Spring 4-28-2020

# Assessing Controlling Stimuli for Safety Responses in Children with Autism Spectrum Disorder

Andrea Giraldo
agiraldo@rollins.edu

# Assessing Controlling Stimuli for Safety Responses in Children with Autism Spectrum Disorder

A Thesis
by
**Andrea Giraldo, BS, RBT**

Submitted to the Faculty of the Department of Health Professions
at Rollins College in Partial Fulfillment
of the Requirements for the Degree of

MASTER OF ARTS IN APPLIED BEHAVIOR ANALYSIS AND CLINICAL SCIENCE

April 2020
Winter Park, FL

## Table of Contents

Page

## Abstract

Children with autism spectrum disorder (ASD) may be less likely to generalize newly learned responses. Lack in generalized responding from one setting to another setting could be because of the presence or absence of specific stimuli. Identifying the stimuli that are influencing the response is critical when teaching safety skills to children with ASD. This study assessed the functional relation between stimuli and response. The experimenters extended the methodology used by Halle and Holt (1991) to identify the controlling stimuli for an identification response to community helpers in various locations. The stimulus parameters that were assessed during the current study were the requester, setting, and the question wording. The methodology adapted from Halle and Holt (1991) was effectively used to assess the controlling stimuli for the target responses. During baseline, all the participants showed 100% correct responding when asked by the therapist the specified question in the typical therapeutic setting. However, each participant responded differentially to the novel antecedent stimuli presented.


*Keywords:* autism, generalization, safety skills, stimulus control

## Introduction

Generalization occurs when an individual engages in learned behavior in the presence of new stimuli (Stokes & Baer, 1977). For example, an individual might learn to park a car by practicing in his or her driveway; if the behavior then generalizes, the individual successfully parks the car in any of several driveways. A lack of generalization responding would be noted in this example if the individual can only park the car if it is in his or her own driveway (i.e., the driveway on which they learned the correct behavior). Another example of lack of generalization is that a child might respond correctly and independently to a therapist when asked, "What is your name?" but he or she may not respond at all when another individual (e.g., a store attendant) asks the child this same question. Generalization is critical in all areas in life because it provides the individual with the skills needed to apply learned concepts to a variety of contexts.

Individuals diagnosed with autism spectrum disorder (ASD) often struggle to generalize novel skills across settings, contexts, or stimuli (Brown & Bebko, 2012). Generalization can be one of the more difficult obstacles families with children with autism confront (National Autism Center, 2011). Parents may witness his or her child master a task with a therapist, but then experience little success when the therapist is absent. In these situations, it would be important for generalization of such skills to be explicitly programmed by the therapist so that the spread of effects could be observed across multiple people and settings.

Related to generalization, stimulus control can be defined as an organism engaging in a particular behavior more frequently in the presence of a stimulus than in its absence due to the behavior's reinforcement history (Cooper, Heron, & Heward, 2007). New skills might not generalize correctly if irrelevant stimuli exert stimulus control or overshadow the effects of

other stimuli for an individual (Singh & Solman, 1990). Individuals working with children with autism should analyze the components that may affect stimulus control.

Halle and Holt (1991) conducted an analysis to determine the distinct stimulus parameters of a compound discriminative stimulus that evoked a response for four young adults diagnosed with intellectual disabilities. In each trial, the participants were asked by a teacher (labeled as the *requester*) to find another adult (the *receiver*) in a different location (the *setting*) and request a specific item to borrow (the *item*). Correct responding was defined as using the word, "please" when making the request. The experimenters then probed for correct responding when one stimulus parameter was kept the same and all other parameters were varied. For example, in one type of probe trial, the requester, setting, and receiver were different from those used in training trials, but the item requested was the same. Post-training probes indicated that, for each participant, different parameters (or combinations of parameters) controlled correct responding. It was observed that Will responded correctly when the receiver was kept the same and all other stimuli were varied. This methodology could be a useful tool to determine which stimulus or combination of stimuli is controlling an individual's responses.

Generalization of safety skills is an especially crucial area of study, particularly for children at a young age. Hemenway and Solnick (2015) examined various cases from the National Violent Death Reporting System and found that in the United States each year nearly 110 children are killed unintentionally with guns. According to the Centers for Disease Control and Prevention (2017), unintentional injuries ranked as the number one for leading causes of death in the United States of America for children between the ages of 1 and 4 years. Unintentional suffocation, unintentional drowning, and unintentional firearm use were the leading causes for some of those injuries, despite available curricula and programs designed to teach parents and children to act safely around water, firearms, and other

dangerous objects.

