

The Persistence of Infant Caregiving Behavior Under Disrupting Conditions

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Abstract

In infant caregiving situations, caregivers often experience frequent periods of extended or inconsolable crying. In these situations, ideally positive caregiving behaviors (rocking, feeding) will persist and not be replaced by negative behaviors (shaking, yelling at the baby). The current study is an initial exploration of persistence of positive caregiving behaviors from the perspective of behavioral momentum theory. Previous basic and translational research has indicated that behavior reinforced in a relatively rich (versus lean) context is more resistant to challenges. Adult participants interacted with simulation infants that cried and were asked to respond as they normally would to a baby. During baseline sessions, crying was turned off contingent on target behavior (rocking, feeding, playing) in lean and rich reinforcement sessions in two different research-lab settings. After each baseline, participants experienced a challenging situation. In Experiment 1, participants experienced extinction sessions in which no response terminated crying, and in Experiment 2, participants were asked to complete a competing task while caring for the infant simulator. The percentage of change in caregiving behaviors in the test sessions was compared across the lean and rich conditions in a within-subjects design. Four of six participants in Experiment 1 and two of six participants in Experiment 2 showed greater persistence during rich test sessions than lean. These results provide an initial demonstration that behavioral persistence of caregiving behavior may be sensitive to contextual reinforcement variables, and the differences observed across disruption conditions highlight the importance of considering both reinforcement history and the broader context in which infant caregiving occurs.

Introduction

Behavioral persistence is the continuation of behavior despite changes to reinforcement contingencies or disruptions to environmental conditions (Dube et al., 2009). Persistence is evident across a wide range of behaviors and contexts. For example, a PhD student nearing completion of their degree may continue to send out job applications despite receiving multiple responses that the positions have been filled, or a preschooler may continue to work on a difficult puzzle despite the availability of other reinforcing activities. Whether behavioral persistence is desirable or undesirable depends on the behavior that persists and the overall context in which the behavior occurs. Thus, understanding the conditions under which behavior either persists or is disrupted is important. Basic work uncovers interactions between relevant behavioral principles (e.g., reinforcement, extinction, antecedent stimuli, etc.) across species (Kyonka & Subramaniam, 2018; Skinner, 1938), including those related to resistance to change during disruption (i.e., persistence; Craig et al., 2024; Nevin & Grace, 2000). In applied settings, understanding the determinants of resistance to change may help practitioners reduce the persistence of dangerous or destructive behavior (e.g., Mace et al., 2010; Suess et al., 2020) and may also inform efforts to establish and maintain desirable behavior when environmental conditions become challenging (e.g., Ringdahl et al., 2018).

Much of the literature on resistance to change has been influenced by behavioral momentum theory (BMT), which uses an analogy to Newtonian physics to explain how environmental factors influence the

persistence of behavior during disrupting conditions (Nevin et al., 1983; Nevin & Grace, 2000). In classical mechanics, the product of a moving body's mass and velocity determines its momentum. Whether an outside force can disrupt the body's motion depends on momentum—increasing mass and holding velocity constant can make the body more resistant to change. BMT equates response rate to velocity and suggests that “behavioral mass” can be estimated by measuring resistance of response rate to disrupting conditions (e.g., the presence of alternative sources of reinforcement, extinction). BMT emphasizes that response rate and resistance to change are separate and independent measures of response strength that are determined by operant and Pavlovian contingencies, respectively (Nevin, 1992). In other words, response rate is determined by the response-reinforcer contingency, and resistance to change is determined jointly by reinforcement from directly engaging in the behavior of interest and reinforcement experienced from other sources in that environment (i.e., stimulus-reinforcer contingency; Nevin et al., 1990).

Typically, studies using the BMT framework to assess resistance to change use multiple schedules of reinforcement because that allows the effects of different baseline conditions (reinforcement contingencies and signaling stimuli) on persistence to be assessed simultaneously within participants (see Cohen, 1993; 1998; 2000 and Lionello-DeNolf & Dube, 2011 applications of BMT to single schedules of reinforcement). After baseline exposure to a multiple schedule in which the components are associated with different reinforcement contingencies, a potential disrupter (extinction, alternative sources of reinforcement) is applied to both components (e.g., Nevin, 1974). Research has indicated that resistance to change is greater in the richer component (e.g., Grimes & Shull, 2001; Hall, 2017; Shahan & Burke, 2004) and BMT attributes this to the stimulus-reinforcer contingencies (Nevin et al., 1990; Nevin & Grace, 2000).

Because of its potential to aid understanding of persistence of behavior in applied settings, there has been a substantial amount of translational and applied research using the BMT framework to examine resistance to change in individuals with autism spectrum disorder and intellectual disability (see Craig et al., 2024; DeLeon et al., 2015; Smith & Greer, 2023; Trump et al., 2021, for reviews). In one early example, Lionello-DeNolf et al. (2010) investigated resistance to change of behavior by children with severe intellectual disability in a human operant task. Participants responded to different color and shape stimuli presented on two computer touchscreens in a multiple schedule. Lionello-DeNolf et al. used a distributed sessions procedure (Dube et al., 2000; 2003) in which a predetermined number of baseline sessions were conducted prior to the disrupter test sessions. Test sessions were composed of both baseline and disrupter components, which allowed responding in disruption to be compared to that in baseline within sessions, thereby minimizing the potential effects of variable response rates across sessions. The effects of four different disrupters were examined within participants. These included presenting an alternative stimulus that signaled the availability of the same reinforcer (small pieces of preferred food items), delivery of the food reinforcers prior to the research session (i.e., prefeeding), playing a preferred movie during the session, and the presence of another person delivering non-contingent praise and food. The results indicated greater disruption in the lean than the rich components

of the multiple schedule for the alternative stimulus and researcher-present disrupters, and inconsistent disruption across rich and lean components with the prefeeding and movie disrupter tests.

Much of the translational work has focused on examining conditions that influence the persistence of challenging behavior when intervention conditions are challenged and ways to mitigate the effects of those disruptions (e.g., Fisher et al., 2018; Wacker et al., 2011). For instance, functional communication training (FCT) for challenging behavior that has been informed by functional analysis is an effective, evidence-based intervention (Carr & Durand, 1985), but both unplanned (e.g., the communication device is not working) or planned (e.g., schedule thinning) lapses in procedural fidelity can result in resurgence of the challenging behavior (e.g., Schieltz et al., 2017). Fisher et al. (2018) based their FCT procedures on BMT by programming a lean reinforcement rate for challenging behavior during baseline and FCT phases and extending the time spent in the functional communication training phase to create a history in the lean context. In this way, they attempted to prevent increasing the overall reinforcing value of the context to make the challenging behavior less persistent. They found that rates of challenging behavior were substantially lower than in a control condition.

There have been fewer studies investigating the persistence of desirable behaviors under distracting conditions (Mace et al., 1990; Parry-Cruwys et al., 2011; Ringdahl et al., 2018; 2023; Romani et al., 2016; Vargo & Ringdahl, 2015, see Schieltz et al., 2025 for a review). For instance, Mace et al. (1990) had two adults with moderate to severe intellectual disability sort red and green silverware in a multiple schedule with rich and lean reinforcement schedules. Disruption tests consisted of a preferred video played throughout the session, and rates of sorting decreased more in the lean than the rich components for both participants. Similarly, Parry-Cruwys et al. (2011) presented academic and leisure tasks in a multiple schedule with differing reinforcement rates to children, aged 4-to-13 years and diagnosed with autism spectrum disorder. In test sessions, distracting stimuli included toys placed on the desk or a video playing. For five out of six participants, results showed that resistance to distraction was greater in the rich condition than in the lean condition. Additionally, Romani et al. (2016) investigated persistence of challenging behavior maintained by negative reinforcement and academic task completion in three children. In baseline, participants were asked to complete a work task. Challenging behavior resulted in a 30 s break, and completing the task resulted in the presentation of the next request. In the next phase, task completion was reinforced with a 30 s break on a fixed-ratio 1 schedule and challenging behavior was placed on extinction. Once consistent task completion was obtained, reinforcement schedules were manipulated to create rich and lean contexts. Finally, persistence of both behaviors was assessed in an extinction phase. All three participants demonstrated greater response persistence in the context associated with the richer reinforcement schedule when reinforcement was disrupted.

The extension of the BMT framework to desired behaviors in more naturalistic settings suggests its potential to aid in understanding the persistence of adaptive behavior as well as challenging behavior. However, much of this work has involved individuals with intellectual and/or developmental disability diagnoses. For example, in a recent review of the literature of BMT in humans, Trump et al. (2021) found that 65% of the participants were under the age of 18 years and only 14% did not have a diagnosis. There

is a lack of research looking at persistence of non-clinically relevant behavior, particularly in adults and people without intellectual disability. One context in which studying behavioral persistence seems especially important is caregiving.

It is important to understand not only how to reduce the persistence of challenging behavior that has already undergone successful treatment when the treatment conditions are challenged, but also how to increase the persistence of safe caregiving behavior. That is, research should also focus on understanding how target caregiving behaviors respond to desired and challenging behavior by the child. Two studies have examined resurgence of undesirable caregiving behavior in the functional communication context but did not examine persistence from a BMT framework (Mitteer et al., 2018; Williams et al., 2023). Both studies used two analog settings, one designed to resemble a home environment and the other to resemble a clinic environment. Baseline sessions took place in a home setting, where a research confederate engaged in challenging behavior according to a script and undesirable caregiver behavior (e.g., delivery of an edible or praise) terminated the challenging behavior. Then participants were taught in the clinic setting how to implement the functional communication intervention using behavior skills training. This was followed by the opportunity to implement the intervention with the confederate, still in the clinic setting. Finally, treatment adherence was challenged in a return to the home setting in which the confederate engaged in the challenging behavior and functional communication responses regardless of the participants' behavior. The results of both studies showed that the frequency of undesirable caregiver behaviors decreased in training and resurged when challenged in the home setting.

Although these extensions (Mitteer et al., 2018; Williams et al., 2023) focused primarily on clinical contexts, they raise the broader question of whether the BMT framework can contribute to understanding the persistence of socially important behavior in everyday life. One area in which it would be advantageous to promote behavioral persistence is caring for an infant, particularly during episodes of prolonged or inconsolable crying. Infant crying is a typical and expected part of infant development (Barr, 1990) that may serve as an early method of communication (Carollo et al., 2023; Cecchini et al., 2007). Crying tends to increase over the first few weeks of life, peaking at about two-to-three hours per day at six weeks before declining to about one hour per day by 12 weeks (Muller et al., 2022), although there is wide variability in reported cry durations across infants and cultures (Vermillet et al., 2022). Infant crying functions as a survival mechanism because cries elicit holding, feeding, and other responses in caregivers across cultures (Bruzek et al., 2024; Lockhart-Bouron et al., 2023).

