Documentation of the Learning and Emotion Laboratory, Institute for the Study of Child Development, 1983-2012

Citation to *this* Version: Sullivan, Margaret Wolan. *Documentation of the Learning and Emotion Laboratory, Institute for the Study of Child Development, 1983-2012*, 2018. Retrieved from http://dx.doi.org/doi:10.7282/T3QZ2F7J.

The Learning and Emotion Infant Laboratory: Physical Layout and Apparatus Documentation

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Introduction and Purpose

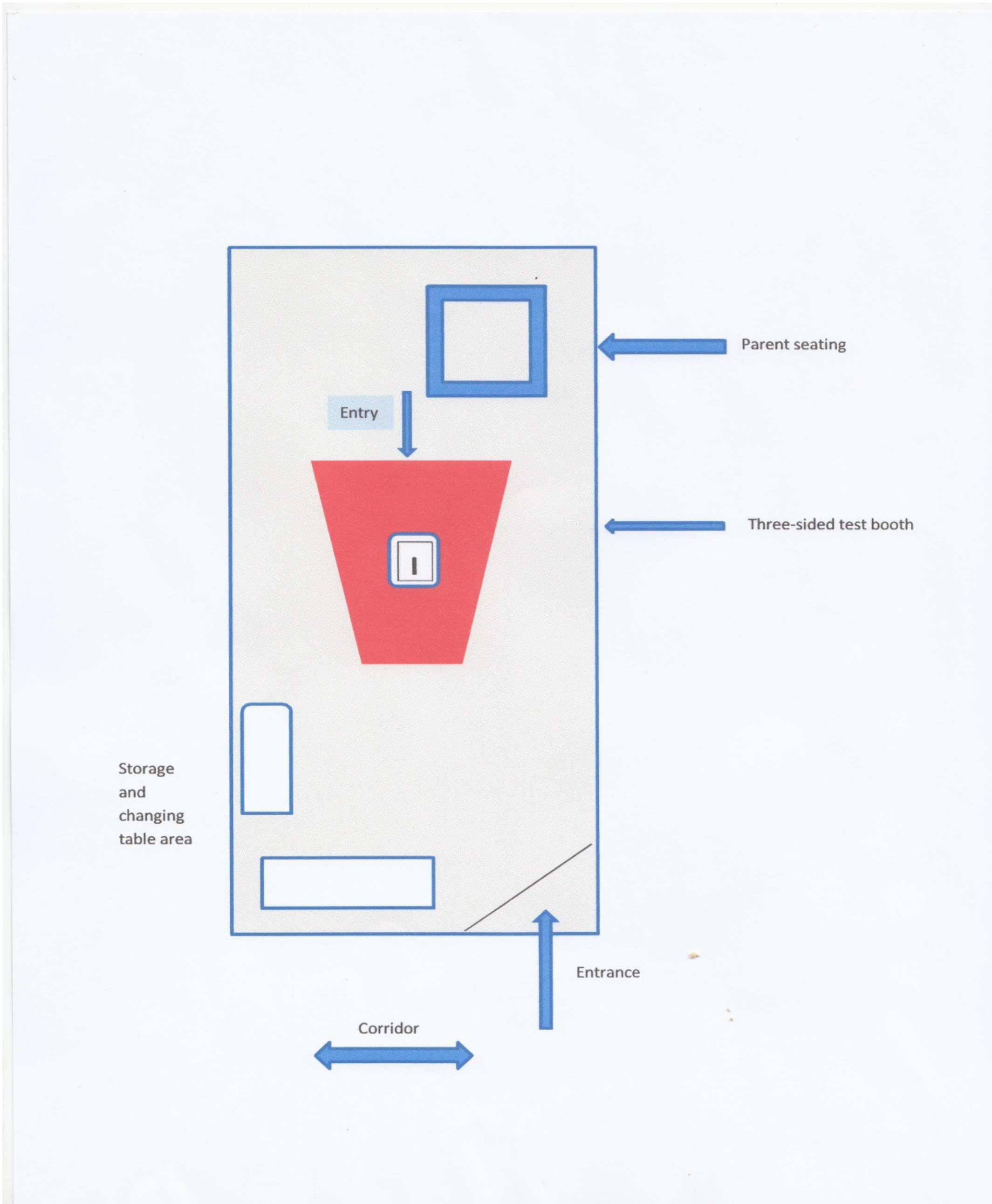
From 1983 through 2012, an infant learning and emotion laboratory, conducted research with typically developing infants under the auspices of the Division of Child Development (Michael Lewis, Ph. D., Director), Department of Pediatrics, Robert Wood Johnson Medical School. The laboratory was funded by various federal and foundation grants during this period. The primary focus of the laboratory was observation of the emotional, physiological, and behavioral responses of infants under six months of age to response-contingent control of a stimulus event (also referred to in the literature as operant learning) and its disruption. Facial expressions during contingency learning and disruptions of control of the contingent stimulus (accomplished by the onset of extinction or the cessation of the contingency between infant behavior and the expected stimulus) were the primary measure of emotional behavior. Expressions and vocal behavior were recorded on videotape in the early years of the laboratory, but later digital recordings were made, while the infants learned in one or two sessions, depending on the particular research question. The contingent response (operant behavior) of the infants was automatically recorded. Cardiac and salivary cortisol measures were also collected in several of the studies. This document describes the physical aspects of the test setting and its recording equipment. Additional documentation will cover facial expression coding and scoring used by this laboratory.

