Global Alliance for
Disaster Risk Reduction & Resilience
in the Education Sector

Child-Centred Risk Reduction Research-into-Action Brief:

School Emergency Drills

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Statement of purpose

The Research-into-Action Brief series provides concise summaries of academic and grey literature on a range of topics for practitioners working in the fields of child-centred risk reduction (CCRR), climate change adaptation (CCA), and school safety. This purpose of this brief is to provide a concise review of research findings for practitioners on the topic of school emergency drills.

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Abstract

There is evidence that school drills play a pivotal role in both the gradual improvement of school Disaster Risk Reduction (DRR), and response preparedness. There is also scholarly consensus that emergency response skills are important to master, and that school drills provide children and adults with important opportunities to learn and practice protective actions and build confidence in such actions. The research also suggests how to improve school drills to make them more effective.

The findings support recommendations in two areas: *individual capacity-building*, with suggestions for how to supplement and modify drills, test realistic scenarios, avoid confusion and build confidence; and *organisational capacity-building*, with suggestions for 'after-action reviews' processes, and developing links between school, household and community preparedness.

Background

Since the mid-19th century, most schools internationally have conducted regular school fire drills. These began specifically to help students and staff to learn and practice safe building evacuation and safe assembly. Over the years, the range of hazards addressed by these drills has expanded to include earthquakes, flash floods, hazardous material releases, tsunamis, and violent intruders. Drills are also used to practice other standard operating procedures including "drop, cover, and hold on", shelter-in-place, lockdown, evacuation to a safe haven, and safe family reunification. Simulation drills that are later reviewed and assessed, allow schools to test and improve their emergency response plans. More recently, mass-participation in community-wide earthquake drills has become a popular way to promote disaster preparedness for both organisations and households. There is a growing body of research on the extent to which drills contribute to improved individual and organisational safety. The purpose of this Research-into-Action (R2A) brief is to provide practitioners with a concise review of the existing research on the outcomes of school drills and how they can be improved.

Glossary

Term	Definition
Building evacuation	Procedure for exiting a building in case occupants are not, or may not be safe indoors.
Disaster drills	A simple drill is a coordinated and supervised activity to test a specific standard operating procedure, to perfect a small part of a response plan (for example, building or area evacuation and safe assembly).
Full simulation drill	(Also known as a "functional exercise") simulates a real disaster or emergency event as close to reality as possible, mobilising people, equipment and supplies, and to activate and demonstrate the school's post-disaster functional division of labour (for example the incident command structure). Participants (adults, children and community members) use this experience to evaluate and improve all aspects of school risk reduction and preparedness plans.
“Drop, cover and hold on”	Protective action while indoors during an earthquake involves dropping to the ground or under a table, making yourself small, covering your head and neck with your arms and holding on to your cover until the shaking stops
“Drop, cover, hold on and count”	Protective action during an earthquake in a tsunami- risk zone. If the shaking lasts more than 40 seconds, an automatic evacuation to higher ground, and away from shore and water channels, is triggered
Evacuation to a safe haven	Procedure for relocating to a safer location when school grounds are unsafe
Lockdown	Procedure for staying indoors, and blocking access, to protect from external threats
Safe assembly	Procedure for gathering students together for safe supervision and care
Safe family re-unification	Procedure for ensuring and documenting release of children to adults who have prior permission to pick them up in case of emergency
Shelter-in-place	Procedure for staying indoors in the current location when outdoors is unsafe
Situational awareness	Being able to consider how emergency responses may need to vary in response to different locations and environments

Introduction

School drills are a cornerstone of school DRR and preparedness. Children face a wide range of physical risks during emergencies and spend a significant amount of time in school. For this reason, most government and school administrations require or advocate for emergency drills to allow students and staff to practise and improve standard emergency response procedures (Johnson, Ronan, Johnston & Peace, 2016) and risk reduction. For most children, these drills constitute a significant – if not the sole – form of education about emergency response and safety strategies (Selby & Kagawa, 2012). Developing links between schools, and practising community-wide drills can also help to promote a culture of safety.