Excessive infant crying has been reported to occur in approximately 20% of infants and can be defined as uncontrollable crying for more than three hours per day, three or more times a day, for at least one week (Muller et al., 2022). Inconsolable crying is crying that does not respond to attempts by caregivers to provide comfort (Khan, 2022). Inconsolable infant crying can have negative effects on caregivers and the caregiver-child relationship. For example, caregivers who experience inconsolable crying are more likely to report feelings of frustration (Fujiwara et al., 2011), distress (Miller et al., 1993), and depression and anxiety (Britton, 2011; Petzoldt, 2018). In addition, inconsolable crying is associated with lower-

quality interactions between caregivers and infants (Bruzek et al., 2024; Fairbrother et al., 2014). Finally, infants are more likely to suffer negligence, harm, or fatality if parents are unable to soothe and end inconsolable crying (Adamsbaum et al., 2010; Barr et al., 2005). For example, abusive head trauma (shaking or hitting the infant's head) can result in subdural hematoma, cerebral edema, retinal hemorrhage, and death (Barr et al., 2006), and inconsolable crying is often cited as the eliciting factor (Barr, 2012; Stewart et al., 2015).

Research suggests that inconsolable crying is only the result of serious etiology in 5% of cases (Khan, 2022). This suggests other sources of control, such as social positive or negative reinforcement, for most inconsolable crying. Behavior analytic work in this area has shown that infant crying is often an aversive stimulus for participants (Bruzek et al., 2025) and that behavior that terminates the crying is maintained by negative reinforcement (Bruzek et al., 2024; Glodowski & Thompson, 2017; Thompson et al., 2011; Witts & Bruzek, 2022). For example, in Thompson et al. (2011), participants interacted with a simulated infant in a research room that contained a crib with a tape recorder attached to its underside. During reinforcement sessions, the cry recording would start, and the cry would stop contingent on the participant engaging in one of the three defined behaviors; crying would begin again if the target behavior ceased for 3 s. In extinction sessions, no target behavior terminated the cry. Overall, the results indicated that caregiving behavior of nine participants was controlled by escape from the recorded cry. Bruzek et al. (2009, Experiment 1) extended this research by demonstrating resurgence of caregiving behaviors that were maintained by negative reinforcement. In an initial baseline phase, engaging in Target Behavior 1 (e.g., rocking) resulted in termination of the crying. Next, Target Behavior 1 was placed on extinction and engaging in a second behavior (e.g., feeding) was reinforced. Finally, extinction was programmed for both caregiving behaviors. In the final extinction session, there was a resurgence of Target Behavior 1 for five of seven participants. More recently, Witts and Bruzek (2022) demonstrated that negative reinforcement can also control undesirable caregiving behaviors, such as the intensity of shaking a simulated infant.

Because infant crying can at times be intractable, it is important to understand the factors that influence the persistence of caregiver behavior so that positive caregiving behaviors may be strengthened (e.g., rocking, feeding, laying down) and the likelihood of negative caregiving behaviors may be reduced. Previous research on behavioral persistence in the BMT literature indicates that the overall reinforcing value of a setting/environment influences the persistence of behavior in challenging situations (Craig et al., 2024; DeLeon et al., 2015; Smith & Greer, 2023; Trump et al., 2021). Specifically, behavior that has been reinforced in an overall richly reinforcing context is more resistant to challenges (extinction, environmental distractions) than behavior that has been reinforced in a relatively lean context, even if the rate of obtained reinforcement for the target behavior is the same in both environments. The current study will extend the literature on behavioral persistence to positive caregiving behaviors in two experiments using the BMT framework. Participants were asked to care for a simulated infant in two different settings, each associated with a different reinforcement rate. In Experiment 1, the disrupting condition was extinction, which was meant to model situations in which the caregiving behavior is no longer effective in consoling crying. In Experiment 2, the disrupting condition was a competing task,

which was meant to model a situation in which a caregiver is simultaneously caring for an infant and trying to complete an important task. The competing task was a series of questionnaires the participants were asked to complete. If persistence of caregiving behavior is sensitive to contextual reinforcement as predicted by BMT, there should be greater reductions in target caregiving behaviors in the lean compared to the rich reinforcement setting.

Experiment 1

Method

Participants

The participants were six undergraduate students recruited using convenience sampling via SONA (<https://www.sona-systems.com/>), a participant management system used by the university. All the participants self-reported that they were female, ranging in age from 18 to 21 years (mean = 19.5 years). In addition, five of the participants self-reported that they were white and one reported that they were Arab. None of the participants indicated that they had children, but four (P1, P2, P3, and P5) indicated having childcare experience (caring for siblings, working at summer camp, and babysitting) with children ranging in age from one to 11 years. Participants received course credit and a \$20 gift card for participation. All participants signed a consent form that had been approved by the university's institutional review board.

Setting and Materials

Research sessions took place in two different research rooms on campus. The research rooms were both located in the same building, but on different floors. The rooms are identified as the “downstairs” and “upstairs” labs. Both rooms were arranged to resemble a living room and contained materials needed to care for an infant (see Figure 1). The downstairs lab contained a couch, a changing table, a highchair, a child bean bag chair, two child-sized chairs, toys (rattles, blocks, Legos, a chipmunk puppet, and flashcards with images on them), and bottles to feed the baby. The upstairs lab contained a couch, a bouncy seat, a child-size table and chair, toys (children's books, a rattle, a bunny puppet, a small ball, and a musical piggy bank), and bottles. Finally, each room contained a one-way window that allowed researchers to view the participant from an adjacent room, but the participant could not view the researchers.

In each lab, participants interacted with the same simulated infant: a RealCare Baby® 3 Infant Simulator (see Figure 2) obtained from RealityWorks. The infant simulator can be programmed to cry and respond to specific caregiving behaviors with the cessation of crying. However, the infant simulator programming did not allow the researchers to manually turn crying on and off based on participant behavior. To do this, a mini speaker (MOMOHO mini Bluetooth speaker) was attached to the back of the simulator, underneath the simulator's clothes. This speaker was connected via Bluetooth to the research assistant's cell phone. The phone was used to play a pre-recorded sound of a baby crying freely available

on YouTube (<https://www.youtube.com/watch?v=oL2B-AAAnsHo>). The researcher could start and stop the audio file using their phone.

Each room contained audio-visual equipment to record sessions. The downstairs lab contained three video cameras mounted on the ceiling, connected to a computer in an adjacent room running Mangold software (<https://www.mangold-international.com/en/research/products/observation-labs>). The software allowed the researcher to manually start and stop the recording and saved a separate video file from each camera to the computer. The upstairs lab contained two iPads mounted on tripods. Sessions were recorded by beginning a Zoom meeting from a computer in the adjacent observation room with each iPad as a “participant” in the meeting. In this way, the recordings from both iPads had identical start and stop times. For both research labs, cameras and iPad placement meant that participants were visible regardless of where they were in each room. Additional materials included timers (CZBRO digital kitchen timer) used by research assistants to time turning off the crying audio and session intervals and a pre-determined list of intervals used to terminate crying on a variable-time (VT) schedule (described below). Finally, prior to the start of the first session, participants were offered earplugs. Earplugs were available throughout the study, but no participant used them.

Dependent Measures and Experimental Design

Sessions were set up in a free operant manner such that participants completed a baseline and test session in one room followed by a baseline and test session in the second room (i.e., an alternating treatments design). Prior to each session, a target caregiving behavior was determined for each participant: feeding, playing, or rocking. Feeding the baby was defined as the participant putting the bottle to the baby’s lips. Playing with the baby was defined as the participant simultaneously interacting with the baby and the toy. For example, playing would be recorded if the participant shook the rattle in the baby’s eyeline or if the participant threw and caught the ball while facing the baby and within the baby’s eyeline. Playing was not recorded if the participant interacted with any of the toys outside of the baby’s eyeline or for any interactions with the baby without a toy. Rocking the baby was defined as the participant holding the baby in either a vertical or horizontal position and moving it side-to-side (i.e., horizontal rocking) or up-and-down (i.e., vertical rocking). Rocking was not recorded if the participant laid the baby on their legs while in a seated position and bounced their legs up and down or if the participant held the baby while standing and repeatedly flexed their knees to create an up-and-down bouncing motion. The duration engaged in the target behavior was recorded for each session and the primary dependent measure was proportion baseline responding, which was calculated as the duration the participant engaged in the target behavior during the test session divided by the duration engaged in the target behavior during the previous baseline session.

Procedure

When participants arrived for a session, they were asked to review the informed consent form. If a participant chose to participate, a research assistant accompanied them into either the downstairs or upstairs lab, depending on their counterbalancing assignment. No participant declined to participate

after reading the consent form. Participants were asked to leave all their belongings, including cell phones, with the researcher in the observation room throughout the study.

Participants completed four 20-min sessions, two in each research lab. The first two sessions took place in one lab (e.g., downstairs), which was followed by a 5-min break. Then the remaining two sessions took place in the other lab (e.g., upstairs). At the beginning of each session, the researcher ensured that the infant simulator (i.e., the baby) was placed either in the highchair (downstairs lab) or the bouncy seat (upstairs lab). At the start of the first session, participants were told that the study's purpose was to learn about how people interact with infants. They were introduced to the baby and told that they could interact with her however they liked. Participants were told that the baby might cry and that they were free to use the ear plugs. Finally, they were shown the bottle and the different toys available in the room. The researcher further explained that they would be in the next room and would return after 20 min when the session was over. At the beginning of the remaining three sessions, the researcher reminded the participants that they could interact with the baby however they liked. Participants were not told the reinforcement contingencies and none of the target behaviors were described to them.

After giving the instructions, the researcher left the lab, started the video recording from the observation room, and began the session. Each session started with the baby crying. Sessions 1 and 3 were designated baseline sessions during which engaging in a pre-determined caregiving behavior (i.e., feeding, rocking, or playing) resulted in the cessation of crying. One baseline session (e.g., in the downstairs lab) was designated as a "lean" reinforcement context and the other (e.g., in the upstairs lab) was designated as a "rich" baseline context. For lean baseline sessions, engaging in the target caregiving behavior resulted in the cessation of crying for 30 s. For rich baseline sessions, engaging in the target caregiving behavior resulted in the cessation of crying for 30 s, as in the lean condition. In addition, at times pre-determined based on a VT 1-min schedule, the crying stopped regardless of caregiver behavior. In this way, the overall programmed reinforcement (lack of crying) in the rich condition was greater than that in the lean condition (cf. Nevin et al., 1990).

