

Group Evacuation Experiment of Visually Impaired Students

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SUMMARY

To respond to visually impaired students' (VI) vulnerabilities in disasters, this study aims to experimentally validate a framework of factors influencing efficacy beliefs regulating VI students' evacuation behavior. A quasi-experimental pre-test and post-test study was conducted. Data from an evacuation experiment highlight the role of efficacy beliefs and group effects in shaping emergency responses, with group efficacy playing an important role in managing anxious thoughts and feelings during an emergency evacuation. Although evacuation times did not significantly differ between groups, the experimental group demonstrated smoother synchronization, while undesirable evacuation behavior emerged in the control group. This emphasizes the importance of clear group structures and roles in fostering positive group behaviors. Compact sub-group formation highlights its importance in promoting safe evacuation for VI students by offering emotional reassurance and flexibility. These findings underscore the significance of efficacy beliefs in shaping behavior and responses during emergencies among VI students.

Key words

Visually Impaired Students, DRR, Evacuation Training, Efficacy Beliefs, Emotion Regulation

1. INTRODUCTION

Disaster risk reduction (DRR) education DRR education is crucial for enhancing awareness and preparedness. Various approaches have been employed, such as co-learning methods^[1], inclusive DRR education compo-

nents^[2] and interactive teaching methods and customized kits^[3]. Differentiated Instruction Techniques cater to diverse learning styles, including those of visually impaired (VI) students^[4]. However, existing DRR approaches do not adequately address the major vulnerabilities of VI students in evacu-

ation, such as disorientation and anxiety^[5].

In group settings, it has been found that there is a noticeable presence of shared responsibility and mutual assistance, particularly from those with better vision. Conversely, when alone, VI individuals tend to slow down or stop altogether when encountering obstacles, relying on physical contact to detect them, thus complicating evacuation routes^[6]. This previous study specified the advantages of group evacuation for VI persons in navigation. However, as for managing the anxiety feeling that is prone to emerge among VI students, no literature has been found.

Efficacy beliefs, as defined by cognitive judgments about one's capabilities, could play a critical role in managing responses during disasters. Bandura (1993) emphasized that the most effective way to alleviate anxiety is by instilling a strong sense of efficacy^[7]. By integrating this theory, we can develop more effective strategies to enhance individuals' confidence in their ability to manage and overcome the challenges presented during disasters.

For these strategies to be effective, however, measures of personal efficacy beliefs must be specifically tailored to the relevant activities^[8]. In our case of VI students in disaster scenarios, tailoring these measures to assess their beliefs about their capabilities to respond to emergencies is crucial. This approach not only addresses their intrinsic beliefs about their abilities in DRR but also enhances the accuracy of predictions regarding their responses. The literature identifies the following elements that influence efficacy beliefs in this context.

Coping efficacy encompasses two main strategies: emotion-focused coping, which deals with managing emotional responses to stress, and problem-focused coping, which addresses changing challenging aspects of stressful situations. Secondary appraisal involves asking oneself, '*What actions can I take?*'^[9]. Coping efficacy regulates avoidance behavior as well as anxiety arousal^{[7],[10]}. Also, a sense of controllability is necessary for people's judgment to produce change. Bandura and Wood (1989) discovered that if people feel they can influence what is happening around them, they are more effective in managing thoughts and behaviors^[11]. A study showed that feeling a lack of control was linked to increased fear and anxiety^[12]. Finding effective ways to address the lack of control could help reduce fear and anxiety during disasters^[11]. Group efficacy is significant, as it determines group performance based on collective beliefs in the group's capabilities in achieving DRR tasks.

Group Efficacy and Group Dynamics:

Literature has reviewed the following group factors that are indeed integral to the study of group dynamics and influence group efficacy in the specific context of this study.

1) Group cohesion: Various aspects of group efficacy were found to be positively correlated with group cohesion^[13]. A team's group efficacy is likely to derive from perceptions of team cohesion^[14]. Other findings suggest that group efficacy is related to team cohesion and self-efficacy^[15]. Cohesion facilitates an environment where members feel supported, respected, and valued. In times of doubt or difficulty, indi-

viduals can rely on the encouragement and support of their peers. Highly cohesive groups contribute to a collective belief in the group's ability to overcome challenges.

2) Group norms: Norms supporting achievement, collaboration, effort, and resilience strengthen the group's belief in capabilities. Observing peers succeed and contribute to group goals provides powerful social modeling, reinforcing the collective belief in overcoming challenges. Research has shown a positive correlation between cooperative group norms and team creativity, with group efficacy playing a mediating role in this relationship^[16]. Prosocial group norms like helping, empathy, and altruism foster trust among members, enhancing their perceived efficacy in tackling challenging tasks. This shared identity fosters perceptions of similarity, closeness, and increased responsibility for the well-being of fellow in-group members^[17].

3) Group size: The size of the group could affect members' shared belief in group ability as suggested by Latané (1981) in his rule about the number of influencers^[18]. Larger groups may experience challenges in maintaining high levels of cohesion impacting their group efficacy. In a friendship group, an increase in group size increases the likelihood of helping behavior when social norms support helping. Researchers suggest that this is associated with heightened feelings of group efficacy^[17]. However, Kerr (1989) indicated that generally, people perceived smaller groups to be more efficacious than larger groups^[19].

4) Leadership: Leaders significantly shape group dynamics and efficacy beliefs. Their

capacity to inspire confidence, offer guidance, and promote collaboration profoundly affects group efficacy. A supportive leader can instill belief and motivation, influencing the group's mindset through positive encouragement. This fosters a belief in the group's ability to leverage its resources and abilities to overcome challenges^[20].

According to these, this proposed framework has been formulated. There are categories of factors forming information for VI students to gather efficacy judgment.

