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EVALUATION OF STIMULUS INTENSITY FADING ON REDUCTION OF RAPID EATING IN A CHILD WITH AUTISM

AMBER L. VALENTINO, LINDA A. LEBLANC

TRUMPET BEHAVIORAL HEALTH

AND

PAIGE B. RAETZ

SOUTHWEST AUTISM RESEARCH AND RESOURCE CENTER

This study assessed the effects of a vibrating pager on reduction of rapid eating. The study also evaluated two strategies for fading the pager, by intensity and by frequency. The pager was successful in decreasing the pace of eating to an appropriate level and the pager prompt was successfully faded. Fading by frequency was ineffective in maintaining an appropriate pace of eating while intensity fading was successful.

Key words: autism, pager prompts, rapid eating, stimulus intensity fading

Vibrating pagers have been used to successfully prompt individuals with autism to engage in socially significant behaviors such as social initiations (Shabani et al., 2002), language initiation (Taylor & Levin, 1998), and to seek assistance when lost (Taylor, Hughes, Richard, Hoch, & Rodriquez-Coello, 2004). Recently, Anglesea, Hoch, and Taylor (2008) successfully used a vibrating pager to slow the pace of food consumption for three adolescents with autism who had a history of rapid eating. Pager prompts may be considered less intrusive and stigmatizing than traditional prompts (such as physical guidance by an instructor) because they can be discretely administered without an instructor in close proximity.

Strategies for effectively fading pager prompts have not yet been developed in the research literature. As an example, Taylor and Levin (1998) evaluated whether a remote activated vibrating pager could be used to increase the social initiations of a child with autism. The pager prompt was effective in establishing the social initiation repertoire, but there were no attempts to fade the prompts. Shabani et al. (2002) replicated the beneficial effects of pager prompts for teaching social initiations and attempted to fade the prompts by altering the schedule of prompt delivery (i.e., prompting less frequently). This fading strategy was ineffective—social initiations and responses did not maintain at the desired level once the pager was removed. It is possible that fading by frequency is ineffective because it is difficult to transfer stimulus control from the tactile prompt to no prompt. Fading by intensity may prove more effective because features of the antecedent stimulus (i.e., the vibration) can be altered more gradually with intensity and without any abrupt transfer.

The current study replicated the procedures used by Anglesea et al. (2008) to slow the pace of food consumption with two extensions. The first extension was to examine whether the pager prompt could be successfully faded by altering the intensity of the vibration. The second was to compare the effects of fading by

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Address correspondence to Amber Valentino, TBH, 6475 Sierra Lane, Dublin, CA 94568.
E-mail: avalentino@tbh.com

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stimulus intensity versus fading by stimulus frequency.

METHOD

Participant & Setting

Mason was a 10-year-old boy diagnosed with autism. He attended a private school that used the principles of applied behavior analysis (ABA) 5 days per week, 6 hr per day. He received 1:1 ABA instruction in his home for approximately 20 hr per week. His mother reported concern with his rapid pace of eating, particularly with highly preferred foods. She wished to reduce his pace of eating, hypothesizing it was resulting in an increase in his weight, expressing concerns about choking, and being dissatisfied with the disruptions to their mealtime social experience his rapid eating caused.

Sessions were conducted in the kitchen of the school and contained a refrigerator, microwave and cupboards. The room contained three to four large folding tables with three to four folding chairs at each table. Mason was seated at one of the tables, typically with one to two students. One instructor per student was present.

Materials

Materials consisted of a paper plate, a plastic fork and six whole strawberries with the tops removed (i.e., highly preferred food with fastest pace of consumption). Other fruits (e.g., pineapple) were used during training trials only. Fruits were used because Mason's caregivers reported that he preferred fruits and often ate them too quickly. Materials used for data collection included two timers, paper data sheets, and a pen. A kitchen dishtowel and one piece of bubble wrap were used during intensity fading. The pager was The Harris Communications Vibrating and Chime Receiver™, which is a two-component device consisting of the main pager and the remote with which to activate the pager's functions. The pager had two options (i.e., vibrate, chime) selectable by a switch, and both options had a high and low setting also selectable by a switch. The single-button remote activated the function based on the switch settings. The pager was created by General Dynamics for the purpose of this study and is not commercially available. However, the device could be easily recreated by an engineer. (For full technical details, please contact the authors.) We chose a pager that could be activated by the experimenter so that we could control the activation within sessions to accommodate various fading techniques.

