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Teaching Earthquake Preparedness Skills to Students With Developmental Disabilities: A Preliminary Evaluation

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Abstract

This study investigated the effects of behavioral skills training (BST) in teaching earthquake preparedness skills to students with developmental disabilities within a small group arrangement. A multiple probe design across behaviors and replicated across participants evaluated the effectiveness of BST when teaching three high school students to prepare an earthquake emergency kit, do drop-cover-hold, and share location through a personal safety app. All students acquired, maintained, and generalized the target behaviors. Participating students and their teachers had positive opinions regarding the target behaviors, procedure, and outcomes. Limitations and implications for future research are discussed.

Keywords: developmental disabilities, earthquake preparedness skills, disaster, behavioral skills training

United Nations, Economic and Social Commission for Asia and the Pacific (UNESCAP) states that, during a disaster, individuals with developmental disabilities (DD) are more than four times as likely to be hurt as their peers with typical development (United Nations, Economic and Social Commission for Asia and the Pacific, 2021). Therefore, comprehensive disaster management plans and practices must be established (Appleby-Arnold et al., 2018). Disaster management refers to a cycle that includes components of risk reduction, preparedness, response, and recovery that are about precaution, post-disaster interventions, training, and supplying information (Becker, 2012). Thus, these practices must be a key concern and priority for individuals with DD (The World Conference on Disaster Reduction, 2005).

Earthquake is one of the natural disasters in which the damage can be mitigated by training and awareness (Ranghieri & Ishiwatari, 2014). Creating awareness and conducting training can be effective for dos and don'ts before, during, and after an earthquake among individuals or communities (Ronan et al., 2015); however, such practices must be adjusted to the needs of individuals with DD (Tonak & Kitiş, 2020). Individuals with DD may not develop safety skills (e.g., asking for help and discriminating dangerous situations, including earthquake preparedness skills) without explicit teaching (Bergstrom et al., 2012). Thus, they need direct, explicit, and systematic training instruction to acquire these skills (Dixon et al., 2010; Tekin-Iftar et al., 2021; Wiseman et al., 2017). There are several systematic review or meta-analysis studies on safety skills (Kıyak et al., 2019; Tekin-Iftar et al., 2021; Wiseman et al., 2017); however, no previous research focused on teaching earthquake preparedness skills to people with DD. One reason for this might be that it is believed that it is not possible for people with DD to acquire or maintain these skills due to lack of opportunities in instruction (Sirin & Tekin-Iftar, 2016). Moreover, it is risky and almost impossible to conduct training and assessment during a real earthquake to teach these skills. However, the literature suggests that teaching earthquake preparedness skills to individuals with DD will increase the likelihood of survival during an earthquake (Dixon et al., 2010). Furthermore, research suggests that people with DD must be provided with active learning opportunities (i.e., behavioral skills training) that include observations, practices, and getting feedback during safety skills instruction, instead of solely relying on passive learning opportunities (i.e., awareness raising; Miltenberger et al., 2015).

Behavioral skills training (BST) is an active learning approach that uses instruction, modeling, rehearsal, and feedback to teach a skill (Miltenberger,

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2008; Miltenberger et al., 2015). BST is an effective teaching method for people without DD in increasing safety skills (e.g., Himle et al., 2004). BST is also an evidence-based practice to teach safety skills to people with DD (Tekin-Iftar et al., 2021). A growing body of literature is documenting the effectiveness of BST in teaching individuals with DD aged between 4 and 46 a variety of safety skills, including sexual abuse or abduction prevention skills (Egemo-Helm et al., 2007; Fisher et al., 2013; Ledbetter-Cho et al., 2016; Lumley et al., 1998; Miltenberger et al., 1999; Olsen-Woods et al., 1998; Sanchez & Miltenberger, 2015), refusing offers from strangers appropriately (Kurt & Kutlu, 2019), staying away from fire (Garcia et al., 2016; Knudson et al., 2009), and poison prevention (Morosohk & Miltenberger, 2022). Studies suggest that more research is needed to investigate the effects of BST in teaching different safety skills to individuals with DD.

BST can be used during 1:1, dyad, or group instructional arrangements. However, BST can be particularly effective and efficient when used during group instructional arrangement for several reasons (Himle & Miltenberger, 2004; Miltenberger, 2008). First, it provides an opportunity to teach all participants during instruction and modeling steps at the same time. Next, it allows the participants to observe each other during the rehearsal step, thus facilitating observational learning. In literature, there are studies that employed group training to investigate the effects of BST to teach individuals without DD safety skills such as preventing gun play (Himle et al., 2004; Miltenberger et al., 2009) and abduction prevention skills (Carroll-Rowan & Miltenberger, 1994; Olsen-Woods et al., 1998). Yet, to our knowledge, no studies have investigated the effects of BST in teaching safety skills to the individuals with DD during group instructional format. Thus, the purpose of this study is to investigate the effects of BST in teaching earthquake preparedness skills to individuals with DD during small group instructional arrangement. Thus, the following questions guided the study:

- **Research Question 1:** Is BST used during small group instructional arrangement effective in teaching earthquake preparedness skills to high school students with DD in terms of the acquisition, maintenance, and generalization?
- **Research Question 2:** What are the opinions of the participating students and their teachers about the study in terms of (a) social significance of the target behaviors, (b) acceptability of the procedure, and (c) the effectiveness of the procedure for the students?

