





# Object play in Tajikistan: Infants engage with objects despite bounds on play

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## Abstract

Object play is a ubiquitous context for learning. Existing knowledge on infant object interaction has relied on Euro-American samples and observations confined to laboratory playrooms or families' homes, where object play is typically observed indoors and in rooms brimming with toys. Here we examined infants' everyday object play in Tajikistan, where spaces are uniquely laid out and homes are not child-centered and toy-abundant. The restrictive gahvora cradling practice in Tajikistan may indirectly shape how infants access and engage with objects. We documented how much time infants spent in object play, the types and diversity of objects they contacted, and the locations of play—indoors or outside. We observed 59 infants (12–24 months) during a 45-min naturalistic observation when infants were out of the gahvora. Infants engaged with objects 50% of the time. Despite a lack of object diversity, object interactions were frequent and dispersed throughout observations. Walkers tended to divide their object interactions between time spent indoors and outside, but pre-walkers mostly interacted with objects indoors. Caregivers inadvertently shape infants' opportunities for exploration and play through culturally guided childrearing practices. And infants make due: they take it upon themselves to move, explore, and engage—gleaning culturally relevant routines.

## 1 | INTRODUCTION

Everyday play with objects provides a context for infant learning and development. Through engagement with cultural materials and artifacts found in their environment, infants hone perceptual and manual skills, practice bimanual coordination, and discover actions tailored to object properties. In essence, infant object play is practice and product of motor, cognitive, social, and communicative abilities, making it an ideal model system for uncovering infants' skills and potential (Brezack et al., 2021; Lockman & Tamis-LeMonda, 2021). The progression of infants' abilities to act on objects has been studied extensively in laboratory settings where researchers curate the environment and select the materials for play (see Malachowski & Needham, 2022; Rochat, 1989; Ruff, 1984). An underlying assumption of this work, however, is that developmental change in object exploration is enacted as infants spend time contacting objects during daily activities at home.

Although relatively few studies have documented infants' everyday play with objects, existing accounts of object play at home provide support for the possibility that infants spend much of their waking day contacting objects (Herzberg et al., 2021; Karasik et al., 2011). In Western homes, typically brimming with infant-designed toys, time in contact with objects creates opportunities to learn about object properties (Lockman, 2000). Largely unexplored is the nature of object play in different cultural communities, where opportunities to contact objects may differ. Here we examined infants' everyday object play in Tajikistan—a part of the world where home environments are uniquely laid out and may not be child-centered or toy-abundant. Moreover, Tajik childrearing practices offer varying opportunities for infant movement and exploration (Karasik et al., 2018), potentially shaping infants' object access and engagement. Thus, we documented the *timing*, *contents*, and *location* of infant object play during everyday activities in Tajik homes. We focused on the second year of life when infants are typically mobile (e.g., can move from place to place and locate objects) and have proficient object exploration skills (e.g., can discover new ways to explore and use objects).

### 1.1 | Infant play with objects

Infants spend most of their day with objects. From contact with infant-designed toys to discovery of household items, time in object contact occupies nearly 60% of infants' everyday activities at home (Herzberg et al., 2021; Swirbul et al., 2022). In Western cultures, infants have a wealth of objects to engage with likely because caregivers provide them. Moreover, caregivers are typically within their infants' vicinity which allows caregivers to initiate play easily and sustain infants' attention to objects with hands-on or communicative support (Ruff & Lawson, 1990).

The benefits of time with objects are far-reaching. As infants gain increasing control of their manual actions, they explore the physical properties of their environment through active exploration and goal-directed behavior (e.g., Lockman & Tamis-LeMonda, 2021). At the same time, infants show increases in sustained attention to objects further enabling them to exploit the features of their environment. Indeed, the literature on infant object manipulation centers on the extent to which infants tailor their actions to an object's physical characteristics (Gibson, 1982, 1988). In the second half of the first year, as new manual behaviors emerge,

infants begin to organize and select actions in targeted ways based on an object's features (Lockman et al., 2020). For example, infants are more likely to bang objects that are hard compared to those that are squishy, suggesting discrimination of object texture (Bourgeois et al., 2005; Lockman & McHale, 1989). As infants acquire locomotor abilities, object play expands even further. Infants can venture out to find and contact new objects in different locations. Walkers access distal objects more frequently than pre-walkers and are more likely to bring discovered toys to their caregivers to initiate social interactions (Karasik et al., 2011, 2012) and elicit verbal responses (Calabretta et al., 2022; Karasik, et al., 2014). Thus, accumulating time with objects enables developmental change in manual exploration of objects, facilitates social interaction, and may focus infants' attention on critical features of objects (Boyette, 2018; Rachwani et al., 2020).

Current understanding of object play predominantly stems from studies with Euro-American families in predetermined settings in the laboratory or during daily activities at home. In the laboratory, researchers observe infants on their own or while engaging with caregivers for brief durations (typically 5–10 min; Tamis-LeMonda et al., 2017). Researchers offer toys for play; and while novel to infants, selected toys are often exemplars of the kinds of objects infants may routinely encounter at home. Such structured play tasks allow researchers to compare infants' skills but do not reveal everyday experiences of object engagement. Studies that have gone beyond the lab to study infant object play in the home have uncovered the sheer abundance and variety of object categories and toy types in middle-income, English speaking and low-income, Hispanic immigrant families (Herzberg et al., 2021; Swirbul et al., 2022). Large quantities of toys may not necessarily result in better opportunities for object play. Indeed, playing with fewer toys has been related to higher quality play and more sustained attention during play (Dauch et al., 2018). Moreover, in Euro-American households there is a clear divide between play indoors and play outside (Burriss & Burriss, 2010; Hart, 2002). Indoor play spaces are typically determined by caregivers, who choose objects and furnishings and design the spaces where infant play occurs (i.e., specific areas of the living room or a separate playroom; see Schneider, *in press* for a review).