The first author timed a typical adult man eating six whole strawberries to calculate the vibration interval to produce a typical pace of eating. The vibration interval was calculated by dividing the duration of eating time of the adult by the number of bites it took Mason to consume six strawberries in baseline. The adult male consumed six strawberries in 114 s. It took Mason an average of 6.5 bites to consume six strawberries in baseline. Based on these data, Mason would have to take one bite approximately every 18 s to consume the strawberries in the same amount of time as the adult. This would mean waiting approximately 6 s longer between bites—Mason consumed the strawberries in an average of 80 s in baseline, which equates to one bite approximately every 12 s.

Response Measurement & Interobserver Agreement (IOA)

The primary dependent variable was the total number of seconds of eating time to consume six strawberries. Total seconds of eating time began when the instructor presented the strawberries and stopped when Mason swallowed the last bite. Total number of bites was recorded, and each bite was defined as each instance of Mason picking up a piece of food with hands or utensils and inserting the food into his mouth. Swallowing the bite of food was not required for a new instance of biting to occur. Mason always ate every available bite of

food so there was no concern about measuring how much was consumed.

A trained independent observer collected data on the total seconds of eating time and the number of bites for 24% of sessions across all conditions. Interobserver agreement (IOA) was calculated by dividing the shorter time or smaller number of bites by the longer time or greater number of bites and multiplying by 100%. IOA was 96.5% for bites (range, 85.7%-100%) and was 98.8% for mean total of seconds (range, 97.4%-99.4%).

Design

An ABABCBCB reversal design was used to evaluate the effects of the tactile prompt on eating pace (ABAB) and to compare the effects of fading the tactile prompt by intensity versus frequency (CBCB).

Procedure

General procedure. Sessions were conducted during Mason's lunch period at school, which began between 11:30 a.m. and 12:00 p.m. each day. One to two sessions per day were conducted, and sessions typically lasted between 1 and 8 min. Each session consisted of six strawberries regardless of whether we conducted one or two sessions per day. The experimenter consulted with Mason's parents, and they indicated that 12 strawberries was a typical amount for him to consume along with other lunch foods. Thus, the risk of satiation was low because the amount of his meal was consistent with the amount he would typically consume. The strawberries were never broken into pieces; they were given to Mason whole (with stem tops removed). Thus, the number of pieces did not vary from session to session. During all sessions, with the exception of training, the experimenter stood approximately one arm length behind Mason and was out of sight.

Baseline (No Pager). Sessions began when the target food was placed on the table in front of Mason. Upon food presentation, the experimenter started the timer and stopped it when all of the food had been consumed. No prompts or reinforcement were provided.

Pager Training. Training trials were conducted with other fruits during the typical lunch session. Strawberries were not used during pager training. The pager was clipped to Mason's waistband and the experimenter held the vibration trigger in her hand. Two timers were used, one to record the total seconds of consumption and one to cue the instructor to activate the vibration at varied intervals. When the session began, the instructor hit "start" on one timer and let it run for the duration of meal consumption. The vibration was activated an average of every 20 s (range, 15-25 s). The instructor watched the seconds timer, and when the predetermined number of seconds passed, she activated the pager. Similar to the procedures by Anglesea et al. (2008), the purpose of varying the interval during training was to decrease the likelihood Mason would begin to respond to a specific time-based schedule and to increase the likelihood the pager would cue responding. Identical to the procedures described by Anglesea et al., during the first training session, the experimenter physically guided Mason to put his hand on the pager to wait until the pager vibrated before consuming a piece of fruit. Mason was no longer required to keep his hand on the pager between vibrations as he learned to respond to the vibration across training sessions. The experimenter blocked attempts to take bites prior to the vibration and guided Mason to pick up a strawberry when the pager vibrated. Mason's hand was guided back to the pager immediately after the bite entered his mouth. The experimenter provided verbal praise if Mason waited to take a bite until the pager vibrated. Prompts were faded from full physical to partial physical and then completely eliminated. Training was considered complete when Mason took bites only when the pager vibrated on 100% of trials for two consecutive sessions.

Pager Prompt. This phase was conducted following mastery of pager training. This condition was identical to baseline, with the exception that the pager was clipped to Mason's waistband and was triggered every 18 s. No other reinforcement or prompts were provided. The pager was always activated during 100% of scheduled bites.

Prompt Fading. During this phase, the intensity was reduced to low and then muffled and the frequency was altered such that the pager was activated for 100%, 50% or 0% of scheduled bites. No other reinforcement or prompts were provided.

Low Intensity, 100%. The pager was activated at a low intensity for 100% of scheduled bites.