Sessions 2 and 4 were designated as extinction test sessions. In these, engaging in the target caregiving behavior no longer stopped the crying (i.e., crying continued throughout the duration of the session). Extinction sessions lasted for 20 min or until 5 consecutive minutes elapsed in which the participant did not engage in the target caregiving behavior. Which research lab served as the rich versus lean context, which lab was experienced first, and the target caregiving behavior was counterbalanced across participants (see Table 1). The target behavior was feeding for two participants, playing for two participants, and rocking for two participants. If at any time the participant engaged in behaviors that could be interpreted as harmful or dangerous (e.g., shaking the baby), the research protocols indicated that the session would be terminated and the participant would be dismissed. However, this did not occur.

After completing the four sessions, the participants completed a demographic survey and answered questions about their previous childcare experience. Once the surveys were completed, the participants

were debriefed and thanked for their participation in the study. The researcher then sent participants an electronic gift card and awarded course credit within the SONA system.

Inter-observer Agreement and Procedural Fidelity

All sessions were recorded and the duration in seconds each participant engaged in the target caregiving behavior was measured from the recordings using BDataPro software (Bullock et al., 2017) by a research assistant. The research assistant was blind to the reinforcement contingencies programmed for each session and was only told which target behavior to score for each session. In addition, the total time crying occurred in seconds throughout the session was recorded by a research assistant. Due to a camera malfunction, there was no sound in the videos for Sessions 3 and 4 for P2.

To ensure reliability in observations, the first author and the research assistant reviewed one video together and came to a consensus. Then, each independently scored one additional video and subsequently watched the video together to resolve disagreements. The research assistant then independently scored all the remaining session videos. To measure inter-observer agreement (IOA), the first author scored a random sample of 38% of sessions (i.e., nine of 24 sessions across the six participants), excluding sessions used to establish reliability. IOA was calculated for four baseline sessions and five extinction sessions by dividing the smaller duration by the larger duration and multiplying by 100 for each session. IOA averaged 97.6% (range: 94.2–100%) for baseline sessions and 96.3% (range: 92.4–99.1%) for extinction sessions.

Videos from 33% (four of 12) of the baseline sessions were also checked by the first author to ensure correct implementation of the reinforcement and contingencies. Baseline videos were reviewed to determine the frequency that crying was turned off when the participant engaged in the target behavior. The cessation of crying within 2 s of the participant engaging in the target behavior was scored as a “+” and crying for longer than 2 s with the participant engaging in the target behavior was scored as “-.” Procedural fidelity was calculated by adding all the + and dividing by all + and – and multiplying by 100. Across all baseline sessions, procedural fidelity was 100%. Because the duration of crying was measured in all videos, whether crying occurred throughout the entire extinction test sessions could be determined from those data. Crying was recorded for the entire duration of the session for all the extinction sessions.

Results

Baseline

Table 2 shows the duration of each 20-min session the participant engaged in the defined target caregiving behavior. The gray shading indicates the participants who experienced the lean condition prior to the rich. There was considerable variability across participants in the duration they engaged in the target behavior during reinforcement. The mean duration was 408.9 s (or 34.1%) of the rich baseline session (range, 75.8 s–972.8 s) and 619.8 s (or 51.6%) of the lean baseline session (range, 151.5 s–

1,088.4 s). This pattern replicates prior studies showing higher response rates in lean than rich components when the rich component consists of a VI reinforcement schedule combined with a VT schedule (e.g., Nevin et al., 1990).

Table 3 depicts the percentage of each baseline session that the participants experienced crying. Generally, the participants did not experience a lot of crying during baseline sessions: Across all participants and baseline sessions, the percentage of the session with crying did not exceed 34%. Four participants experienced crying in only 10% or less of the session. Overall, however, the mean percentage of the session with crying was only slightly higher in lean baseline sessions (17.1%) than rich baseline sessions (15.1%). For three participants (P1, P3, and P5), a greater percentage of the lean baseline sessions had crying than the rich baseline sessions (as programmed), but the difference between these components was small. P4 experienced more crying in the rich than the lean baseline session and P6 experienced a similar percentage of crying in both session types. Note that duration crying could not be determined for the rich session for P2 due to equipment failure.

Extinction Test Sessions

Sessions 2 and 4 for each participant were extinction test sessions. Table 2 shows the duration each participant engaged in the target caregiving behavior in extinction after the corresponding rich and lean reinforcement baseline sessions. Mean duration engaging in the target behavior was similar in the rich (222.8 s, range, 111.9s–317.7 s) and lean (223.4 s, range, 39.9 s–414.3 s). For the rich extinction sessions, P1, P3, and P5 engaged in the target behavior more compared to the previous reinforcement session, indicating an extinction burst. In all other cases, there was less responding in extinction relative to reinforcement. Table 3 indicates that all participants experienced crying for the entire extinction session. Most participants experienced 20-min extinction sessions. Extinction sessions ended early for P4 rich (17.2 min) and P6 rich (12.6 min) because they met the session termination criterion.

Responding during the extinction sessions was also analyzed as a proportion of baseline responding (see Figure 3). Proportion baseline responding was calculated by dividing the duration the participant engaged in the target behavior during extinction by the duration they engaged in the behavior in the corresponding baseline session. The black bars in Figure 3 indicate proportion baseline for the rich session and the gray bars indicate proportion baseline for the lean session. These data show that there was more disruption in extinction following the lean reinforcement condition than following the rich for P1, P2, P3, and P5. Proportion baseline was similar in the rich and lean sessions for P4; for P6, there was more disruption after the rich component than the lean. Finally, it should be noted that P4 and P6 were the only two participants who did not experience more crying in the lean than the rich baseline sessions.

Discussion

The purpose of Experiment 1 was to extend analysis of behavioral persistence to caregiving behavior within the BMT framework. This was a translational experiment with undergraduate participants in a simulated home setting. The primary finding was that caregiving behavior was more

resistant to extinction in the rich reinforcement context than the lean context for four of the six participants. This provides preliminary support for extending analysis of behavioral persistence to socially important behavior outside of clinical settings, such as caregiving behavior, using the BMT framework. It is noteworthy that the effect was evident even though the direct contingency for the target behavior was the same in both the lean and rich contexts. In other words, in both contexts, engaging in the target behavior resulted in 30 s of the cessation of crying. However, in the rich context, crying was also terminated regardless of participant behavior on a VT schedule (cf. Nevin et al., 1990). This latter manipulation was intended to alter the overall reinforcing value of the context and is consistent with BMT's assertion that persistence is determined by the stimulus-reinforcer contingency rather than the response-reinforcer contingency (Nevin et al., 1983).

There was substantial variability in baseline durations of caregiving behavior across participants, with some participants engaging in the target behavior for less than 10% of the session (e.g., P1 rich baseline) and others doing so for approximately 75% of the session. There does not appear to be a correlation between baseline duration of engagement and type of caregiving behavior. Generally, participants engaged in longer durations of the target behavior in the lean session than the rich, which replicates prior research measuring response rates (e.g., Lionello-DeNolf et al., 2010). This finding illustrates that longer durations of responding did not correspond to greater persistence, providing additional support for the notion that response rate and persistence are separate dimensions of response strength (Nevin, 1974).

One reason that some participants had low engagement in the target behavior could be the relatively short baseline session. Because participants only experienced one 20-min baseline session in each environment, the baseline session may not have provided sufficient exposure to the programmed contingencies to establish stable patterns of responding. Nonetheless, the amount of reinforcement experienced was enough to differentially affect persistence in the two contexts for four (P1, P2, P3, and P5) of the six participants.

There are two potential reasons why two participants (P4 and P6) did not show greater persistence of caregiving behavior in rich rather than lean context. First, neither participant reported prior caregiving experience, whereas the other four participants did have prior experience from past jobs or caring for siblings. Possibly the prior experience of these four participants had established a reinforcement history for the target behaviors used in the current study that generalized to the current set up. Future research could explore differences in persistence between participants with and without experience caring for infants. Second, although the experimental protocols programmed more crying to occur in the lean than the rich context, P4 and P6 did not experience this difference: P4 experienced more crying in the programmed rich context than the lean and P6 experienced a similar amount of crying in both contexts. This occurred because both participants performed the target behavior for long durations at a time, which prevented the crying from occurring for most of the baseline sessions. Because P4 and P6 experienced similar or greater amounts of crying in the rich context, the programmed distinction between rich and lean reinforcement contexts was not maintained in their

actual experience. Thus, their results highlight the importance of the reinforcement context actually experienced by the participant.

When caring for a young infant, it is typical for caregivers to experience periods of extended crying that might not respond to appropriate caregiving behavior (Khan, 2022; Muller et al., 2022). There has been a focus on developing training materials for caregivers regarding crying and appropriate responses to it (e.g., to walk away; Barr et al., 2009; Fujiwara et al., 2012). The results of Experiment 1 suggest that the broader history of contextual reinforcement associated with caregiving behaviors may influence whether caregivers continue with behaviors that no longer stop crying or soothing the baby.

The results of Experiment 1 suggest that the persistence of caregiving behavior may be sensitive to the overall reinforcement context when the response-reinforcer contingency is disrupted by extinction. However, extinction represents a relatively extreme disruption (i.e., extended or inconsolable crying is limited to the first several weeks of life). In everyday caregiving situations, caregivers often need to care for the infant while simultaneously attending to other demands, such as caring for other children or work tasks. These competing demands may disrupt caregiving behavior without eliminating the consequences for engaging in it. Thus, the purpose of Experiment 2 was to examine persistence of caregiving behavior under competing demands rather than extinction.

Experiment 2

In Experiment 2, the disrupting condition was the presentation of an additional task, which is analogous to situations in which a caregiver is trying to complete work while caring for an infant. In test sessions, participants were asked to complete a series of long surveys. We attempted to set up a motivating operation for completing the surveys by telling the participants that the survey responses were very important for the results of the study and that they needed to finish them within the session. Based on the BMT framework, we expected participants to interact less with the infant simulator in the lean test session than the rich.

Method

Participants and Setting

The participants were five undergraduates and one graduate student recruited using convenience sampling via SONA or via word of mouth. Based on self-report, five participants were female and one was male; all were white. They ranged in age from 18 to 30 years (mean = 20.8 years). None of the participants indicated that they had children, but five (P7–P11) indicated having childcare experience (caring for siblings, working at summer camp, and babysitting) with children ranging in age from 10 weeks to 14 years. Undergraduate participants received course credit and all participants received a \$20 gift card for participation. All participants signed a consent form that had been approved by the university's institutional review board.