These factors — emotion regulation skills, DRR skills, and group dynamics — play distinct yet interconnected roles in shaping the students' abilities to navigate evacuation scenarios effectively and manage their anxiety. First, emotion regulation skill, the ability to gain or regain control of their emotions, this skill determines individuals' perceived control and emotion coping efficacy. The skills are crucial for VI students as they help manage feelings of anxiety and loss of control during high-stress situations like evacuations. By improving their ability to regulate emotions, these skills enhance the students' emotional coping efficacy, enabling them to maintain composure and make rational decisions under pressure.

Second, hands-on DRR skills directly refer to VI students' ability in DRR. They provide the practical knowledge and capabilities required for safe navigation during emergencies. These skills directly impact the students' sense of control and coping efficacy by equipping them with the problem-solving skills related to DRR could hold promise as a crucial

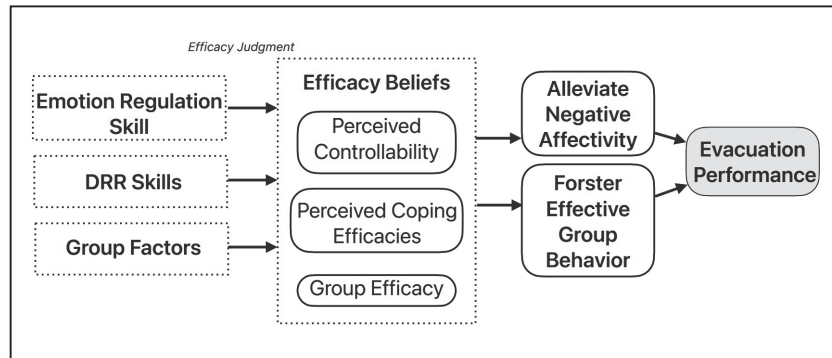


Figure 1: A Framework of Factors Influencing Efficacy Beliefs Regulating VI Students' Evacuation Behavior

ability and a measurer to navigate evacuation routes effectively. Hence, it is also involved with their efficacy judgment on how they are confident to utilize the skill resources.

Third, group factors including cohesion, leadership, norms, and size can play a significant role in influencing group efficacy, which is crucial for effective group performance in evacuation scenarios. The dynamics within a group, such as leadership and mutual support, can significantly affect how effectively the group functions. For VI students, being part of a cohesive and supportive group can enhance their overall efficacy during evacuations, as they can rely on navigation and assistance. Group efficacy is associated with the tasks, level of effort, persistence, shared thoughts, stress levels, and achievement of groups resulting in group performance^[21].

These categories aim to minimize vulnerabilities in safe route navigation, manage anxiety during evacuations, and leverage the benefits of group dynamics. Understanding and addressing these factors comprehensively is key to empowering VI students, enhancing their efficacy beliefs, and ensuring their safety and effectiveness in evacuation situations.

Overall, coping efficacies, controllability, and group efficacy are specified in this condition. After the efficacy judgment is done, its level determines how much effort, and persistence people will contribute, and this will translate into their overall performance. If a group of VI students can make an efficacy judgment even slightly above their actual capabilities, they are likely to put more effort into helping each other and persist in organizing and executing courses of action and overcoming barriers^[7]. To prove the proposed framework, this study aims to experiment to find field evidence support.

2. Hypotheses

When the environment is hard to control, regaining control over own emotions could affect an individual's sense of controllability. This could be achieved by the ability to regulate over own thoughts and feelings.

Emotion Regulation

Emotion regulation strategies are an effective way to change emotions, feelings, desires, beliefs, and practices of the individual and give order and meaning so that one can reach

higher goals; people's success in reaching goals is determined based on their skills in emotional regulation, knowledge, and behavior^[22]. A study conducted among people with anxiety disorder found that training on emotion regulation skills could decrease the signs and symptoms of social anxiety^[23]. Furthermore, improvement in emotional regulation skills is associated with psychological treatment outcomes for depression and/or anxiety in youth^[24]. Some applications aim to manage emotion by utilizing mental and psychological states as follows:

Emotion Regulation Training

Emotion regulation is the ability to effectively manage and modulate one's emotions. In clinical settings, several schools of psychology establish theories and applications working with emotional management such as dialectical behavior therapy (DBT), cognitive behavioral therapy (CBT), and mindfulness-based cognitive therapy. Emotional regulation intervention can also be employed in several settings. Berking et al. (2014) demonstrated the effectiveness of emotional regulation training in reducing symptoms of depression and anxiety among individuals with mood disorders^[25]. Interventions, such as CBT and DBT, have been shown to enhance emotion regulation strategies and decrease emotional reactivity^{[26],[27]}.

Grounding Techniques:

Grounding techniques, rooted in cognitive behavioral strategies, serve to help individuals remain anchored in the present moment and

regulate feelings of anxiety or distress. The concept of grounding was developed by a psychotherapist Lowen^[28]. It emphasizes the psycho-physical presence in the "here and now," guiding attention toward sensory experiences, physical sensations, or environmental elements which are effective strategies used to manage overwhelming emotions and reconnect with the present moment. Grounding techniques draw from principles of CBT and DBT, redirecting attention from distressing thoughts to sensory experiences (CBT) and enhancing present-moment awareness to manage emotional distress (DBT).

Grounding Techniques for Managing Negative Thoughts and Feelings in Disasters:

When the mind is overwhelmed by negative thoughts and emotions, maintaining a clear focus to solve problems becomes challenging. Grounding techniques help alleviate anxiety and panic during emergencies. These exercises redirect attention to the present moment, allowing individuals to regulate feelings of distress. By enhancing emotional awareness and promoting a sense of control, grounding techniques provide effective relief^{[29],[30]}.