In addition to determining the locations of object play, childrearing practices may also guide infants' movements within spaces and subsequent access to objects. Evidence from anthropology and cultural developmental psychology offers compelling reasons why object play may vary across cultural contexts. Unlike Western settings, many regions in the world do not prioritize child-centered environments (Lancy, 2015; Morelli et al., 2003). Child-designed toys are not readily available, and restrictions preventing children from accessing potentially hazardous objects are less prevalent. Researchers have observed that children among the Aka people (as young as 1 year of age) are taught to use small machetes for digging (Hewlett & Roulette, 2016). Children are given autonomy over their movements and engage in frequent “work-themed play” where they use objects to imitate household activities and social rituals (Boyette, 2018). For example, children of the Mbuti, Batek, Aka, Baka, and Hadza of the Central African Republic build replicas of huts they see adult caregivers construct (Boyette, 2013). Infants in these cultures rely less on adult scaffolding during object play and are expected to assume responsibility for their own learning by observing and participating in family and community activities (Paradise & Rogoff, 2009). Children in hunter-gatherer societies play with twigs, bones, household implements like mortar and pestle, and objects hanging around their mothers' necks (Bakeman et al., 1990; Boyette, 2018). These patterns suggest that the accessibility of objects for infants and the definition of object play likely varies across cultures.

## 1.2 | Tajikistan: Setting for object play

We observed everyday object play in Tajikistan, an ideal context for testing hypotheses about cultural variation in infant development. In villages of Tajikistan, extended families live in collective compounds of one-story, single-room homes arranged around a small courtyard (see Karasik et al., 2018). Homes have limited electricity and water and no central heating system. The limited indoor space does not allow for much furniture and is prone to crowding as 20+ adults and children may live in one compound. Environments are not always child-friendly—irrigation ditches run through courtyards, outlets are exposed, outdoor toileting is common, farm animals, tools, and construction equipment are out in the open, and rough mountainous terrain covers much of the geography. Although Tajik homes may have limited indoor space and objects, the boundary between indoor and outside areas is not clearly defined (see Figure 1a–c). Infants can freely explore the expansive courtyards, thereby broadening their access to objects beyond the confines of indoor spaces. As a result, the varying physical layouts of Tajik infants' everyday environments may either confine objects to specific locations or facilitate object play across multiple areas.

The widespread cultural practice of cradling in Tajikistan may also play a role in shaping infant object play. Tajik infants are swaddled and bound to a gahvora cradle for the first 2 years of life (Karasik et al., 2018). Caregivers rely on gahvoras to induce and improve the quality of sleep, maintain cleanliness and reduce dependency on expensive diapers and limited water, and keep children safe and away from environmental hazards. Researchers have also found that Tajik infants who were cradled since birth showed lags on postural and locomotor abilities relative to the World Health Organization standards (Karasik et al., 2023). For example, infants who spent more daily hours in the gahvora were less proficient at walking compared to infants who spent fewer hours in the gahvora. The enduring practice of gahvora cradling has likely persisted across generations due to its multifaceted function, making it particularly effective for coping with various environmental challenges in the region. Although gahvoras are omnipresent, Tajik infants have fewer containment devices relative to U.S. infants and have more opportunities to be unrestricted when not in the gahvora (Karasik et al., 2022). Thus, despite the constraints of the gahvora, Tajik home environments may provide numerous opportunities for object play when infants are not restricted.

## 1.3 | Current study

Three research questions guided our description of infants' opportunities with objects in Tajikistan. For each question, we examined the effects of infants' chronological age and their locomotor status (pre-walker vs. walker). We focused on infants in their second year of life as infants are typically mobile (Karasik et al., 2023).

First, we asked about the *timing* of object play (i.e., how much time infants spent in manual contact with objects) during everyday activities at home. Previous work with Western samples has shown that objects are plentiful and caregivers frequently serve as play partners to support play. Moreover, mobile infants access objects and spend similar amounts of time engaged with objects, regardless of their locomotor abilities (Herzberg et al., 2021; Swirbul et al., 2022). Based on our previous work in the region, we hypothesized that time in object contact may be lower for Tajik infants compared to reports of Western infants. It is also possible that the environment may not be as child-centered and toy-abundant as described in Western homes. Indeed, our

## A. Indoor area



## B. Outdoor multipurpose area



## C. Outdoor courtyard



**FIGURE 1** Photographs depicting infants' everyday home environments in Tajikistan. Panel (a) shows a sparsely furnished indoor space and a child's gahvora prominently displayed. Panel (b) depicts an expansive outside space with various elevations and ground surfaces, very few objects, and exposed hazards (e.g., a cow, open fire). And panel (c) displays another example of the outside space highlighting infants and children at play with a few toys.

prior work has shown that the physical environment contains many hazards, potentially limiting infant exploration. Thus, even when outside the gahvora, safety concerns may confine infants to specific areas and constrain their object play opportunities.