The study took place in the same two research rooms as Experiment 1 and used the same infant simulator and related materials. In addition, the following surveys were used as competing tasks in distracter test sessions. Surveys were chosen based primarily on length and being on a topic that we thought the participants would perceive as relevant to the study. The surveys were compiled into Set 1 and Set 2. Set 1 contained the WHOQOL-BREF (World Health Organization, 2004) and the Parental Authority Questionnaire (PAQ; Buri, 1991). The WHOQOL-BREF is a 26-item questionnaire developed by the World Health Organization that measures respondents' subjective quality of life. It includes five domains: physical health, psychological health, social relationships, environment, and general items about quality of life and general health. The PAQ evaluates how respondents retrospectively perceive the parenting strategies of their caregivers during their upbringing. It consists of two sets of 30 items rated on a five-point scale; one set is used to evaluate the respondent's mother, and the other is used to evaluate the respondent's father. We used both sets in this study. Set 2 contained the Personality Diagnostic Questionnaire 4th Edition Plus (Bagby & Farvolden, 2004), which is a self-report screening tool used to evaluate symptoms of personality disorders. It contains 99 true or false questions about long-standing behavioral patterns, emotional responses, and interpersonal styles.

Procedure

The general procedures were the same as in Experiment 1. Participants completed four 20-min sessions, two in each research lab. The first two sessions took place in one lab, and the remaining two sessions took place in the other lab. Participants were offered a 5-min break between Sessions 2 and 3. As before, Sessions 1 and 3 were designated baseline sessions during which engaging in a pre-determined caregiving behavior resulted in the cessation of crying. One baseline session (e.g., in the downstairs lab) was designated as a "lean" reinforcement context and the other (e.g., in the upstairs lab) was designated as a "rich" baseline context. For lean baseline sessions, engaging in the target caregiving behavior resulted in the cessation of crying for 30 s. For rich baseline sessions, engaging in the target caregiving behavior resulted in the cessation of crying for 30 s, as in the lean condition. In addition, at times pre-determined based on a VT 1-min schedule, the crying stopped regardless of caregiver behavior. Sessions 2 and 4 were designated as distracter test sessions. At the beginning of these sessions, participants were handed a clipboard with either the Set 1 or Set 2 surveys and a pen. Which set was paired with the rich or lean context was counterbalanced across participants (see Table 1). Participants were asked to complete the forms during the session while they were interacting with the infant simulator. Further, they were told that it was important for the study that the forms be completed within the session. During the distracter sessions, crying occurred as it did in baseline sessions, and the target caregiving behavior terminated the crying for 30 s. Also, in the rich context, crying continued to stop on the VT 1-min schedule. The target behavior was feeding for two participants, playing for two participants, and rocking for two participants.

After completing the four sessions, the participants completed a demographic survey and answered questions about their previous childcare experience. Once the surveys were completed, the participants were debriefed and thanked for their participation in the study. The researcher then sent participants an

electronic gift card and awarded course credit within the SONA system, if applicable. Because the survey responses were not being used as a dependent measure, they were shredded directly after the sessions and not included in the analysis of the results.

Inter-observer Agreement and Procedural Fidelity

All sessions were recorded and the duration in seconds each participant engaged in the target caregiving behavior was measured by a research assistant as in Experiment 1. In addition, we measured the duration in seconds each participant completed the forms. The research assistant was blind to the reinforcement contingencies programmed for each session and was only told which behaviors to score for each session. In addition, the total time crying occurred in seconds throughout the session was recorded. Procedures to establish reliability and measure IOA were the same as in Experiment 1. IOA was calculated for four baseline sessions and five distraction sessions. IOA averaged 97.4% (range: 92.2%–99.1%) for baseline sessions and 98.5% (range: 97.2%–99.8%) for distraction sessions.

Videos from 33% (four of 12) of the baseline and 33% of the distraction sessions were also checked by the first author to ensure correct implementation of the reinforcement contingencies using the same methods as in Experiment 1. Across the baseline sessions, there was one instance in which crying was not terminated when the participant engaged in the target behavior (P9 lean session). No other lapses in procedural fidelity were observed.

Results

Baseline

Table 4 shows the duration of each 20-min session the participants engaged in the defined target caregiving behavior. The gray shading indicates the participants who experienced the lean condition prior to the rich. During reinforcement, the target behavior was emitted more during the lean session (mean of 49% of the session) than the rich session (mean of 37% of the session), similar to Experiment 1. There was also variability across participants in the duration they engaged in the target behavior during reinforcement, which ranged from 185.7 s to 723.1 s in the lean session and 259.2 s to 539.8 s in the rich session.

Table 5 depicts the percentage of each baseline session that the participants experienced crying. As in Experiment 1, the participants did not experience a lot of crying during baseline sessions. The mean percentage of the session with crying was 19% (range, 6.6%–36.3%) in the rich session and 26.1% (range, 9.9%–57.4%) in the lean session. Five participants (P8–P12) experienced crying for a greater percentage of the lean baseline session than the rich. P1 experienced more crying in the rich than the lean baseline session.

Distraction Sessions

Sessions 2 and 4 for each participant were distraction test sessions in which participants were asked to complete surveys while caring for the simulated infant. Table 4 shows the duration each participant engaged in the target caregiving behavior in distraction after the corresponding rich and lean reinforcement baseline sessions as well as the duration they completed the forms. Mean duration engaging in the target behavior was similar in the rich (440.6 s, range, 209.1 s–646.4 s) and lean (485.2 s, range, 156.5 s–956.9 s) distraction sessions. There was less responding in distraction relative to reinforcement in all instances except for P7 rich distraction session and P8 rich and lean distraction sessions. Participants spent a similar amount of time completing the forms in the rich (632.7 s, range, 515.0 s–777.2 s) and lean (676.7 s, range, 357.3 s–832.9 s) distraction sessions.

Responding during the extinction sessions was also analyzed as a proportion of baseline responding (see Figure 4), which was calculated as in Experiment 1. These data show that there was more disruption in the distraction session following the lean reinforcement condition than following the rich for P9 and P10. Proportion baseline was similar in the rich and lean sessions for P11; for P12, there was more disruption after the rich component than the lean. P7 and P8 did not show evidence of disruption. For both participants, there was equal or more responding during the distraction session than in the previous baseline components.

Discussion

In Experiment 2, participants were exposed to distraction test sessions in which they were asked to complete a competing task (a lengthy series of surveys) while simultaneously caring for the infant simulator. During baseline sessions, participants experienced less crying overall in the rich than the lean condition, consistent with the programmed reinforcement schedules. However, in distraction sessions, greater disruption to caregiving behavior in the lean than the rich component was found in only two of the six participants (P9 and P10). The remaining participants did not show a consistent pattern, as there was little difference between sessions for one participant, the opposite pattern for another participant, and no evidence of the forms functioning as a competing task for two participants. Overall, the results of Experiment 2 show minimal evidence for the prediction that caregiving behavior would be more resistant to disruption in the richer context, as predicted by BMT.

One reason that the results of Experiment 2 differed from those of Experiment 1 is that the former tested disruption through response competition rather than suspension of the reinforcement contingencies. Thus, participants could still access reinforcement by continuing to engage in the target behavior during distraction sessions. It is possible that the competing response interacted with the specific target behaviors across participants in ways that were not anticipated prior to the experiment. For instance, both participants who emitted more target behavior during distraction sessions than baseline sessions (P7 and P8) had feeding as the target behavior. For these participants, it was possible to simultaneously engage in feeding (thereby accessing reinforcement) and complete the forms. Review of the session videos indicates that both participants sat on the couch with the baby cradled in one arm, which they also used to hold the bottle at the baby's mouth, while completing the forms with their other

hand throughout most of the session. The two participants (P9 and P10) who showed greater disruption in the lean component had playing as the target behavior. Because the definition of playing involved interacting with a toy and the baby simultaneously, it was difficult to engage in both the target and competing behavior at the same time. Thus, the survey task functioned more clearly as a competing response for playing than for feeding. Finally, the remaining two participants showed inconsistent disruption patterns, and both had rocking as a target behavior.

Overall, the results of Experiment 2 are consistent with prior evidence that resistance-to-change can vary as a function of the type of disruption introduced. For example, Lionello-DeNolf et al. (2010) showed greater persistence in the rich component of a human operant task by children with intellectual disability when the distracting condition was an alternative stimulus presented on the touchscreen or when a researcher entered the room and delivered non-contingent food and praise, but not when a movie was played during the session. Future research should continue to explore the types of stimuli that function as competing tasks for caregiving behaviors and how those tasks might interact with specific caregiving behaviors.

The competing task used during distraction sessions was chosen to model situations in which a caregiver is simultaneously caring for an infant and completing a work task. We attempted to establish a motivating operation for the participants to complete the surveys by stressing the importance of the survey responses and that they needed to be completed during the session. Overall, the participants spent similar durations completing the forms in both components. There was no consistent pattern across participants, but it should be noted that P9 and P10 both spent less time completing the forms in the rich than the lean component, consistent with their proportion baseline data. However, the results of the current experiment do not provide a direct behavioral measure of whether the manipulation successfully established the survey task as sufficiently valuable to compete with caregiving. Future research should verify that completing the alternative task has enough value to compete with caregiving.

General Discussion

The purpose of this study was to extend the analysis of behavioral persistence to appropriate caregiving behaviors within the BMT framework. Previous clinical behavior-analytic work on caregiving behavior has assessed resurgence of inappropriate caregiving behavior within the context of functional communication training (Mitteer et al., 2017; Williams et al. 2023) but did not examine persistence from this perspective. The current study further explored caregiving behavior, but outside of a clinical context by examining persistence of appropriate responses to infant crying. This is a socially relevant behavior because infant crying is ubiquitous (Barr, 1990) and can at times be excessive and inconsolable (Khan, 2022; Muller et al., 2022), potentially eliciting unwanted behavior (Barr et al., 2006). Failure of appropriate caregiving behaviors to persist, or persistence of inappropriate behaviors, can have potentially dangerous consequences for an infant (i.e., abusive head trauma; Barr et al., 2006).

Participants in both experiments interacted with a simulated infant in rich or lean reinforcement contexts and then were exposed to extinction (Experiment 1) or competing task (Experiment 2) test sessions. Experiment 1 provides preliminary evidence that caregiving behavior was more resistant to extinction following the richer reinforcement context for most participants. Experiment 2, however, provided less consistent evidence when the disruption was the competing task, as there was greater disruption in the rich than the lean condition for only two participants.

