are considered limited. Table 4 will describe disaster adaptation skills based on genders of high school students in disaster-prone area III Mount Merapi.

Table 4 shows that most respondents have good adaptation to Merapi eruption categorized as high (64,71%). Table 4 also shows that women (34,12%) have more respondents in high-level category than men (30,59%). The high level of adaptation skills to disaster in high school students in disaster-prone area III Mount Merapi is influenced by their high level of psychological and behavioral adaptation skills to disaster. Good adaptation skills to disaster also mean that most respondents are prepared to deal with Merapi eruption. The differences in adaptations between female and male students in disaster-prone area III Mount Merapi can be seen in the interview results below (respondents B and F – females and respondents E and G – males).

"I've already prepared a bag full of phone charger, flashlight, drinks, biscuits and insecticide. So when the eruption occurs, I don't need to panic as I've prepared everything. My family also does the same. My mother has packed our important things for the evacuation," respondent B said.

"My mom often asks me to help her prepare for the evacuation, like what things we have to bring with us and other things like foods and drinks. From that on, I know that Merapi's condition is worsening. The faster the preparation means the level is already higher," respondent F said.

"I often attend disaster training and I know someone who is responsible to observe Merapi, so I always get the newest information about Merapi. With that information, I can prepare myself better in dealing with the disaster," respondent E said.

"My father often brings me to disaster training in our village. From that event, I know that we have to prepare ourselves to deal with the disaster and then I start preparing myself after that," respondent G said.

These interviews show the role differences between women and men. Female respondents do things related to household like taking care of their family members or preparing items for the evacuation. On the other hand, male respondents shared their direct involvement in disaster training so they know what they should do while observing Merapi's condition. Men usually make decisions when disaster strikes while women will only follow instructions. Further information about the influence of gender on adaptation skills to disaster of the students in disaster-prone area III Mount Merapi can be seen in table 5.

Table 5 shows that there is no relationship between gender and behavioral and psychological adaptation skills with sig. value more than 0,05. Table 5 shows the sig. value of 0,364 which means there is no relation between gender and students' adaptation skills in dealing with disaster. This result is similar to table 4 where there are more female respondents with a high level of adaptation skills than male respondents, so it can be concluded that gender holds no influence on the adaptation skills of the students in disaster-prone area III Mount Merapi. This result is also supported by the interview with respondents F and H (females) and respondents E and I (males).

Table 5
Significant value of gender to adaptation skills to disaster

Indicators	B	Beta	F	Sig	R Square	Std Error
Gender	109.041 -3.541	-.100	.832	.000 .364	.010	17.684

Source: Analysis result, 2021

“While helping my mom prepare for the evacuation, I observe what I should do in that kind of situation. Besides, my mom always tells me to keep calm so that I won’t disturb other people,” respondent F said.

“Even though I’m a girl, my parents always teach me about anything related to eruption. They told me eruption can occur anytime so I always have to prepare myself well,” respondent H said.

“Disaster training that I did help me a lot in preparation for eruption. I often talk with my parents as well about what we should and shouldn’t do during that situation,” respondent E said.

“When I followed the disaster training with my parents, I know what action I should make in that situation, but until now I’m still stuck in following my parents’ decision and instruction,” respondent I said.

From the results of the analysis and interview, there are visible role differences between women and men in dealing with Merapi eruption. However, that does not stop women from having good adaptation skills to disaster. The habit of preparing things for the evacuation leads women to know what they should prepare before, at the time and after the disaster strikes. Women also tend to be better at giving social supports to other people than men. Men are frequently directly involved in disaster training but in the end they still follow their parents’ instruction and they barely know about what they must prepare before, at the time and after the disaster happens. Usually, men only do what their mothers/women have prepared.

Discussion

Psychological adaptations on the forming of students’ behavioral adaptations: The analysis result of this research shows that psychological skills have some influence on students’ behaviour in dealing with disaster. This is supported by a statement by Tchou and Mertan⁵² and Dai et al¹⁵ that social support is important for behavioral adaptations. It is also one of the indicators of psychological adaptations that are used in this research. The support from the society around them can influence an individual’s behaviour in dealing with disaster. Social support can also help an individual deal with trauma and stress caused by the disaster.^{15,21}

Jain and Cohen³⁰ stated that support from family members, friends and society has positive effects on teenagers and will increase their behavioral adaptations from time to time.

Besides social support in psychological adaptations, Almazan et al¹, Becker et al⁵ and Deng et al¹⁸ stated that experience in dealing with disaster may influence an individual’s perspective which in the end will affect their behaviour. An individual who has experienced a disaster before, usually has a better perspective on the disaster than the one who has not.¹⁸ It is because the experience earns someone the concrete prevention on dealing with disaster, so they understand well what should do and what not to in dealing with disaster. The relation between experience and adaptive behaviour in an individual who lives near disaster-prone area is not always significant because the experience directly influences their perspective, such as behaviour and value.¹⁸