Second, we asked about the *contents* of object play (i.e., what Tajik infants played with and the diversity of objects they contacted). Studies with Western samples have documented an abundance of toy and non-toy categories. In non-Western settings, toy play is not as prevalent and infants may discover other types of objects for play if commercially manufactured toys are unavailable (e.g., Boyette, 2018). Given this, we used a data-driven approach to document the variety of object categories present in the environment of Tajik infants. Importantly, this approach provided us with flexibility to expand our definitions of object categories to include those previously undocumented in the literature on object play.

Finally, we examined the *location* of object play (i.e., where object play took place). Given the unique layout of Tajik homes, we documented whether the objects infants contacted were primarily found indoors or if infants encountered objects while exploring outside. We hypothesized that all infants would have opportunities to play with objects indoors and outside, but that infants' locomotor status may shape their time in each context (e.g., walkers may spend more time playing outside than pre-walkers).

## 2 | METHOD

### 2.1 | Participants

We observed 59 Tajik infants (29 girls, 30 boys) and their caregivers during everyday activities at home. At the time of observation, infants were 12 ( $M = 11.94$  months,  $SD = 0.19$ ;  $n = 12$ ), 16 ( $M = 16.00$  months,  $SD = 0.19$ ;  $n = 20$ ), 20 ( $M = 20.00$  months,  $SD = 0.38$ ;  $n = 14$ ), or 24 ( $M = 23.95$ ,  $SD = 0.27$ ;  $n = 13$ ) months of age. The sample was balanced for infant natal sex within each age group. A Tajik researcher recruited families from medical clinics serving villages in the Khatlon and Rasht provinces of Tajikistan. Khatlon, the most populous of the regions, is located to the south of the capital city, Dushanbe, and Rasht to the east. Most Tajiks outside of the capital live in “kishlaqs,” characterized by small, closely connected clusters of houses made of brick or mud, built along irrigation canals, and connected with a small orchard. Both regions have villages and homes that are similarly laid out. Infants' age, term birth, and the absence of birth complications served as inclusionary criteria. The researcher told mothers that the purpose of the study was to learn about infant development, but did not mention that infant object play was the focus of the current study. Families received a pajama set as a souvenir of their participation. Data were collected between 2013 and 2014. The present study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from a parent or guardian for each child before any assessment or data collection. All procedures involving human subjects in this study were approved by the Human Research Protection Program at the College of Staten Island.

Mothers ranged from 20 to 35 years of age ( $M = 25.82$  years,  $SD = 3.52$ ) and had between one and eight children at the time of data collection ( $M = 2.45$  children,  $SD = 1.42$ ). All mothers breastfed infants from birth. Most mothers (64%) had completed secondary school (11 years of education), 21% finished primary school (4 years), 9% had no formal education, and 5% completed more than 11 years of schooling. Most mothers did not work for pay (87%); 8% worked on a collective farm; and the rest (5%) did miscellaneous work. All mothers were

married. Fathers (49%) were primarily migrant workers in Russia and did not live in the home; 26% lived at home and did miscellaneous work; 13% worked in construction; 5% were drivers; and 7% did not work. All mothers spoke Tajik as their primary language; none spoke English. Home visits were conducted in Tajik.

## 2.2 | Procedure

A Tajik researcher visited families at home for 1.5–2 h. Each visit included interviews with caregivers about gahvora use during the previous day, structured play with toys, standard assessments of infants' motor abilities, demonstrations of gahvora use, and observations of infants and caregivers during everyday activities when infants were awake and out of the gahvora. The current study focused on video observations of infants and caregivers during daily activities when infants were out of gahvoras. The researcher asked mothers to continue going about their day as they typically would, allowing them to interact with their infants or leave them on their own. Infants could choose to engage with objects or not. We aimed to videorecord 45 min ( $M = 45.36$  min,  $SD = 14.09$ ,  $M_d = 46.31$ ) of everyday activity. However, our observation times varied because we continued recording until caregivers placed infants back in gahvora cradles. Half the sample (50%) was observed for 45 min or more ( $M = 56$  min,  $SD = 8.10$ ); and the other half was observed for at least 20 min ( $M = 33$  min,  $SD = 8.16$ ). Infants' observation time did not vary by age, locomotor status, or natal sex, all  $ps > 0.05$ .

The researcher videorecorded infants, capturing their entire body with the camera zoomed out enough to also capture the surrounding environment. In cases when infants and mothers were separated, the researcher focused the camera on the infant and followed them. During filming, the researcher remained in the background and offered minimal responses to infants and mothers. Recording began after the researcher explained study instructions and clarified questions from caregivers.

At the end of the observation, the researcher assessed infants' locomotor status. To determine locomotor status, the researcher rolled out a 5 m × 1 m runner, marked every 25 cm, and encouraged infants to crawl or walk on at least two trials. The researcher placed infants in a prone or upright standing position at one end of the runner and asked caregivers to call to their infants from the other end. Infants that could crawl (on hands and knees or hands and feet) the distance of the runner without stopping or falling were classified as *pre-walkers*; and infants who could walk 3 m without stopping or falling were classified as *walkers* (see Karasik et al., 2023). In the 12-month group, five infants could not locomote, seven crawled, and none walked. In the 16-month group, seven infants could crawl but did not walk and 13 infants could walk. In the 20- and 24-month groups, all infants ( $ns = 14$  and 13, respectively) walked.

