Spring 2021

Learning to Code Human Behavior

Jennika Mannesto
University of New Hampshire

INQUIRY journal
www.unh.edu/inquiryjournal 2021

Research Article

Learning to Code Human Behavior

—Jennika Mannesto

I have always enjoyed observing people and their behaviors. I often find myself analyzing relationships in public places, such as parents disciplining their children in the grocery store or talking with their children about certain types of food in a restaurant. In my major of human development and family studies (HDFS) at the University of New Hampshire (UNH), we learn why children might behave in certain ways and use this knowledge to better guide our interactions with them to support positive development. I also am enrolled in the elementary education accelerated master's program. Observation is a huge part of teaching; keen observational skills are essential to both assess students and learn from other teachers.

Jennika Mannesto

As an undergraduate, I wanted to continue my studies beyond the UNH classroom, and I knew that getting involved in research would help to develop my observation and communication skills, as well as give me practice with analyzing data. I also really wanted to dive deep into a topic that interested me. I was able to take advantage of this through involvement in two research projects led by my mentor, Jill Trumbell, assistant professor in the human development and family studies department. The Mommy and Me project involves home visits to mothers and their preschool-aged children. I have used data from this project to study caregiver sensitivity, an important variable that can have a huge impact on children, such as being linked to their academic performance and social-emotional well-being (Kopystynska et al., 2016; Manning, 2019). I have also been involved with Project Advancing Children's Museum Engagement (Project ACME), for which videos are recorded of three- to six-year-old children interacting with a parent as they explore exhibits at a children's museum. I have used data from this project to examine the interactions between caregiver sensitivity, gender, and play.

Through both projects, I have gained expertise in coding observable behavior. Observational research involves closely watching and documenting specific behaviors of interest to the researcher. In the field of human development and family studies, observational or behavioral coding is common, as it allows us to better understand the frequency of behaviors of interest and their developmental significance. It is important to note that behavioral coding may take a variety of forms, from time sampling behaviors (tallying the frequency over a given time period), to detailed anecdotes of behaviors, to using a series of pre-existing labels or descriptors to categorize an individual's behavior or activities.

Before learning to code, I had not focused on looking for specific behaviors when I casually observed people; I was used to just analyzing the situation as a whole. However, my experience with these two projects helped develop my attention to detail and taught me to critically analyze my observations in a more productive way.

Observational Research in Naturalistic Settings

Research is not always done in a laboratory setting; in my field a lot of research is done in naturalistic settings such as homes, schools, or community organizations, where children or families live and learn, i.e., where normal behaviors are elicited. This ensures ecological validity so that findings translate more to the everyday experiences of children and families. After observing behaviors, researchers then code observed behaviors and analyze the resulting data to draw conclusions. For example, researchers might observe and code interactions to draw conclusions about the quality of parent-child attachment or caregiver behavior. In my field, observational coding is a way to report on specific human behaviors of interest to better understand their frequency and developmental significance.

Observation is used instead of self-report methods such as surveys or questionnaires in order for the data to be as objective as possible. The risk of self-report bias is strong, so to ensure observational data is accurate, trained observers are often used. Having multiple observers who code behavior is best to increase reliability of the data. The coding process is complex, and I've coded using both existing coding schemes as well as an original coding scheme I developed. Creating my own coding scheme involved a lot of trial and error that enhanced my knowledge of the research process.

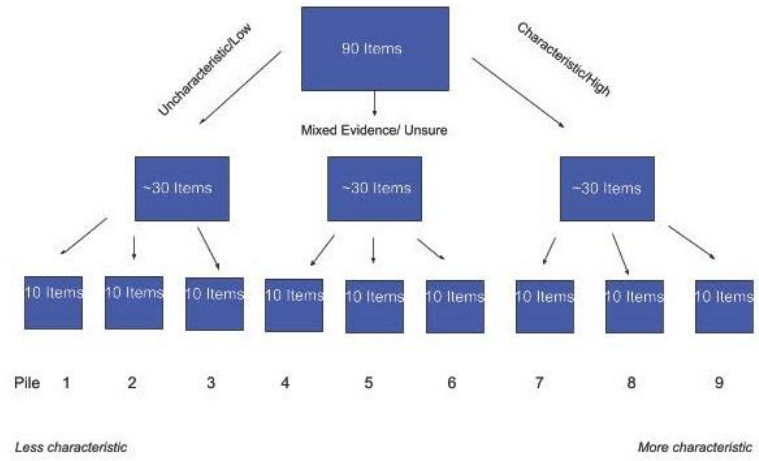
Learning How to Code Behaviors: The Mommy and Me Project

I have participated in the Mommy and Me Project, which focuses on caregiving sensitivity, since spring 2018. This is an ongoing project that involves in-person observations of mother-preschooler interactions that are conducted by trained observers during home visits. Trained observers include Dr. Trumbell as well as students she recruits in the HDFS major, such as myself.