From the perspective of BMT, greater resistance to disruption was expected in both the current experiments. By contrast, this study suggests that the effect of reinforcement context was not consistent across disruption types. Gladowski and Thompson (2017) may provide an additional perspective on the role of competing activities in caregiving. They exposed undergraduate participants to recordings of infant crying that could be terminated by pressing a button on a computer and measured participant latency to pressing the button. In some sessions, additional activities (puzzles, cell phones, etc.) were present. The results indicated that, for some participants, engagement in a distracting task increased latencies to terminate the crying. This suggests that the role of competing activities as disrupters is complex and effects may depend on how the activity changes the broader context in which caregiving occurs.

The results of the current study extend prior translational behavior-analytic work showing that infant caregiving behavior is influenced by reinforcement contingencies and extinction procedures (Bruzek et al., 2009; Gladowski & Thompson, 2017; Thompson et al., 2011; Witts & Bruzek, 2022) and that infant crying often functions as an aversive stimulus (Bruzek & Witts, 2024; Witts & Bruzek, 2024). The current research extended this work by investigating what determines whether an appropriate caregiving response continues when the environmental context changes through an initial exploration of this topic in a translational preparation. We used simulated infants, student participants who were not primary caregivers, and relatively brief exposure to the contingencies. Thus, additional translational research is needed to further explore the role of different contextual reinforcement variables on the persistence of a range of caregiving behaviors, both appropriate and inappropriate. Further, conclusions based on the current data are limited by lack of diversity in our sample. There are likely cultural (Bruzek & Witts, 2025) and other demographic differences in response to infant crying that may not be apparent in a small sample of college students.

The reinforcement contingencies used in the current study differ from those in previous infant caregiving studies (Bruzek et al., 2009; Thompson et al., 2011). For example, in both Bruzek et al. (2009) and Thompson et al. (2011), participants needed to engage in the target behavior for 3 s before crying ceased for 3 s. By contrast, in the current study, there were no requirements on the duration of caregiving behavior prior to the cessation of crying (e.g., 1 s of holding the bottle to the lips resulted in the cessation of crying). Further, target behavior terminated the cry for 30 s, which is markedly longer than past studies. The reinforcement contingency used in the current study was based on a recent study in our lab (Pantano et al., 2026) replicating Thompson et al. In Pantano et al., 19 participants experienced alternating sessions of no reinforcement or negative reinforcement in which engaging in a target

caregiving behavior terminated crying for 30 s. Sessions took place in the downstairs lab used in the current study and showed that time spent engaging in the target behavior was lower in no reinforcement than reinforcement conditions. As a result, we used the same procedures and schedules in the current study. However, the 30 s of no crying may have inadvertently decreased the distinction between the lean and rich components in the current study which may have impacted the opportunities for reinforcement across participants and the likelihood of persistence during the test sessions. Although the current parameters were sufficient to produce the predicted pattern for most participants in Experiment 1, future research should parametrically vary the duration of the cessation of crying and measure effects on persistence during disruptions.

The current procedures also differed from laboratory investigations of resistance to disruption in that we used a single relatively brief baseline session for each condition, whereas laboratory investigations with rats or pigeons as subjects will conduct baseline sessions until a predetermined level of stability in responding is obtained (e.g., Nevin, 1974; Shahan & Burke, 2004). One consideration for translational and applied work with humans is the feasibility of conducting extended baselines to stability or requiring participants (students, caregivers) to attend multiple research sessions across days or weeks. Researchers have successfully devised arrangements that do not require extended baselines (Ahearn et al., 2003; Dube et al., 2000; 2013; MacDonald et al., 2013). For example, Dube et al. (2003) used a distributed sessions procedure in which a predetermined number of baseline sessions were conducted, and test sessions were composed of both baseline and disrupter components, which allowed responding in disruption to be compared to that in baseline within sessions, thereby minimizing the potential effects of variable response rates across sessions. Similarly, Ahearn et al. and MacDonald et al. exposed participants to sessions that included four successive 5-min components and alternated whether the rich or lean condition was experienced across six sessions. Future research could modify the current procedures to use a similar framework.

One consideration is whether the stimulus-reinforcer framework of BMT provides a useful model for understanding the natural environment in which caregiving occurs. Basic and translational investigations of resistance to change typically use multiple schedules in which the rich and lean components alternate regularly within sessions and resistance is often greater in the component associated with the richer schedule (e.g., Lionello-DeNolf et al., 2010; Nevin, 1974; Nevin & Grace, 2000). However, when the rich and lean components are experienced differently, such as in single schedules, resistance to disruption is not always greater in richer schedule (e.g., Bell & Baum, 2021; Cohen, 1998; Lionello-DeNolf & Dube, 2011). For example, Cohen (1998) compared resistance to disruption in rich vs. lean schedules in rats within subjects in three different conditions: (1) blocked, in which only one schedule was experienced each session, followed by disruption tests; (2) daily alternation, in which the rich and lean schedules were every other day and disruption tests were experienced successively, and (3) the typical multiple schedule. Cohen found that resistance to disruption depended both on the training context and type of disrupter used. Specifically, typical greater resistance to change was found in the rich component for the multiple schedule condition but not for the blocked condition. In the daily alternation condition, greater resistance in the rich component was found under prefeeding disrupter

conditions but not extinction. Similarly, Lionello-DeNolf and Dube (2011) compared the effects of a competing stimulus disruption to responding on a computer task by children with autism. One group experienced rich and lean conditions alternated within session using a multiple schedule and showed greater resistance to disruption in the rich component. By contrast, the second group experienced blocked single schedules and no differences in resistance were found.

Differences in resistance to change across single-schedule and multiple-schedule arrangements pose a conceptual challenge for BMT's assertion that resistance is determined by Pavlovian stimulus-reinforcer contingencies (see Craig, 2023, and Ringdahl & O'Brien, 2026, for discussions regarding this and other challenges to BMT). Thus, an important concern is whether caregiving in the natural environments is experienced as a multiple schedule, or whether it is better characterized as another type of arrangement. It is possible to conceptualize how a caregiver may experience different contexts in which caregiving behavior experiences difference rates of reinforcement. Consider, for example, a caregiver who does not work outside of the home. The rhythm of a household may naturally change throughout the day thereby creating distinct periods (e.g., morning routine, midday, late afternoon, evening, etc.), each associated with separate discriminative stimuli (e.g., the presence of other family members, the presence or absence of sunlight, etc.) and potentially sources of reinforcement. However, it is also possible to conceptualize different arrangements, highlighting the need for additional work in this area.

Another important consideration for future translational research is that caregiving does not occur in a uniform environment. Barr (2014) noted that cultural and contextual variables influence caregiving responses, suggesting that the contingencies experienced by caregivers may differ substantially across families and settings (Bruzek & Witts, 2025). This consideration is also relevant to intervention development. Sugai et al. (2012) emphasized that intervention practices should be aligned with the cultural and contextual variables relevant to the individuals receiving the intervention. Thus, identifying contextual variables that influence persistence may be important not only for understanding caregiving behavior but also for developing interventions that are appropriate for the contexts in which caregivers and infants interact.

One common recommendation for caregivers experiencing prolonged or inconsolable crying includes placing the infant in a safe location and briefly leaving the room when necessary (Barr et al., 2009; Fujiwara et al., 2012). Although these strategies can provide caregivers with an opportunity to disengage from an aversive stimulus (Bruzek et al., 2024), a behavioral analysis of persistence raises the possibility of also teaching caregivers to recognize contextual variables that influence their own responding to infant crying. For example, future research could examine whether caregivers can be taught to identify contexts in which their caregiving behavior is more or less likely to persist and to discriminate changes in those contexts that may affect their responding. Such an approach would not replace existing strategies for managing prolonged crying but could augment them.

In summary, the current findings provide an initial demonstration of a translational analysis of behavioral persistence of infant caregiving behavior. The differences observed across the extinction and

competing-response disruption conditions highlight the importance of considering both reinforcement history and the broader context in which caregiving occurs. Continued research examining these variables may provide a better understanding of the factors that influence the persistence of caregiving behavior and inform interventions designed to support caregivers across diverse caregiving contexts.

Declarations

Ethics Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declarations and its later amendments or comparable ethical standards. This research was approved by the Assumption University IRB (#2024-48). All participants completed an informed consent form and consented to participate and include their data in the published report.

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The authors have no competing interests to declare that are relevant to the content of this article. The authors did not receive support from any organization for the submitted work.

Author Contribution

KLD and NP both contributed to the study conception, design, material preparation, and procedural protocols. KLD performed data collection and analysis. KLD wrote the first draft of the manuscript and KLD and NP both contributed to manuscript revisions. Both authors reviewed and approved the final version.

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Data Availability

The de-identified data from this study are available from the first author upon reasonable request.