## 2.3 | Data coding

Video data were coded using a computerized video coding system, Datavyu ([datavyu.org](http://datavyu.org)), that records frequencies and durations of specific behaviors time-locked to video. First, coders identified times throughout the observation when infants were indoors and when they were outside. Indoor spaces were classified as those that had four enclosed walls and a roof. Partially enclosed spaces, like verandas were classified as outside spaces. Coders identified location continuously and began the onset of infants' location coding at the start of the observation.

Change in location was noted when infants crossed a threshold leading to a change in location (e.g., a doorway leading outside). Coders marked the threshold with an offset of the previous location and continuous onset of the subsequent location (i.e., the following millisecond).

Next, coders identified instances when infants were in manual contact with objects. We defined object bouts as episodes of contact with any manipulable, moveable item or part of an item (Herzberg et al., 2021; Karasik et al., 2011). Large, fixed items and structural components of the home (e.g., ovens, armoires, banisters) were not considered manipulable objects. The onset of an object bout was coded when infants contacted an object with their hands. The offset of a bout marked the video frame when infants' manual contact with the object was terminated for 3 s or more. If infants contacted multiple objects with less than a 3-s break in between objects, the entire object bout was counted as a single episode. In these multiple-object episodes, manual contact with the first object marked the onset and the end of contact with the last object signaled offset. Time spent in object episodes indicated the *accumulated time* that infants spent in manual contact with objects during the entire observation (e.g., Banerjee & Tamis-LeMonda, 2007; Karasik et al., 2011).

To assess object types, coders classified objects into one of seven mutually exclusive categories: (1) *toys* included child-designed artifacts found in Tajik homes (e.g., balls, trucks, toy gahvoras, dolls, plush animals); (2) *household* objects were small moveable domestic artifacts like spoons, bowls, blankets, and saucers; (3) *food* items were coded when infants came in manual contact with edible foodstuffs but were not consuming them; (4) *natural kinds* included rocks, pebbles, plants, and other organic objects; (5) *furniture* included large home furnishings that were too large for infants to pick up or carry but that could be displaced when pushed (e.g., full-size gahvoras, stools); (6) *study toys* were toys that experimenters brought with them for other purposes (e.g., toys for the locomotor assessment task); and (7) *locomotor toys* included objects on wheels that could be pushed (e.g., walkers, stroller, ride-on truck).

Finally, coders classified each object contact as either *unique* (i.e., first encountered during the observation) or *repeated* (i.e., objects that infants returned to after having previously interacted with them earlier in the observation). The frequency of both unique and repeated objects was summed to yield a total score for objects contacted during the observation.

A primary coder scored 100% of each infant's video data, and a second coder independently scored between 25% and 33% for reliability. Inter-observer reliability was high. Percent agreement for categorical variables (object types; unique vs. repeated) ranged from 94.4% to 99.6% ( $k_s = 0.75\text{--}0.96$ ,  $p_s < 0.05$ ). Correlations on duration variables (indoors vs. outside; time in object contact) ranged from 0.95 to 0.98, all  $p_s < 0.001$ . Disagreements between coders were resolved through discussion.

### 3 | RESULTS

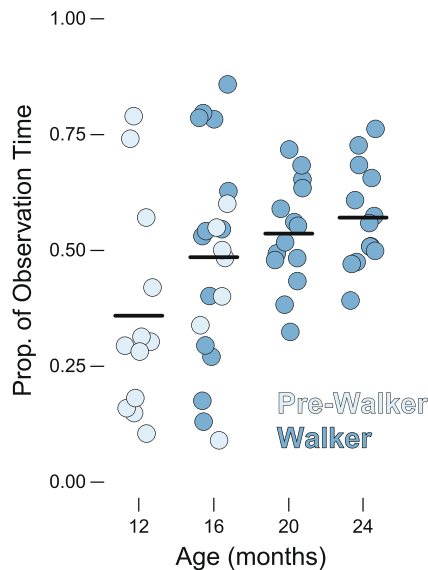
This study documented the *timing* (e.g., how much time infants spent contacting objects), *contents* (e.g., the diversity of objects infants encountered), and *location* (e.g., whether object play took place indoors vs. outside) of Tajik infants' everyday object play in the second year of life. Moreover, we examined whether infants' chronological age and locomotor status (pre-walker vs. walker) were related to their play with objects. Data were analyzed with either univariate or repeated-measures analysis of variance (ANOVA). Sidak comparisons were conducted to follow up on significant main effects and interactions.



Our primary measures included: (1) accumulated time with objects; (2) relative frequency and diversity of object types; and (3) accumulated time with objects indoors versus outside. Preliminary analyses indicated no differences between boys and girls, so analyses collapsed across infant sex, all  $ps > 0.05$ . Moreover, there were no differences on any measure between infants who did not locomote and those who crawled, all  $ps > 0.05$ . Thus, we classified these infants as *pre-walkers* for subsequent analyses. Finally, time spent in manual contact with objects, the relative frequency and diversity of object contacts, and time spent with objects indoors versus outside did not vary as a function of the number of hours infants spent in a gahvora cradle during the previous day, all  $ps > 0.05$ .