Method

Participants

Three students aged between 18 and 19 with DD (intellectual disability and autism spectrum disorder [ASD]) participated in the study. All students attended 12th grade in a public special education vocational high school and were in the same class. Special education vocational high schools are the educational settings in Turkey in which only students with DD attend to receive training on vocational, independent living, and academic skills. Written and verbal information regarding the goals, significance, and procedures of the study was given to student participants and their parents, who gave informed written consent for participation in the study.

The following prerequisite skills were identified for the students: being able to (a) imitate nonverbal skills, (b) imitate at least three-word verbal expressions, and (c) follow verbal instructions. In evaluating the nonverbal imitation skills, the teacher instructed the student by saying "Watch me and do what I do" and exhibited a three-step behavior (e.g., took the keys on the door, shook them, and put them in drawer.) To evaluate their ability of verbal imitation, the teacher instructed the students by saying "Listen to me and say what I say" and emitted sentences of at least three words (e.g., "Joints connect bones."). The criterion for verbal and nonverbal imitation skills was five correct responses out of five trials for one session. To evaluate the ability of following directions, the teacher verbally stated a total of five three-step instructions (e.g., "Point to the picture that begins with the same sound as 'three,' pick up the red crayon, and put a triangle around that picture."). The criterion was five correct responses out of five trials for one session.

The participants' names were disguised with pseudonyms for the ethical rules. Arif and Bora were 18- and 19-year-old male students with a mild level of intellectual disability. Bora had a comorbid ASD diagnosis. The third participant, Melis, was a 19-year-old female student with a mild level of intellectual disability. All students had attended primary and secondary inclusive classrooms prior to high school. They were able to read and write in Turkish, solve basic math problems, explain how natural

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disasters (i.e., earthquake and flood) occur and their effects on earth, and exhibit such social skills as asking for help or sharing objects. Additionally, they had typical fine and gross motor development. All students could correctly answer wh- questions (i.e., what, where, when, who, whom, and why) related to a story or a video. The students required support regarding vocational skills, community living skills, and safety skills according to their parents and teachers.

Researchers and Observer

The first researcher had a PhD degree in special education and 17 years of experience in working with students with ASD. The second and third researchers were grad students in special education. The second researcher, who was also the student participants' special education teacher, conducted all experimental sessions. The researcher had 10 years of experience working with teenage and adult students with DD, and frequently conducted BST in her classroom.

The observer, who was a special education teacher and a grad student in special education, collected the dependent and independent reliability data. The researchers explained to the observer how to collect reliability data regarding the following subjects: (a) target earthquake preparedness skills, (b) BST delivered during small group instructional arrangement, (c) response definitions, and (d) implementer behaviors. The observer was blind to the study conditions.

Experts

Three academic experts provided their opinions for the study. For validity purposes, two academic experts in the field of special education and one expert in disaster management first reviewed and evaluated the checklist of earthquake preparedness skills that was developed by the researchers. The experts also provided their opinions regarding the task analyses of the target behaviors. Furthermore, they watched and evaluated the videos prepared for modeling steps of BST as well as the social validity question forms.

Setting

The experimental sessions were conducted in the participating students' classrooms during weekdays. There was a desk and a chair for each student, and a smartboard; the desks were arranged in a U shape so that the students could see each other, the smartboard, and the teacher clearly. The generalization sessions were conducted in the lunchroom of the school. The lunchroom was furnished with a cupboard, backpack hangers, a closet, a table, a refrigerator, a store cupboard, and an oven. Also, there was a kitchen island where students could cook or eat.

Materials

For the first target behavior (preparing an earthquake emergency kit), a number of emergency supplies (i.e., a flashlight, a bottle of water, and a whistle), as well as incorrect items (i.e., a candle, a key, and spaghetti) were used. Also, a smartphone was used for the third target behavior (sharing location through the personal safety app). In the modeling step, the researchers used videos in which a peer with typical development acted as a peer model who had been trained through BST regarding how to exhibit the target behaviors at 100% accuracy. When the videos were prepared, the researchers sent them to two academic experts in the special education field and one expert in the disaster management field for expert review. A video camera was used to record the experimental sessions.

Experimental Design

A multiple probe design across behaviors, replicated across participants, was used to examine the effects of BST delivered during small group instructional arrangement to teach earthquake preparedness skills to the students with DD. In multiple probe designs with probe conditions, functional relation is established when therapeutic change occurs in the dependent variable on which the independent variable is implemented and no significant change occurs in the other dependent variables and when the therapeutic change is replicated on other dependent variables as the independent variable is implemented in a time-lagged manner (Gast et al., 2018). When behaviors are not independent, the introduction of the independent variable to one tier will bring about a change in the other untreated tiers. Furthermore, the independent variable is unlikely to have similar effects on each tier when the behaviors are not functionally similar. Thus, care was taken to select targets that were independent and functionally similar for controlling for behavioral covariation.