Group Problem Solving

Group problem-solving is one group dynamic process where individuals collectively tackle issues, drawing upon diverse perspectives, skills, and knowledge to arrive at solutions. Positive interdependence, where members perceive their goals as mutually dependent, fosters collaborative efforts, enhancing problem-solving efficacy^[31].

Effective group problem-solving is influenced by various factors, including:

1) Group Dynamics: Cohesion, communication, leadership styles, and group norms can significantly impact the problem-solving process. Open and effective communication facilitates information sharing, idea generation, and consensus building^[32]. A formally appointed leader can bolster group effectiveness while factors like pressures for conformity can inhibit the free expression of ideas in a group^[33]. Supportive norms for risk-taking and constructive dissent enhance problem-solving outcomes^[34], whereas conformity to groupthink diminishes critical thinking and innovation^[35].

2) Individual and Collective Skills: Diversity in expertise, cognitive styles, and personalities enrich problem-solving processes. However, excessive heterogeneity may hinder cohesion and communication^[36].

3) Problem Complexity: The nature of the problem influences the strategies and approaches employed during the problem-solving process. There are five characteristics of the problem to consider in doing group problem-solving including task difficulty, number of possible solutions, member interest, group familiarity, and need for solution acceptance^[37].

Group Problem-Solving Exercise:

Problem-Based Learning

Problem-based learning is an educational method centered on real-world problems. It enhances students' problem-solving abilities and motivation by engaging them in collabora-

tive problem-solving experiences aimed at addressing challenges. These problems prompt students to identify and learn the necessary knowledge and skills to understand and solve them^[38]. Problem-based learning is praised for promoting self-directed learning and key skills such as critical thinking, problem-solving, and teamwork.

This study formulates hypotheses that underscore the design of the intervention as follows:

Firstly, it is hypothesized that (1) *training in emotion regulation skills would help develop a sense of controllability and emotion-focus coping efficacy resulting in less expression of anxiety feelings and thoughts during evacuation*.

Carried from the literature review, there are three key points identified for promoting positive group dynamics among VI students in safety evacuation, including group problem-solving skills, roles, and norms of mutual assistance.

Secondly, it is necessary to endorse critical thinking skills which could be developed through training in group problem-solving. It is hypothesized that (2) *group problem-solving training would increase problem-focus coping efficacy and the sense of controllability resulting in the occurrence of undesired decisions or actions during evacuation would not be observed*.

Thirdly, group conditions could facilitate group efficacy creating positive group dynamics and mutual assistance, under the hypothesis that (3) *a clear group structure and roles could facilitate the overall group efficacy among*

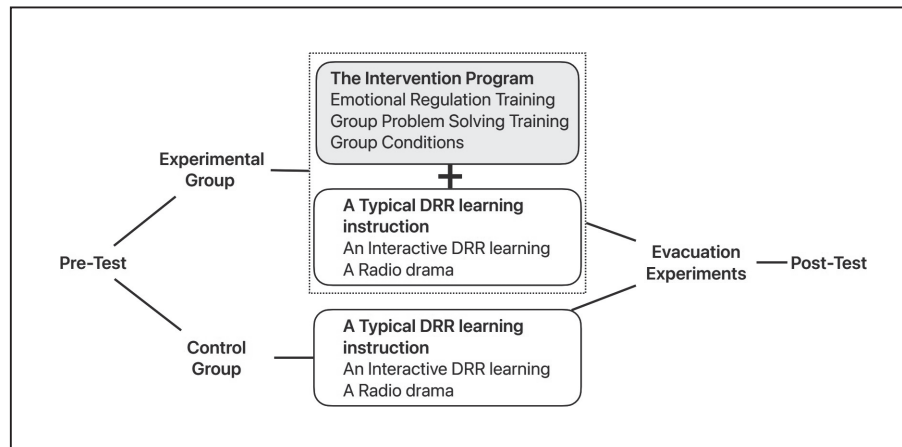


Figure 2: A Framework of the Research Design

group members creating positive group dynamics resulting in better evacuation performance.

3. METHOD

This study employed a quasi-experimental with pre-test and post-test design. Its objectives are to: (1) examine VI students' evacuation behavior, (2) assess the influence of efficacy beliefs on safety, including evacuation performance and anxiety control, and (3) evaluate the effectiveness of the DRR group training intervention on promoting positive evacuation performance. The study formulates hypotheses based on these variables.

Independent Variables: Efficacy beliefs, Gender, Age, and Group conditions

Dependent Variables: Evacuation behaviors, Emotions during evacuation, Evacuation time, Evacuation performance

Working Hypotheses:

- 1) The experimental group would show a higher evacuation emotion score than the control group.
- 2) The experimental group would show a higher evacuation behavior score than the control

group.

- 3) There would be correlations between efficacy beliefs, evacuation emotions, and evacuation behavior scores.
- 4) With a condition of group factors controlled, the experimental group would perform better evacuation performance than the control group.

3.1 Research measurers

There were two main methods for collecting data first, a questionnaire survey, and second, observation of the evacuation experiment by memos and video recording.

3.2 Questionnaire Survey

The survey questions we developed were based on similar questions from previous qualitative studies^{[39],[40]}. As for measuring anxiety feelings and thoughts that occurred during the experiment, a Semantic Differential (SD) scale was developed to help facilitate the participants' describing their inner feelings^[41].

Pre-test questionnaires consist of (1) Personal information including gender, age,

school year, and VI levels. (2) The efficacy beliefs scale consists of 15 items regarding subscales of self-efficacy in DRR (*e.g., I know exactly what to do in case of an emergency.*), Problem-focus coping efficacy (*e.g., I can be safe even if there are obstacles caused by a fire such as smoke or, a route blocked.*), Emotion-focus coping efficacy (*e.g., I can regulate unpleasant/negative thoughts to go away.*), Group Efficacy (*e.g., If I and my friend(s) cooperate well, we can evacuate safely.*), and perceived controllability (*e.g., To a great extent my life is controlled by accidental happenings.*). This is a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The sum of this scaled score will be named the ‘Total efficacy score’.