There is an ample amount of research on ways to teach children a variety of safety skills. Often, instructors or parents will show videos, discuss safety scenarios, or read books on topics like firearm safety, abduction prevention, or fire safety to teach safety skills to children. In addition to these resources, the National Rifle Association (NRA) also promotes firearm safety with children by using a series of animated educational videos called "The Eddie Eagle Program" ("Eddie Eagle GunSafe Program", n.d.).

Within behavior analysis research, Himle, Miltenberger, Flessner, and Gatheridge (2004) evaluated behavioral skills training (BST) to teach firearm safety skills to children, and Miltenberger and Duffy (1988) compared BST on personal safety skills (e.g., appropriate versus inappropriate physical touch) to a commonly used prevention program that utilized prevention books, role-playing, and picture discrimination to teach prevention skills. Wurtele, Saslawsky, Miller, Marrs, and Britcher (1986) compared BST, video presentation, and a combination of both BST and a video to a no-treatment control group to teach personal safety skills. In all three of these studies, the authors found that BST was effective in teaching target safety skills and was more effective than the commercially available programs.

Over the years, researchers have modified existing educational systems and designed new interventions to teach safety skills specifically to children with ASD. Gunby, Carr, and LeBlanc (2010) conducted a study that focused on abduction-prevention skills using BST and in situ feedback with three boys with autism. The experimenters taught the participants a series of responses through verbal instruction, live modeling, and rehearsal when approached by a stranger. All the participants displayed higher correct responding during post-training sessions than during baseline.

Aids, such as pagers, phones, and identification or communication cards, have also been used to teach children safety skills. Hoch, Taylor, and Rodriguez (2009) evaluated the

use of a cell phone along with a communication card with instructions to teach three teenagers with autism to look for help when lost. After the training session, all three of the participants' safety behavior increased compared to baseline. Bergstrom, Najdowski, and Tarbox (2012) taught three participants diagnosed with ASD to seek help when lost without the use of any technology device in the natural environment. A combination of rules, role-playing, prompting, and praise increased the participants' help-seeking behavior compared to baseline. Carlile, DeBaer, Reeve, and Reeve (2018) taught six young males with ASD to engage in help-seeking behavior using low-tech (i.e., presenting an identification card) and high-tech responses (i.e., using a cell phone). The experimenters used a packaged intervention: video modeling, programmed common stimuli, and an error correction procedure. The experimenters found that the combination of the intervention was successful when teaching children how to seek for help when lost.

Despite the abundant amount of research conducted on teaching safety skills to children with ASD, few studies have fully evaluated the generalization of those safety skills. Gunby et al. (2010) did not test for generalization with all the participants after teaching abduction-prevention skills. Hoch, Taylor, and Rodriguez (2009) conducted training sessions and probes in various locations in the community. However, the participants' responding did not maintain; the participants' responding required a booster session during community probes to increase the correct response of seeking help. Bergstrom, Najdowski, and Tarbox (2012) conducted generalization probes for two participants, but the probe setting was in an environment where baseline data were not collected. As a result, it is unknown to the researchers how the participants would have responded in the setting during baseline probes. As a notable exception, Carlile et al. (2018) did evaluate generalization thoroughly, and the authors found both low- and high-tech responses generalized and maintained at the 1-week and 2-week follow up in novel locations and with novel individuals.

Although there are several empirically supported methods for teaching children the skills needed when confronted with an unsafe scenario, further research is needed on the specific stimuli that control responding to ensure that generalization of safety skills occurs. Given the challenges individuals with ASD encounter, analyzing the stimulus or stimuli controlling a target response can result in better teaching procedures and ultimately greater generalization for these individuals. Based on the procedures described by Halle and Holt (1991), the purpose of the current study was to extend methodology evaluating stimulus control to identify the specific features of a compound discriminate stimulus that evoked correct responding when a community helper asks an individual with ASD for his or her personal contact information.