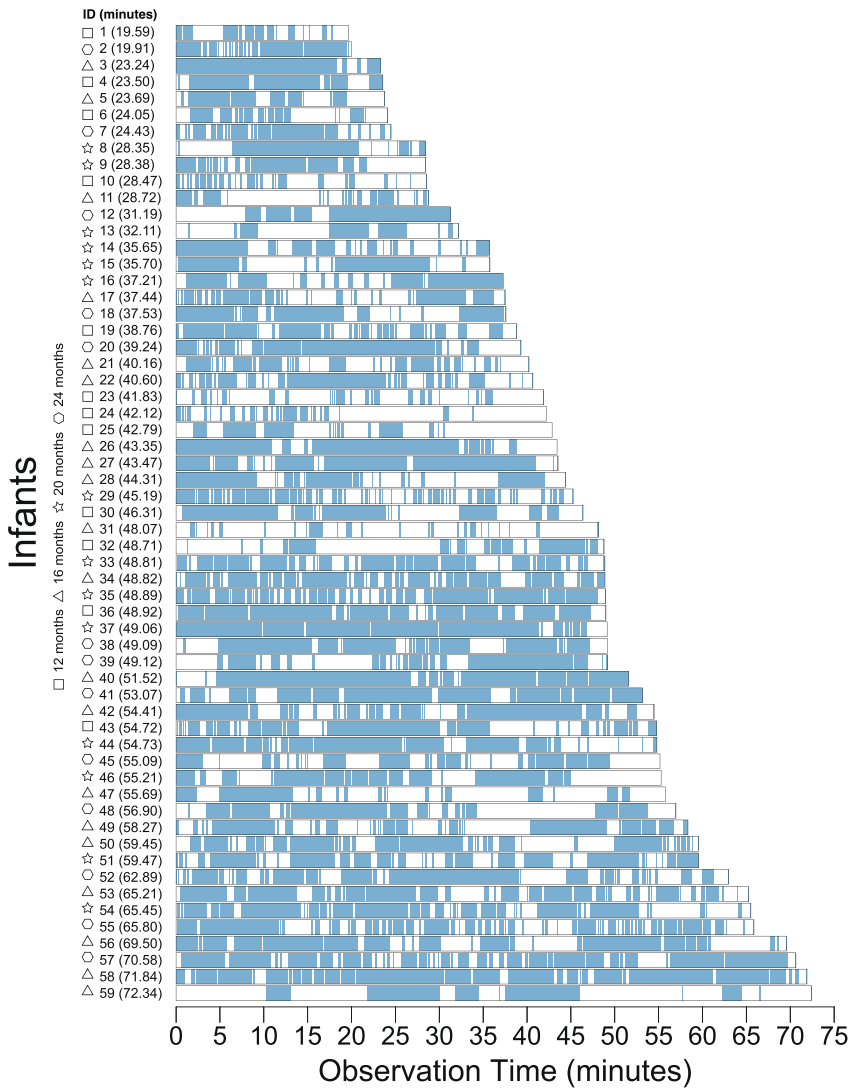
### 3.1 | Time contacting objects

We first analyzed how much time infants spent in manual contact with objects. Total time in object contact ranged from 2.52 to 57.21 min ( $M = 22.54$  min,  $SD = 12.05$ ). Because observation times differed among infants, we analyzed the proportion of time spent in object contact out of total observation time. Figure 2 shows individual differences and group averages for the proportion of time infants spent in manual contact with objects during the observation. Infants spent approximately half of their observation time in object play ( $M = 0.49$ ,  $SD = 0.19$ ). A univariate ANOVA confirmed that older infants (20- and 24-month-olds) spent proportionally longer time in manual contact with objects ( $M_s = 0.54$  and  $0.57$ ,  $SD_s = 0.11$  and  $0.11$ , respectively) as compared to 12-month-olds ( $M = 0.36$ ,  $SD = 0.29$ ), but did not differ from 16-month-olds ( $M = 0.49$ ,  $SD = 0.22$ ),  $F(3, 55) = 3.19$ ,  $p < .05$ ,  $\eta^2 = 0.15$ . Controlling for age, walking infants spent more time with objects ( $M = 0.54$ ,  $SD = 0.17$ ) compared to pre-walking infants ( $M = 0.38$ ,  $SD = 0.21$ ),  $F(1, 57) = 10.08$ ,  $p < .01$ ,  $\eta^2 = 0.15$ .



**FIGURE 2** Individual differences in the proportion of observation time spent in manual contact with objects. Symbols represent individual infants and are color-coded by infants' locomotor status (light blue = pre-walkers; dark blue = walkers). Horizontal lines show group averages.