Post-test questionnaires consist of (1) Evacuation behavior 9 items which consist of questions asking about their actions, thoughts, and decisions during evacuation (*e.g., Have you thought about being stunned and not trying to evacuate.*). This is a 4-point Likert scale (1 = I thought I should not do it, 2 = I thought I might do it, 3 = I thought I should do it, and not involved). However, it includes both positive and negative questions, (2) The efficacy beliefs scale, and (3) a Semantic Differential

(SD) scale describing anxiety feelings during evacuation (Evacuation Emotions) with 10 items (*e.g., Calm- – Nervous*).

3.3 Evacuation Behaviors from Field Observation

Memos and Videos on evacuation behavior were recorded. Evacuation and response time were also reckoned as represented in Table 6. The video was recorded from four cameras. Two were set in the scenes in the classroom and from the top view. Another two were recorded along with the evacuees. All records were integrated and analyzed using behavioral coding capturing the response and evacuation behaviors based on previous literature and observation goals as represented in Table 7.

Ethical Approved by Research Ethics Review Committee of the Faculty of Societal Safety Sciences, Kansai University: Reference Number FY2023_017

Consent was obtained from all subjects. Information was conveyed through reading, and consent was confirmed via signature or thumbprint on a consent form. For subjects under 18 years old, parental or guardian consent forms were utilized.

Table 1: Details of the Training and the Experiment

Sessions	Activities	Participants
1	• Rapport: Asking for Consent (Sign and Thumb stamp) • Pre-test questionnaire	All (24)
2	• A traditional DRR education session	All (24)
3	• Group Emotion Regulation session – Grounding Technique training for emotional and anxiety control.	The experimental group (12)
4	• Group DRR Training session: Group Problem Solving Session from topics of DRR in a situation of an earthquake.	The experimental group (12)
5	• Evacuation Experiments (Earthquake evacuation) • Post-test questionnaire	All (21)

3.4 Data collection and the intervention

The study was carried out at the Pattaya Redemptorist School for the Blind, Chon Buri, Thailand. The period starting from 11 January to 6 February 2024. The approach of acquiring questionnaire survey data was done by reading in a one-on-one approach as suggested by the educators.

3.5 The Efficacy-based DRR intervention.

The DRR training curriculum in this study consisted of 3 sessions with approximately 6 hours. The training was separated into two phases.

(1) Traditional DRR education for VI students involved interactive lectures supplemented with radio dramas (25 mins). These lectures covered an introduction to disasters, their impacts, and real-life examples to enhance comprehension. Additionally, emergency preparedness, including creating emergency plans and emergency bags, was addressed. Radio dramas featuring successful DRR stories of similar VI individuals served as instructional tools, providing vicarious learning experiences^[21]. This learning process includes attention, retention, reproduction, and motivation, fostering efficacy beliefs and skill acquisition^[22].

(2) The intervention: training targeted emotional control and group discussion in a time of emergency was developed as follows:

Emotion Regulation Training:

In the context of this study, employing grounding techniques can be important for coping with negative thoughts and feelings in disasters. Particularly, the techniques are

appropriate for VI students due to their emphasis on utilizing non-visual senses, allowing students to rely more on their other senses. Additionally, these techniques facilitate psychological support from their peers. Three methods of grounding techniques, namely Breathing Exercises, Acknowledging Surroundings, and Positive Affirmations are selected to be tailor-made to apply to proper the context of teaching VI students. The session comprised three steps:

Breathing Exercise: Students learned to regulate their nervous system by breathing. Inhale deeply through the nose for four counts, hold for four counts, and exhale slowly through the mouth for six counts. Repeated this to bring all participants to the current moment. Later, they were asked to practice without instructions.

Acknowledging Surroundings: This module gave participants a moment to acknowledge their surroundings and engage their senses to anchor themselves in the present moment. Sensations including touching, hearing, smelling, tasting and persons (peers) were gradually immersed, identified, and named by the participants.

Positive Affirmations: Participants were asked to say positive reassuring statements like “*I am safe*,” “*I can handle this*,” and “*This will pass*.” They were asked to repeat the statements out loud with a stronger sense of assuring group members and affirming physical touches were also suggested. The importance of encouraging each other whenever they are facing a hard time and fostering a culture of mutual assistance was emphasized.

Group Problem-Solving Training: The objective of this session was to let the participants consider how challenging it could be to face unusual disaster scenarios and to understand the idea of decision-making for them to be able to prioritize needs during emergencies and encourage critical thinking. Through group problem-solving activities, participants engaged in 5-minute discussions on each task, promoting thoughtful and timely consideration and adaptability. This simulation using imagination, aimed to increase the sense of efficacy via mastery experience. Facilitators also guided reflective phases to reduce stress and encourage diverse perspectives, fostering positive group dynamics and reinforcing with verbal feedback at the session's end. The examples of the tasks, *Q. Should or shouldn't in the earthquake?* – *Leave everything and*

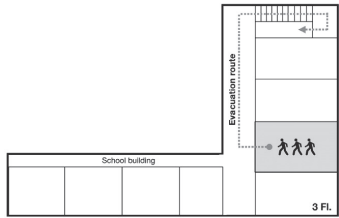
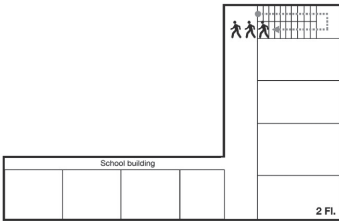
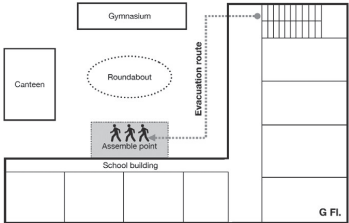
evacuate from the shaking building immediately – Hide under a table – Press every button on the floor level of the elevator.

