AN EVALUATION OF PREFERENCE DISPLACEMENT IN INDIVIDUALS WITH AUTISM

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ABSTRACT

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In this study we replicated the procedures of DeLeon, Iwata, and Roscoe's 1994 study which examined the extent of which edible stimuli displaced leisure stimuli in a preference assessment. Participants took part in three separate multiple stimulus without replacement (MSWO) preference assessments. One preference assessment contained all leisure stimuli, another all edible stimuli, and a final preference assessment that contained the top selected stimuli from the edible and leisure assessments. Their study found that 12 of the 14 participants selected edible stimuli over leisure stimuli in a combined preference assessment. Another recent study, Conine and Vollmer (2019) found similar results. However, our findings were different. Our results indicated that 11 participants selected edible stimuli as their most preferred stimulus and 14 selected leisure as their most preferred stimulus. This study also evaluated the effects of preference displacement in a combined preference assessment. The implication of our results suggest that preference is based on the individual and may be influenced by age, setting, and disability.

Keywords: preference, selection response, displacement, preference assessment

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KEY TO SYMBOLS AND ABBREVIATIONS

ABA	Applied Behavior Analysis
ASD	Autism Spectrum Disorder
MSWO	Multiple Stimulus Without Replacement
IOA	Interobserver Agreement
PI	Procedural Integrity
EIBI	Early Intensive Behavioral Intervention

Introduction

Positive reinforcement is a pivotal component of any effective behavioral intervention program (Higbee, 2000). Positive reinforcement "occurs when a stimulus change immediately follows a response and increases the future frequency of that type of behavior in similar conditions" (Cooper, Heron, & Heward, 2007, p. 701). In order to streamline reinforcer identification, preference assessments are administered to use student choice (i.e., the selection of one response option over other simultaneously available options) as a way to infer preference for stimuli. Highly preferred stimuli (i.e., items chosen more often than other items) are more likely to function as reinforcers than low preferred stimuli. Preference assessments have strong predictive validity in identifying reinforcers and have been shown to effectively identify reinforcers across a variety of contexts and with a variety of participants (Kang et al., 2013). One type of preference assessment is the multiple stimulus without replacement (MSWO). The MSWO is a preference assessment that contains stimuli in which all stimuli are presented at once and when the participant is selected the remaining stimuli are removed from the area and rotated from left to right then re-presented. This is done repeatedly until all stimuli are selected or a specified period of time has elapsed with no selection. This is done for a total of five rounds (DeLeon and Iwata, 1996).

To better understand preference assessments, researchers have evaluated what variables may contribute to differences in obtained results within and across participants. One specific example of such an evaluation is in preference displacement. Displacement is when one stimulus is selected and moves another stimuli lower in the rank of preference. DeLeon, Iwata, and Roscoe (1997) conducted a study to evaluate the extent to which food displaces leisure items in a preference assessment (i.e., is food, as a stimulus class, likely to be more preferred when

combined with leisure items?). Fourteen participants with developmental disabilities that lived in a residential facility participated in the study. The participants were exposed to three different MSWO preference assessments. First, they were exposed to an edible and a leisure preference assessment. However, the exposure to which preference assessment was administered first was unsystematic. Following both assessments, a combined preference assessment was conducted, which consisted of the top 3 to 4 stimuli from the edible and leisure preference assessments. This typically consisted of the top 3 stimuli from the first preference assessment and the top 4 from the second preference assessment, but this was not specified as being consistent. This study found that 12 of 14 participants chose edible stimuli over leisure stimuli during the combined assessment.

DeLeon et al. (1997) concluded that edible and leisure should not be included in the same preference assessment because edible stimuli may artificially deflate the relative value of leisure items, due to the inherent differences between edible and leisure stimuli. This recommendation was supported by the finding that 12 of the 14 participants preferred edible stimuli during the combined assessment. This finding was further supported by results obtained from Bojak and Carr (1999) and Fahmie, Iwata, & Jann (2015). Across all three studies, an edible stimulus was the top preferred stimulus across 83% of the participants, and total displacement of leisure stimuli was observed for 67% of the participants (Conine & Vollmer, 2019). Bojak and Carr (1999), Fahmie, Iwata, & Jann (2015), and Conine & Vollmer (2019) all replicated DeLeon et al.'s (1997) study.