Literature Review

Since the mid-1900s, most school systems run routine fire drills in which students, teachers and other school staff practice building evacuation and safe assembly (Heath, Ryan, Dean & Bingham, 2007). In areas vulnerable to hazards, many schools also perform drills to respond appropriately to earthquakes, tsunamis, tornadoes, wildfires, flash floods, hazardous materials release and violent intruders (Ronan, Alisic, Towers, Johnson & Johnston, 2015, Nickerson, 2007). Some schools also practice family reunification drills (Johnston et al, 2016).

"… children can be taught procedures and skills to help prevent injuries and deaths…"

School and community drills are, at least theoretically, based on personal behaviour change models for disaster preparedness as well as on research on the impacts of social marketing (US Department of Homeland Security, 2006; Galloway, 2015). Studies of adults have shown that disaster exercises have very positive outcomes for professional emergency responders and citizen volunteers (Perry, 2004). The value that adults place on protective action depends on their sense of competence and confidence in those actions. In the case of school drills, regular repetition is considered to be good practice because it helps students and staff to really understand the process. School drills are one of the external factors known to help people feel prepared (Montgomery et al., 2017, Benthien et al., 2017). Four drills a year, including one full simulation drill, are widely recommended (UNISDR, 2012).

In *Public Awareness and Public Education for Disaster Risk Reduction: Action-Oriented Key Messages for Households and Schools* (2nd Edition) a set of Standard Operating Procedures for Disasters and Emergencies in Schools recommended by global experts includes an emergency "decision tree" with six basic procedures: building evacuation, safe assembly, (area or vertical) evacuation to a safe haven, shelter-in-place, lockdown, and safe family reunification. Hazard-specific procedures are also recommended for earthquakes, tsunamis and other risks (IFRC & Save the Children, 2018).

Research to date addresses two main questions: (1) Do school drills establish skills that will prevent injuries and save lives? and (2) Do drills lead to consistent and improved implementation of school disaster

management plans? School fire drills have been credited with a significant reduction in fire-related injuries and deaths in school buildings, common in the 1800s and first half of the 20th century (Hull, 2011). Many scholars, educators and disaster management practitioners agree that children can be taught procedures and skills to help prevent injuries and deaths (Ronan et al., 2015). There is also consensus that consistent implementation of full simulation drills and reflective practice leads to improvements in school disaster management (Risk RED, 2011; Galloway, C.H., 2015; Montgomery, H. et al., 2017).

In recent years, large-scale annual drills for earthquakes and other hazards have engaged tens of millions of children and adults in many countries in the continuous process of disaster preparedness. For schools, these drills have improved staff knowledge for disaster prevention, preparedness to respond and enhanced disaster policies, plans and procedures. They have also increased staff engagement in disaster planning in their own homes, encouraged them to seek training and reduced their exposure to physical risks (Montgomery, H. et al, 2017; Galloway, C.H., 2015; Barnes, J. & Miscolta, A., 2017; Izadkhah, Y. & Hosseini, 2017; Risk RED, 2011).

Nonetheless, there is little post-disaster research on the effectiveness of school drills and their role in the prevention of injuries and deaths, and there is only survey research on the role of drills in improving school disaster management. School drills usually take place in highly controlled and predictable settings. Evaluations are often limited to the observations of school administrators and focus predominantly on the speed and efficiency of the drill (Ramirez, et al, 2009; Johnson, et al, 2014). While drills may provide important and necessary learning opportunities, it is not clear whether they improve children's situational awareness and decision-making skills (Johnson et al., 2014). Researchers recommend improved situational awareness, mastery of response skills, realistic simulation scenarios, practice in decision-making, increased school accountability self-assessments, and 'after-action reviews' to stimulate improvements in school disaster management (Ramirez et al., 2009).

Practical applications

The following lessons are supported by evidence from the scholarly literature and reflect our best current knowledge on how to conduct effective school drills.

Lesson 1: Students should learn situational awareness, the purpose of each response action, master standard operating procedures and develop decision-making skills for emergencies.