Dependent Variables

The dependent variables of the study were earthquake preparedness skills. The determination of the dependent variables was based on several reasons. First, 2021 was declared as "Disaster Education Year" in Turkey by the Ministry of Interior—Disaster and Emergency Management Authority. As such, trainings

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were organized and conducted for earthquake preparedness skills for Turkish citizens, and many of these trainings were conducted in schools. Second, Turkey is one of the most earthquake-prone regions in the world (The Georeferenced Emergency Events Database, 2020). For example, two recent massive magnitude Pazarcik 7.8 and 7.6 Elbistan earthquakes struck the country, leaving thousands of aftershocks and killing over 50,000 people. Thus, acquisition of earthquake preparedness skills is vital for all citizens. Finally, these skills were selected after considering the students' individualized education programs.

Earthquake preparedness skills consist of behaviors that must be exhibited before, during, and after the earthquake. The researchers developed a checklist that included a number of earthquake preparedness skills. Three academic experts (as previously described in the Experts subsection) reviewed the checklist and provided their opinions regarding the list of skills for validity purposes. In identifying the target behaviors, the teacher and parents of the students completed the checklist. Additionally, the teacher interviewed students' parents regarding the skills. Thus, the target behaviors were selected based on their opinions. The dependent variables were preparing an earthquake emergency kit within 1 min, doing drop-cover-hold within 10 sec, and sharing location through the personal safety app (Guvendeyim, translated to "I am safe") on a smartphone within 10 sec by performing the steps in task analyses. Guvendeyim is a free app that allows the users to notify others that they are safe during an emergency even if phone lines are not working. The app has an emergency button for a quick SMS that includes the user's present location. The researchers prepared a task analysis that consisted of four steps for each target behavior. Table 1 presents the task analyses of the target skills. Two academic experts in the field of special education and one expert in disaster management field (as previously described) reviewed the task analyses to determine that they were accurate, appropriate, and comprehensible. The mastery criterion for the target behaviors for each student was 100% across three consecutive daily probe sessions. For target behaviors, data were collected on the percent of correct steps of the task analyses using the single-opportunity method, which is used to assess a learner's ability to perform each behavior in the task analysis in correct sequence (Cooper et al., 2019; Snell & Brown, 2006). In the single-opportunity method, the implementer stops the assessment upon an incorrect or no response and scores that step and all remaining steps as incorrect.

Independent Variable

The independent variable was the BST delivered during small group instructional arrangement. The delivery of BST involved verbal instructions related to the target behavior, video modeling of the target behavior, rehearsal of the behavioral steps, and providing feedback during the rehearsal. The researchers used videos in the modeling step of BST to maintain the consistency of accuracy to show the target skills because earthquake preparedness skills are crucial for survival.

Procedure

The experimental sessions included probe (daily and full probe sessions), intervention, maintenance, and generalization sessions. Probe, maintenance, and generalization sessions were conducted in a 1:1 arrangement. Correct responses were reinforced during probe, maintenance, and generalization sessions, and incorrect or no responses were ignored.

Probe Sessions

The teacher collected data on target behaviors during each full and daily probe session. The initial full probe condition was conducted to assess students' baseline performance prior to intervention. The other full probe conditions were conducted before intervention and after the condition change criteria were met. In fact, the postintervention full probe conditions were conducted as post-BST. The teacher collected data across all targeted skills during full probe sessions once or twice a day for five sessions with at least three sessions with a stable data pattern. Furthermore, the teacher conducted daily probe sessions to monitor performance on the target behavior currently being taught. A daily probe session was conducted prior to each intervention session in intervention conditions. Daily probe sessions continued until the condition change criterion for target behaviors was met across three consecutive sessions.

The teacher conducted probe sessions in a controlled baseline format (Tawney & Gast, 1984). The target stimulus for all skills was a skill direction. For preparing the earthquake emergency kit, the teacher placed a cardigan, a flashlight, a whistle, a can of food, and a bottle of water (the emergency supplies) as correct items, and a shoe, a buttermilk drink, a candle, a key, and spaghetti as incorrect items in the classroom closet. For preparing the earthquake emergency kit, the teacher and the student were in front of the closet and the teacher said, "Prepare what you may need during an earthquake." For doing

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Table 1
Task Analyses of Target Skills

	Before Earthquake PEEK	During Earthquake DCH	After Earthquake SL
1.	Takes the empty kit. (*Takes the earthquake emergency kit hung on the backpack hanger*)	Goes to a safe area. (*Goes to the safe area that is determined by school management*)	Finds the personal safety app on the phone. (*Picks the phone and slides the screen to find the app's icon*)
2.	Opens the classroom closet that includes emergency supplies. (*Pulls the handle until the closet door is full open*)	Drops down on his/her hands and knees. (*Drops to the ground onto his/her knees and hands, and leans over*)	Taps the Guvendeyim icon. (*Touches the app's icon with one fingertip*)
3.	Puts flashlight, water, whistle, canned food, and cardigan in the kit, while telling the function of each. (*Puts flashlight and says, "To see around." Puts water and says, "To wash mouth and nose." Puts whistle and says, "To make noise." Puts canned food and says, "To eat." Puts cardigan and says, "To keep warm."*)	Covers his/her head and neck with arm and hand. (*Stays on his/her knees and covers his/her head and neck with the other hand*)	Taps the emergency button. (*Touches the emergency button with one fingertip*)
4.	Puts the emergency kit under his/her desk. (*Zips the kit, goes to his/her desk, and puts the kit under the desk*)	Holds on to a stable object. (*Stays on his/her knees and holds a stable object with one hand*)	Stays calm and waits for help. (*Silently stays still until help is provided*)

Note. DCH = doing drop-cover-hold, PEEK = preparing earthquake emergency kit, SL = sharing location through the personal safety app.