In order to assess caregiving sensitivity, I used the *Maternal Behavior for Preschoolers Q-Sort* (MBPQS; Posada et al., 1998) to report on caregiving behavior. A Q-sort is a coding method that allows for individuals to rank order a series of statements to provide an overall description of some phenomenon of interest. For instance, some researchers use Q-sort methodology to have participants describe their personalities by rank ordering a series of different personality traits. For the Mommy and Me Study, the MBPQS was used to rank specific caregiving behaviors in order from least characteristic to most characteristic of the observed caregiver. The MBPQS involves a set of ninety cards; on each card is a description of a caregiving behavior. Some examples of behaviors that indicate a high level of sensitivity include, "behaves as part of a team, exchanges with child are harmonious," "responds promptly to child's signals (vocalizations, smiles, reaches)," and "well resolved interaction with child–interaction ends when child is satisfied." Some examples that indicate a low level of sensitivity are "parent responses to child's initiations (e.g., proximity seeking, smiles, outstretched arms, vocalizations) are incomplete or unsatisfying at times," "unaware of child's signs of distress," and "is over-controlling, intrusive, in interactions with child, e.g., provides excessive instructions, or physically re-orients child."

Prior to participating in home visits, observers were trained to identify the behaviors included on the cards and practiced the Q-sorting procedure. Observers then went with Dr. Trumbell to visit families participating in the study. Upon returning from the two-hour home visit, each coder independently used the ninety items to describe the mother's behavior. The Q-sort method is a forced choice method, wherein observers are forced to assign a score of one through nine to each of the ninety items. The Q-sort involves a two-stage item sorting process. First, you sort the items into three piles: "characteristic/descriptive", "uncharacteristic," and "neither characteristic nor uncharacteristic," (i.e., unobserved or inconsistent behaviors) of the caregiver. At this stage of the Q-sort, there is no set number of items that belong in those three piles, and the observer can place as many items in each pile as they deem appropriate to best capture what they observed.

Next, the observer further sorts those three piles into nine piles with ten items each. You start by further sorting the "characteristic" pile of cards, putting the ten most characteristic items in pile nine, then the ten next characteristic items in pile eight, and so on, until you have sorted all of the "characteristic" initial pile. You would then move to the "uncharacteristic" pile, and put the ten least characteristic items in pile one, the next ten items into pile two, and so on, until all the "uncharacteristic" cards were sorted. Lastly, the remaining items in the "neither characteristic nor uncharacteristic" pile would be used to fill in the remaining spots in the middle piles. These final pile placements indicate the score of each item. For example, a behavior placed in pile eight would get a score of eight.



A visual representation of the Q-sort procedure.

It is important to note that although all ninety items are assigned scores, we do not perform item-level analyses, so their scores have little meaning taken out of context of how the caregiver scores on all other items in the Q-sort. We are interested in overall patterns of behavior, so analyses are based on the overall behavioral profile of the mother, meaning where the mother scored on all ninety items and how scores on each item relate to one another.

Two observers complete each Q-sort independently and input their scores into a computer program called QStat, which creates a behavioral profile for each observed mother and calculates inter-rater reliability between observers. My mentor uses .60 as the bare minimum reliability score for data collection. When reliability scores fall below this threshold, participant data is excluded from analyses. The two observers' Q-sorts are compared to one another, and any major disagreements on items are discussed to try to come to a consensus in order to most accurately describe the mother's behavior. After discussion, the two behavioral profiles are revised and then averaged together. The resulting averaged behavioral profile of where the observed mother scored on all ninety items is compared to what is called the "criterion sort," meaning the behavioral profile generated by experts in the field of attachment to best capture how the "ideally sensitive parent" would score on each of the ninety items. The end result is a correlation, ranging from -1 to 1, with higher scores reflecting caregiving more consistent with the ideally sensitive parent, or in other words, greater sensitivity.