There is a widely held belief that repeated practice of school drills helps children acquire skills for safe emergency response, so that behaviours such as "drop, cover and hold" in case of earthquakes become second-nature (Dengler, 2014). However, there is also evidence that the practised response is not always the correct one: for example, after an earthquake that causes damage to buildings and power lines, it may be safer to remain in a particular building rather than go outside (Tipler, Tarrant, Johnston, & Tuffin, 2015). Typically rote drills do not teach people how to best assess their situation and make decisions in unexpected scenarios.

Research studies of earthquake drills in Washington (Johnson, Johnston, et al, 2014) and California (Wood, 2013) found that students were knowledgeable about *what* action to take if an earthquake happened while they were in the classroom (i.e. “drop, cover and hold” under a desk), but the overwhelming majority did not know *why* they took that action (i.e. “drop” to prevent falling injuries; “cover” to protect your head and neck, both of which are associated with fatal injuries; and “hold on” to maintain that protection).

Moreover, in the Washington study, a third of students did not know what to do if they were outside when an earthquake occurred. In a case study of a school that incorporated both problem-solving and realism into their regular earthquake drill, teachers and students had to cope with the frustrations of being trapped and use the opportunity to problem-solve. Following the drill, the teachers and students recommended the school supply window ladders in upper-storey classrooms (RiskRED, 2009). It is important that school drills provide opportunities for children (and adults) to apply their knowledge to a variety of scenarios, to engage in problem-solving and to receive constructive feedback on their responses.

Lesson 2: Acquisition of response skills and drill practice should be modified for different age levels and abilities and should leverage children’s unique strengths and capabilities.

Children of different ages and capabilities vary in their physical and cognitive abilities. Both child development theory (Learning, Practice & Council, 2000) and practical experience offers guidance on how to modify the teaching of response skills and drill practice for different ages and abilities. Below are some specific recommendations.

(Note: Children with disabilities are likely to need specific adaptations and extra practice.)

Young children (ages 7 and under)

To meet the needs and abilities of young children, recommendations include:

- Using mobile cribs and wagons to evacuate infants and toddlers
- Teaching ambulatory children to stay together by holding on to handles on opposite sides of an evacuation rope. Adaptations may be needed for small children, and extra practice may be needed where steps and staircases are involved. Older children can hold hands with a buddy (two children maximum).
- Desensitising children to loud fire alarms by clearly explaining their purpose and function, providing verbal cues (warning) and conducting short demonstrations prior to any unannounced drills.
- Starting with simple exercise, breaking down each step to, gradually teaching mastery of protective actions (e.g. each of the four rules for building evacuation: don’t talk so you can hear the teacher; don’t run and don’t push, so you don’t fall down; don’t go back, so you stay together).
- Using frequent repetition, stories, games, songs and analogies to consolidate children’s knowledge of key procedures and protective actions.

- Describing hazards and dangers and involving young children in identifying these in their environment. Then teaching simple rules for safety (e.g., just as you would for hand-washing and road safety).
- Taking time to explain actions that may not be part of familiar daily routines (e.g., why children may not have time put on a coat or why they must use an unfamiliar route for evacuation).

Older children (ages 8 to 11)

Children at this age are able to:

- Consider solutions to problems that may arise during an emergency, such as a blocked evacuation route.
- Discuss emergency response at home with their parents and other household members. Simple homework activities can be used to track if those discussions have occurred.
- Learn the reasons for specific actions, and consider how their own behaviour can have a positive impact on community response (e.g,. staying off mobile phones, waiting to be safely reunited with family).

Youth (ages 12 to 18)

Youth are able to:

- Plan and lead drills and incorporate realistic problem-solving during drills.
- Think through risks and discuss how to prepare for a variety of scenarios and unknowns.
- Take on roles and responsibilities in post-disaster emergency response (e.g., first aid, setting up temporary shelters, helping with water and food distribution, and safe family reunification).
- Take leadership roles in emergency preparedness activities such as school hazard hunts, identifying and implementing mitigation measures, and preparing response supplies.
- Participate in monitoring and evaluation of drills, through classroom discussion, surveys and homework activities.

Children of all ages demonstrate pro-social behaviour during times of distress (Vezzali, Drury, Versari, & Cadamuro, 2016). This is an important strength to build on. Rather than regarding children as solely reliant upon adult guidance, they should be facilitated to help others in age-appropriate ways.