References

1. Adamsbaum, C., Grabar, S., Mejean, N., & Rey-Salmon, C. (2010). Abusive head trauma: Judicial admissions highlight violent and repetitive trauma. *Pediatrics*, 126(3), 546–555. <https://doi.org/10.1542/peds.2009-3647>
2. Ahearn, W. H., Clark, K. M., Gardenier, N. C., Chung, B. I., & Dube, W. V. (2003). Persistence of stereotypic behavior: Examining the effects of external reinforcers. *Journal of Applied Behavior Analysis*, 36(4), 439–448. <https://doi.org/10.1901/jaba.2003.36-439>
3. Bagby, R. M., & Farvolden, P. (2004). The Personality Diagnostic Questionnaire-4 (PDQ-4). In M. J. Hilsenroth & D. L. Segal (Eds.), *Comprehensive handbook of psychological assessment, Vol. 2. Personality assessment* (pp. 122–133). John Wiley & Sons, Inc.
4. Barr, R. G. (1990). The normal crying curve: What do we really know? *Developmental Medicine and Child Neurology*, 32(4), 356–362. <https://doi.org/10.1111/j.1469-8749.1990.tb16949.x>
5. Barr, R. G. (2012). Preventing abusive head trauma resulting from a failure of normal interaction between infants and their caregivers. *Proceedings of the National Academy of Science*, 109(2), 17294–17301. <https://doi.org/10.1073/pnas.1121267109>
6. Barr, R. G. (2014). Crying as a trigger for abusive head trauma: A key to prevention. *Pediatric Radiology*, 44(Suppl 4), S559–S564. <https://doi.org/10.1007/s00247-014-3100-3>
7. Barr, R. G., Rivara, F. P., Barr, M., Cummings, P., Taylor, J., Lengua, L. J., & Meredith-Benitz, E. (2009). Effectiveness of educational materials designed to change knowledge and behaviors regarding crying and shaken-baby syndrome in mothers of newborns: A randomized, controlled trial. *Pediatrics*, 123(3), 972–980. <https://doi.org/10.1542/peds.2008-0908>
8. Barr, R. G., Trent, R. B., & Cross, J. (2006). Age-related incidence curve of hospitalized shaken baby syndrome cases: Convergent evidence for crying as a trigger to shaking. *Child Abuse & Neglect*, 30(1), 7–16. <https://doi.org/10.1016/j.chiabu.2005.06.009>
9. Bell, M. C., & Baum, W. M. (2021). Resistance to extinction versus extinction as discrimination. *Journal of the Experimental Analysis of Behavior*, 115(3), 702–716. <https://doi.org/10.1002/jeab.688>
10. Britton, J. R. (2011). Infant temperament and maternal anxiety and depressed mood in the early postpartum period. *Women & Health*, 51(1), 55–71. <https://doi.org/10.1080/03630242.2011.540741>
11. Bruzek, J. L., Thompson, R. H., & Peters, L. C. (2009). Resurgence of infant caregiving responses. *Journal of Applied Behavior Analysis*, 92(3), 327–343. <https://doi.org/10.1901/jeab.2009-92-327>
12. Bruzek, J. L., Thompson, R. H., & Witts, B. N. (2024). A review of crying and caregiving: Crying as a stimulus. *Perspectives on Behavior Science*, 47(1), 71–105. <https://doi.org/10.1007/s40614-023-00395-w>
13. Bruzek, J. L., & Witts, B. N. (2025). A call for standards: Identifying demographic and methodological variables in infant behavior-analytic research. *Perspectives on Behavior Science*, 48(4), 689–710. <https://doi.org/10.1007/s40614-025-00479-9>
14. Bruzek, J. L., & Witts, B. N., & Lang, H. (2025). A computer-based caregiving simulation. *Experimental Analysis of Human Behavior Bulletin*, 36, 39–44. <https://doi.org/10.17605/OSF.IO/BG7S4>

15. Bullock, C. E., Fisher, W. W., & Hagopian, L. P. (2017). Description and validation of a computerized behavioral data program: "BDTAPro." *The Behavior Analyst*, 40(1), 275–285.
16. Buri, J. R. (1991). Parental authority questionnaire. *Journal of Personality Assessment*, 57(1), 110–119. https://doi.org/10.1207/s15327752jpa5701_13
17. Carollo, A., Montefalcone, P., Bornstein, M. H., & Esposito, G. (2023). A scientometric review of infant cry and caregiver responsiveness: Literature trends and research gaps over 60 years of developmental study. *Children*, 10, 1042. <https://doi.org/10.3390/children10061042>
18. Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis*, 18(2), 111–126. <https://doi.org/10.1901/jaba.1985.18-111>
19. Cecchini, M., Lai, C., & Langher, V. (2007). Communication and crying in newborns. *Infant Behavior and Development*, 30(4), 655–665. <https://doi.org/10.1016/j.infbeh.2007.03.002>
20. Craig, A. R. (2023). Resistance to change, of behavior and theory. *Journal of the Experimental Analysis of Behavior*, 120(3), 440–456. <https://doi.org/10.1002/jeab.875>
21. Craig, A. R., Ringdahl, J. E., & Sullivan, W. E. (2024). Resistance to change from bench to bedside (and back again). In H. S. Roane, A. R. Craig, V. Saini, & J. E. Ringdahl (Eds.), *Behavior analysis: Translational perspectives and clinical practice*, pp. 392–413.
22. Cohen, S. L. (1998). Behavioral momentum: The effects of the temporal separation of rates of reinforcement. *Journal of the Experimental Analysis of Behavior*, 69(1), 29–47. <https://doi.org/10.1901/jeab.1998.69-29>
23. Cohen, S. L. (2000). Behavioral momentum: Issues of generality. *Behavioral and Brain Sciences*, 23(1), 95–96. <https://doi.org/10.1017/S0140525X00272403>
24. Cohen, S. L., Riley, D. S., & Weigle, P. A. (1993). Tests of behavior momentum in simple and multiple schedules with rats and pigeons. *Journal of the Experimental Analysis of Behavior*, 60(2), 255–291. <https://doi.org/10.1901/jeab.1993.60-255>
25. DeLeon, I. G., Podlesnik, C. A., & Miller, J. R. (2015). Implications of behavioral momentum theory for intervention in autism spectrum disorder. In F. DiGennaro Reed (Ed.), *Autism service delivery. Autism and child psychopathology series*, pp. 353–374. Springer. https://doi.org/10.1007/978-1-4939-2656-5_13
26. Dube, W. V., Ahearn, W. H., Lionello-DeNolf, K., & McIlvane, W. (2009). Behavioral momentum: Translational research in intellectual and developmental disabilities. *The Behavior Analyst Today*, 10(2), 238–253. <https://doi.org/10.1037/h0100668>
27. Dube, W. V., Mazzitelli, K., Lombard, K. M., & McIlvane, W. J. (2000). Assessing behavioral momentum in humans with mental retardation and unstable baselines. *Experimental Analysis of Human Behavior Bulletin*, 18, 6–11.
28. Dube, W. V., McIlvane, W. J., Mazzitelli, K., & McNamara, B. (2003). Reinforcer rate effects and behavioral momentum in individuals with developmental disabilities. *American Journal on Mental*

- Retardation*, 108, 134–143. [https://doi.org/10.1352/0895-8017\(2003\)108%3C0134:rreabm%3E2.0.co;2](https://doi.org/10.1352/0895-8017(2003)108%3C0134:rreabm%3E2.0.co;2)
29. Fairbrother, N., Barr, R. G., Pauwels, J., Brant, R., & Green, J. (2014). Maternal thoughts of harm in response to infant crying: An experimental analysis. *Archives of Women's Mental Health*, 18(3), 447–455. <https://doi.org/10.1007/s00737-014-0471-2>
30. Fisher, W. W., Greer, B. D., Fuhrman, A. M., Saini, V., & Simmons, C. A. (2018). Minimizing resurgence of destructive behavior using behavioral momentum theory. *Journal of Applied Behavior Analysis*, 51(4), 831–853. <https://doi.org/10.1002/jaba.499>
31. Fujiwara, T., Barr, R. G., Brant, R., & Barr, M. (2011). Infant distress at five weeks of age and caregiver frustration. *Journal of Pediatrics*, 159(3), 425–430. <https://doi.org/10.1016/j.jpeds.2011.02.010>
32. Fujiwara, T., Yamada, F., Okuyama, M., Kamimaki, I., Shikoro, N., & Barr, R. G. (2012). Effectiveness of educational materials designed to change knowledge and behavior about crying and shaken baby syndrome: A replication of a randomized controlled trial in Japan. *Child Abuse & Neglect*, 36(9), 613–620. <https://doi.org/10.1016/j.chiabu.2012.07.003>
33. Glodowski, K., & Thompson, R. (2017). Do distracting activities increase tolerance for an infant cry? *Journal of Applied Behavior Analysis*, 50(1), 159–164. <https://doi.org/10.1002/jaba.361>
34. Grimes, J. A., & Shull, R. L. (2001). Response-independent milk delivery enhances persistence of pellet-reinforced lever pressing in rats. *Journal of the Experimental Analysis of Behavior*, 76(2), 179–194. <https://doi.org/10.1901/jeab.2001.76-179>
35. Hall, N. J. (2017). Persistence and resistance to extinction in the domestic dog: Basic research and applications to canine training. *Behavioural Processes*, 141(1), 67–74. <https://doi.org/10.1016/j.beproc.2017.04.001>
36. Khan, A. (2022). An infant with inconsolable crying. *The American Journal of Emergency Medicine*, 55, 227.e5–227.e6. <https://doi.org/10.1016/j.ajem.2021.12.066>
37. Kyonka, E. G. E., & Subramaniam, S. (2018). Translating behavior analysis: A spectrum rather than a road map. *Perspectives on Behavior Science*, 41(2), 591–613. <https://doi.org/10.1007/s40614-018-0145-x>
38. Lionello-DeNolf, K. M., & Dube, W. V. (2011). Contextual influences on resistance to disruption in children with intellectual disabilities. *Journal of the Experimental Analysis of Behavior*, 96(3), 317–327. <https://doi.org/10.1901/jeab.2011.96-317>
39. Lionello-DeNolf, K. M., Dube, W. V., & McIlvane, W. J. (2010). Evaluation of resistance to change under different disrupter conditions in children with autism and severe intellectual disability. *Journal of the Experimental Analysis of Behavior*, 93(3), 369–383. <https://doi.org/10.1901/jeab.2010.93-369>
40. Lockhart-Bouron, M., Anikin, A., Pisanski, K., Corvin, S., Cornec, C., Papet, L., Levréro, F., Fauchon, C., Patural, H., Reby, D., & Mathevon, N. (2023). *Communications Psychology*, 1(26). <https://doi.org/10.1038/s44271-023-00022-z>
41. Mace, F. C., Lalli, J. S., Shea, M. C., Lalli, E. P., West, B. J., Roberts, M., & Nevin, J. A. (1990). The momentum of human behavior in a natural setting. *Journal of the Experimental Analysis of Behavior*,