In a recent evaluation of preference displacement in 26 individuals with ASD ranging in age from 2 to 12, Conine and Vollmer (2019) found that edible stimuli were top ranked in a combined assessment for 17 participants (65%). Participants in this study

all attended an Applied Behavior Analysis (ABA) clinic. Prior to starting the preference assessments participants were pre-exposed to both the edible and leisure stimuli. Furthermore, they found that complete displacement of leisure stimuli occurred for 6 (23%) participants. Though their result indicated that edible stimuli were more likely to be selected in combined assessments, they also found that leisure stimuli were more likely to be selected than was previously reported in prior research (i.e., Bojak & Carr, 1999; DeLeon et al., 1997; Fahmie et al., 2015). However, in this study a brief MSWO was conducted and not a full MSWO like in DeLeon et al. (1997). Stimuli in this study also all included a stimulus with a screen (e.g., iPad, computer, etc.). This may have affected the results of their study by artificially inflating the screen time stimuli and lowering the value of other stimuli.

Given the results of Conine and Vollmer (2019) and its inconsistencies with previous studies (e.g., disability, age range, type of preference assessment.), further evaluation of preference displacement is needed in order to further evaluate once ubiquitous recommendations about preference displacement for individuals with ASD. This research is needed in order to further understand the role of preference displacement across specific populations, ages, and settings as well. These variables are important to be able to identify a reinforcer for young children with ASD in an EIBI clinic. Therefore, the purpose of this study was to replicate of the procedures DeLeon et al. (1997) with 25 new participants with autism spectrum disorders (ASD) who are currently receiving services in a community-based early-intensive behavioral intervention (EIBI) program and are between the ages of 2-5 years old. Given the proliferation of EIBI as a form of treatment for ASD, and the role of reinforcement in behavioral intervention, it is important to understand preference displacement in young children with ASD in order to inform preference assessments and reinforcer identification in this setting.

Our first research question evaluated if our participants selected an edible or leisure stimuli as their most preferred stimuli in a combined assessment? Our second research question evaluated the effect of displacement that was observed, if any, in a combined assessment?

Method

Participants

Participants for this study were recruited from a community-based EIBI clinic for children with autism. Participants that attended the clinic received 1:1 applied behavioral analysis therapy four days a week. Participants were between 2-5 years of age. Twenty-five children who were newly enrolled in the clinic were recruited to participate in this study. See Table 1 for participant demographics.

Prerequisite skills to be included in this study were that the participant could scan an array of eight stimuli and could make a selection response (pointing, tapping, etc.). Participants who engaged in challenging behavior (e.g., aggression) or could not sit at the table for the duration of each assessment (approximately 45 min) were excluded from the study.

Setting and Materials

The study was conducted in a separate room from the participant's typical treatment area. The room contained a camera and a tripod (to record all sessions). Edible and tangible stimuli that were identified prior to the start of each session were also present. Edible stimuli were preselected by the assessor from a list of stimuli. If at least four stimuli were not selected, the assessor would speak with the participants therapist about other edible stimuli they would consume. Leisure stimuli were preselected from a list as well. Paper data sheets, pencils, tables, and chairs were also present.

Dependent Variables

Selection percentage. Selection percentage served as the primary dependent variable for this study. The selection percentage was derived from measuring each participant's selection responses across each preference assessment. A selection response was defined as the item the

participant touched, following the instruction “pick one” or “choose one”. The participant was then allowed to interact with or consume the item selected. A selection percentage was calculated by dividing the number of times a stimulus was selected by the number of times the stimulus was presented, and multiplying it by one hundred to yield a percentage (Higbee, 2000).

Items were then ranked by their percentage from most to least preferred. Consider an example of a preference assessment of four stimuli, and the selection percentages for the toy ball, car, airplane, and boat were 70%, 85%, 20% and 50%, respectively. The toy car would be ranked as the highest preferred, followed by the ball, boat, and airplane.