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drop-cover-hold, the teacher and the individual student sat on a chair, facing each other with a table of an activity between them (e.g., solving math questions). The teacher was leaning towards the table, checking what the student was writing and talking about the activity. One of her arms was on the top of the table so that she could camouflage the other hand. She held the leg of the table out of student's view and shook it a little, simultaneously saying "We're shaking. It's an earthquake. Protect yourself!" For sharing location through the personal safety app, the teacher said, "There was an earthquake a while ago. Ask for help by sharing location." The teacher used the single-opportunity method during all of the probe sessions. Thus, she stopped the assessment upon an incorrect or no response and scored that step and all remaining steps as incorrect to calculate the percent of correct steps. The teacher behaviors during these sessions were (a) devising means to get students to exhibit the target behaviors, (b) delivering appropriate behavioral consequences, and (c) recording student's responses.

Intervention Sessions

Intervention sessions were conducted after the daily probe sessions, using a total task format. The teacher secured students' attention (i.e., "There are several things that we should do in an earthquake. If we do them, we can survive. Today, we will learn what we can do for this. Ready to work with me?"). The delivery of BST involved the teacher first providing the students with verbal instructions outlining the relevant information of the target behavior (i.e., "Doing drop-cover-hold is very important during an earthquake. If you drop down, cover your head, and hold on to your shelter, you can stay safe."). Following the instruction step, the teacher provided a model of the target behavior by showing the video on the smartboard. In the following step of BST, the teacher gave each student an opportunity to rehearse the behavioral steps by saying, "Please show me what you should do during an earthquake." While working with one of the students in the group, the teacher encouraged the others to observe the rehearsal (i.e., "Watch your friend very carefully.") The teacher provided feedback to the student during the rehearsal. She identified instances in which the student did or did not exhibit the correct behavior. If the student correctly exhibited the step, the teacher provided praise. If the student did not engage in the correct behavior, the teacher provided feedback in the form of an instruction until the student completely exhibited the target behavior. In fact, the teacher concluded the session when the student exhibited independent correct responding at 100% accuracy for three consecutive times during the rehearsal step of BST. The order of students for rehearsal was randomly determined prior to each session. The intervention sessions were terminated, and postintervention probe condition was conducted once the student exhibited correct responding at 100% across three consecutive daily probe sessions. The teacher behaviors during these sessions were (a) delivering the attentional cue, (b) reinforcing student's affirmative response, (c) providing instructions, (d) video modeling the target behavior for the students, (e) having the students role play the skill, (f) praising correct behaviors and providing corrective feedback for incorrect behaviors, and (g) providing praise for cooperation at the end of the session.

Maintenance and Generalization Sessions

The maintenance sessions were conducted 2 and 4 weeks after the intervention conditions ended to assess if students maintained the target behaviors. The generalization sessions were conducted before and after the intervention as pre- and post-test across settings in the lunchroom area by another teacher in the school. For example, for doing drop-cover-hold, the teacher and the individual student sat on a chair, facing each other with a school lunch table of food between them, while other classmates were also in the room eating lunch. One of teacher's arms was on the top of the table so that she could camouflage the other hand. She held the leg of the table out of student's view and shook it a little, simultaneously saying "We're shaking. It's an earthquake. Protect yourself!" The maintenance and generalization sessions were the same as probe sessions.

Social Validity

The social validity was assessed through teachers' and participating students' opinions regarding the target behaviors, procedure, and outcomes. The researchers developed a student social validity question form that included five close-ended and two open-ended questions. Furthermore, they developed a teacher social validity question form that included nine open-ended questions. Table 2 includes the social validity questions for students and teachers. The experts provided their opinions for social validity question form. The second researcher conducted semistructured interviews with the students and five of their teachers. Before the

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Table 2
Social Validity Questions

Questions for Student Participants
1. You have learned earthquake preparedness skills. Did you like learning these skills?
2. Do you feel more secure because you have learned earthquake preparedness skills?
3. Do you think that learning these skills has made people around you happy?
4. Did you like the way your teacher taught you these skills?
5. Would you like to learn other skills in the same way?
6. What did you like most about the training?
7. What did you like least about the training?
Questions for Teachers
1. What can you tell about the significance of the target earthquake preparedness skills?
2. Do you think the target skills were functionally important for the students? Why? Why not?
3. What do you think about the pros and cons of BST in teaching earthquake preparedness skills?
4. In the study, the BST was effective in teaching earthquake preparedness skills to the students. Why do you think the BST was effective?
5. Based on the videos that you have watched, what can you tell about the behavior changes in the students?
6. How do you think the behavior change in student participants can make a difference in their lives?
7. How do you think the behavior change in student participants can make a difference in their family?
8. What did you like most about the study?
9. What did you like least about the study?

Note. BST = behavioral skills training.

interviews, the teachers watched videos of three sessions (the first baseline and intervention sessions, and the last daily probe session).