Figure 3 displays timelines of object contacts for each infant, sorted by observation time (from least to most). As shown in the figure, all infants were in manual contact with objects throughout their observations, regardless of the length of their observation. ANOVAs on rates of object contacts revealed no effects of age or locomotor status,  $ps > 0.05$ . Object bouts were generally brief (83% of bouts were 1 min or less) and only 2.2% were longer than 5 min. ANOVAs confirmed that there were no significant effects of age or locomotor status on maximum duration of object bouts,  $ps > 0.05$ . Nonetheless, there was immense variability in the number of object episodes that infants accumulated ( $M = 44.12$  objects per hour,  $SD = 23.36$ ,  $M_{\min} = 6.64$  objects per hour,  $M_{\max} = 111.70$  objects per hour; object interactions were prorated



**FIGURE 3** Timelines of object contact bouts for each infant ordered by length of observation time (from shortest to longest). Each row shows data from one infant. Symbols represent infant age groups (squares = 12-month-olds; triangles = 16-month-olds; stars = 20-month-olds; and hexagons = 24-month-olds). Blue bars indicate times when infants were in contact with objects, and white bars show times when infants were not in contact with objects.

to 1 h for interpretation). However, this measure also did not vary by age or locomotor status,  $p_s > 0.05$ .

### 3.2 | Object types and diversity of objects

The majority of infants' object bouts involved objects from only one category (88% of bouts) rather than multiple categories. Specifically, 10% of bouts involved objects from two categories, and 2% involved objects from three object categories. As shown in Figure 4, most of infants' object bouts were with toys (38% of bouts), household items (29% of bouts), food (11% of bouts), natural kinds (10% of bouts), and furniture (8% of bouts), in that order. The remaining 4% of bouts included contact with locomotor objects that allowed for full body movement (0.8% of bouts; e.g., rocking horse, tricycle) and at times, infants contacted objects that the experimenter brought into the home for data collections (3% of bouts). Repeated measures ANOVAs with type as a within-subjects factor and age or locomotor status as between-factors confirmed that the proportion of object categories infants contacted differed by type,  $F(6, 348) = 38.26, p < .001, \eta^2 = 0.38$ ; but not by infants' age or locomotor status. Similarly, time spent engaged in object bouts also differed by object type but not by age or locomotor status,  $F(6, 330) = 25.78, p < .001, \eta^2 = 0.32$ .

Infants racked up object contacts—some had as few as eight contacts during their observations, while others as many as 98. Unique contacts (i.e., encountering an object for the first time in the observation; 36% of all objects) were less likely to occur compared to repeated contacts (i.e., returning to a previously contacted object; 64% of all objects). Moreover, whether an object was unique or repeated varied as a function of object type (see Figure 5). For example, although toys were the most frequently contacted object type, they were the least varied—only 18% of toys encountered during observations were unique. In contrast, most household objects were unique (59% of household objects). Natural kinds (36% of natural kind objects), furniture (38% of furniture objects), and food (31% of food objects) also had high frequencies of unique

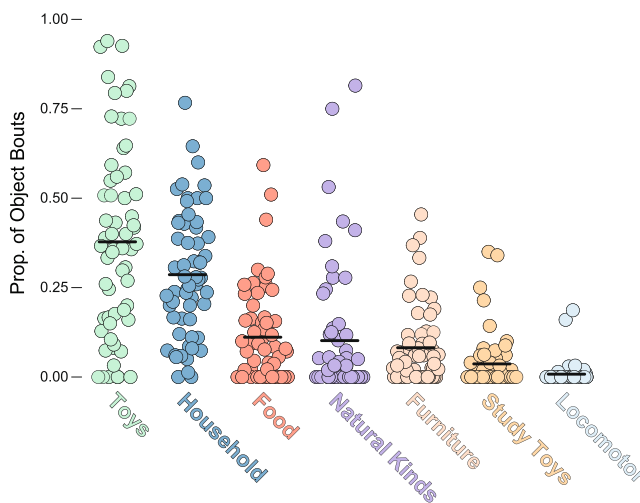
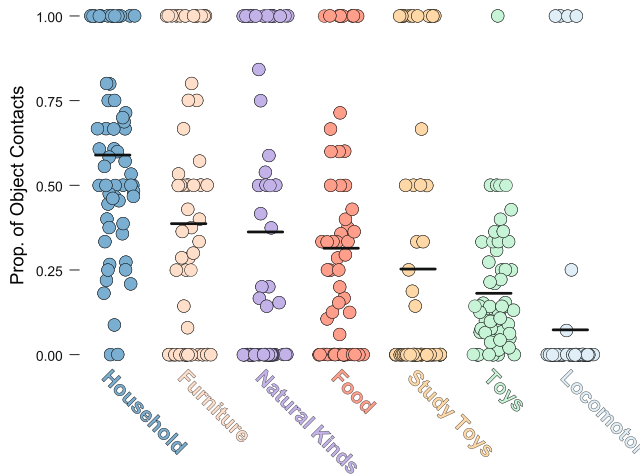


FIGURE 4 Individual differences in the proportion of objects bouts encountered during the session by object type. Symbols represent individual infants; horizontal lines show group averages.



**FIGURE 5** Individual differences in the proportion of new objects contacted within an object category. Proportions closer to one indicate that infants contacted relatively more new objects within an object type category. Proportions closer to 0 indicate that infants tended to contact previously encountered objects within an object type category. Symbols represent individual infants; horizontal lines show group averages.

encounters. A univariate ANOVA examining the proportion of unique objects by age and locomotor status found only a significant effect of object type,  $F(6, 348) = 15.63$ ,  $p < .001$ ,  $\eta^2 = 0.22$ , with no significant effects of age or locomotor status,  $ps > 0.05$ .