"Frightening and unnecessary theatrics… and explosions should be avoided. These make it difficult to distinguish between a drill and a real emergency"

Lesson 3: School drills should test varied and realistic scenarios. Unannounced drills, simulations and scenario 'injects' should all be used to build skills and critical thinking.

Several studies have found that despite constraints on time and resources, most school staff identify a need for more realistic drills (Perkins, 2015). They are aware of the need to learn to cope with the unexpected and they feel unprepared for the wide variety of scenarios for which they will be responsible. Once everyone is familiar with the basic standard operating procedures, subsequent drills should challenge the

school community to tackle additional problem-solving. These activities should have a no-fault/no-fail expectation. Mistakes and inconsistencies are learning opportunities to improve future response.

Examples include:

- Unannounced drills for different scenarios conducted at varying times, including during break times when students are in places other than their regular classrooms.
- Full simulation drills in which post-disaster division of labour is practiced (e.g. incident command; communications; operations – fire suppression, light search and rescue, first aid; logistics – security, shelter and sanitation, nutrition, psychosocial first aid, transportation, reunification).
- During the simulated scenario, add new situations ('injects') that drill participants have to figure out how to cope with. For example, announce new information, such as aftershocks and secondary hazard impacts, discover some exits blocked, or find individuals who are injured or trapped.
- Practice and reflection should both contemplate and plan for the first 12-48 hours after impact, including potential evacuation to a safe haven and safe family reunification.

Drills are more effective when they are unannounced; however, it is important to alert the school community about the general period in which a drill is planned (e.g., during a particular week). Frightening and unnecessary theatrics, including running, screaming, make-up simulating injuries (moulage), and explosions should be avoided. These make it difficult to distinguish between a drill and a real emergency. Children model their reactions on adult behaviour; therefore, drills are most effective when school staff and teachers inspire calm and confidence in students (NASP & NASR, 2014).

"Questionnaires, interviews and group discussion can all be used to evaluate if children have learned the purpose of the drill and can apply what they've learned in a real emergency."

Lesson 4: Engage all participants in reflecting upon, evaluating and applying learning outcomes from drills.

Observation is one way to assess the outcomes of a school drill, but a drill may not reveal if students understand the emergency responses they are practising (Johnson, Johnston, et al, 2014). Questionnaires, interviews and group discussion can all be used to evaluate if children have learned the purpose of the drill and can apply what they've learned in a real emergency (Johnson, Ronan, et al. 2014). It is important to know if children understand why they are taking a particular action; if they don't, in a real emergency, "fight or flight" instincts can kick in (Johnson et al. 2016; Johnson, Ronan et al. 2014; Kourou, Ioakeimidou, & Avramea, 2016; Wang, 2016).

After-action reviews should involve staff, students, parents and the wider school community, and should identify a list of action points and assignment of responsibilities to reduce risks in the school environment and improve school disaster management plans (Risk RED, 2009; UNISDR, 2012). Many school authorities and universities have developed forms and checklists that they have found useful for this purpose.

Lesson 5: The T3 signal should be used only to signal the need for a building evacuation, and verbal announcements should be used to clarify that a drill is taking place.

An important component of any school emergency procedure is the use of signals and alarms. For emergencies that require an immediate building evacuation, there is an International Standard for Acoustics-Audible Emergency Evacuation Signal for all structures where people may be present, including schools, hotels, residential buildings, public institutions and workplaces (ISO, 1987). Commonly referred to as the T3, this signal should never be used for emergencies that require a shelter-in-place or lockdown response. The signals for building evacuation, shelter-in-place and lockdown should be different and easily distinguishable.

Research on the most appropriate signal for a lockdown situation is scarce, however some education authorities advise against the use of loud alarm-type signals that have the potential to agitate an intruder (Queensland Government, 2006). Others have suggested broadcasting a code word over the public announcement system or sending school-wide text messages to predetermined distribution lists (US Department of Education, 2013).

Some sources advise that all drills, including those otherwise unannounced, should be immediately preceded by a verbal announcement via the public-address system such as: “This is an emergency drill. It is not a real emergency. This is a drill.” The rationale behind this is that staff and students should be able to discern a drill from a real emergency (NASP & NASR, 2014).