Data Analysis

Each session was videotaped during the probe, intervention, maintenance, and generalization. The observers and researchers then reviewed the videotapes and coded the students' responses. The researchers analyzed three types of data as reliability data (interobserver agreement and procedural integrity), effectiveness data, and social validity data.

Reliability Data Analysis

The second researcher and the observer who was blind to the conditions of the video clips independently recorded all students' responses for 30% of the sessions per condition across each student. For interobserver agreement (IOA), the percentages were calculated using the Exact Agreement IOA calculation method: dividing the number of agreements by the number of agreements and disagreements and multiplied by 100 (Cooper et al., 2019). The mean IOA was 96.5% (92-100) across sessions and students. Average procedural fidelity (PF) data was calculated with the following quotient: the number of observed researcher behaviors divided by the number of preplanned researcher behavior (see the Intervention Sessions section) and multiplied by 100 (Cooper et al., 2019). The mean PF was 100% across sessions and students.

Effectiveness Data Analysis

Effectiveness data were collected for target behaviors during each condition. For target behaviors, data were collected on the percent of steps of the task analyses using the following quotient: the number of correct steps divided by the total number of steps and multiplying by 100 (Cooper et al., 2019). The students' target responses were visually inspected to determine the promise of effect between the BST during small group instruction and the students' responses. The researchers examined the level and trend of data. Furthermore, effect size scores of each student's target responses were calculated via the Tau-*U* calculating program (Vannest et al., 2016).

Social Validity Data Analysis

Social validity data collected through interviewing the students and teachers were descriptively analyzed.

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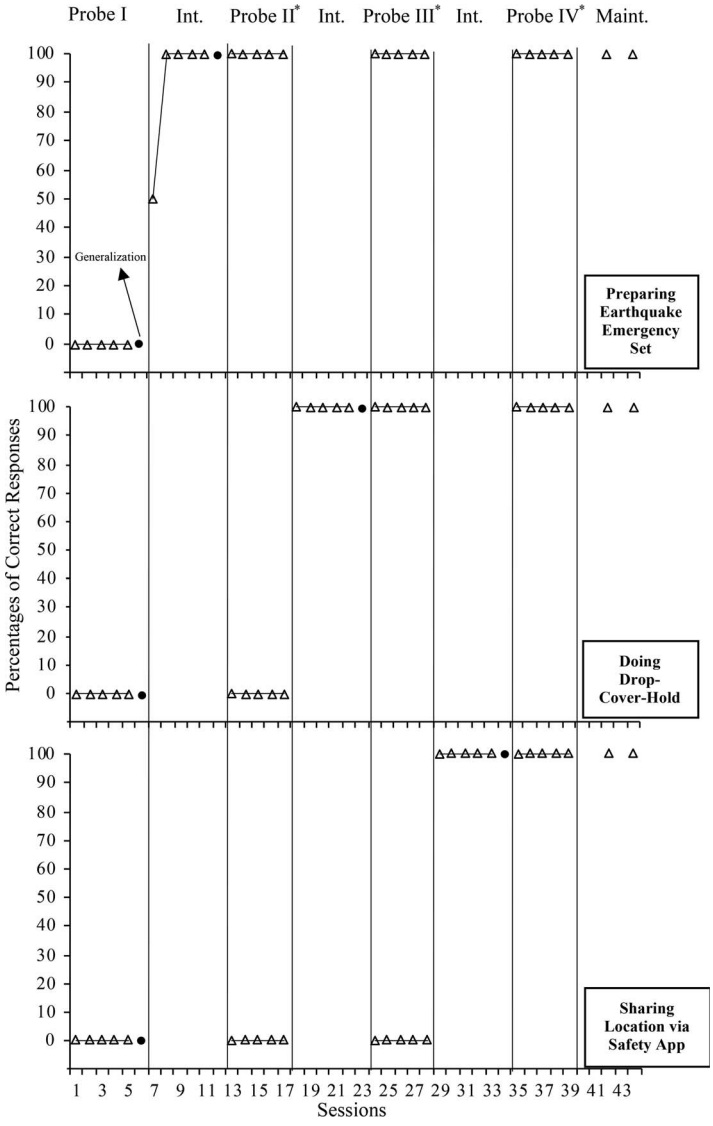
Results

Effectiveness for Target Behaviors

The percentages of target behaviors for Arif, Bora, and Melis are presented in Figures 1 to 3 respectively. The students responded incorrectly during all pre-intervention conditions, reached the mastery criterion during intervention, maintained them when the intervention was withdrawn, and generalized the acquired skills.

Arif did not prepare the earthquake emergency kit during the initial probe condition (see Figure 1). He also did not exhibit any correct responses during all pre-intervention sessions for doing drop-cover-hold and sharing location through the personal safety app. During the intervention for preparing earthquake emergency kit, there was an immediate upward trend in his correct responses with no overlap with baseline data. During the intervention for doing drop-cover-hold and sharing location through

Figure 1
The Percentages of Correct Responses of Arif



*These conditions were conducted as post-BST once the mastery criterion for the skill in that tier was met.