Paired control or group structure control:

Participants were assigned into small groups of three. With this paired control, then, the discussion about group roles was given to the group members. At the beginning of the group problem-solving session, participants were asked to discuss group roles facilitating them to develop a clear group structure.

Norm of mutual assistance: Along with the two group sessions, the importance of mutual assistance was input within their group. For example, in group activities of positive affirmation, the crucial role of encouraging each other in times of challenge was informed, and the important role of group members to check that everyone is together and safe was stressed.

Table 2: Evacuation Route and Details

Details	Route
The starting point was a classroom on the 3 rd floor. Participants were asked to take a designated evacuation route.	
Participants needed to go down from the 3 rd floor through the ground floor.	
Participants needed to go outside the building, pass a roundabout, and assemble at the designated assembly point.	

Emphasizing group cohesion and the norm of mutual assistance.

The Evacuation Experiment

The evacuation route started from the classroom on the third floor. The participants needed to follow the designated route to the designated assembled point at the ground level. However, unlike the usual evacuation drill where there is a full scale of students evacuated with all schoolteachers and trainers assisting and guiding along the route. This experiment created a scenario where the participants were required to respond to the earthquake by themselves.

Scenario: Sound Effect of Earthquake: Total time was 39 seconds: Alert repeated 3 times

(0-7 sec.) + Shaking (8-39 sec.). Followed by an evacuation order for 8 seconds.

4. RESULTS

The research experiment results are presented in two parts including results from a questionnaire survey consisting of descriptive statistics, a manipulation check and correlation, and results from a field evacuation experiment consisting of evacuation time and evacuation behavior observation.

4.1 Descriptive Statistic Results

Data analysis was conducted using SPSS with a significance level set at 0.05. Participants' privacy was safeguarded by using codes instead of names. The sample consists

Table 3: Demographic data of the participants

Demographic data	N = 24*	Percent (%)
Groups		
Experimental Group	12	50
Control Group	12	50
Gender		
Male	8	33.3
Female	14	58.3
Prefer not to say	2	8.3
Age		
13	2	8.3
14	2	8.3
15	5	20.8
16	4	16.7
17	4	16.7
19	2	8.3
20	2	8.3
21	2	8.3
22	1	4.2
<i>Mean = 16.83</i>		
VI Conditions		
Partially Impaired	14	58.3
Blind	10	41.7

Table 4: Mean Scores Comparisons

	Pre-test	S.D.	Post-test	S.D.	Mean Scores
Experimental Group	52.500	7.948	60.417	6.473	56.458
Control Group	52.444	6.287	59.444	6.482	55.944
Mean Scores	52.476		60.000		

Table 5: Results from the Analysis of Variance

	Sum of Squares	df	F	p-value
Groups	2.716	1	0.45	.834
Efficacy Scores	572.161	1	16.510	<.001
Interaction Groups* Efficacy Scores	2.161	1	0.062	.806
Error (Efficacy scores)	658.458	19		

*. The mean difference is significant at the 0.05 level.

of 24 individuals, with 12 each in the experimental and control groups. However, 3 participants from the control group dropped out due to sick leave and family business on the experiment day, resulting in 21 participants who completed the study.

4.2 Manipulation Check

A two-way mixed ANOVA was analyzed to investigate the impact of the intervention and group on efficacy scores revealing a significant main effect of efficacy, $F = 16.51$, $p < .001$. However, the interaction effect between efficacy scores and groups was not significant, $F = 0.062$, $p = .806$, suggesting that the changes in efficacy scores did not significantly differ between the groups.

4.3 Additional Results

The results from the manipulation check found no significant difference in the efficacy scores between groups. It was not possible to analyze the data following hypotheses no.1 and no.2. However, multiple regression analyses were conducted to examine the effects of self-

efficacy, problem-focus efficacy, emotion-focus coping efficacy, group efficacy, and controllability on evacuation behaviors. While the model explains a moderate portion of the variance in evacuation behavior, it is not statistically significant overall. However, controllability is a significant individual predictor of evacuation behaviors, indicating a positive relationship as represented in Figure 3.

Furthermore, multiple regression was analyzed to examine the effects of self-efficacy, problem-focus efficacy, emotion-focus coping efficacy, group efficacy, and controllability on evacuation emotions. The multiple regression model in Figure 4 showed a significant relationship with $R^2 = .553$, suggesting that approximately 55.3% of the variance in emotional states can be explained by the predictors.

The multiple regression analysis revealed that group efficacy significantly predicts evacuation emotions ($\beta = .347$, $p < .05$), while emotion-focused coping efficacy shows a trend toward significance ($\beta = .535$, $p < .05$). Other predictors did not show a significant relation-