## Method

### Participants and Setting

The participants were three individuals diagnosed with autism spectrum disorder (ASD) between the ages of 6 and 8 years old. To participate in this study, participants had to be able to communicate through expressive vocalization (i.e., vocally respond to questions) and follow simple three-step instructions, as reported by the participant's caregivers. Additionally, participants had to be able to recite his or her name, the parent's name, and the parent's phone number when instructed by a familiar adult (e.g., therapist) to do so. Participants were selected based on parents' interest in generalizing safety skills for his or her child. Adult helpers (i.e., community helpers and therapists) were recruited based on the participant's therapist and confederate community helpers. The participants were recruited from local applied behavior analysis centers for children with intellectual disabilities. Sessions were conducted at the participant's home at which he or she regularly received behavior analytic services.

**Target Response and Interobserver Agreement**

Data were collected on the participant's correct responses to answering questions asked by the community helpers. The therapist collected data on individual responses. If the participant answered the question correct for (a) name; (b) mother/father/caregiver's name; and (c) phone number, the response was counted as correct. An incorrect response was marked if the response was wrong or no response was provided. Prior to the start of the study, the therapist determined (based on parent preference) which parent/caregiver's name to use and the preferred phone number.

Surreptitiously, the therapist and the confederate community helpers collected data on the participants' responding. Two independent observers collected data simultaneously with, but independent of, the primary observer for 100% of all sessions across all conditions for each participant. An agreement was defined as two observers scoring the same independent response. Disagreement was defined as the two observers scoring different responses. Interobserver agreement was calculated by dividing the number of agreements by the number of trials and multiplying by 100. Interobserver agreement data were collected on 100% of trials and was 100% for each participant.

**General Procedures**

In each trial, a specific individual asked the participant to state their name, the caregiver's name, or the phone number. Contingent on a correct response, verbal praise was provided. Four trials of each condition below were conducted in a randomized fashion. At least 30 s elapsed between each trial, and up to 10 trials were conducted each day. This procedure was repeated three times, once for each target behavior (participant's name, caregiver's name, and phone number). Some trials were reconducted because of an error in the distribution of trials. At the beginning of the study, some trials were incorrectly

conducted in that they contained two parameters from baseline, and only one parameter from variation 2 or 3 – the data from those trials were discarded, and new trials were conducted. For each stimulus parameter, a trained topography and two variations were identified. For example, a participant might have been trained to respond to the question "What is your name?" by their clinical therapist in their home. These three parameter variations served as the baseline question wording, requester, and setting, respectively. In each trial for which a non-baseline variation was needed, one of the two non-trained variations were selected through a toss of a coin. If the coin landed on heads, Variation 2 was selected for that trial (e.g., see Table 1). If the coin landed on tails, Variation 3 was used for the trial.

**Baseline.** Baseline trials were conducted prior to the randomized alternating trials. During this phase, the therapist asked the participant the specified question in the typical therapeutic setting. The experimenter provided verbal praise to the participant for correct responses.

**Setting probes.** The purpose of this condition was to evaluate if the setting alone exerted stimulus control over correct responding. During this condition, the experimenter altered two stimulus parameters (the question wording and the requester) in each trial. The setting remained the same as in baseline. Either Variation 2 or 3 (see Table 1) was used for the requester and the question. For example, a police officer might have asked, "Give me your name" in the playroom setting.

**Requester probes.** In these trials, the person asking the question was the same as in baseline, and the setting and questions were different (i.e., backyard and "tell me your mother's name"). The participants' therapist served as the requester.

**Wording probes.** This condition evaluated if the wording of the question was the controlling stimulus for correct responding. The wording of the question remained the same as in baseline. The experimenters randomized the variation used for both the setting and the

requester.

**Varied stimulus probe.** During this condition, the experimenter altered all of the stimulus parameters (i.e., setting, requester, and question wording) in each trial. Either Variation 2 or Variation 3 for all three of the different stimulus parameters were used.

## Results

The percentage of correct responses across all stimulus variations for each participant are displayed in Figures 1, 2, and 3. During baseline, all the participants showed 100% correct responding when asked the specified question by the therapist in the typical therapeutic setting.

Figure 1 depicts the percentage of correct responses for Douglas across baseline and the various probe conditions. Douglas responded correctly for each trial in the name condition, regardless of who was asking the question. For both caregiver name and phone number, variable responding was observed across setting, wording, and in the varied trials, suggesting partial generalization. Douglas responded correctly in all caregiver name and phone number trials in which the therapist asked the question, though, indicating that the requester exerted stimulus control over the correct responses.