Publications emerging from the laboratory may be found in the developmental literature from 1984 – 2018 and are listed at the end of this document. Although the specific procedures and methodology are detailed in each publication, physical description of the lab setting and test conditions is spare. In addition, technology improved radically during this period and changes were incorporated into the lab as funding allowed in order that stimulus delivery and data recording keep pace with the times. Because the laboratory will be dismantled with the retirement of myself and Dr. Lewis, and given the importance of replicability to psychological science, this document describes the physical context and key features of the test environment as they evolved. The goal is to provide sufficient detail to supplement published information and to enable future behavioral researchers to replicate and extend our findings without the need for extensive piloting. Finally, the document will provide a benchmark against which future variations in test settings or experimental design may be referenced.

Test Space

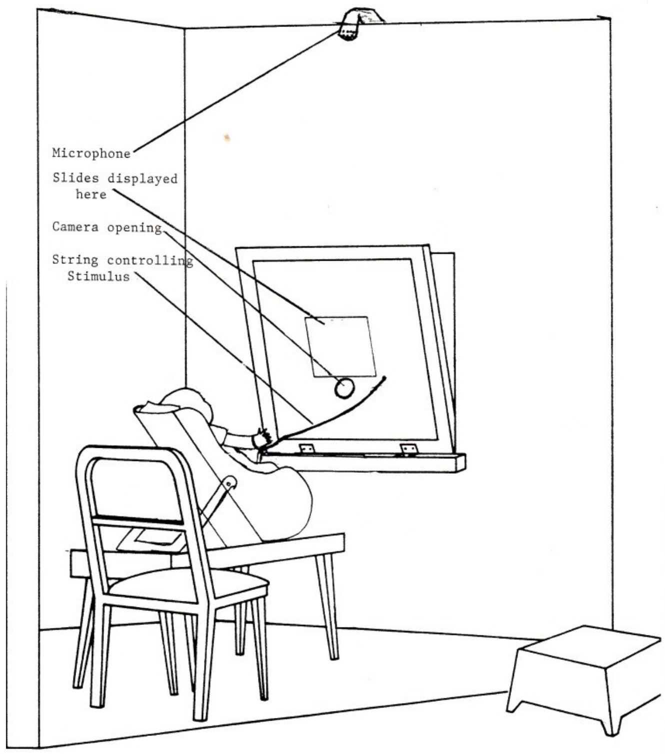
The test booth was set up centrally in a standard-sized faculty office in an academic building at Robert Wood Johnson Medical School in New Brunswick. Three different rooms were used over the years. However, all were interior, windowless spaces, longer than wide, with control or work areas at the front and rear of the booth. Figure 1 depicts the standard layout. The rooms had typical overhead fluorescent office lighting, however these were dimmed during testing (see below).

Figure 1. Schematic of the Learning and Emotion Laboratory Floorplan (Not drawn to scale).



Test Apparatus

Figure 2 is a schematic showing the interior front wall of the three-sided test booth and the positioning of the infant within it. The booth walls were 7 feet tall but open at the top. Prior to 1985, the walls were painted beige, but subsequently, a light lemon yellow was used. The color change was made to make the context less austere, yet distinctive, given the findings on the importance of contextual features in infant learning and memory demonstrated by the Rovee-Collier and colleagues at Rutgers (Rovee-Collier, 1999; http://journals.sagepub.com/doi/abs/10.1111/1467-8721.00019). Each side wall of the booth had a narrow aperture at approximately the height of the infant's

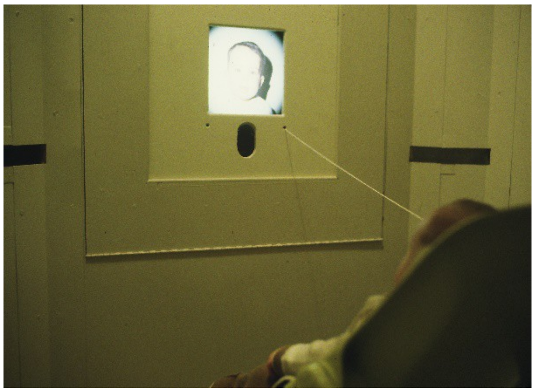


upper body to allow an observer to manually code behavior or to position a camera to obtain additional video angles or obtain still photos. These were rarely used during actual studies and were covered with an opaque, tinted plexiglass shield when not in use.