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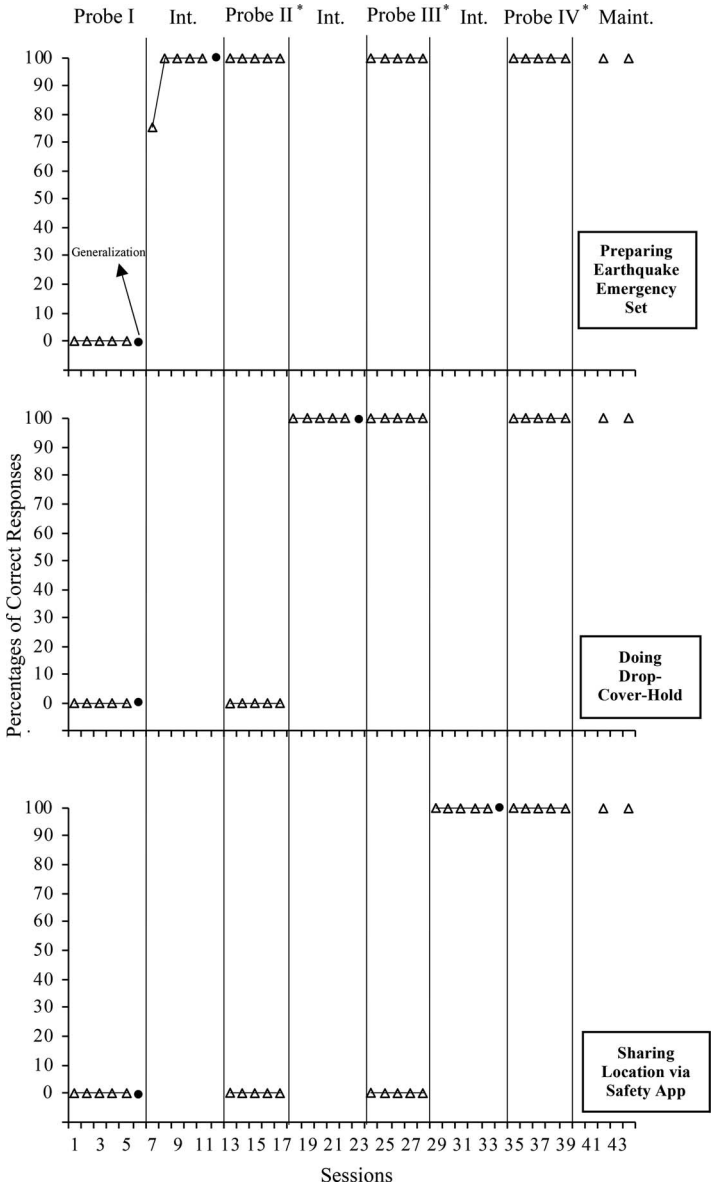
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the personal safety app, his correct responses abruptly increased at mastery criterion level. This pattern was replicated for Bora (see Figure 2) and Melis (see Figure 3).

As to effect size, all students demonstrated a large or strong effect size across target behaviors. The effect size was 1.00 for all target behaviors across the students.

Maintenance data indicated that all students maintained exhibiting all target behaviors at the mastery criteria during the maintenance condition. Furthermore, all students did not exhibit any correct behaviors for target behaviors during pre-test generalization sessions. Post-test generalization data showed all students generalized the acquired behaviors at 100% accuracy across different settings and adults.

Figure 2
Percentages of Correct Responses of Bora

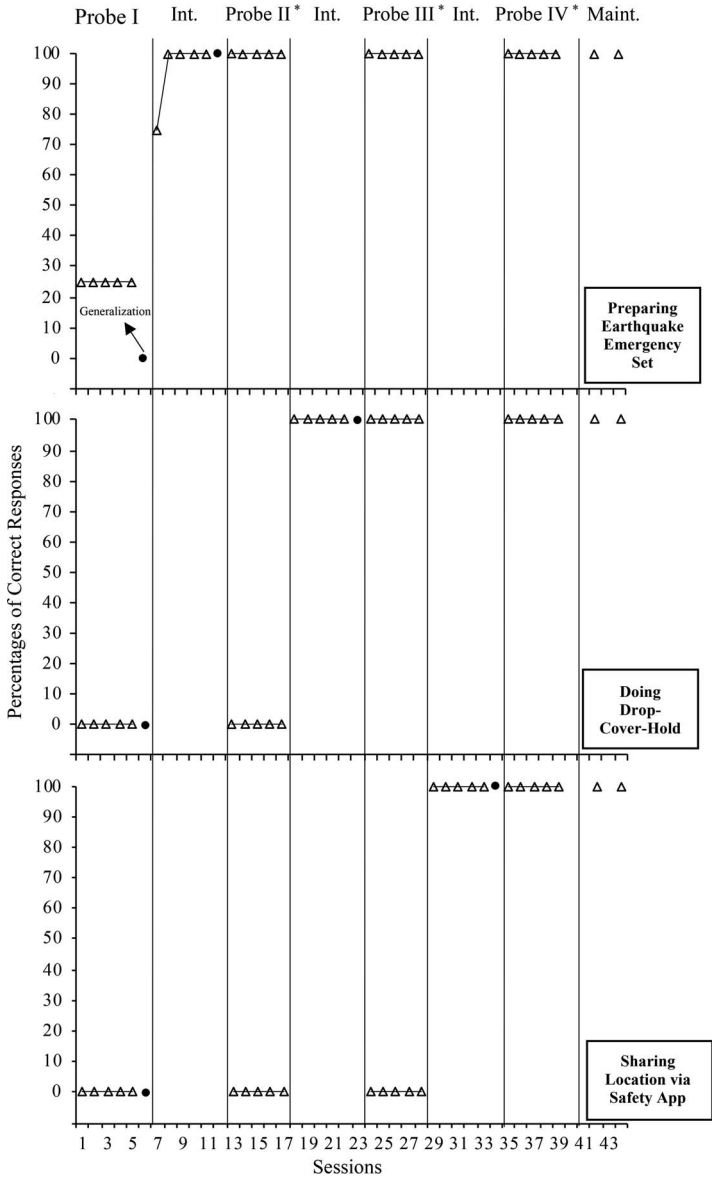


*These conditions were conducted as post-BST once the mastery criterion for the skill in that tier was met.