As shown in Figure 2, Larry responded correctly in all name and caregiver name trials. However, in the phone number condition, incorrect responding occurred in the varied condition, where all the stimuli presented were dissimilar to baseline. Results of Junior's percent of correct responding are shown in Figure 3. Junior responded at 100% during baseline probes and in the four parameter conditions for all three target behaviors.

## Discussion

The methodology adapted from Halle and Holt (1991) was effectively used to assess the controlling stimuli for the target responses. When asked to state their names, all three participants responded at 100% correct across all stimulus variations. However, when more

complex responses were required (e.g., stating the phone number), responding was more variable across participants. This finding suggests that the complexity and reinforcement history with the response may affect an individual's ability to generalize. For instance, a child may have a longer history of being asked for their name rather than their phone number.

Across responses and participants, the percentage of correct responses was higher when the RBT was the requester. In contrast, for two participants, the percentage of correct responding was lower in varied trials. Therefore, across individuals, familiarity of the requester may be an important variable influencing generalized responding. Results from the study indicate that programming for generalization is important. In a real safety related situation, it is highly unlikely that a familiar requester will be present, thus emphasizing the importance in teaching children with ASD to respond to a variety of stimuli. Therefore, a related recommendation is that when children are being taught safety skills, stimulus control be transfer from therapist to novel requesters.

However, generalization was highly idiosyncratic across participants. For example, Junior's percentage of correct responses was 100% across all conditions. On the other hand, the setting seemed to be an important variable affecting Douglas's responding, particularly when more complex responses were required. Identifying the controlling stimuli or stimulus compound for a new response can facilitate additional strategies while teaching the skill, such as establishing stimulus control with community helpers. It is therefore crucial to assess the controlling stimuli for each individual.

The advantage of conducting an assessment analyzing stimulus control for a particular behavior can be very beneficial to both the instructor and learner. Establishing strategies on how to teach a diverse set of skills beyond safety responses may result in the learner acquiring the skill much faster. One potential limitation of conducting a stimulus control analysis for skill acquisition goals for every client is that it might be time-consuming in the

clinical setting. As an alternative, it may be best to conduct a few varied probe trials and conduct further probes for skills that are not generalizing for the individual. Future researchers should develop a brief indirect analysis in evaluating stimulus control for a particular behavior that analysts can use during their initial assessments.

In the current study, similarities in the wording of the question in each trial may have influenced responding. For example, in the name condition, the researcher presented the participants with three variations of the question: “What is your name?”; “Tell me your name”; and “Give me your name.” The phrase “your name” was used in each trial, possibly acting as the controlling stimulus to the response. In fact, the phrase “your name” was used in each trial for both name and caregiver name condition, possibly acting as the controlling stimulus to the response. Further examination of multiple variations (e.g., “Who are you?”) would have potentially produced different results.

Programming for generalization by training sufficient exemplars is a fundamental component when teaching essential skills that must generalize beyond the clinical setting (Stokes & Baer, 1977). The experimenter only presented the participants with two novel variations of each condition, and the setting was always in the participants’ home. It may be the best practice to conduct probes in a setting where safety responding may be needed (e.g., a theme park, grocery store, or community park). Adding various amounts of different variations seems to be an essential component to include in future research, because in real-life safety situations, the environment in which the participant is in may vary along all dimensions in comparison to what was taught in a clinical setting.

Just as conducting functional analyses is essential to identify the maintaining function of behavior, an analysis of the stimuli controlling a behavior should also be essential when teaching new responses. Although the experimental design suggests reasonable conclusions about analyzing stimuli controlling a particular behavior, there are several limitations in the

experiment. The confederate community helpers in the study were not real-life community helpers. Volunteer females wearing black pants and the shirt for the role they were playing ran the community helper requester trials. Results could have differed if the community helpers were male community helpers. Anecdotally, two of the participants in the study mentioned wanting to see the community helpers again and requested if they could bring their police car and firefighter truck next time. The statements said by the participants are important to note because the participants believed they were real-life community helpers.

Another limitation of the study was the people present during the conditions. It is worth noting that the RBT was present throughout all the conditions, the RBT and the community helpers would alternate as the requester depending on the random sequence assigned. Although the non-requesters would leave the area in which the trial was conducted, the constant changing of requesters still made the presence of the RBT noticeable to the participants. During Larry's and Junior's trials, each of the participant was present in each other trials because they are brothers. It is possible that the brothers were a controlling stimulus for each other's' responding. It was typical for each brother to be present because, in the clinical setting, they are present throughout each other's session. Additionally, in the current study, the researcher assessed generalization only across two community helpers because of practical constraints. Future research might investigate participants responding to various community helpers without the presence of a familiar adult.