Infants were seated in a reclining infant seat that was bolted to a low table, facing a large, hinged wooden panel, where the image that served as the contingent stimulus would appear as shown in the above schematic. The panel could be tilted to compensate for the angle at which the infant sat. This was done in to maintain the same visual angle for videotaping of facial expressions as the infant grew. In our early developmental studies, infants were tested from 2- to 8-months of age and the seat position was adjusted as the infants tolerated sitting a more upright posture. Similarly, the camera was mounted behind the panel directly below the screen for the youngest infants and could be mounted above it, for older infants. Infants as old as 10- to 12-months could be tested in the booth, but most of the published work focuses on learning in the 4- to 6-month-olds. For older infants, the wooden table was replaced with a high chair adjusted to the appropriate height.

Response device. A pulling response was chosen for the contingency because of its efficacy with young infants as infants typically develop visually-guided reaching prior to six months (Lewis, Sullivan, & Brooks-Gunn, 1985; White, Castle, & Held, 1964). A narrow satin ribbon was attached to the infant's right wrist by tying it to a terrycloth elastic wristband that was placed around the infant's right wrist as shown in the schematic and images. We experimented with various wristlets before settling on the elastic loop (in reality, a pony-tail hair fastener) because they were soft, well-tolerated, could be laundered, and allowed us to secure the ribbon with the appropriate amount of slack, while having sufficient "stretchiness" to accommodate infant movements and wrist size. The loop was placed on each infant's right wrist with the ribbon looped through it. The infant's hand was raised to its mouth to allow enough slack that sucking on the hand would not trigger the contingent display. The ribbon was tied off at that point with the knot positioned at the underside of the wrist. This allowed the ribbon to cross the palm so infants could easily grasp the ribbon if they made a fist. However, this was not required to activate the audiovisual display. To trigger the display, infants could move their arms to either side or pull downward. The ribbon entered the booth wall at the right corner of the display, as shown in Figure 2. It was connected to a switch mounted behind the panel (see below) to allow automatic recording of infant pulling.

Ambient Sensory Environment



Infants were tested with overhead lights dimmed. The dimmed light made the slide more salient when it appeared. There was sufficient light for the camera to record good facial images, but not wash-out the slide image. The room did not have special sound baffling as the lab was always located along a quiet office corridor away from general office noise. The door was always closed when testing began and the room was quiet unless the infant activated the audiovisual display, or the parent (usually mother) or research assistant spoke to one another over the intercom. Additional family members were not permitted in the room, but could watch from the adjacent control area on the closed circuit monitor.

<u>Audiovisual Display.</u> In the early studies (1984-2000), the infants, seated 45 cm from the screen, faced an18 cm square rear-projection screen mounted in the rear wall of the booth. Distances were adjusted for older or younger infants as noted in specific papers and when the screen was replaced by a monitor display in studies conducted after 2000. The color slide was always a portrait of a 6-month-old smiling baby. The image appeared for 3 seconds when the infant tugged at the ribbon; otherwise the screen was dark. Additional pulls within the 3 second period were recorded, but had no effect on the length of the display's exposure. A quarter second offset was required before another tug re-displayed the slide. Simultaneous with slide onset, a switch-adapted cassette player behind the screen provided sound feedback at an average level of 40- 50 dB. The volume was adjusted so that infants would not startle at the sound. A 1-minute continuous loop tape with a segment of the *Sesame Street* theme song was the audio stimulus for most of the studies, although in some studies, other songs featuring children's voices were used.

After 2000, the visual image was presented on a 17" color computer monitor and both the image and the music were delivered digitally. A different baby image was used (see Figure 4a), but the square display was maintained with the additional exposed background on the monitor appearing blue, as shown in Figure 4b and c. When the image offset, a solid blue square was visible. The original sound recording was re-produced as a wave file and the print image was scanned as a jpeg file. The figures below show the laboratory setting after 2000 with the new slide.

Figure 4a (left): Advertising copy that was scanned and cropped to produce the jpeg image used in infant learning studies after 2000.