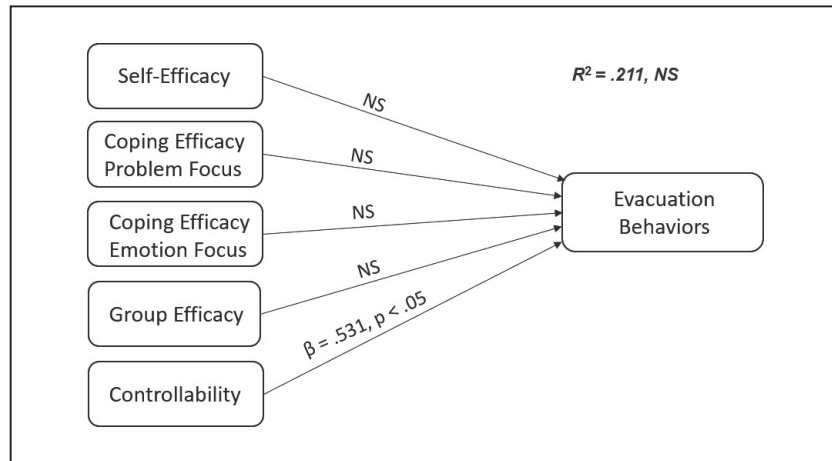
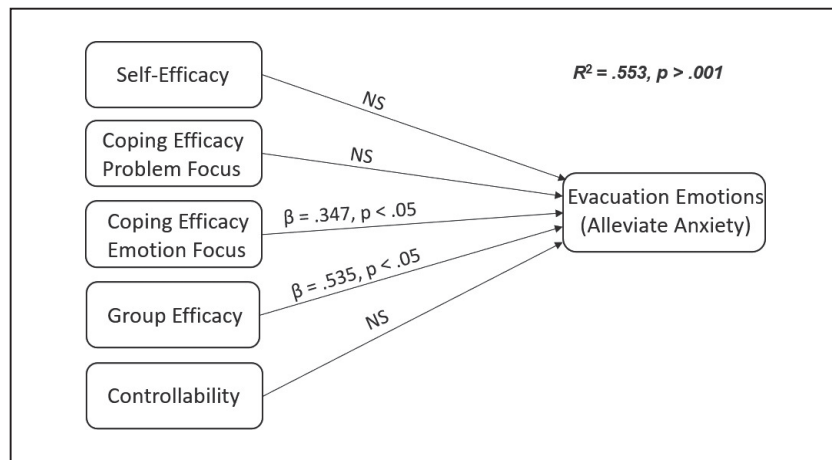

Figure 3: A Model of Predictors of Evacuation Behaviors¹⁾


Figure 4: A Model of Predictors of Emotions During Evacuation

ship. The model highlights the importance of group involvement in emotional outcomes during evacuation.

4.4 Field Experiment: Evacuation Performance and Behavior Observation Results

4.4.1 Evacuation Time

All participants completed the evacuation. The evacuation time was separated from the response time which was when the evacuees first initiated their action and started evacuation while the escaping time refers to the total

Table 6: Evacuation Time of the Experimental and Control Groups

Groups and Subgroups	Response Phrase	Escaping time (Seconds)
Experimental		
(1)	Started evacuation during the evacuation order	64
(2)		63
(3)		63
(4)		63
Control		
(1)	Started evacuation at the third alert	60
(2)		60
(3)		61
(4)		62

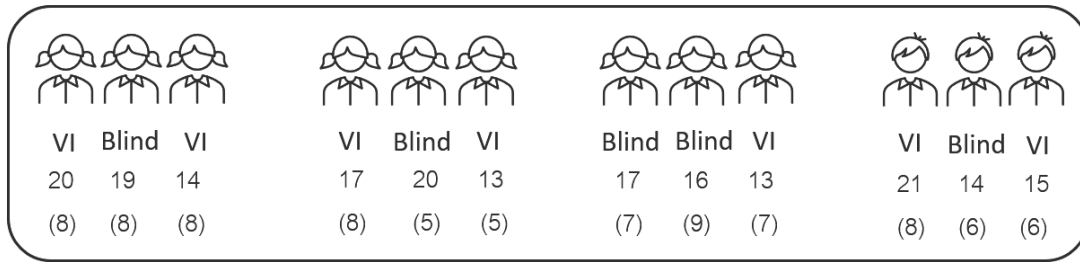


Figure 5: Group Pattern of the Experimental Group²⁾

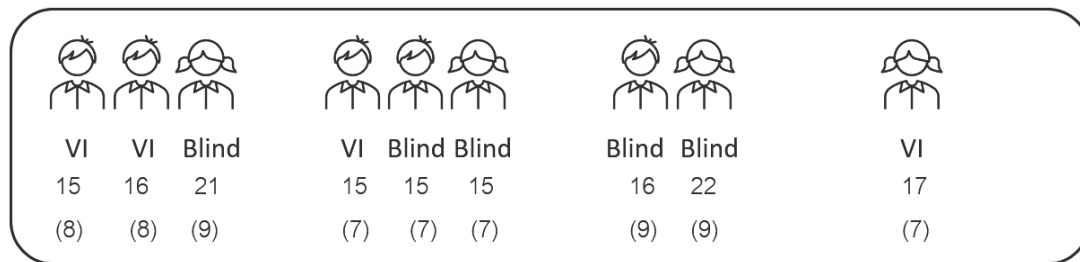


Figure 6: Group Pattern of the Control Group

time it took for the evacuees to move from the starting point to the assembly point. In the field experiment, it was found that the time responses of the two groups were different the participants in the control group started to notice their friends, stood up, and gathered when the evacuation alert was about to finish, and the shaking sound was playing. In contrast, the experimental group got down on the floor waiting until the evacuation was announced to start their evacuation.

4.4.2 Observation Results of Evacuation Behavior

The experimental group was assigned into four subgroups of three considering their relationships such as classmates, and friendships.

In the control group, there were two subgroups of three, one pair and a single person. Without the order of group evacuation, these subgroups were simultaneously formed by

themselves. However, at the beginning of the evacuation, the last three participants were in one group (physical touch observed).

Experimental Group

Image 1: Participants got down on the floor during the shaking sound.