Interobserver agreement (IOA) was taken for all sessions for the primary dependent variable (selection response). For each trial, a second observer wrote down the item the participant selected. An agreement was scored if the second observer wrote down the same stimulus, for a given trial, as the primary researcher. A disagreement was scored if the second observer recorded a stimulus that was different than the primary researcher, for a given trial. IOA for each preference assessment was calculated by dividing the sum of agreements, by the sum of agreements plus disagreements, and multiplying it by 100 to yield a percentage (Cooper et al., 2007). IOA was 100% for Ethan, Marissa, Andrew, Robert, Trent, Megan, Ben, Oliver, Stanley, Tim, Henry, Larry, Aaron, Ryan, Linda, Sam, Luke, Tina, George, Tyler, Lisa, Abby, and Josh. Doug’s IOA was between 90%-100%. Jim’s IOA was not complete due to the camera dying during the first session (leisure). The edible IOA for Jim was 85.5% and 100% for the combined assessment.

Procedural integrity (PI) was also measured for every preference assessment administered. A task analysis of the primary researcher’s behavior was developed. The task analysis is depicted in Table 2. For each step in the task analysis, a second observer scored a

"yes" if the experimenter had implemented that step correctly each time, and a "no" was checked if at any point during the preference assessment that the fidelity protocol was not followed. PI for each participant was calculated by dividing the sum of "yes" scores by the sum of "yes" plus "no" scores and dividing it by 100 to yield a percentage (Cooper et al., 2007). PI was 100% for Larry, Ryan, Linda, Sam, Luke, Tina, George, Lisa, Abby, Josh, Ethan, Marissa, Andrew, Robert, Ben, Oliver, Stanley, Tim, and Henry. Aaron's PI ranged between 92.3% - 100% with an average of 97.4%. Tyler's PI ranged between 92.3% - 100% with an average of 97.4%. Trent's PI ranged between 92.3% - 100% with an average of 94.9%. Megan's PI ranged between 92.3% - 100% with an average of 97.4%. Doug's PI ranged between 92.3% - 100% with an average of 94.9%. Finally, Jim's PI ranged between 83.3% - 100% with an average of 91.65%. During Jim's Tangible preference assessment, the camera died, and no PI was able to be collected. Also, his combined preference assessment was re-done but not recorded and PI was collected on the session that had not been re-done.

Preference displacement. As a secondary dependent variable, three categories of displacement were defined in order to evaluate the extent of displacement of one stimulus type over the other. *Complete displacement* was defined as a participant selecting either all four leisure stimuli or edible stimuli as their top four selected stimuli in the combined assessments. *Partial displacement* was defined as a participant that either selected three edible or three leisure stimuli as their first, second, and third selection in the combined preference assessment. *Mixed displacement* was defined as a participant who did not display complete or partial displacement in the combined preference assessment.

Procedure

Participants were randomly assigned to Group 1 or Group 2 (see Table 1). Participants in Group 1 were exposed to the edible preference assessment first, then they were exposed to the leisure preference assessment. Participants in Group 2 were exposed to the leisure item preference assessment first, then the edible preference assessment. The purpose of this randomization was to evaluate if exposure to a specific type of preference assessment (i.e., edible or leisure) affected subsequent results of the combined assessment. Participants in Groups 1 and 2 all received the combined assessment following the leisure and edible assessments.

The experiment was conducted across two days for each participant. Individual sessions were conducted around the same time of day for each participant. On the first day, both the leisure and edible preference assessments were conducted. On the second day, the combined assessment was conducted. The combined assessment was conducted the following day due to time constraints at the clinic.

General MSWO procedures. Three types of MSWOs = (leisure stimuli, edible stimuli, and combined stimuli) were conducted using the following general format. First, sessions began with the experimenter bringing the participant to the separate room. The experimenter and participant sat across from each other at the table in the room. A camera was present to record the research session.

Prior to starting the leisure, edible, and combined stimuli preference assessments, stimuli were selected for each participant. Eight edible and eight leisure stimuli were selected out of a list of preselected stimuli. There was a bag containing preselected leisure stimuli, which consisted of toys that were similar to toys that may be found in the participants clinic. Edible stimuli were selected from a list of preselected edible stimuli that would be typically found in the

participants clinic room. The participant was then pre-exposed to each stimulus. The pre-exposure process for the leisure stimuli allowed the participant to interact with each stimulus for 30 seconds; if necessary, the primary researcher briefly showed the participant how each of the stimuli worked (e.g., showing the participant that pressing a button makes the toy light up). The pre-exposure process for the edibles consisted of each of the edible stimuli being presented and the participant being allowed to consume each item. If the participant did not consume a stimulus, then the next item was presented, and pre-exposure continued until all stimuli had been presented. If a participant did not select at least four edible stimuli, then the experimenter spoke with the participants therapist to see if there were other edible stimuli the participant consumed regularly and those were then incorporated into the pre-exposure.