Future studies should address these limitations and evaluate the effects of generalization with several community helpers and evaluate how certain ethnic groups might interact with various community helpers in both genders in different ways. Future research can use this analysis to determine a more effective way to teach safety skills to children where the response generalizes to novel settings or novel people. The ability for any individual to generalize learned responses outside the setting in which they learned it is a skill

vital for an individual to succeed in life.

## References

Bergstrom, R., Najdowski, A., & Tarbox, J. (2012). Teaching children with autism to seek help when lost in public. *Journal of Applied Behavior Analysis*, *45*, 191-195. doi:10.1901/jaba.2012.45-191

Brown, S. M., & Bebko, J. M. (2012). Generalization, overselectivity, and discrimination in the autism phenotype: a review. *Research in Autism Spectrum Disorders*, *6*, 733-740. doi:10.1016/j.rasd.2011.10.012

Carlile, K. A., Debar, R. M., Reeve, S. A., Reeve, K. F., & Meyer, L. S. (2018). Teaching help-seeking when lost to individuals with autism spectrum disorder. *Journal of Applied Behavior Analysis*, *51*, 191-206. doi:10.1002/jaba.477

Center for Disease Control and Prevention. (2019). Ten Leading Causes of Death by Age Group, United States [PDF file] Retrieved from https://www.cdc.gov/injury/wisqars/LeadingCauses.html. (Original work published 2017).

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis*. Upper Saddle River, NJ, Columbus, OH: Pearson/Merrill-Prentice Hall.

Eddie Eagle GunSafe Program. (n.d.). Retrieved from https://eddieeagle.nra.org/

Gunby, K., Carr, J., & LeBlanc, L. (2010). Teaching abduction-prevention skills to children with autism. *Journal of Applied Behavior Analysis*, *43*,107-112. doi: 10.1901/jaba.2010.43-107

Halle, J. W., & Holt, B. (1991). Assessing stimulus control in natural settings: an analysis of stimuli that acquire control during training. *Journal of Applied Behavior Analysis*, *24*, 579–589. doi: 10.1901/jaba.1991.24-579

Hemenway, D., & Solnick, S. J. (2015). Children and unintentional firearm death. *Injury Epidemiology, 2*,1-7. doi: 10.1186/s40621-015-0057-0

Himle, M. B., Miltenberger, R. G., Flessner, C., & Gatheridge, B. (2004). Teaching safety skills to children to prevent gun play. *Journal of Applied Behavior Analysis, 37,* 1–9. doi: 10.1901/jaba.2004.37-1

Hoch, H., Taylor, B., & Rodriguez, A. (2009). Teaching teenagers with autism to answer cell phones and seek assistance when lost. *Behavior Analysis in Practice, 2,* 14-20. doi:10.1007/BF03391733

Miltenberger, R., & Thiesse-Duffy, E. (1988). Evaluation of home-based programs for teaching

personal safety skills to children. *Journal of Applied Behavior Analysis, 21,* 81-87. doi:10.1901/jaba.1988.21-81

National Autism Center. (2011). *Evidence-based practice and autism in the schools: a guide to providing appropriate interventions to students with autism spectrum disorders*. Randolph, MA: National Autism Center/A Center of May Institute.

Singh, N., & Solman, R. (1990). A stimulus control analysis of the picture-word problem in children who are mentally retarded: the blocking effect. *Journal of Applied Behavior Analysis, 23,* 525-532. doi:10.1901/jaba.1990.23-525

Stokes, T., & Baer, D. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10,* 349-367. doi:10.1901/jaba.1977.10-349

Wurtele, S., Saslawsky, D., Miller, C., Marrs, S., & Britcher, J. (1986). Teaching personal safety skills for potential prevention of sexual abuse: a comparison of treatments. *Journal of Consulting and Clinical Psychology, 54,* 688-692. doi: 10.1037/0022-006x.54.5.688

Table 1

*Stimulus Parameters for Each Target Behavior*

| | Setting | Requester | Wording (Name) | Wording (Caregiver Name) | Wording (Phone Number) |
|---|---|---|---|---|---|
| **Variation 1 (Baseline)** | Playroom | Therapist | "What is your name"? | "What is mommy's name"? | "What is your phone number"? |
| **Variation 2** | Playground | Police Officer | "Give me your name"? | "Tell me your mom's name"? | "Tell me your phone number"? |
| **Variation 3** | Driveway | Firefighter | "Tell me your name." | " Give me your mom's name"? | " Give me your phone number"? |

*Note.* Variation 1 served as the baseline question wording, requester, and setting. Non-baseline variation, one of the two non-trained variations were selected through a toss of a coin. If the coin landed on heads, Variation 2 was selected for that trial. If the coin landed on tails, Variation 3 was used for the trial.