- 54, 163–72. <https://doi.org/10.1901/jeab.1990.54-163>
42. Mace, F. C., McComas, J. J., Mauro, B. C., Progar, P. R., Taylor, B., Ervin, R., & Zangrillo, A. N. (2010). Differential reinforcement of alternative behavior increases resistance to extinction: Clinical demonstration, animal modeling, and clinical test of one solution. *Journal of the Experimental Analysis of Behavior*, 93(3), 349–367. <https://doi.org/10.1901/jeab.2010.93-349>
43. MacDonald, J. M., Ahearn, W. H., Parry-Cruwys, D., Sancroft, S., & Dube, W. V. (2013). Persistence during extinction: Examining the effects of continuous and intermittent reinforcement on problem behavior. *Journal of Applied Behavior Analysis*, 46(1), 333–338. <https://doi.org/10.1002/jaba.3>
44. Miller, A. R., Barr, R. G., & Eaton, W. (1993). Crying and motor behavior of six-week-old infants and postpartum maternal mood. *Pediatrics*, 92(4), 551–558. <https://doi.org/10.1542/peds.92.4.551>
45. Mitteer, D. R., Greer, B. D., Fisher, W. W., Briggs, A. M., & Wacker, D. P. (2018). A laboratory model for evaluating relapse of undesirable caregiver behavior. *Journal of the Experimental Analysis of Behavior*, 110(2), 252–266. <https://doi.org/10.1002/jeab.462>
46. Muller, I., Ghio, D., Mobey, J., Jones, H., Hornsey, S., Dobson, A., Maund, E., & Santar, M. (2022). Parental perceptions and experiences of infant crying: A systematic review and synthesis of qualitative research. *Journal of Advanced Nursing*, 79(2), 403–417. <https://doi.org/10.1111/jan.15492>
47. Nevin, J. A. (1974). Response strength in multiple schedules. *Journal of the Experimental Analysis of Behavior*, 21, 389–408. <https://doi.org/10.1901/jeab.1974.21-389>
48. Nevin, J. A. (1992). An integrative model for the study of behavioral momentum. *Journal of the Experimental Analysis of Behavior*, 57(3), 301–316. <https://doi.org/10.1901/jeab.1992.57-301>
49. Nevin, J. A., & Grace, R. C. (2000). Behavioral momentum and the Law of Effect. *Behavioral and Brain Sciences*, 23(1), 73–130. <https://doi.org/10.1017/S0140525X00002405>
50. Nevin, J. A., Mandell, C., & Atak, J. R. (1983). The analysis of behavioral momentum. *Journal of the Experimental Analysis of Behavior*, 39(1), 49–59. <https://doi.org/10.1901/jeab.1983.39-49>
51. Nevin, J. A., Tota, M. E., Torquato, R. D., & Shull, R. L. (1990). Alternative reinforcement increases resistance to change: Pavlovian or operant contingencies? *Journal of the Experimental Analysis of Behavior*, 53(3), 359–379. <https://doi.org/10.1901/jeab.1990.53-359>
52. Pantano, N. A., Sloan, E. K., Lionello-DeNolf, K. M., Block, A. E., Jones, L., & Gulick, L. (2026). *The role of negative reinforcement and extinction on infant caretaking* [Unpublished manuscript]. Department of Psychology, Assumption University.
53. Parry-Cruwys, D. E., Neal, C. M., Ahearn, W. H., Wheller, E. E., Premchander, R., Loeb, M. B., & Dube, W. V. (2011). Resistance to disruption in a classroom setting. *Journal of Applied Behavior Analysis*, 44(2), 363–367. <https://doi.org/10.1901/jaba.2011.44-363>
54. Petzoldt, J. (2018). Systematic review on maternal depression versus anxiety in relation to excessive infant crying: It is all about the timing. *Archives of Women's Mental Health*, 21(1), 15–30. <https://doi.org/10.1007/s00737-017-0771-4>

55. Ringdahl, J. E., Berg, W. K., Wacker, D. P., Crook, K., Molony, M. A., Vargo, K. K., Neurnberger, J. E., Zabala, K., & Taylor, C. (2018). Effects of response preference on resistance to change. *Journal of the Experimental Analysis of Behavior*, 109(1), 265–280. <https://doi.org/10.1002/jeab.308>
56. Ringdahl, J. E., Crook, K., Berg, W. K., Wacker, D. P., Molony, M., Romani, P., Ryan, S., Ryan, A., & Zabaka, K. (2023). Further evaluation of prompt density, rate of reinforcement, and the persistence of manding. *Behavioral Interventions*, 38(3), 538–553. <https://doi.org/10.1002/bin.1944>
57. Ringdahl, J. E., & O'Brien, M. J. (2026). Behavioral momentum theory: Evidence and limitations. In V. Saini, V. (Ed.), *Quantitative Behavior Analysis*. Springer. https://doi.org/10.1007/978-3-032-17450-5_6
58. Romani, P. W., Ringdahl, J. E., Wacker, D. P., Lustig, N. H., Vinkquist, K. M., Northup, J., Kane, A. M., & Carrion, D. P. (2016). Relations between rate of negative reinforcement and the persistence of task completion. *Journal of Applied Behavior Analysis*, 49(1), 122–137. <https://doi.org/10.1002/jaba.252>
59. Schieltz, K. M., Ringdahl, J. E., & O'Brien, M. J. (2025). Persistence of desirable behavior. In M. P. Kranak (Ed.), *Behavioral treatments for individuals with autism* (pp. 147–167). Springer. https://doi.org/10.1007/978-3-031-91965-7_8
60. Schieltz, K. M., Wacker D. P., Ringdahl J. E., & Berg W. K. (2017). Basing assessment and treatment of problem behavior on behavioral momentum theory: Analyses of behavioral persistence. *Behavioural Processes*, 141(3), 75–84. <https://doi.org/10.1016/j.beproc.2017.02.013>
61. Shahan, T. A., & Burke, K. A. (2004). Ethanol-maintained responding of rats is more resistant to change in context with added non-drug reinforcement. *Behavioral Pharmacology*, 15(4), 279–285. <https://doi.org/10.1097/01.fbp.0000135706.93950.1a>
62. Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. Appleton-Century-Crofts.
63. Smith, S. W., & Greer, B. D. (2023). Behavioral momentum theory. In J. L. Matson (Ed.), *Handbook of applied behavior analysis. Autism and child psychopathology series*. pp. 123–139. Springer. https://doi.org/10.1007/978-3-031-19964-6_7
64. Stewart, T. C., Gilliland, J., Parry, N. G., & Fraser, D. D. (2015). An evidence-based method for targeting an abusive head trauma media campaign and its evaluation. *Journal of Trauma and Acute Care Surgery*, 79(5), 748–755. <https://doi.org/10.1097/TA.0000000000000828>
65. Suess, A. N., Schieltz, K. M., Wacker, D. P., Detrick, J., & Podlesnik, C. A. (2020). An evaluation of resurgence following functional communication training conducted in alternative antecedent contexts vis telehealth. *Journal of the Experimental Analysis of Behavior*, 113(1), 278–301. <https://doi.org/10.1002/jeab.551>
66. Sugai, G., O'Keeffe, B. V., & Fallon, L. M. (2012). A contextual consideration of culture and schoolwide positive behavior support. *Journal of Positive Behavior Interventions*, 14(4), 197–208. <https://doi.org/10.1177/1098300711426334>
67. Thompson, R. H., Bruzek, J. L., & Cotnoir-Bichelman, N. M. (2011). The role of negative reinforcement in infant caregiving: An experimental simulation. *Journal of Applied Behavior Analysis*, 44(2), 295–304. <https://doi.org/10.1901/jaba.2011.44-295>

68. Trump, C. E., Herrod, J. L., Ayres, K. M., Ringdahl, J. E., & Best, L. (2021). Behavioral momentum theory and humans: A review of the literature. *The Psychological Record*, 71(1), 71–83. <https://doi.org/10.1007/s40732-020-00430-1>

69. Vargo, K. K., & Ringdahl, J. E. (2015). An evaluation of resistance to change with unconditioned and conditioned reinforcers. *Journal of Applied Behavior Analysis*, 48(3), 643–662. <https://doi.org/10.1002/jaba.226>

70. Vermillet, A., Tølbøll, K., Mizan, S. L., Skewes, J. C., & Parsons, C. E. (2022). Crying in the first 12 months of life: A systematic review and meta-analysis of cross-country parent-reported data and modeling of the “cry curve.” *Child Development*, 93(4), 1201–1222. <https://doi.org/10.1111/cdev.13760>

71. Wacker, D. p., Harding, J. W., Berg, W. K., Lee, J. F., Schieltz, K. M., Padilla, Y. C., Nevin, J. A., & Shahan, T. A. (2011). An evaluation of persistence of treatment effects during long-term treatment of destructive behavior. *Journal of the Experimental Analysis of Behavior*, 96(2), 261–282. <https://doi.org/10.1901/jeab.2011.96-261>

72. Williams, C. L., Montague, K. L., Bernstein, A. M., Call, N. A., & Slocum, S. K. (2023). Expanding a laboratory model for evaluating relapse of caregiver nonadherence. *Journal of the Experimental Analysis of Behavior*, 120(3), 363–375. <https://doi.org/10.1002/jeab.873>

73. Witts, B. N., & Bruzek, J. L. (2022). An analogue assessment of caregiver escape from infant crying based on rate of shaking. *Experimental Analysis of Human Behavior Bulletin*, 33(1), 17–30. <https://www.eahb.org/2023-eahb-issue>

74. Witts, B. N., & Bruzek, J. L. (2024). Assessing negative reinforcement through simultaneous observing and committed concurrent progressive-ratio procedures: Preliminary investigations. *Journal of the Experimental Analysis of Behavior*, 121(3), 346–357. <https://doi.org/10.1002/jeab.913>

75. World Health Organization. (2004). The World Health Organization quality of life (WHOQOL) - BREF, 2012 revision. World Health Organization. <https://iris.who.int/handle/10665/77773>

Tables

Table 1

Participant	Target	Session 1	Session 2	Session 3	Session 4
<i>Experiment 1</i>					
P1	Feeding	Upstairs, rich	Upstairs, Ext	Downstairs, lean	Downstairs, Ext
P2	Feeding	Downstairs, lean	Downstairs, Ext	Upstairs, rich	Upstairs, Ext
P3	Playing	Upstairs, lean	Upstairs, Ext	Downstairs, rich	Downstairs, Ext
P4	Playing	Downstairs, rich	Downstairs, Ext	Upstairs, lean	Upstairs, Ext
P5	Rocking	Upstairs, rich	Upstairs, Ext	Downstairs, lean	Downstairs, Ext
P6	Rocking	Downstairs, lean	Downstairs, Ext	Upstairs, rich	Upstairs, Ext
<i>Experiment 2</i>					
P7	Feeding	Upstairs, rich	Upstairs, Set 1	Downstairs, lean	Downstairs, Set 2
P8	Feeding	Downstairs, lean	Downstairs, Set 1	Upstairs, rich	Upstairs, Set 2
P9	Playing	Upstairs, lean	Upstairs, Set 2	Downstairs, rich	Downstairs, Set 1
P10	Playing	Downstairs, rich	Downstairs, Set 1	Upstairs, lean	Upstairs, Set 2
P11	Rocking	Upstairs, rich	Upstairs, Set 1	Downstairs, lean	Downstairs, Set 2
P12	Rocking	Downstairs, lean	Downstairs, Set 2	Upstairs, rich	Upstairs, Set 1

Counterbalancing Assignment of Participant Conditions in Experiments 1 and 2

Note. “Upstairs” and “downstairs” refers to the location of the two research labs. “Ext” refers to extinction.