Low Intensity, 50%. The pager was activated at a low intensity and was implemented as described in the pager training condition for 50% of scheduled bites (i.e., the first three scheduled bites). After the first three bites, the vibration prompt was no longer provided, but the pager remained clipped to Mason's waistband. That is, the pager was present the whole session but was not activated the whole session.

Muffled, 100%. The pager was activated at a low intensity and was wrapped in one piece of bubble wrap and a standard kitchen dishtowel. Bubble wrap and a dishtowel were used because they allowed for the most significant change in sensation. This change in sensation was assessed by placing the pager on an adult and asking him to indicate when he noticed a difference in intensity from the pager at low intensity without any stimuli. After placing the pager on the adult without any stimuli, the experimenter tested four different arrangements of stimuli on the pager: bubble wrap only, one dishtowel only, two dishtowels, and finally one dishtowel and bubble wrap. These materials were required because the experimenters wished to continue fading by intensity, but the pager device was not equipped to deliver any lower intensity settings. The pager was clipped to Mason's waistband and used throughout the session.

No Intensity, 0%. Mason wore the pager but it was not activated.

RESULTS AND DISCUSSION

Figure 1 depicts the total time of consumption for six strawberries and the total number of bites. During baseline, Mason consumed the strawberries in substantially less time than an adult male (M = 80 s). During training trials (not depicted in current graph but available upon request), Mason met mastery criteria in nine sessions. After only three of these sessions, Mason took bites only when the pager was activated. However, he also took bites when the pager was not activated, so six more sessions were required to meet mastery criteria (i.e., taking bites only when the pager vibrated on 100% of trials for two consecutive sessions). Mason's consumption time increased during the initial pager prompt phase at high intensity, indicating the pager prompt was effective at slowing his pace of eating to that of the pace of a typical adult male (M = 149 s). Mason's bites remained the same (i.e., 6-7 bites) from baseline to treatment, indicating the number of bites was not an influencing factor on the change in meal consumption duration. The first reversal to baseline indicated a decrease in consumption time to a similar duration observed in the initial baseline phase (M = 81 s). The second introduction of the pager prompt at high intensity had the same effects as in the first intervention phase (M = 158 s).

During the prompt fading phase, appropriate duration maintained when the pager was faded from high to low intensity (activated for 100% of session) and remained at that level for three sessions at the lowest intensity. During the low intensity, 50% phase, the number of bites remained consistent; however, the duration of food consumption increased significantly above typical range (M = 476 s). A return to the low