The author practicing the Q-sort.

Using the data collected for the Mommy and Me Project, I analyzed specific aspects of caregiving behaviors and I found a significant interaction between parental stress and mood (negative affect) that suggests high levels of parenting stress significantly disrupt sensitivity, but only when mothers also have high levels of negative affect. To share these findings, I authored both a poster and an oral presentation at the spring 2019 Undergraduate Research Conference (URC) that

focused on parent stress, negative affect, and sensitivity in the preschool period. I have since completed additional home visits and assisted with other research tasks relevant to the project. While data collection is temporarily suspended due to COVID-19, my mentor will resume data collection on this project once research operations return to normal, and plans to complete the project by May 2022.

Creating My Own Coding Scheme for SURF Research

Simultaneously while working on the Mommy and Me Project, I have been collecting data for Project ACME. Project ACME is a collaboration between several professors, including my mentor, who are all interested in different aspects of development evident during parent-child interactions at a children's museum (e.g., caregiving quality, language skills, school readiness). After collecting data for Project ACME for a little over a year, I decided to apply for a Summer Undergraduate Research Fellowship (SURF) to take a more active role in analyzing the data. I explored three research questions: "Is parent gender related to parental sensitivity and the types of play activities parent-child dyads engage in at the museum?"; "Is child gender related to parental sensitivity and types of dyadic play activities?"; and finally, "Does the combination of parent and child gender impact parental sensitivity and dyadic play?"

These questions are important because both caregiving behavior and play behavior have important implications for children. Research suggests that play is essential for healthy child development (Milteer et al., 2012). It is further important to consider the effects that child gender can have on caregiving and play behavior in the museum context, because some research suggests gender differences in children's play activities and child-parent play (Prioletta & Pyle, 2017). This could potentially lead to boys and girls having more or fewer opportunities for different types of play, which may limit the types of benefits they can reap from their play.

I coded fifty-seven previously recorded videos consisting of twenty-minute interactions between a child (aged three-to-six years) and one of their parents in a river-themed exhibit at the Children's Museum of New Hampshire. My objective was to code these videos for both caregiving sensitivity and play behavior. Gender was self-reported by parents using a demographic questionnaire, so I did not examine associations with gender until after I completed sensitivity and play coding.

The river exhibit at the Children's Museum of NH.

I worked with Dr. Trumbell on coding caregiving sensitivity using the *Caregiving Behavior for Preschoolers Q-sort–44 for Videotaped Interactions.* This Q-sort is a forty-four item modified version drawing from the ninety item Q-sort used in the Mommy and Me Project. I wanted to create my own coding scheme for play behavior, because I wanted to deepen my knowledge of the research process and have a hands-on opportunity to design something from scratch. I also wanted the coding scheme to be able to capture exactly what I was interested in, and it was helpful to be able to tailor it specifically to my project to be efficient.

It was challenging to come up with a coding scheme for play behavior. I started by conducting a literature review, but there was very limited information available on coding play behavior. The play behaviors I chose to examine were Object Exploration, Imaginative Play, Environmental Exploration (e.g., discussing pictures on the walls), Games with Rules (e.g., card game), and

Other. The terms "imaginative play" and "object exploration" came from previous research found in the literature. I named the remaining categories based on what I observed while watching the interactions.

My first idea was to use a stopwatch or simply make tally marks when each type of play occurred (e.g., time sampling). I quickly learned that this would not be efficient, or give me all of the detailed information I needed. For example, I coded a few videos using tally marks and asked my mentor to check if she was getting similar numbers, and then I realized that without writing down the actual time it occurred in the video, we would not know if we were counting the same episodes as the same type of play. Using that method, it would have been difficult to ensure reliability. I then added two columns in my spreadsheet for what type of play occurred and the specific time duration for each play episode. My mentor suggested that I look at whether the parent or the child initiated the play to see if that somehow related to other variables. I then realized that I had to sum the total amount of time spent in each type of play. Certain families were spending all their time in one type of play, which would only count as one episode, and I wanted to look at total time spent in each category rather than just episodic counts.

Through trial and error, I came up with a coding sheet where I recorded start and end time of each play episode, labeled each play episode as it happened, categorized it into one of the play types described above, and wrote down who initiated play. Using the recording sheet made it easier to keep track of things and resolve any discrepancies between Dr. Trumbell and me.