Table 2

Duration (s) each Participant Engaged in the Target Behavior in Baseline and Extinction Sessions in Experiment 1

Participant	Target	Duration (s) Rich		Duration (s) Lean	
		Baseline	Extinction	Baseline	Extinction
P1	Feeding	86.9	111.9	291.4	39.9
P2	Feeding	431.0	267.2	908.0	227.0
P3	Playing	317.7	75.8	151.5	117.9
P4	Playing	687.5	212.1	921.1	310.7
P5	Rocking	199.2	280.1	358.1	230.3
P6	Rocking	972.8	147.9	1088.4	414.3

Note. The rich extinction session for P4 and P6 ended prior to 20 min because the session termination criterion of 5 min without engagement in the target behavior was met. Shading indicates participants who experienced the lean condition first.

Table 3

Percentage of Each Session Spent with Crying for Individual Participants in Experiment 1

Participant	Percentage Rich		Percentage Lean	
	Baseline	Extinction	Baseline	Extinction
P1	5.4	100.0	10.3	100.0
P2	NA	NA	16.5	100.0
P3	28.6	100.0	30.6	100.0
P4	13.0	100.0	8.8	100.0
P5	25.9	100.0	33.9	100.0
P6	2.4	100.0	2.7	100.0

Note. “NA” indicates that crying duration data were not available due to equipment failure.

Table 4

Duration (s) each Participant Engaged in the Target Behavior in Baseline and Distraction Sessions and Duration (s) each Participant Interacted with the Forms in Experiment 2

Participant	Target	Duration (s) Rich			Duration (s) Lean		
		Baseline	Disruption	Forms	Baseline	Disruption	Forms
P7	Feeding	342.8	555.0	515.0	584.5	579.9	357.3
P8	Feeding	470.5	646.4	607.3	453.9	956.9	770.0
P9	Playing	534.6	484.9	616.2	702.3	298.5	854.1
P10	Playing	539.8	397.4	616.6	689.4	384.2	644.6
P11	Rocking	259.2	209.1	777.2	185.7	156.5	601.0
P12	Rocking	704.4	350.6	663.9	723.1	535.0	832.9

Note. Shading indicates participants who experienced the lean condition first.

Table 5

Percentage of Each Session Spent with Crying for Individual Participants in Experiment 2

Participant	Percentage Rich		Percentage Lean	
	Baseline	Distraction	Baseline	Distraction
P1	23.4	38.1	14.4	38.7
P2	36.3	49.2	57.4	44.7
P3	22.7	53.7	27.9	43.0
P4	6.6	40.4	9.9	42.2
P5	10.0	41.8	15.8	46.4
P6	15.2	62.8	30.9	60.1

Figures



Figure 1

The Downstairs (Left) and Upstairs (Right) Research Labs



Figure 2

Infant Simulator used in Experiments 1 and 2

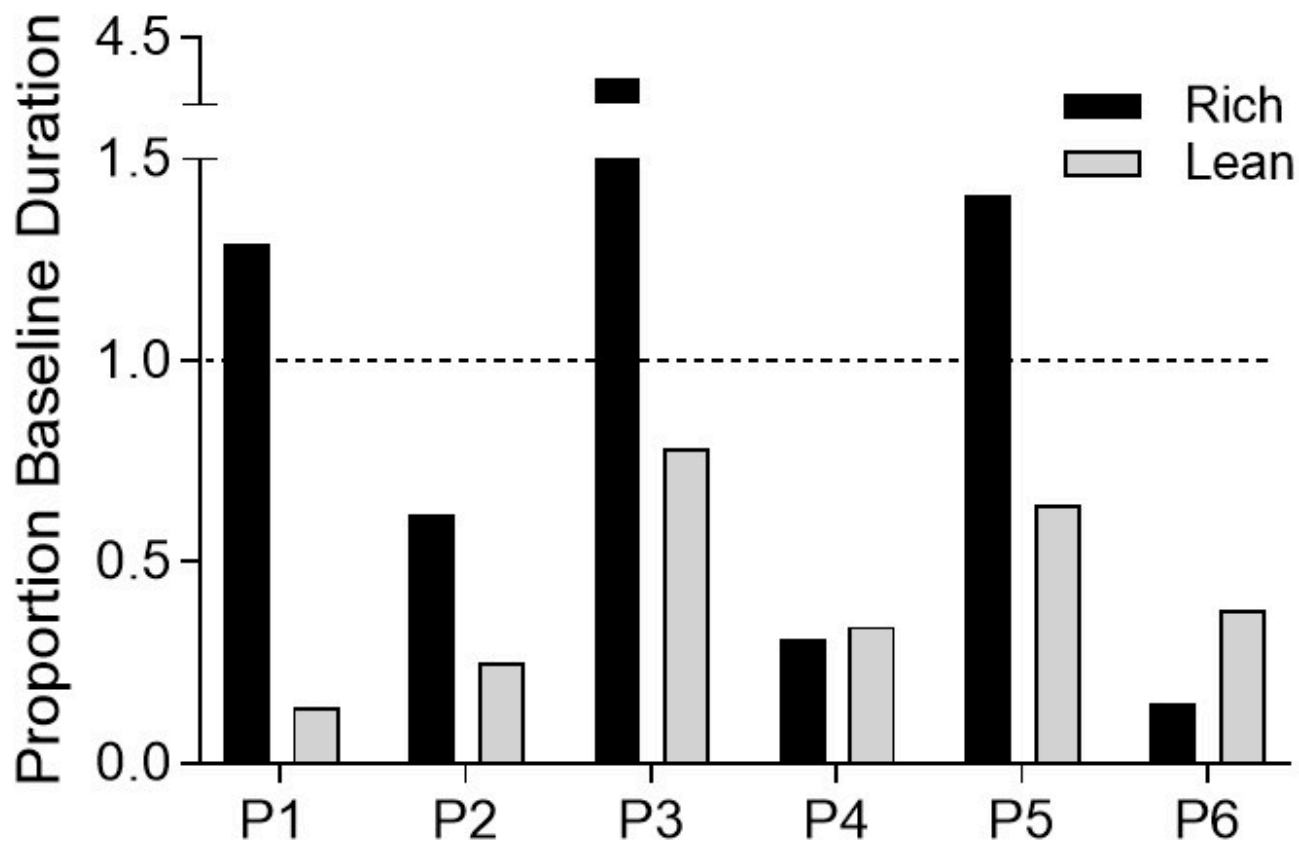


Figure 3

Proportion Duration Responding in the Target Caregiving Behavior for Individual Participants in Experiment 1

Note. The dashed line indicates equal durations of caregiving behavior in baseline and test sessions.

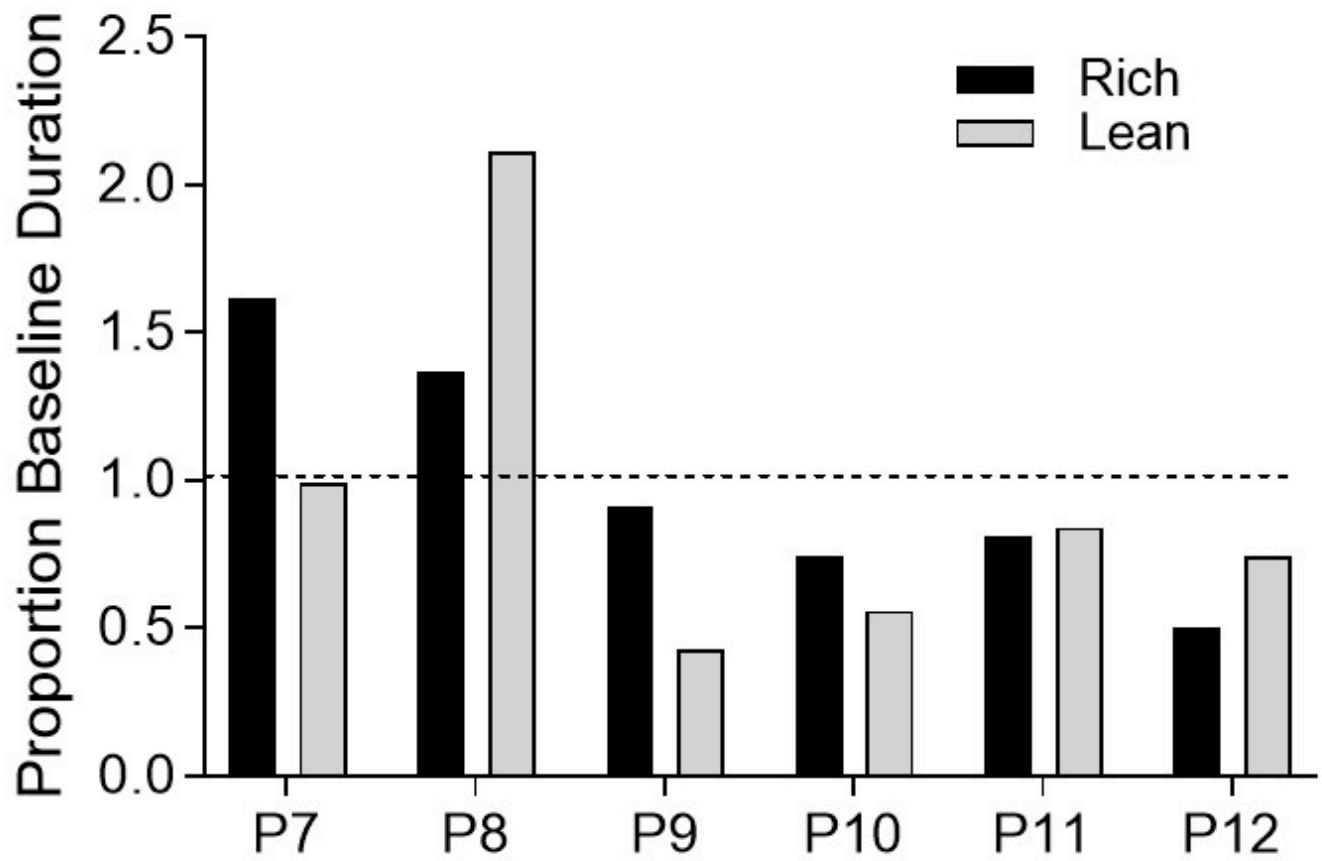


Figure 4

Proportion Duration Responding in the Target Caregiving Behavior for Individual Participants in Experiment 2

Note. The dashed line indicates equal durations of caregiving behavior in baseline and test sessions.