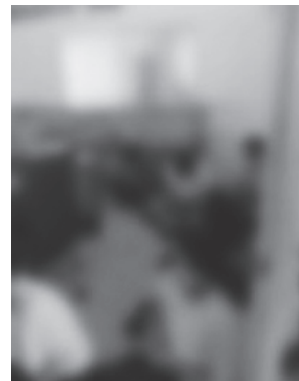


Image 2: Holding member on one or both of their leaders' shoulder(s), an elbow, or hands in line.



Image 6: Some members were waiting for their close friends to form into a group creating a bottleneck.



Image 3: Participants evacuated orderly in groups.



Image 7: A doorframe was used for guiding and navigating.



Image 4: Handrails were used for safety and assistance when walking at the stairs.



Image 8: Walls and handrails were used for safety and assistance when walking.



Control Group

Image 5: The first mover impacting the whole group started the evacuation during shaking.



Image 9: Rush running was observed.



Image 10: The last group that arrived was broken down into a pair and one following. (Confusion of responsibility)



Overall, participants used physical touches by holding each other hands, shoulders, or elbows. Some also relied on tactile cues like walls and handrails, tracing with fingers. These behaviors align with a previous study indicating that walls serve as vital orientation cues along evacuation routes^[42]. Participants moved in single-file lines through corridors and stair-

cases, with distinct behaviors observed in open ground-level spaces. Mutual assistance behavior was observed, but undesired behaviors, such as rush running and abandonment, occurred in the control group.

Hypothesis 4: The experimental group performed better evacuation performance than the control group in the evacuation experiment.

The analysis of the hypothesis of paired control partially failed due to the formulation of subgroups of three within the control group simultaneously. Even though the experimental group expressed better evacuation performance, it was unable to analyze the group effect. However, from the observation of the control group, interesting results were found based on the analysis of group behavior as represented in Figure 7 including (1) the confusion of responsibility which disintegrated the evacuation of the last three evacuees. The discontinuation of physical touch helping in navigation was found. In the interview, the two evacuees ahead reported themselves complet-

Table 7: Summary of Behavior Observed

Behaviors	Positive	Risk	Group Observed ³⁾
Get down below	○		E
Evacuate during a shaking sound		○	C
Forming in a small group	○		E C
Walking in a line	○		E C
Rushing		○	C
Waiting for friends causes a bottleneck		○	C
Watch out for group member	○		E C
Abandon (Confusion of responsibility)		○	C
Walking with calmness	○		E C
Use handrails and walls to help navigation	○		E C

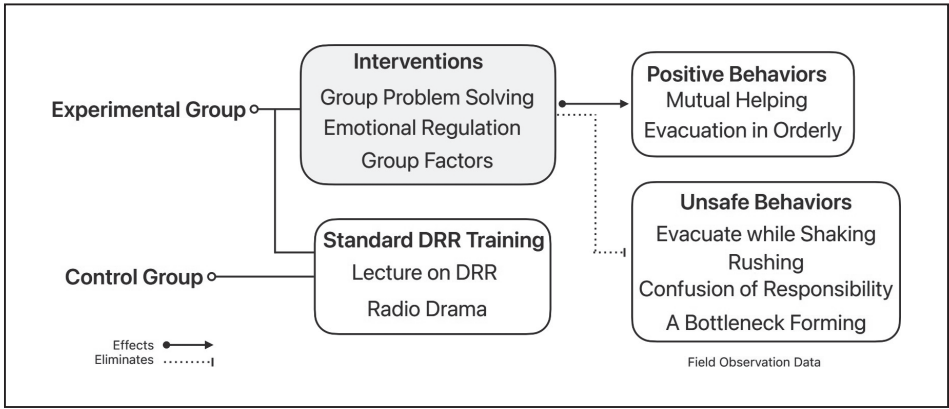


Figure 7: Summarizing Results from the Field Observation and Recorded Data

ing an evacuation in a pair, but the one who considered completing a single evacuation reported herself included in the group ahead. (2) There was a participant who initiated the first move by noticing another participant by physical touch to start. Then, everyone began to assemble, and navigate to the exit while the shaking sound was still playing. This social effect of following was considered risky in this situation where critical thinking is absent. Finally, (3) a bottleneck emerged during group formation. For a few moments, participants in the control group spent time searching for friends and this created a blockage of the evacuation flow since VI students mostly depend on physical touch and audio to search for their friends and identify the obstacles in the classroom.

In summary, due to that, there is no significant difference in efficacy scores between experimental and control groups within the data from the questionnaire survey, the analysis of the specific working hypotheses could not be further processed. Hence, the available data were combined. The multiple regression analyses were tested, and the results high-

lighted the importance of group efficacy and emotion-focused coping in influencing emotional outcomes during evacuation. In addition, this study also included field observation which could help identify the different behaviors resulting from the effect of the operation control and discuss together with the previous results.

5. DISCUSSION

1) The Effectiveness of the Intervention is not Represented by the Manipulation Check Results.

Ideally, the study was designed to include four cases controlled: a control group, a group receiving emotional regulation training, a group undergoing group problem-solving training, and a group receiving both types of training to assess whether the results come from the group effect or the operational effect. Unfortunately, due to the limited number of VI students available, only two groups could be assigned for this study. However, the available results data were carefully analyzed, and there are two possibilities to explain the result. First, efficacy beliefs do not affect the evacu-

ation results. According to the available results, from the evacuation experiment, it cannot yet be assumed that the effectiveness of the evacuation performance comes from the effect of participants' efficacy beliefs. However, from the additional results, group efficacy and emotion-focus coping efficacy showed their effectiveness in evaluating anxious feelings and thoughts. Consequently, it is believed that this explanation is not so valid. Secondly, the effectiveness of the dependent variable measurer. The intervention was effective on the field observation. The manipulation check measurement of this study may not function enough to assess participants' perceptions of their capabilities relating to accomplishing evacuation behavior. It is possible that the experimental group's high confidence in performing evacuation behavior led to their outstanding performance, while confusion in evacuation flow was observed in the control group. It might be assumed that at some level or some hidden aspect the control group might experience the feeling of unassured than the experimental group. Here, the discussion that the current measurer may only be able to access the surface level of sense of efficacy is the most possible.