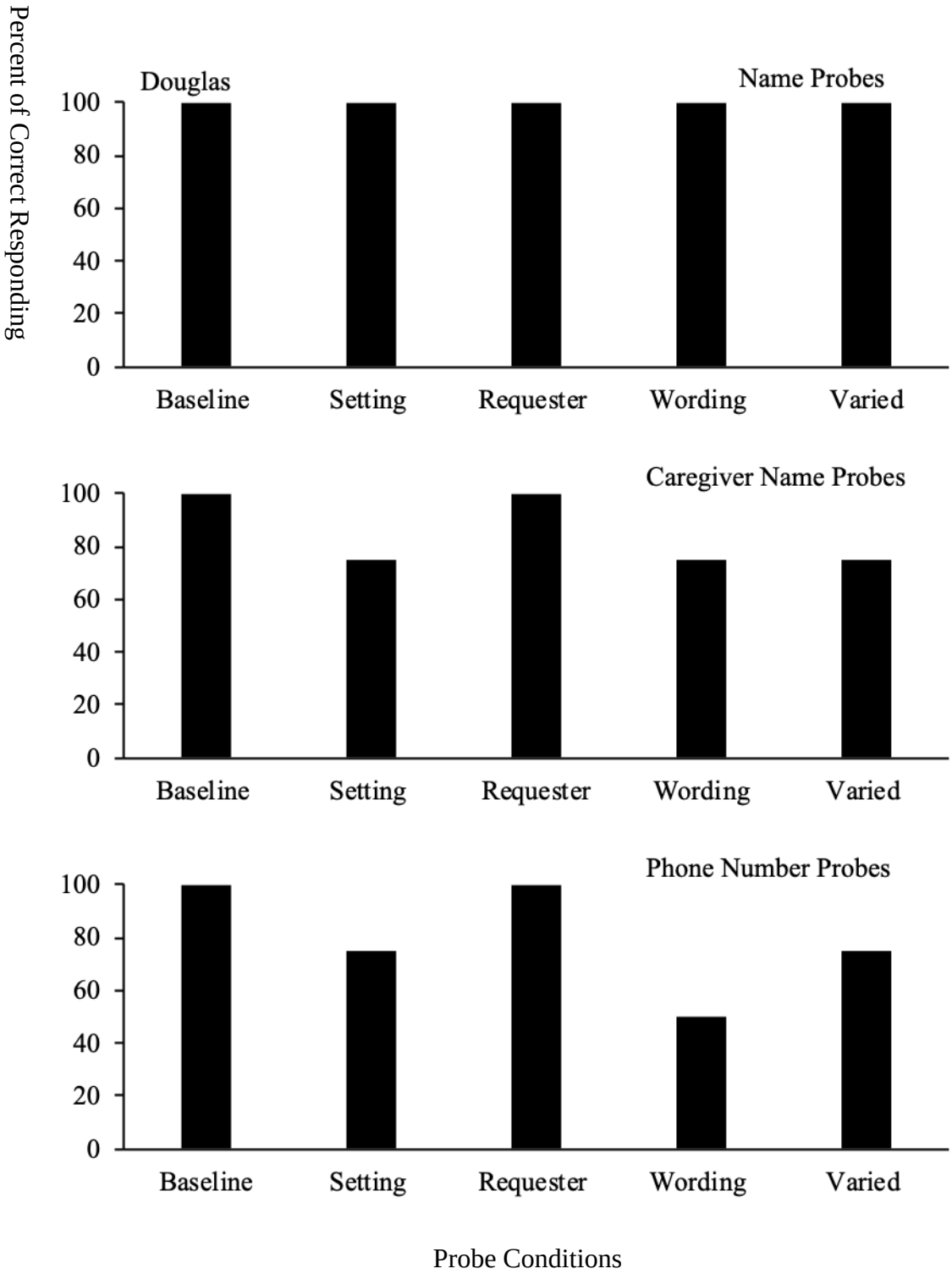


*Figure 1.* Percentage of correct responding for Douglas in each condition. The bar graphs represent the percent correct responding in each condition when the particular stimulus was kept the same as in baseline. The varied condition consisted of all of the stimulus parameters altered (i.e., setting, requester, and question-wording).

