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ASSESSMENT OF THE INFLUENCE OF BACKGROUND NOISE ON ESCAPE-MAINTAINED PROBLEM BEHAVIOR AND PAIN BEHAVIOR IN A CHILD WITH WILLIAMS SYNDROME

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We examined the influence of background noise on levels of problem behavior and pain behavior under functional analysis conditions for a child with a diagnosis of Williams syndrome and hyperacusis. Background noise was associated with increases in escape-maintained problem behavior and increases in pain behavior such as clasping ears and crying. When the child was fitted with earplugs, there were substantial reductions in both problem and pain behavior under the background noise condition.

DESCRIPTORS: Williams syndrome, hyperacusis, functional analysis

Some genetic conditions that are associated with intellectual disability may influence an individual's sensitivity to certain classes of consequences as reinforcers (Dykens & Kasari, 1997). The reinforcing effectiveness of food, for example, is increased for individuals with Prader-Willi syndrome, resulting in hyperphagia or overeating (Dykens & Kasari).

As many as 95% of individuals with Williams syndrome, a genetic condition characterized by distinct facial features, growth deficiency, aortic stenosis, and intellectual disability, suffer from hyperacusis or hypersensitivity to sound (Klein, Armstrong, Greer, & Brown, 1990; Van Borsel, Curfs, & Fryns, 1997). For these individuals, this hypersensitivity to noise means that many everyday sounds that are neither intrinsically threatening nor uncomfortably loud to the typical person (e.g., vacuum cleaner, telephone, lawnmower) can be aversive and evoke responses that include covering ears, crying, running away, and body rocking. In this study, we systematically examined how hyperacusis influenced operant responding under functional analysis assessment conditions for an individual with Williams syndrome who exhibited problem behavior.

METHOD

Participant, Setting, and Target Behaviors

Eilis was 5 years 2 months old at the beginning of this study. She had been diagnosed with Williams syndrome and hypercalcemia at 14 months. Although no formal IQ scores were available, she was considered to function at the moderate range of intellectual disability. Her daily living score on the Vineland Adaptive Behavior Scale was about 2 years. She had good expressive language skills but often had difficulty understanding simple instructions. She had previously been treated for feeding problems (O'Reilly & Lancioni, in press).

Eilis was referred to the Biobehavioural

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Unit at the National University of Ireland, Dublin, because she displayed aggressive behavior at playschool. She was about to be placed in an inclusive classroom at a regular national school, and her mother believed that her aggression might jeopardize this placement. Her mother also reported that Eilis suffered from hyperacusis and that aggression seemed particularly problematic in noisy contexts at playschool. The functional analysis was conducted in the child's home with the mother acting as therapist under the guidance of the first author.

Hyperacusis was assessed using the Williams Syndrome Questionnaire (Klein et al., 1990). The mother reported that Eilis was sensitive to many everyday noises such as telephone ringing, lawnmower, loud music, and loud crowds. Eilis reacted to such noises by covering her ears with both hands, crying and whining, making statements like "it hurts my ears," and cringing (arching her back and bringing her shoulders towards her neck). These reactions to noise usually occurred simultaneously and were measured as pain behavior for the purposes of the functional analysis. Problem behavior included hitting (striking the instructor with a closed fist), grinding (shoving the chin into the arm or hand of the instructor), throwing items (e.g., instructional materials from table top), and destroying items (e.g., tearing books, breaking pencils).

Functional Analysis

A series of three conditions (i.e., play, attention, and demand) were presented. Sessions of each functional analysis condition were 5 min and were implemented in a random order. All sessions were unobtrusively videotaped and were later scored by the observers. Problem behavior and pain behavior were measured separately using a 10-s partial-interval recording procedure. Interobserver agreement for problem and pain behavior was assessed using an interval-by-interval method during 39% of the sessions and averaged 88.7% (range, 80% to 100%) and 96% (range, 83% to 100%) respectively.

Attention. In this condition her mother ignored Eilis unless she engaged in problem behavior, at which point she was to attend to her (e.g., "Please don't hit me."). Preferred toys were available in the room. Pain behavior was ignored. This condition was designed to assess whether problem behavior was maintained by attention from others.

Demand. A series of instructional tasks that were selected from her playschool curriculum (drawing letters, numbers, and shapes; coloring inside the lines) were introduced by her mother in a semirandom order during this condition. Contingent upon problem behavior the tasks were removed for 5 s and then were reintroduced. Pain behavior was ignored. The demand condition assessed whether problem behavior was maintained by escape from tasks.

Play. In this condition preferred toys were available and her mother interacted with Eilis continuously. Both problem and pain behavior were ignored.