2) Efficacy Beliefs are Responsible for Controlling Anxious Thoughts and Feelings Emerge during Evacuation.

The findings underscore the importance of the sense of efficacy, particularly coping efficacy, group efficacy, and controllability during emergency evacuations. The multiple regression results revealed that group efficacy sig-

nificantly predicts emotional status during evacuation and emotion-focus coping efficacy also shows a trend toward significance, supporting the role of coping efficacy and group efficacy in regulating adverse emotional responses. VI students perceive disasters as emotionally challenging yet controllable situations, demonstrating a realistic optimistic belief. The literature emphasizes the necessity of efficacy beliefs for VI students in coping with disasters, with controllability perception influencing cognitive and behavioral responses. Controllability is a significant predictor of effective evacuation behaviors further supports this notion, aligning with previous studies indicating its influence on the effectiveness of behavioral responses and functioning^{[11],[43]}.

3) Reasons Underlying the Emergent Subgroups and Social Support Dynamics during Evacuation.

Without assigning an instruction for group evacuation, participants in the control group simultaneously organized into smaller subgroups of three. This collective behavior appears to be influenced by their supportive cultural norms and friendship, in which the control group consisted of close friends, mixed schoolmates, and classmates. Also, the stress from the unusual evacuation scenario may be responsible for their group behavior. The impact of acute stress on social behavior leading to bonding was indicated as it evokes feelings of shared vulnerability, prompting acts of kindness and a desire for mutual support^[44]. Feeling a lack of control leads to greater generosity and helpfulness^[45]. In the

case of the control group, this emergent group likely reflects an instinctive response to the stress of the situation, with participants seeking comfort and security in the presence of their peers.

Furthermore, the consequence of small group formations instead of individuals or a whole may resulted from the phenomenon that people perceived a small group as more effective than a big group^[19]. The formation of compact sub-groups could offer flexibility and emotional support to VI students during the evacuation, boosting their confidence through physical touch and emotional assistance.

In addition, one participant expressed fear of evacuating alone but not with friends *“I am scared of evacuation alone by myself.” “With friends, I will be safe.”* The result of the correlation between group efficacy and their emotional states during evacuation supports these statements. Group efficacy could derive from perceptions of group cohesiveness and self-efficacy^{[14],[15]}. This cohesion among a group of friends helps facilitate an environment where members feel supported and contribute to a collective belief in the group’s ability to overcome challenges. In groups, mutual helping behavior has been observed during the evacuation^{[6],[46]}.

4) The Emergence of Undesirable Evacuation Behavior in the Control Group.

The participant who completed a single evacuation last was abandoned due to a misinterpretation between friends, highlighting a confusion of responsibility where the identity of group members and their roles were

unclear^[47]. As expected, this phenomenon did not occur in the experimental group, which had a clear supportive group structure. Social identity theory also suggests that setting roles and common goals fosters a sense of responsibility and positive group identity^[48]. The absence of critical thinking but herd-following behavior, where unsafe evacuation was initiated, suggests that this group effect requires discussion alongside consideration of personal backgrounds. Varying perceptions of building strength among Thai people may explain their immediate evacuation, contrary to official safety guidelines^[49]. Here, the group problem-solving session on earthquake safety behavior might claim its effectiveness for this matter as observed in the behavior of the experimental group. Secondly, as VI students cannot preemptively navigate, they took time and effort to identify the locations of their friends and obstacles, causing a bottleneck in the control group^{[6],[46]}. This was not found among participants in the experimental group, who had a clear understanding of their assigned group and were able to identify persons and routes calmly by utilizing the time gap when they were down on the floor.

5) The Emergence of Leadership in an Emergency may be Facilitated by a Sense of Efficacy.

Analysis of records from the evacuation experiment and examination of demographic data revealed no discernible pattern indicating group leadership based on variables such as VI condition, grade, or age. This is in contrast to the previous study indicating that those with

better vision tend to help those with blindness in navigation^[6]. Interestingly, individuals who assumed the role of group representative during training did not consistently emerge as leaders during the evacuation. Instead, leadership roles appeared to be contingent upon a combination of factors including the sense of responsibility and perceived efficacy in a particular task. Prior research has suggested that distinctions can be made between leaders in emergencies and those in normal circumstances. In emergencies, leaders often emerge as individuals who are quick to identify directions or discover exits^{[50],[51]}. Remarkably, it was observed that a significant number of participants who assumed leadership roles possessed the highest levels of efficacy beliefs within their respective groups and/or belonged to groups with strong efficacy beliefs.

CONCLUSION

Aiming to mitigate VI students' vulnerabilities in evacuation, this study developed an efficacy-based DRR intervention. The results from this data review the important role of efficacy beliefs, and group effects in shaping emergency responses, with group efficacy playing an important role in managing anxious thoughts and feelings during emergencies. While evacuation times and mutual helping behaviors did not differ between groups, the experimental group demonstrated smoother synchronization while the emergence of the undesirable group behavior was observed in the control group, emphasizing the importance of clear group structures and roles in fostering positive group behaviors. The compact sub-

group highlights its importance in promoting safety evacuation for VI students by offering emotional reassurance and flexibility. These findings underscore the importance of group factors and group efficacy in shaping emotional responses and group performance during evacuation among VI students.

FOOTNOTES

- (1) NS=Not Significant
- (2) Numbers represented in the second line refer to participants' ages. The numbers in the parentheses represented their grade.
- (3) E=Experimental Group, C=Control Group

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