Following pre-exposure, the preference assessment was administered. For each assessment, eight stimuli were presented in a random order on the table, in a horizontal line, and the participant was told to “pick one”. Following a selection response, the participant was allowed to engage with or consume that stimulus for up to 30 seconds. All other stimuli were removed from reach of the participant while the participant engaged with or consumed the selected stimulus. The remaining stimuli were rotated by taking the item on the left end of the line and placing it on the right end, and were spaced of approximately equal distance on the table. The participant was then instructed to “pick one” or “choose one”. This process was repeated until all stimuli were selected or there was a 30 second time lapse in which no stimuli were selected. If the participant did not make a response in 30 seconds the session was terminated, and remaining stimuli not selected were recorded as not selected, and given a selection value of 8.

The above process continued until all eight stimuli were selected. Following the selection of the 8th stimulus, this process was completed four additional times, for a total of five rounds of each preference assessment. To address satiation, leisure stimuli were limited to a time limit of 30 seconds per stimuli. Edible stimuli were cut into small bite- sized pieces.

We defined the following displacement effects as follows:

Leisure. In this condition, eight leisure stimuli were presented in an MSWO format. A selection response resulted in 30 s access to that stimulus.

Edible. This condition resembled that of the leisure condition, except 8 edible stimuli were included in the preference assessment (instead of 8 leisure stimuli). A selection response resulted in the opportunity for the participant to immediately consume that edible stimulus.

Combined assessment. The combined assessment took place a day after both the leisure and edible assessments were completed. This assessment resembled that of the previous two assessments, except it consisted of the top four edible and leisure stimuli from the previous two assessments (for a total of 8 stimuli). The stimuli were placed unsystematically on the table. Otherwise, this condition resembled that of the leisure and edible assessments.

Results

During the combined assessment, 11 participants selected edible stimuli as their most preferred stimulus (George, Lisa, Aaron, Linda, Ethan, Marissa, Robert, Trent, Ben, Oliver, and Stanley) and 14 participants selected leisure stimuli as their most preferred stimulus (Tina, Tyler, Abby, Larry, Ryan, Sam, Luke, Andrew, Megan, Josh, Doug, Tim, Jim, and Henry).

With regard to preference displacement, complete displacement was observed for five participants (see Figure 1). For Ethan, Ben, and Oliver, edible stimuli completely displaced leisure stimuli. For Abby and Ryan, leisure stimuli completely displaced edible stimuli. Partial displacement was observed for five participants, with edible stimuli partially displacing tangible stimuli for Lisa and Linda, and leisure stimuli partially displacing edible stimuli for Tyler, Doug, and Tim (see Figure 2). Finally, mixed displacement was observed for 15 participants: Tina, George, Larry, Aaron, Sam, Luke, Marissa, Andrew, Robert, Trent, Megan, Josh, Stanley, Jim, and Henry (see Figures 3-5). See Table 1 for a summary of participant performance.

Discussion

The results of the study show that 11 participants selected edible stimuli as their most preferred stimuli and 14 participants selected leisure stimuli as their most preferred stimuli in the combined assessment. These findings are inconsistent with DeLeon et al. (1997), Conine and Vollmer (2019), Bojak and Carr (1999), and Fahmie et al. (2015). In DeLeon et al. (1997) found that 12 out of 14 participants selected edible stimuli as their most preferred reinforcer. Conine and Vollmer (2019) found that edible stimuli were top ranked in a combined assessment for 17 participants (65%). Bojak and Carr (1999) all 4 (100%) of their participants selected edible stimuli as their most preferred stimuli. Finally, Fahmie et al. (2015) found that 10 of 12 (83%) participants selected edible stimuli as their top preferred stimulus.

In the combined assessment, complete displacement was observed for five participants (20%), partial displacement was observed for 5 participants (20%), and mixed displacement was observed for 15 participants (60%). DeLeon et al. found that 21% of the participants exhibited complete displacement, 42% exhibited partial displacement, and 36% of participants exhibited mixed displacement. Conine and Vollmer (2019) found that complete displacement of leisure stimuli occurred for 6 participants (23%). Bojak and Carr (1999) all 4 (100%) of their participants completely displaced leisure stimuli in the combined assessment. Finally, Fahmie et al. (2015) found that 9 participants (75%) were observed completely displacing leisure stimuli in the combined assessment and 3 participants (25%) were observed demonstrating mixed displacement (see Table 2).