No Noise, Noise, Noise Plus Earplugs

The functional analysis conditions described in the previous section were evaluated under three contexts that were designed to examine the influence of noise on performance. During no noise, the functional analysis was conducted in relatively quiet circumstances (i.e., no background noise that was reported by Eilis or her mother to be aversive was present during the assessment). In the noise condition, an audiotape of classroom activity was played during the functional analysis. The volume of this audiotape was at a level that was not aversive to the mother or experimenter and was held constant across all noise conditions during the experiment. The audiotape consisted of such activities as students (of similar age to Eilis)

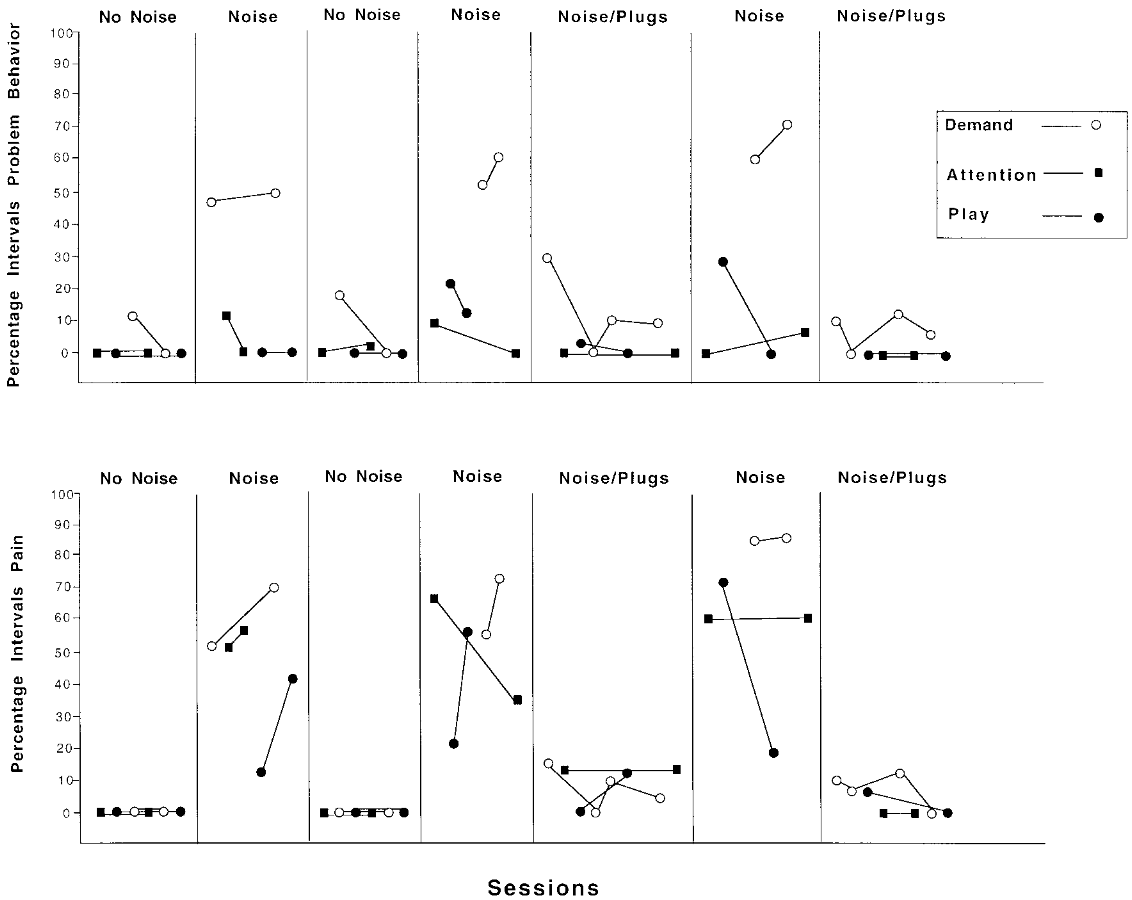

Figure 1. Percentage of intervals with problem behavior (top panel) and pain behavior (bottom panel) across functional analysis conditions during the no-noise, noise, and noise plus earplugs conditions.

responding to teacher instructions, asking questions of the teacher, and talking with one another. In the noise plus earplugs condition, the functional analysis was conducted while the audiotape was played; however, Eilis was fitted with a pair of earplugs to reduce noise level.

Experimental Design

A multielement design embedded within a reversal design was used to examine responding under the functional analysis conditions and the influence of the various noise conditions on responding during the functional analysis.

RESULTS AND DISCUSSION

The results of the experiment are presented in Figure 1. The top panel presents the percentage of intervals with problem behavior during the functional analysis assessment under no-noise, noise, and noise plus earplugs conditions. Little problem behavior was observed during the functional assessment under the no-noise condition. During the noise condition, high levels of problem behavior were observed under the demand assessment conditions (M = 57%; range, 47% to 70%), but little problem behavior occurred during the attention (M = 6%; range, 0% to 13%) and play (M = 11%; range, 0% to 26%) conditions. When Eilis was fitted with earplugs, her problem behavior was substantially reduced during the demand assessment (*M* = 13%; range, 0% to 30%), and little problem behavior occurred during the attention and play assessments. The lower panel presents the percentage of intervals of pain behavior for all functional analysis conditions during each phase of the study. No pain behavior was observed during any of the functional analysis assessments under the no-noise condition. Pain behavior was observed across demand (*M* = 71%), attention (*M* = 56%), and play (*M* = 38%) functional assessments during the noise condition. Little pain behavior was observed during the functional assessments under the noise plus earplugs condition.

Background noise seemed to influence responding under functional analysis conditions by increasing the aversiveness of task demands. This potential hypersensitivity to sounds should be considered when conducting functional analyses of problem behavior for individuals with Williams syndrome. Future research should continue to examine how various genetic or biological conditions might alter the reinforcing effectiveness of certain environmental events. From an applied perspective these results have practical implications. For Eilis, academic instruction might best be conducted under relatively quiet conditions and, in situations in which this is not possible, earplugs or other forms of adaptive equipment might be considered to reduce noise levels.

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