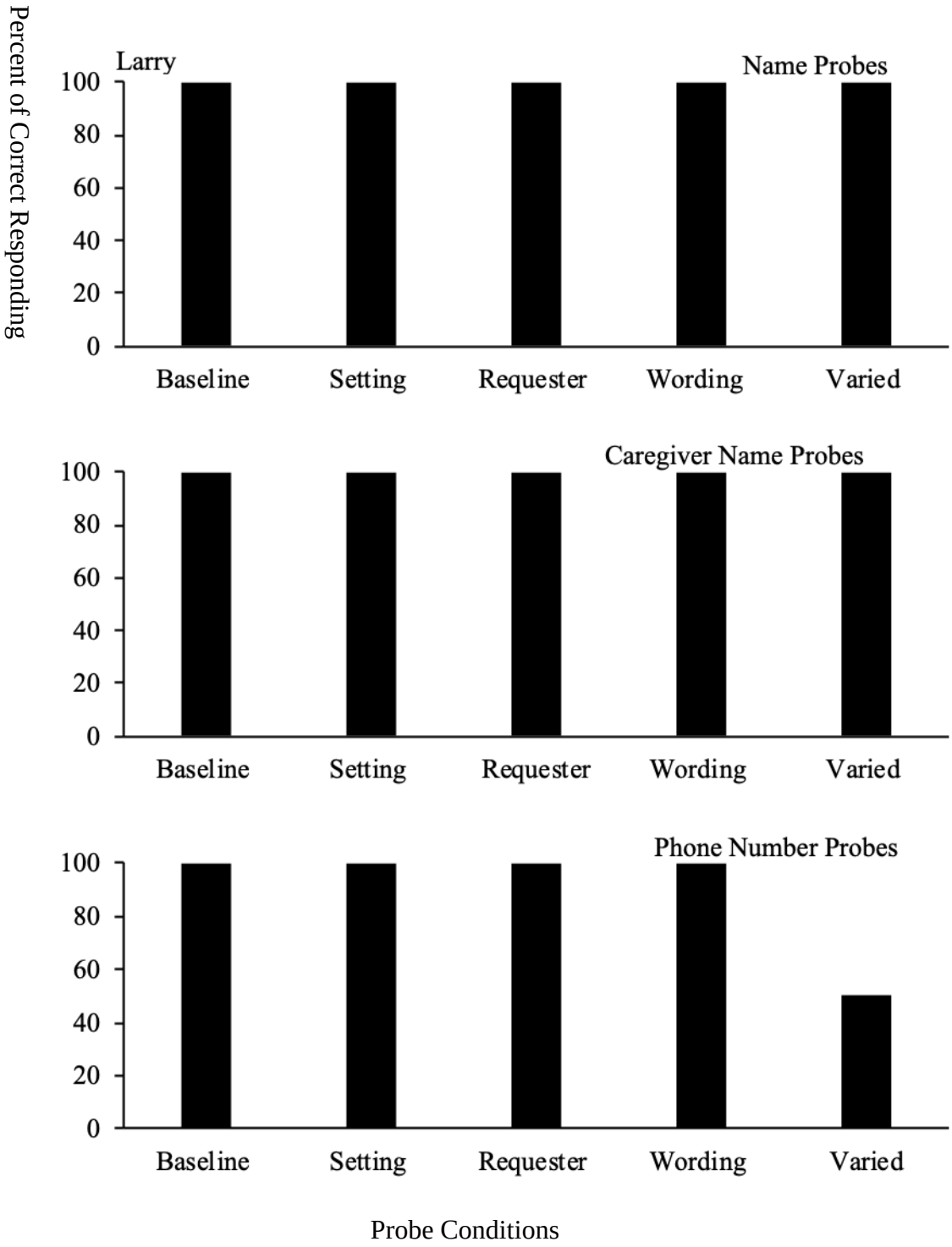


*Figure 2.* Percentage of correct responding for Larry in each condition. The bar graphs represent the percent correct responding in each condition when the particular stimulus was kept the same as in baseline. The varied condition consisted of all of the stimulus parameters altered (i.e., setting, requester, and question-wording).