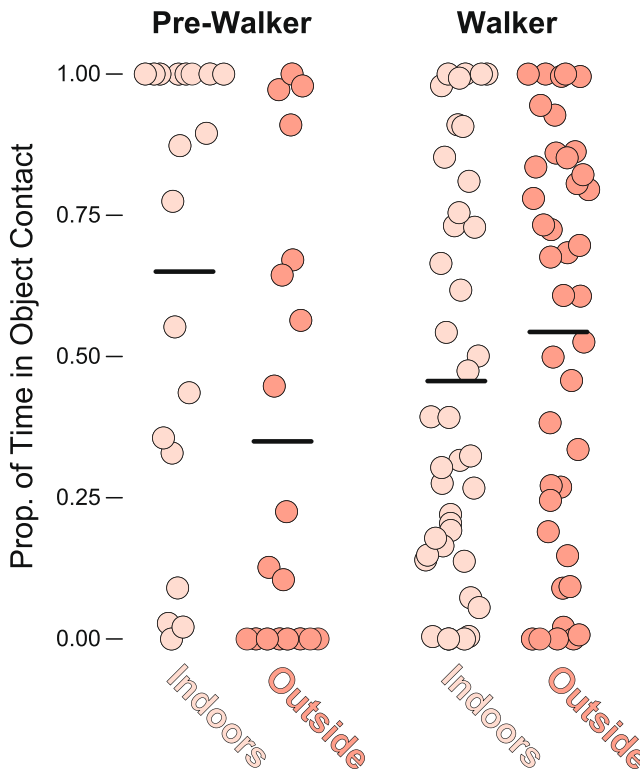
### 3.3 | Where did object play take place?

Infants' object contacts spanned the indoors and outside. Most infants' observations began indoors (83% of infants), but a few started their observations outside (17% of infants). Regardless of where infants began their time, the majority (78%) trekked to another setting; that is, if infants began indoors, at some point, they wandered outside.

Of the time infants spent with objects, approximately half of their object time occurred indoors ( $M = 0.52$ ,  $SD = 0.38$ ) and half took place outside ( $M = 0.48$ ,  $SD = 0.37$ ). As shown in Figure 6, infants' time contacting objects indoors versus outside differed by infants' locomotor status, controlling for age,  $F(1, 57) = 3.99$ ,  $p < .05$ ,  $\eta^2 = 0.06$ . Specifically, pre-walking infants spent most of their time in object engagement indoors ( $M = 11.90$  min,  $SD = 12.15$ ) with only a few minutes of object time while outside ( $M = 5.00$  min,  $SD = 7.03$ ,  $p < .05$ ). By contrast, walkers split their object time between the indoors ( $M = 10.77$  min,  $SD = 10.48$ ) and outside ( $M = 14.47$  min,  $SD = 12.77$ ). The relative frequency and diversity of objects contacted did not vary as a function of whether infants were indoors or outside,  $ps > 0.05$ .

## 4 | DISCUSSION

The overall goal of this study was to examine the ebb and flow of infants' everyday object play at home in a unique part of the world. Our study advances existing knowledge on infant object engagement in three important ways. First, we took our inquiry far from Western ethnotheories



**FIGURE 6** Individual differences in the proportion of time contacting objects out of the total time spent indoors versus outside for pre-walkers and walkers. Symbols represent individual infants and are color-coded by location (light orange = indoors; dark orange = outside). Horizontal lines show group averages.

about object play to document everyday experiences of infants in Tajikistan, Central Asia. Examining object engagement in Tajikistan is particularly interesting because of the restrictive cradling practices used in the region, which have been linked to infant motor development and opportunities for exploration (Karasik et al., 2022, 2023). Although cradling was related to the acquisition of new motor skills and motor proficiency in infancy, effects were fleeting as older Tajik children seemed to perform most locomotor tasks comparably to U.S. children. Unknown is the extent to which motor delays in infancy set the stage for different trajectories in other developing domains. Thus, we examined how infants' locomotor status shaped their object play. Second, researchers are increasingly aware of restrictions that laboratory contexts place on human behavior, thus constraining generalization to real-world behaviors in everyday settings (e.g., Schneider & Iverson, 2023; Tamis-LeMonda et al., 2017). So we conducted our work outside the context of the laboratory to examine whether and how infants' experiences with objects during naturalistic activities may be shaped by their age and locomotor abilities. Finally, we leveraged the power of video to capture rich details of infant object play on a frame-by-frame basis—the timing, contents, and location of play. Documenting patterns of seemingly ordinary behaviors at the level of milliseconds (e.g., when infants touched objects, what they touched, for how long, in what setting, and so on) revealed how culture infuses daily life and highlights the ways in which infants' cultural contexts shape their learning.

## 4.1 | The timing and contents of everyday object play

We discovered that infants in the Khatlon and Rasht regions of Tajikistan, regardless of age and locomotor status, contacted objects often during typical everyday activities. Given that infants' opportunities for object exploration are shaped both by their motor abilities and the availability of objects in their environment (Franchak, 2020), we were surprised to see that rates of Tajik infants' object exploration were comparable to observations of U.S. infants (Herzberg et al., 2021; Karasik et al., 2011; Swirbul et al., 2022). Tajik infants encountered objects throughout their observation, played with objects in brief spurts, and accumulated nearly 50% of their observation time in manual contact with objects. These findings are similar to reports in Western cultures where objects are abundant, particularly in middle-to high-SES and even in low-SES families (e.g., Herzberg et al., 2021; Swirbul et al., 2022).