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Figure 3
Percentages of Correct Responses of Melis



*These conditions were conducted as post-BST once the mastery criterion for the skill in that tier was met.

Social Validity

The social validity data were collected using open- and close-ended questions for the studens with DD, and open-ended questions for the teachers of students (see Table 2).

Social Validity Results: Student Participants

All student participants indicated that they were satisfied with learning earthquake preparedness skills and the intervention process. They also stated they were feeling secure after the study. According to the students, learning these skills made them, their parents, and teachers happy. The students were also satisfied with the procedure because they learned a skill that will ensure their safety. The students found the training fun and wanted to learn other skills through the same procedure. All students indicated that they enjoyed watching the videos and practicing the

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behaviors in the videos. None of the students indicated any negative aspects of the study.

Social Validity Results: Teachers

Two special education teachers and three vocational education teachers provided their perspectives for the study in terms of social significance of the target behaviors, acceptability of the procedure, and the effectiveness of the procedure. Before interviewing the teachers, the teachers watched video clips of the first baseline and intervention sessions, and the last daily probe session. All teachers indicated that Turkey is an earthquake-prone region, thus earthquake preparedness skills were important, functional, and vital for the participating students. Two teachers stated the students could stay safe because they learned earthquake preparedness skills. One teacher indicated everyone in the country must learn these skills regardless of presence of a disability.

According to the teachers, the BST was effective and acceptable as it helped students practice what they watched, promoted active learning, and encouraged students to engage in the training. No teachers indicated any negative aspects of the procedure. The teachers remarked that BST was effective in teaching earthquake preparedness skills to the students because it allowed students to rehearse the skills repeatedly and included videos in the modeling steps. They reported positive opinions regarding the outcomes, stating the students could exhibit the target behaviors fluently. Three teachers indicated the behavior change would bring about positive effects among students' families who would notice that their children could stay safe through the acquisition of the target behaviors. Four teachers were satisfied with the study, reporting the students actively engaged in the training as they practiced the target behaviors. One of the teachers stated that it was significant the students learned how to use the personal safety app as well as the objects that they might need during an earthquake. Two reported no negative aspects of the study, and another two did not give responses. One teacher suggested collecting long-term data on students' performance.

Discussion

The present investigation indicated that all students acquired earthquake preparedness skills, maintained, and generalized them across different conditions. Effect size results for the students indicated large or strong effects and gains indicated via inspecting the data visually. The effect of the intervention was immediate. In fact, all students started to exhibit the target behaviors at 100% in the second intervention session. The researchers continued collecting data for at least five sessions per condition, as recommended by Kratochwill et al. (2013). Previous research on video modeling found that peer video modeling was effective for teaching various targeted outcomes (e.g., Ozkan, 2013). Also, meta-analysis studies on video modeling revealed a large omnibus effect size across the studies (e.g., Bellini & Akullian, 2007). Thus, the use of videos during modeling step of BST could have contributed the effectiveness of the intervention. Future research may include or combine voice-over, textual, or verbal instructions, wh- questions, mock scenarios, and skits in BST steps to assess knowledge and associate feedback. Furthermore, in the current study, the students were allowed to watch each other while practicing the behavior in the rehearsal step of BST, which may have facilitated observational learning. Therefore, providing the students with observational learning opportunities could be the other factor contributing to the effects of the intervention. Furthermore, students watched or listened to the teacher feedback delivered to their friend; as such, this may have improved the students' overall performance (Bandura, 1977). Previously, BST has been used to teach individuals with DD many different safety skills such as poison recognition skills (e.g., Dancho et al., 2008), pedestrian safety skills (e.g., Sidman et al., 2005), sexual abuse prevention skills (e.g., Egemo-Helm et al., 2007), and firearm safety skills (e.g., Himle & Miltenberger, 2004). The current study documented the effectiveness of BST in teaching earthquake preparedness skills to people with DD. Given that no previous studies examined the effects of the procedure in teaching earthquake preparedness skills to this group, the results of the current study are significant for the literature.