Another variable that may influence adaptive behaviour of an individual who lives near a disaster-prone area is adaptive practice. Brink¹⁰ explained that adaptive practice would help an individual through continuous cognitive and active actions, so they have a better understanding about the meaning of adaptation to disaster. Behavioral adaptations are dynamic skills based on the level of danger in an area.³⁰ Therefore, adaptive practice helps an individual to have more understanding about the disaster in their surroundings by studying the changes in the area. On the other hand, Fischer and Jasny²² stated that networking could increase adaptive skills of an individual who lives near a disaster-prone area by facilitating better action and learning. Adaptive skills will increase more if it is balanced with the use of good technology.^{32,39}

Even though psychological adaptations have a significant influence on someone’s adaptive behaviour, there are other variables that can influence it too. Those other variables are always related to one another because adaptive behaviour in dealing with disaster is complex and needs more variables to push it forward. Students who live in a disaster-prone area, demanded to have the ability to adapt to any conditions in their surroundings to prevent the damages in the future.

Gender on the students’ adaptation skills to disaster: This research shows that gender has no significant influence on adaptation skills to disaster of students in disaster-prone area III Mount Merapi. This result is actually different from De Silva and Jayatilaka¹⁷ who stated that women tend to be more susceptible to dealing with disaster than men.

Araujo et al² even stated that women have 14 times more chances to be the victims of disaster than men. These statements show that women ability are limited in dealing with disaster that they even categorized as susceptible.

Even though considered susceptible, women hold an important role in post-disaster recovery. According to Purnomo,⁴² women have better social and economics adaptation skills than men, especially at the recovery phase. Women get those skills from their social roles when they stay home to do housework and take care of their family.²⁶

There is no relation between gender and the students' adaptation skills in dealing with disaster. It is similar to Fu et al²⁵ who stated that parents can recover faster from a disaster if they have good social bonds and support from people around them, so gender has no significant influence on adaptation skills to disaster of an individual. This result is supported by Kangas-Dick and O'Shaughnessy³³ that gender has no influence on someone's resilience.

Adaptation skills to disaster can be developed with the support of appropriate disaster policies. However, the role of the Government in integrating gender in disaster management activities is still minimal. That is similar to a statement by Siahaan and Tambunan⁴⁸ that the limited role of women is due to the lack of gender mainstreaming strategy in disaster training, the lack of commitment and the lack of data collection on gender, so the empowerment of women and gender is still limited. Hafida²⁶ stated that the role of women is usually limited to food preparation only which leads the role of women in dealing with disaster also to be limited. Other than that, women are also stuck to be the ones taking care of their family members when disaster occurs.² Therefore, women also hold an important role in disaster training, especially in training their family members to get used to the situation.

Another statement by Waters and Adger⁵⁶ stated that structural factor like gender is very influential on disaster adaptive skills. Polusny et al⁴⁰ explained that gender makes a huge contribution to an individual's trauma as women usually experience worst trauma than men. It is supported by Ashraf and Azad⁴ that women have lower life expectancy than men when facing a disaster. Women are more susceptible to disaster because of the differences in job status, earnings, social roles, social norms and other rules that manage women's behaviour.¹⁷ Moreover, because of the different level of susceptibility of women and men, women usually are the ones who suffer more damages in disaster.²⁶

Purnomo⁴² mentioned that a woman's adaptive skills in dealing with disaster could increase the adaptive skills of her family. The adaptive skills can be seen in her social and economical activities. Women teach their family about how to deal with disaster as an adaptive social activity while economically, women make an application for job⁴² diversification to recover their income post-disaster.

Araujo et al² also stated that women's knowledge and responsibility in disaster training have important parts in their society in order to survive. Women are able to encourage the adaptive skills to disaster of their family.

However, there are some social barriers such as the lack of knowledge and understanding of the disaster as women are rarely involved in the decision-making when the disaster occurs.⁴⁶ In fact, women have the capacity and skills to support the sustainable improvement of disaster policy.⁵⁹

Conclusion

Adaptation skills to disaster need a long time. Adaptation skills to disaster can encourage an individual to keep surviving in disaster situation. Hence, it is important for the students in disaster-prone area III Mount Merapi to have good adaptation skills to disaster. In order for it to happen, they need to have good psychological and behavioral adaptation skills. It is meant for them to control their emotion better and do not quickly go panic to keep the effectiveness of all the disaster prevention and control actions. When an individual fails to contain their emotion in a disaster situation, they will quickly get panic and do not know what they should do. Both psychological and behavioral adaptations are important for the students to minimize the total victims of the Merapi eruption.

On the other hand, adaptation skills to disaster do not have any relation to gender. Even though women have limited roles related to disaster activity, it does not mean their adaptation skills are low. Many things women do are, in fact, bring improvement in other people's adaptation skills to their surroundings. On the other hand, mainly being involved in disaster training does not guarantee men to have good adaptation skills. Male students still have to follow their parents' decision and instructions while female students directly help prepare for the evacuation. As psychological adaptations are closely related to emotion, women play an important role in adaptation to disaster. For that reason, disaster policy where women can be actively involved in any activities is needed to maximize women's roles in society.

This research is limited to the psychological and behavioral adaptation skills of the students in disaster-prone area III Mount Merapi while there are more variables that may influence adaptation skills in an individual.

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