Our findings may be different from previous studies for a few reasons. Participants were pre-exposed to all stimuli prior to the beginning of each preference assessment session and they were not atypical to any stimuli participants may have encountered outside of the study. One

possible reason is that edible stimuli were not systematically withheld throughout the treatment day to participants where they received EIBI treatment, and therefore their relative value was not as high as that for leisure stimuli.

The participants in our study all attended an EIBI treatment center where they were between the ages of 2-5 years old and all had a diagnosis of autism. Previous studies have reported a range of participant disabilities and settings. Participants in DeLeon et al. (1997) where residents of a residential treatment facility, were older and had a range of diagnoses (e.g., moderate to profound "mental retardation"). It is possible that the participants in this study preferred edible over leisure stimuli because it was a more controlled setting where access to food may have been more controlled. The setting in which Conine and Vollmer (2019) was conducted likely most resembles the present study. However, Conine and Vollmer (2019) had a larger age range of participants (2-12 years old). Fahmie et al. (2015) also had a large age range of participants (5-22 years old) and a variety of diagnoses such as ASD, Down syndrome, intellectual disability, or microcephaly. The participants in Bojak and Carr (1999) all had a diagnosis of intellectual disability and were between the ages of 29 and 44 years old.

There were a few limitations to our study. One limitation was the way that we selected stimuli for our participants and did not individualize stimuli to each participant. A survey to the participant's therapists was not conducted as they did in Conine and Vollmer (2019). This may have affected the stimuli preference for each participant since stimuli were not selected based on the individual.

Another limitation was that we did not restrict access to edible stimuli. They all participated in snack and lunch and participants were able to work for edible stimuli during individual goal time when they received ABA treatment. Due to edible stimuli that were readily

available to participants, the displacement effect associated with them may not have been as salient. However, this may not serve as a limitation of the study, but more so a contextual factor of EIBI settings. Therefore, a more controlled study that compares displacement outcomes across settings may be warranted.

The variation of displacement observed in our participants suggest that preference in either edible or leisure stimuli as the highest preferred stimuli is based on the preference of the individual. This may mean that when conducting preference assessments in practice the use of an all edible, leisure, or combined preference assessment should be made based on the individual. In some instances, the use of an all edible or leisure preference assessment may yield different results than in a combined preference assessment. Setting may also be a factor when deciding which preference assessment to use. If edible stimuli are easily accessed throughout a participant's day, then that may be a factor when deciding if a combined assessment is appropriate to conduct or not. In practice it is unlikely that clinicians will conduct and edible, leisure, and then combined preference assessment due to time restraints. Therefore, the extent to which the displacement effect generalizes to practice is unknown.

APPENDIX

Name	Age	Overall Developmental Quotient	Group	Finding (Displacement)
Tina	4 years, 6 months	61.79	2	Mixed
George	4 years, 1 month	28.88	1	Mixed
Tyler	4 years, 6 months	115.15	2	Partial
Lisa	3 years 6 months	58.82	1	Partial
Abby	4 years, 3 months	42.41	2	Complete
Larry	5 years, 1 month	80.26	1	Mixed
Aaron	3 years, 5 months	65.76	2	Mixed
Ryan	5 years, 2 months	53.07	1	Complete
Linda	5 years, 0 months	39.73	2	Partial
Sam	5 years, 4 months	77.16	1	Mixed
Luke	4 years, 2 months	60.91	2	Mixed
Ethan	4 years, 7 months	72.45	1	Complete
Marissa	4 years, 5 months	50.88	2	Mixed
Andrew	4 years, 2 months	99.43	1	Mixed
Robert	5 years, 3 months	48.22	2	Mixed
Trent	5 years, 5 months	40.68	1	Mixed
Megan	5 years, 3 months	65.18	2	Mixed
Ben	3 years, 11 months	38.50	1	Complete
Oliver	3 years, 6 months	67.22	2	Complete
Josh	5 years, 4 months	35.27	1	Mixed
Stanley	3 years, 6 months	65.25	1	Mixed
Doug	3 years, 4 months	60.80	2	Partial
Tim	4 years, 10 months	66.03	1	Partial
Jim	3 years, 9 months	50.44	2	Mixed
Henry	3 years, 5 months	-	1	Mixed

Table 1.