Because it is difficult to predict when student participants can encounter an earthquake, it is significant that target behaviors maintain over long periods of time. Thus, the researcher did not remove the intervention and continued instruction when the students started to exhibit the target behavior at criterion level, as such repeated assessments may have increased overlearning. This was validated by the maintenance of the behavior changes with the final maintenance sessions conducted 2 and 4 weeks after the intervention. This result on maintenance is consistent with those of previous research on teaching

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safety skills to individuals with DD through BST (e.g., Lumley et al., 1998; Miltenberger et al., 1999). Furthermore, the researchers observed that the participant students accurately exhibited the acquired earthquake preparedness skills during an earthquake drill held in the school around 2 months after the conclusion of the study, although they did not collect data systematically. Around 2 months after the conclusion of the study, an earthquake of 5.9 magnitude was recorded at nighttime with tremors felt in the city of residence for the students. The city was also the epicenter of another earthquake of 3.2 magnitude 2 weeks later, while the students were at school. Based on informal interviews with parents and teacher observation, the students independently and accurately exhibited drop-cover-hold and shared their location using their phone. Furthermore, they asked other people (i.e., parents and classmates) to drop, cover, and hold immediately. Future research should include maintenance probes several months or years after the intervention to determine whether any procedural modifications are needed to ensure long-term maintenance of the acquired target safety skills. Future research may also evaluate occasional booster training sessions months or years after training as a method to maintain skill use over time.

Previous research on the topic of safety skills suggested that earthquake preparedness drills be performed in natural settings (Indriasari et al., 2018). In the current study, the teacher of the participating students delivered the intervention in classroom setting. As such, the intervention agent and the setting contributed to the generalization of the behavior change. Furthermore, all the students generalized earthquake preparedness skills across different conditions in the presence of an unacquainted teacher. According to parental reports, all students generalized doing drop-cover-hold and sharing location through the personal safety app during the earthquake of 5.9 magnitude across the home setting after the conclusion of the study. This result that behavior change generalized to other conditions is consistent with those in published studies on BST (e.g., Garcia et al., 2016; Sanchez & Miltenberger, 2015). Future research may assess generalization in additional settings such as the community and home in addition to the school assessments utilized in this study.

Previous studies on teaching safety skills to individuals with DD through BST typically did not include measures of social validity. However, the research that measured social validity reported that the consumers gave positive opinions towards the target behaviors, procedures, and outcomes (e.g., Egemo-Helm et al., 2007; Lee et al., 2019). Similarly, the participating students in the current study indicated that learning earthquake preparedness skills made them feel secure. Furthermore, the teachers stated learning these skills was a must for everyone in Turkey, as such the target behaviors were functional for the students. Given that Turkey is an earthquake-prone region, and many citizens are affected by earthquakes, the targeted skills for the students were also socially valid. This was also validated by the teachers' perspectives during the interviews. The students and teachers also expressed positive opinions about BST. The students wanted to learn further skills with the same procedure. The teachers stated that the use of video modeling and rehearsals increased the effects of the training. Future research should consider using additional measures such as normative comparisons that are less subject to bias to increase confidence in the social validity of the study.

Another issue that should be considered is that probe, maintenance, and generalization sessions were conducted in natural contexts to test the transfer of stimulus control to natural stimuli. For example, for doing drop-cover-hold, the researcher used naturally occurring stimuli in addition to teacher-arranged stimuli (i.e., skill direction). Thus, the teacher gently shook the table out of the student's view to make a rolling sensation. The degree of this was determined considering the opinions of an expert in disaster management field. Furthermore, the teacher said, "We're shaking. It's an earthquake. Protect yourself!" for doing drop-cover-hold, and "There was an earthquake a while ago. Ask for help by sharing location." for sharing location through the personal safety app with a low and nervous tone of voice. Again, the expert opinion was taken regarding the tone of voice. The teacher tended to implement the same degree of shaking and use the same tone of voice across the sessions but, nevertheless, the rates of adherence were not formally measured. Another limitation was the use of such phrases as "Protect yourself!" in probe sessions. Because it is not possible to simulate an actual earthquake in classroom settings due to lack of technological sources in the country, the teacher used expressions as a component of the simulation to enhance the persuasiveness within the context. However, we observed that all students did not wait for the teacher to emit these phrases (i.e., "We're shaking, It's an earthquake! Protect yourself!") and

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began exhibiting the target skill as soon as the rolling sensation occurred in majority of the sessions. Additionally, the students independently exhibited the drop-cover-hold move and shared their locations through the personal safety app during two real earthquakes after the conclusion of the study. These examples indicate that these phrases did not function as a discriminative stimulus for the students. In other words, the transfer of stimulus control occurred in the presence of signs of an earthquake. Future research may conduct intervention and/or in situ assessment for the earthquake preparedness skills in settings with better simulations (e.g., using remote control). Moreover, expert opinions were obtained from only three individuals. Given that expert opinions are significant due to their clinical judgement, an increased number of experts to five or more individuals in related fields (i.e., disaster management) may provide stronger judgement and suggestions. Finally, another limitation was that only three students participated in the study.

Although the results of the current study are promising, there are a few implications for research that need to be addressed. As this is the first and only study investigating the effects of BST in teaching earthquake preparedness skills to individuals with DD, more replication is needed to increase confidence in the results. Three participants are sufficient in a single subject design study because it allows for three replications of findings at three different points in time. However, it is important to examine the effects of the procedure in teaching other disaster preparedness skills in future studies containing more participants with DD. Although the researchers planned for generalization at an earthquake simulation center, they could not conduct these sessions as it was the only simulation facility in the city and unavailable at that time. This may be another limitation of the study, but it is also significant to focus on teaching such crucial skills to the individuals with DD in the countries where resources (i.e., facilities) are limited.

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