Example	Type of Play	Initiated by	Time Start	Time Stop	Total Time	Notes
Sail	OE	C	0:45	1:08	0:23	
Wheel	OE	C	1:45	2:13	0:28	
Under treehouse	EE	C	2:37	2:57	0:20	
Fish ladder	OE	C	3:08	3:52	0:44	
	OE	C	4:58	5:58	1:00	
Beavers	OE	P	6:20	7:30	1:10	
Mail	OE	C	7:48	8:11	0:23	
Eagle wings	OE	P	8:18	8:54	0:36	
Fishing game	OE	P	10:00	10:26	0:26	
Eagle wings	OE	C	10:55	11:27	0:32	
Boat	IP	C	11:53	12:03	0:10	
	IP	P	12:41	13:25	0:44	
Sail	OE	C	13:32	14:17	0:45	
Bricks	OE	P	14:38	16:11	1:33	
Clean up message: 15:52						
Total time: 18:16						
Total OE	11	CInitOE	7	PInitiOE	4	TimeOE 8:00
Total IP	2	CinitIP	1	PInitIP	1	TimeIP 0:54
Total EE	1	CInitEE	1	PInitEE	0	TimeEE 0:20
Total GwR	0	CInitGwR	0	PInitGwR	0	
Total Other	0	CInitOther	0	PInitOther	0	TotPlay 9:14

This is the final play coding sheet with an example of how the videos were coded. OE= Object Exploration, IP= Imaginative Play, EE= Environmental Exploration, GwR= Games with Rules, C= child, P= parent, Cint= child-initiated and Pint= parent-initiated.

After finalizing the coding sheet, Dr. Trumbell and I practiced coding together to make sure we were consistently labeling the types of play we observed; we did this by watching approximately six of the videotaped interactions, using the coding sheet independently to report play activities, and then comparing our findings. It was only after we got reasonable reliability on several videos that I could actually start recording the data from these interactions. The process of practicing and calibrating with Dr. Trumbell took about three weeks, and coding took about six weeks. Dr. Trumbell then checked my final coding on a proportion (approximately thirty-three percent) of the videos to ensure reliability.

After analyzing the data, several significant findings emerged. Specifically, I found out which types of play children were most likely to engage in, and how this related to child gender. I found that girls spent more time engaged in imaginative play than did boys. Additionally, caregiving sensitivity was positively correlated to higher levels of imaginative play. Unfortunately, we did not

have enough fathers participate in the study to examine any differences related to caregiver gender.

My mentor and I are planning to publish our results in a peer-reviewed journal in my field. I am also presenting this research at my first professional conference, the Biennial Meeting of the Society for Research in Child Development (SRCD), which is a large international and well-respected conference in the field. This will provide a wide range of opportunities to engage with professionals in the field and practice presenting to those professionals. I will also present my findings during an oral presentation at the College of Health and Human Services' Grimes Competition at the 2021 URC, which is another opportunity to communicate with people both in and out of the field.

Conclusion

Both of these research experiences have given me insight into the research process and provided me with opportunities to engage in meaningful work. I also learned how to overcome some challenges related to coding. For example, if I didn't observe every behavior written on the Q-sort cards, I had to use my best judgment on how the caregiver would have behaved in the situation. If the parent was inconsistent in their behavior, it also made it difficult to code. It was also challenging to remember ninety different behaviors while simultaneously keeping track of what the parent was doing and assisting the parent or child with other research tasks conducted during the home visit. Observers are not allowed to write anything down, and must retroactively recall things from the entire two-hour visit upon returning to the research lab.

Fortunately, after a while, I overcame these challenges as I better remembered what to look for and made mental notes of anything significant that happened during the visit. One of the highlights of my experience was having significant findings come from my research. I know that sometimes at the end of a research project the results aren't what you hoped for, and I was very proud that both of the topics I explored led to significant findings. Another highlight was having a close professional relationship with a faculty member. Dr. Trumbell monitored my progress and challenged me to expand my critical thinking and was always there when I struggled. Having a close relationship with a faculty member at a large university like UNH feels very special. I've seen first-hand how a teacher that believes in you and holds you to high expectations can have a positive impact. I will take the behavior modeled by Dr. Trumbell and apply it to teaching younger students at the elementary level.