Participant Descriptions

Study	Participants	Complete Displacement	Partial Displacement	Mixed
DeLeon et al. (1997)	14	14.3%	57.1%	28.6%
Bojack and Carr (1999)	4	100%	0%	0%
Fahmie et al. (2015)	12	75%	0%	25%
Conine and Vollmer (2019)	26	23.1%	7.7%	69.2%
Our Study	25	20%	20%	60%

Table 2.

Displacement in the combined preference assessment

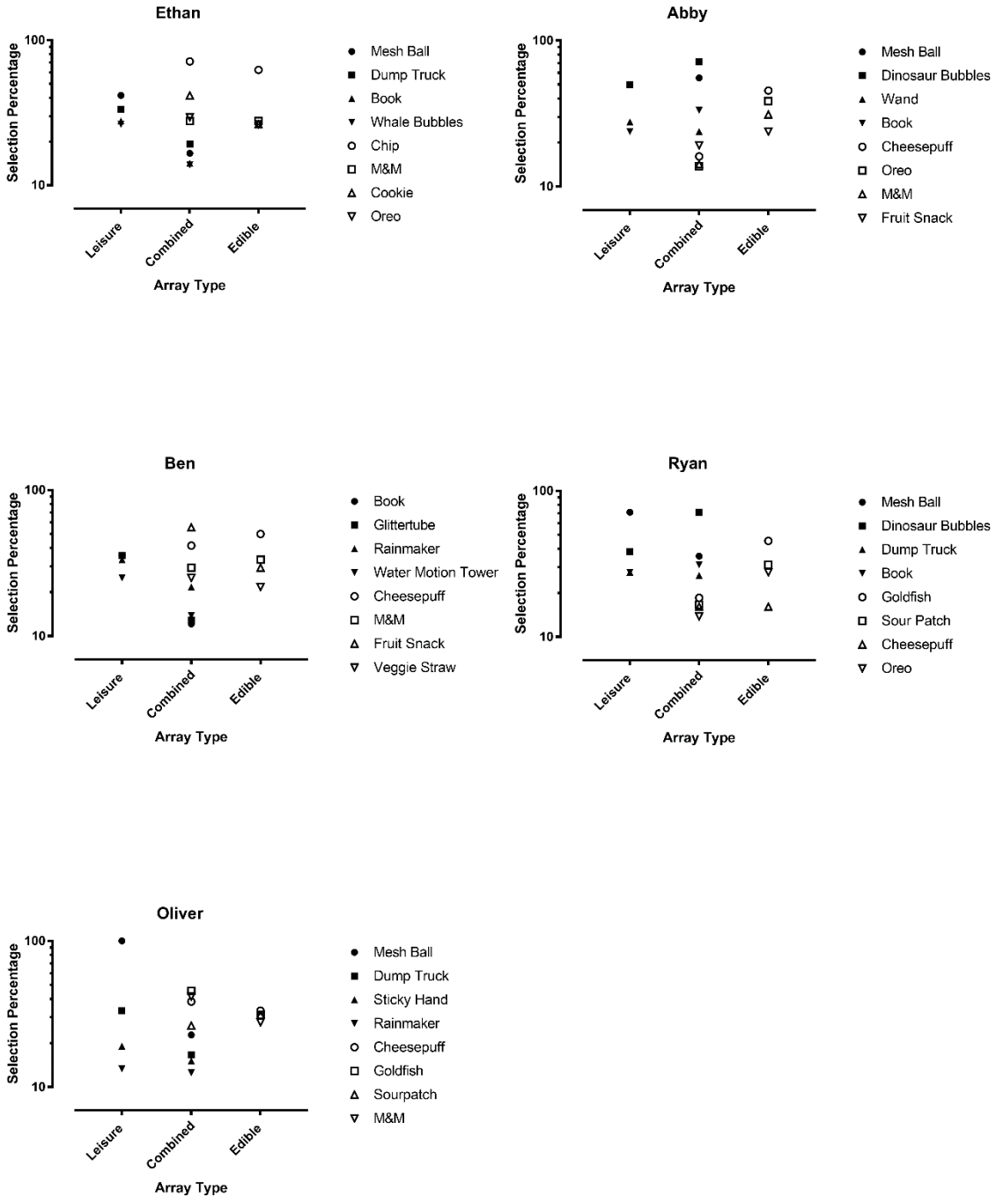

Figure 1. Complete displacement observed in Ethan, Ben, Oliver, Abby, and Ryan.