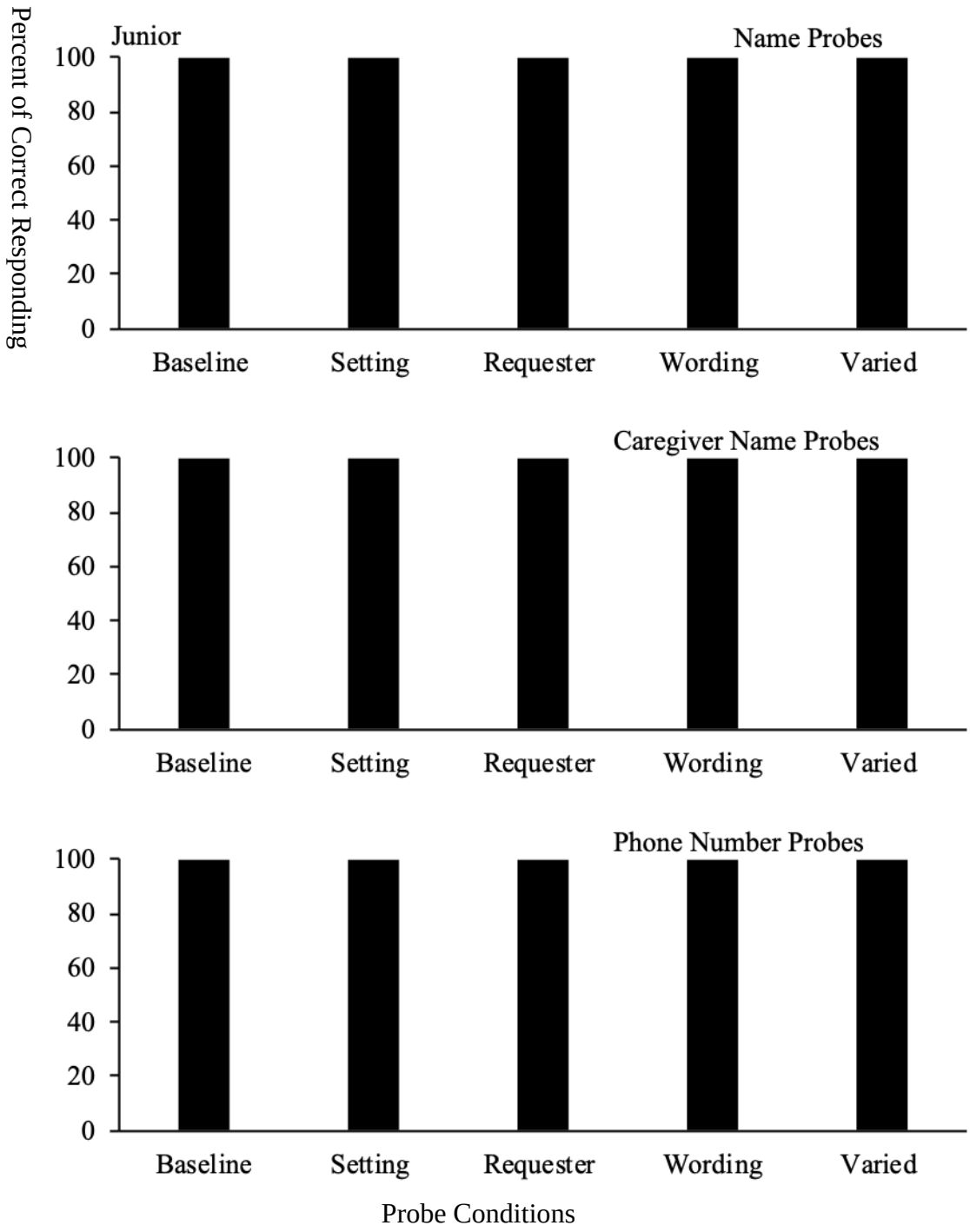


*Figure 3.* Percentage of correct responding for Junior in each condition. The bar graphs represent the percent correct responding in each condition when the particular stimulus was kept the same as in baseline. The varied condition consisted of all of the stimulus parameters altered (i.e., setting, requester, and question-wording.