Conducting this research will influence my career as a teacher as well as a parent. It has made me more aware of potential gender differences in play, as well as benefits of various types of play and specific caregiving qualities that encourage one type of play or another. Individual children respond best to different things, so it is fun to learn about all of the strategies to use. I have also learned about some of the effects of parenting stress on caregiving sensitivity, which I will keep in mind as a parent as well as share with my co-workers and the parents of students with whom I am working. I am confident that this knowledge will inform my practice in the classroom and will improve my own interactions with children as a teacher in play contexts.

First, I would like to thank Dr. Jill Trumbell for her guidance as a mentor through my time at UNH. This research would have not been possible without her encouragement to engage in opportunities involving research. Next, I would like to thank Dr. Kim Nesbitt and Dr. Jill Thorson who are involved in collecting data for Project ACME. I would like to thank the Hamel Center for Undergraduate Research, the Patricia M. Flowers '45 Scholarship Fund, and Ms. Anne Sarkisian for their support through the Summer Undergraduate Research Fellowship. Lastly, I would like to thank my family and friends for their belief in me through this whole process.

References

Kopystynska, O., Spinrad, T. L., Seay, D. M., & Eisenberg, N. (2016). The interplay of maternal sensitivity and gentle control when predicting children's subsequent academic functioning: Evidence of mediation by effortful control. *Developmental Psychology*, *52*, 909–921. https://doi.org/10.1037/dev0000122

Manning, L., (2019). The relation between changes in maternal sensitivity and attachment from infancy to 3 years. *Journal of Social and Personal Relationships*, *36*, 1731–1746. https://doi.org/10.1177/0265407518771217

Milteer, R., Ginsburg, K., Council on Communications And Media Committee On Psychosocial Aspects Of Child And Family Health, & Mulligan, D. (2012, January 01). The importance of play in promoting healthy child development and maintaining strong Parent-child BOND: Focus on children in poverty. Retrieved March 10, 2021, from https://pediatrics.aappublications.org/content/129/1/e204.short

Posada, G., Moreno, A., & Richmond, M. K. (1998). *The Maternal Behavior for Preschoolers Q-set*. Unpublished manuscript, University of Denver, Denver, Colorado.

Prioletta, J., & Pyle, A. (2017). Play and gender in Ontario kindergarten classrooms: Implications for literacy learning. *International Journal of Early Years Education*, *25*, 393–408. https://doi.org/10.1080/09669760.2017.1390446

Author and Mentor Bios

Jennika Mannesto, from Concord, New Hampshire, is majoring human development and family studies with a concentration in child development and minoring in psychology at the University of New Hampshire (UNH). She will graduate in May 2021 with a bachelor's degree with honors in major, and in May 2022 with a master's degree in elementary education. Her *Inquiry* article discusses her research for a 2020 Summer Undergraduate Research Fellowship (SURF), but she continued to collaborate during her senior year with her research mentor, Dr. Jill Trumbell, through the Grimes II award, and for her honors thesis. Through her research experience, Jennika learned that in the process of creating something new, trial and error is an important step that cannot be rushed. She says that her research was highly satisfactory because she was able to use her previous knowledge about behavior coding to create her own coding scheme. She hopes that her *Inquiry* article will teach readers about how coding works for human subjects. After receiving her master's degree, Jennika aspires to be an elementary school teacher. This research experience has helped her develop more precise and professional writing skills, and the results of her research have made her aware of the potential role of gender in play, which will be advantageous to her as a future teacher.

Jill M. Trumbell is an assistant professor in the human development and family studies department and began working at the University of New Hampshire (UNH) in the fall of 2015. Her area of teaching specialization is child development and building strong connections between schools and families. Dr. Trumbell frequently works with undergraduate researchers and supports students interested in completing intercollege (INCO) research credits or volunteering in her research lab, with three to eight students earning research credit or volunteering in her lab each semester. In her time at UNH, she has mentored two other students' honors theses, but had not mentored an *Inquiry* author until this year. Because much of Dr. Trumbell's research is conducted in person, it has been incredibly difficult to advance projects during the COVID-19 pandemic. A

unique challenge presented by the pandemic is that as a mentor, she had to conduct all training remotely on Zoom for her research assistants. On a positive note, Dr. Trumbell found it incredibly rewarding to mentor Jennika, whose Summer Undergraduate Research Fellowship (SURF) award allowed for a more intensive mentorship experience. She believes that writing for the broader *Inquiry* audience allows students to understand that research can take many different forms, and is a great way for students to think about the applied nature of research in their field.