Figures 4b and c (below). Video slide image with rear (left) and side views (right) of the infant seat (2000-2012). The infant is actively pulling the ribbon.

<u>Electronic/Digital Controls</u>**.** The ribbon was connected to a leaf switch (Zygo Industries, Inc., CM-2, Portland Oregon). The switch (shown in figure 5) was a 4 1/8” vinyl- clad copper leaf (total switch length, 6”). One ounce of force deflected the leaf sufficiently to close the switch. It was mounted behind the booth as shown in Figure 6, next to the rear projection screen in the pre-2000 arrangement of the apparatus. When pulled, the ribbon’s deflection of the copper leaf activated a three-second view of an infant’s smiling face accompanied by the auditory feedback as described above.

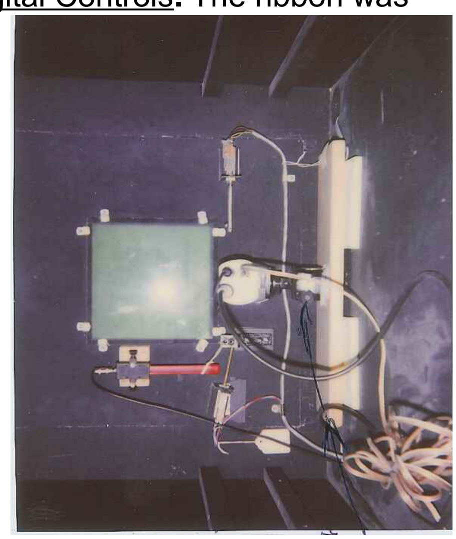


Figure 6a also shows the camera mounting directly below the projection screen. Infant pulls were recorded online by the lab computer, which also controlled the timing and delivery of the slide and music during each session. Originally, the software program was developed in Basic for the *Apple II* computer platform. By 2000, we moved to a *Microsoft* platform, using the *E-prime* software package with specific code written to control the timing and onset of the slide image and music.

Electronics

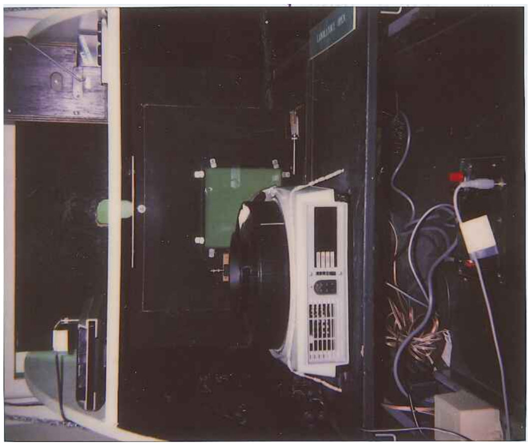


Figure 6b shows the placement of the adapted cassette tape recorder and speaker (top shelf) and a standard *Kodak* carousel projector (seated on a removable, sliding shelf directly behind the rear projection screen). Below this removable shelf, were a surge-protected power strip for all the devices and the Input/Output box into which the leaf switch (Input) and both the adapted slide projector remote and the cassette lead (2 outputs) were plugged. As previously described, the cassette recorder (seen on the stationary shelf above the slide projector) was adapted so that a tug on the switch simultaneously activated the cassette's speaker and moved the slide forward. At the slide's offset, the carousel moved back to a blank slide, until the infant tugged again.

After 2000, the slide projector was replaced with a color monitor and the *E-prime* program was rewritten to deliver both image and sound digitally as previously described. Figure 7 shows how the positions of the leaf switch and the camera were altered and the sliding shelf removed to accommodate the monitor behind the booth wall. The monitor's speakers were positioned on the top shelf, replacing the cassette recorder. This was the final configuration of the laboratory apparatus.

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Published research of data collected with apparatus described in this document is listed below. Both peer-reviewed and chapters in edited volumes are listed. Links are provided to RU Core or other online access, where available. Grants supporting this work are also listed.

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Grant Support

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2001-2006	National Institute of Mental Health: Emotional and physiological responses to frustration in infants. (**Principal Investigator**).
1997-1999	National Institute for Mental Health/Small Grants Program: Frustration and the Violation of Expectancy in Young Infants (**Principal Investigator**).
1991 - 1994	Harry Frank Guggenheim Foundation: The Socialization of Anger. (Project Co-Investigator with M. Lewis).
1991 - 1994	NSF: The Interface Between Affect and Cognition in the First Year of Life. (**Principal Investigator**).
1987 - 1990	NICHD: Developmental studies of the interface between affect and cognition. (**Principal Investigator**)

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