In the event of a real earthquake, everyone must be clear that the shaking alone will signal the beginning of emergency response procedures. However, in the case of a drill, an announcement should signal that the drill has begun, and that the shaking will last for a specific period of time (US Department of Education, 2013).

Lesson 6: When conducted thoughtfully, drills will not create anxiety in children. They will build children’s confidence and competence, even when conducted after a recent hazard event.

There is sometimes concern from parents, teachers and school administrators that drills and other forms of disaster education will cause children to be anxious and fearful. However, research has found that well-planned drills and associated learning activities do not increase anxiety or worry in children; rather, they increase their knowledge of what to do and their confidence in their coping abilities (Johnson, Ronan, et al. 2014).

Disaster education and drills should be executed with the intention of providing children and adults with an increased sense of personal control. It is important to talk about disasters, share accurate information and acknowledge children’s emotions. Although it is advisable to limit children’s exposure to repeated media coverage of traumatic events, which can increase anxiety, it is important not to avoid the subject of injuries, deaths and loss with children when they are aware that a disaster has happened.

“… well-planned drills do not increase anxiety or worry in children; rather, they increase their knowledge of what to do and their confidence in their coping abilities.”

Remaining research questions

There remains a need for practice-based research to answer questions about how students and staff learn and apply response skills, and how to improve school disaster mitigation and response planning. Specific questions include: How often should drills be held? How important are situational awareness, problem-solving, and mastery of standard operating procedures when it comes to making the best choices of protective actions in actual emergencies? Do staff and students learn these skills in different ways? How can school drills best be linked to household and community preparedness? How can the needs of young children and children with disabilities best be met? Can drill guidance, checklists and 'after action reviews' improve indicators of best practices in school disaster management?

Conclusions

Research has found that well-implemented drills can improve children's knowledge and execution of emergency response actions and build their confidence and resilience. Drills also serve to test and improve upon school risk reduction and response planning. However, research has also found that school drills need to be improved to foster situational analysis and decision-making skills in actual emergencies.

In spite of the need for additional research, there is sufficient evidence to support specific recommendations to improve school drills.

These include:

1. Supplement drills with explanations of the reasons for response actions and activities to foster decision-making skills.
2. Modify teaching for different age levels and abilities, and leverage children's strengths and capabilities.
3. Test realistic scenarios and conduct some drills at unannounced times.
4. Engage participants in evaluating and applying learning outcomes from drills.
5. Use the T3 signal for building evacuations followed by verbal announcements to clarify that a drill is taking place.

Also, research indicates that well-planned drills don't increase anxiety in children as long as they are announced, and unnecessary theatrics are avoided.

Follow-up questions

1. School drills should help children to gradually learn:

    (a) standard operating procedures for building evacuation and safe assembly, evacuation to a safe haven, shelter-in-place, lockdown and safe family reunification as well as hazard-specific actions such as drop-cover-hold-on and drop-cover-hold-on-and-count

    (b) the purpose of each response action

    (c) both of the above

2. True or false: Children with disabilities and young children should not be expected to participate in school drills.

3. How can drills be made realistic, and what should be avoided?

4. How should young children be prepared prior to their first full-scale unannounced drill?

5. How could you evaluate if youth (age 12 and older) understand the reasoning behind the response procedures practised in school drills?

Readings

Disaster and Emergency Preparedness: Guidance for Schools (2010) by International Finance Corporation (IFC): http://www.preventionweb.net/educational/view/13989

International Federation of Red Cross and Red Crescent Societies & Save the Children (2018), *Public Awareness and Public Education for Disaster Risk Reduction: Action-Oriented Key Messages for Households and Schools* (2nd Edition)

Petal, M (2008), Disaster Prevention for Schools: Guidance for Education Sector Decision-Makers, https://www.unisdr.org/we/inform/publications/7556

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All the references cited in this Research-into-Action Brief, can be found in the Child-centred Risk Reduction and Comprehensive School Safety Bibliography at:

https://www.zotero.org/groups/1857446/ccrr__css