Interestingly, the frequency, diversity, and location of object play did not vary as a function of the amount of hours infants had spent in a gahvora cradle during the previous day. When infants were observed out of the gahvora, they all contacted similar types of objects for similar amounts of time, suggesting that opportunities for object exploration were comparable. However, it is possible that gahvora restriction may have had indirect effects on object play through differences in infants' motor abilities. In our sample of gahvora-reared infants, 32% of infants were not yet locomotor. Compared to World Health Organization standards, our Tajik sample had more pre-locomotor infants (Martorell et al., 2006). Still unexplored is whether motor abilities shape the kinds of actions infants produce on objects.

Unlike homes in Western contexts, which vary enormously within and across cities, Tajik dwellings were remarkably consistent across families. Tajik homes were comparable in size, were equally likely to be minimally furnished, contained few toys, and had large outdoor spaces where families gathered to eat and where children played. Although their home environments were sparse, Tajik infants maximized opportunities to contact whatever objects were available. Indeed, any object became a play opportunity: doors, spoons, bowls, food, dolls, rocks, leaves, grass, and even the family cow. Although infants' homes contained relatively few objects in each category—just one toy truck, one doll, or one stuffed animal, as compared to over 30 different toy types in U.S. homes (Herzberg et al., 2021)—infants contacted a diverse range of objects over the course of their observations. It is possible that a smaller diversity of objects available in the home may limit the variety of actions infants can learn and produce on objects. However, some laboratory studies of object play suggest the opposite. Indeed, researchers have found that infant play in a room with a handful of toys resulted in longer episodes of sustained attention to objects and a larger variety of play actions as compared to play a room with many toys (Dauch et al., 2018). The lack of object abundance and possibility of sustained attention to only a few objects may inadvertently foster Tajik infants' creativity with object manipulation. Infants may generate new ways to use objects beyond their initial design (e.g., picking flowers to practice a pincer grasp). In future work, we will examine the variety of manual actions infants spontaneously generated on the objects they contacted during everyday play.

In our prior work, we showed that Tajik infants were always surrounded by social partners during daily life at home. Nonetheless, it is noteworthy that mothers did not serve as infants' primary play partners as they were often occupied with daily chores and routines. Indeed, our observations suggest that many of Tajik infants' encounters with objects were embedded in various daily tasks, from cooking to cleaning, potentially fostering infant learning about essential skills of daily life. For example, infants touched dough while watching caregivers bake

bread in rooms housing large ovens, gripped onto woven brooms while sweeping stone steps in front of doorways, and poured pretend tea from kettles with loose-fitted handles.

## 4.2 | Infants' locomotor status shaped the location of object play

Consistent with our hypotheses, infants' locomotor abilities enabled different opportunities to encounter objects in different locations. During everyday interactions, pre-walkers spent more time with objects indoors than outside, compared to walkers, who split their time with objects between the two contexts. Research has shown that walkers have greater access to distal objects in their environment. Walkers are more likely to play at a distance from their caregivers and carry objects as they change locations than pre-walkers, who tend to explore objects within reach while proximal to caregivers (Chen et al., 2023; Karasik et al., 2011, 2012). Indeed, this also appeared to be the case with Tajik infants: Whereas walkers' object bouts took place both indoors near caregivers and outside far from other adults and children, pre-walkers mostly spent their play time indoors.

Outside environments provide novel opportunities for play that may not be available indoors. In Tajikistan, life unfolds both indoors and outside simultaneously. Children and adults frequently move between dwellings and spend considerable time outside, regardless of the season. Our research revealed that infants spent a significant amount of time outdoors, which shaped the types of objects they encountered and may shape the variety of object actions they produce. We note that contacting and exploring objects outdoors is certainly not unique to Tajik infants. It is likely that Western infants also have many object opportunities while playing outside (e.g., in the backyard, home garden). Future research can continue to examine everyday object play outside.

## 4.3 | Conclusions

Our focus on the daily experiences of Tajik infants contributes to an expanding research landscape aiming to diversify both samples and methodologies in developmental science (e.g., Singh et al., 2023). Tajikistan, an often overlooked and underrepresented population in research, takes center stage in our study. And our results revealed that despite the limited availability of objects in Tajik households, infants engaged with objects comparably to their Western counterparts. Furthermore, the interplay between infants' locomotor abilities and environmental contexts shaped their object interactions. In sum, our findings underscore the profound impact of cultural and environmental factors on infants' everyday object play.

### AUTHOR CONTRIBUTIONS

**Lana B. Karasik:** Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Writing—original draft. **Joshua L. Schneider:** Visualization; Writing—review & editing. **Yana A. Kuchirko:** Visualization; Writing—review & editing. **Rano Dodojonova:** Methodology; Project administration.

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### CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest with regard to the funding source for this study.

### DATA AVAILABILITY STATEMENT

Raw video data and spreadsheets of coded behaviors are shared with authorized investigators on Databrary.org (<https://nyu.databrary.org/volume/11>).

### ETHICS STATEMENT

The present study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from a parent or guardian for each child before any assessment or data collection. All procedures involving human subjects in this study were approved by the University Integrated-IRB at the College of Staten Island (440783-CSI), City University of New York.

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