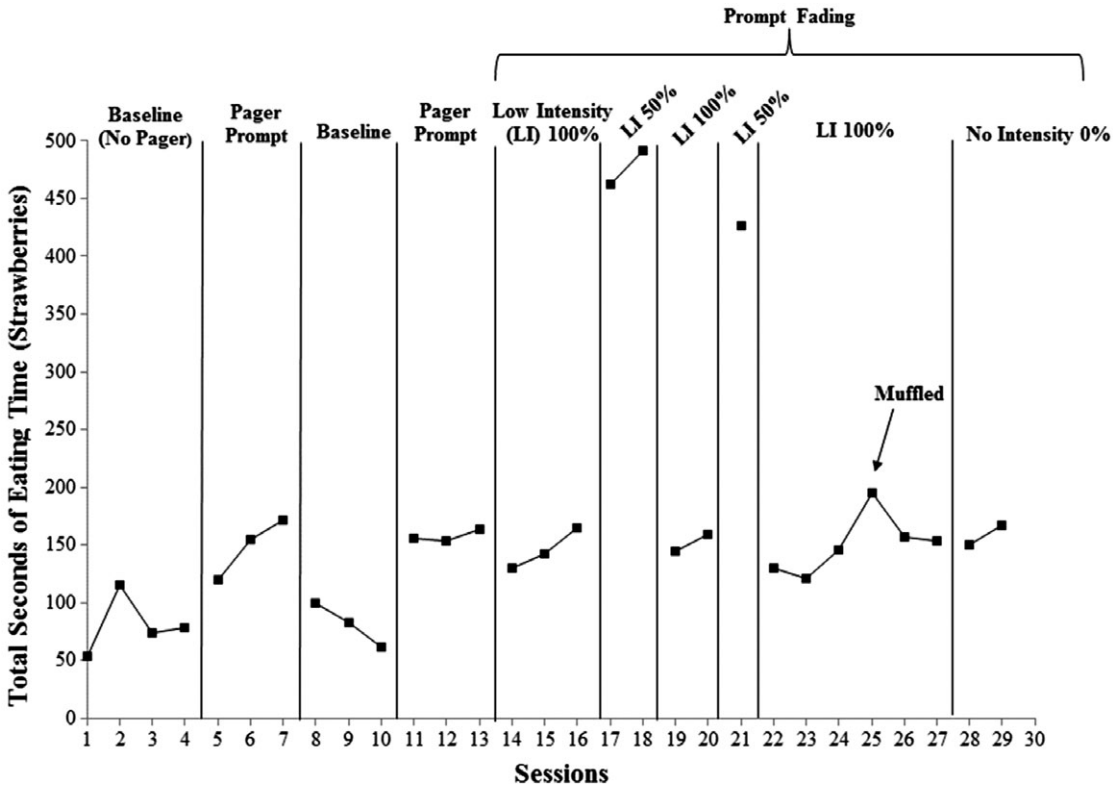

Figure 1. Total eating time in seconds (left y-axis) and number of bites (right y-axis) to consume six whole strawberries across sessions. A typical adult male consumed the same food in 114 sec.

intensity 100% phase replicated the prior effects and were more consistent with a typical pace (M = 151 s). A reversal to the low intensity 50% fading phase resulted in a significant increase in consumption time again (M = 426 s), while number of bites remained consistent. We hypothesize that the significant increase in consumption time was due to Mason relying on the vibration prompt and waiting for it to occur. During this fading phase, he looked around at others in the room, requested to take a bite of food, and touched the pager to attempt to trigger a vibration. This behavior suggests that transitioning from the vibrating prompt to no prompt was ineffective.

During the final phase, (low intensity, 100%), the pager prompt was effective at maintaining an appropriate pace of eating across three sessions (M = 132 s). Once the pager was muffled to decrease the perceived vibration intensity another level, Mason's overall duration of eating time increased slightly upon the first session but remained at a typical pace for the remaining two (M = 168 s). Finally, when the pager was not activated (no intensity, 0% phase), the duration of food consumption was within normal range (M = 158 s). Bites remained consistent across all phases (M = 6.5; range, 6-10).

The results replicate the findings of past research (e.g., Shabani et al., 2002; Anglesea et al., 2008), revealing that a vibrating prompt can be effective in cueing individuals to engage in socially important behaviors, in this case to maintain an appropriate pace of eating. The results extend our knowledge on the topic and demonstrate that a tactile prompt can be

successfully faded by intensity. Intensity fading was likely more successful than frequency fading because it was easier to transfer stimulus control by altering features of the antecedent stimulus (i.e., the vibration) than removing the antecedent stimulus abruptly, which is done in frequency fading. Our findings show that fading vibration prompts by frequency may be an ineffective fading strategy, replicating the effects observed in other studies (e.g., Shabani et al., 2002; Anglesea et al., 2008). However, these results should be interpreted with some caution because we only evaluated frequency fading when combined with a low intensity prompt. Future researchers may wish to conduct an evaluation of frequency fading alone and with more steps to more fully compare frequency fading to intensity fading.

Some additional imitations to the current study exist. First, we did not formally assess the faded prompt with other foods, at home, or with his parents. Future research should assess for generalization of the pace of eating in these areas. Future research should also include a final phase wherein the pager is completely removed. We also did not conduct a phase prior to the training steps that consisted of the pager on, but not activated. Future researchers may wish to conduct this phase so that a comparison can be made during the final phases when the pager prompts have been fully removed. Finally, during the final intensity phase, we also altered the visual presentation of the prompt through the use of a dishtowel and bubble wrap. Future researchers may wish to use a device that has more intensity switches that allow for multiple versions of intensity such that other stimuli do not need to be used—the device used in the current study contained only two vibrating settings. It is unclear how this change of visual presentation affected responding in addition to the intensity fading.

Future researchers should focus on assessing and, if needed, increasing the social validity of the current methods. We did not collect social validity data, which would be important for assessing the extent to which others in Mason's environment viewed his pace of consumption with the pager prompt. Social validity would be particularly important in the current study, because the final phase of fading contained the pager with a dishtowel and bubble wrap. Although we made every attempt to cover the pager with Mason's shirt, it was still visible to those around him. Future researchers may wish to use other stimuli that are more easily covered, or use technology that does not require the use of extra stimuli to decrease the intensity of the prompt. Future researchers might also evaluate procedures to transition control from the pager prompt to more typical contextual cues to allow the pager to be fully faded while maintaining the pace of eating. Future research should also report data on swallowing and the actual time of each bite to ensure all bites were consumed in an appropriate pace across the session.

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