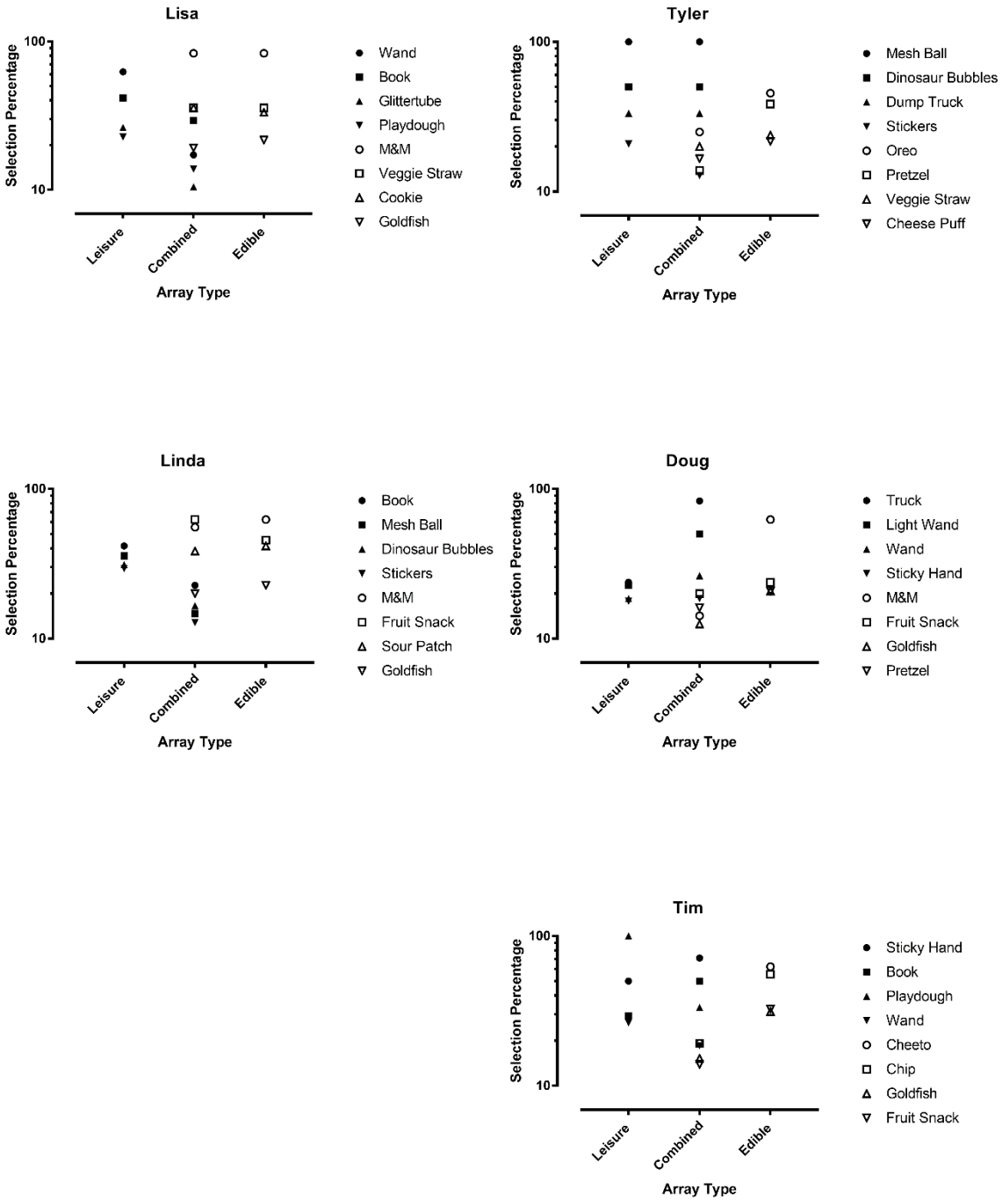

Figure 2. Partial displacement observed in Lisa, Linda, Tyler, Doug, and Tim.

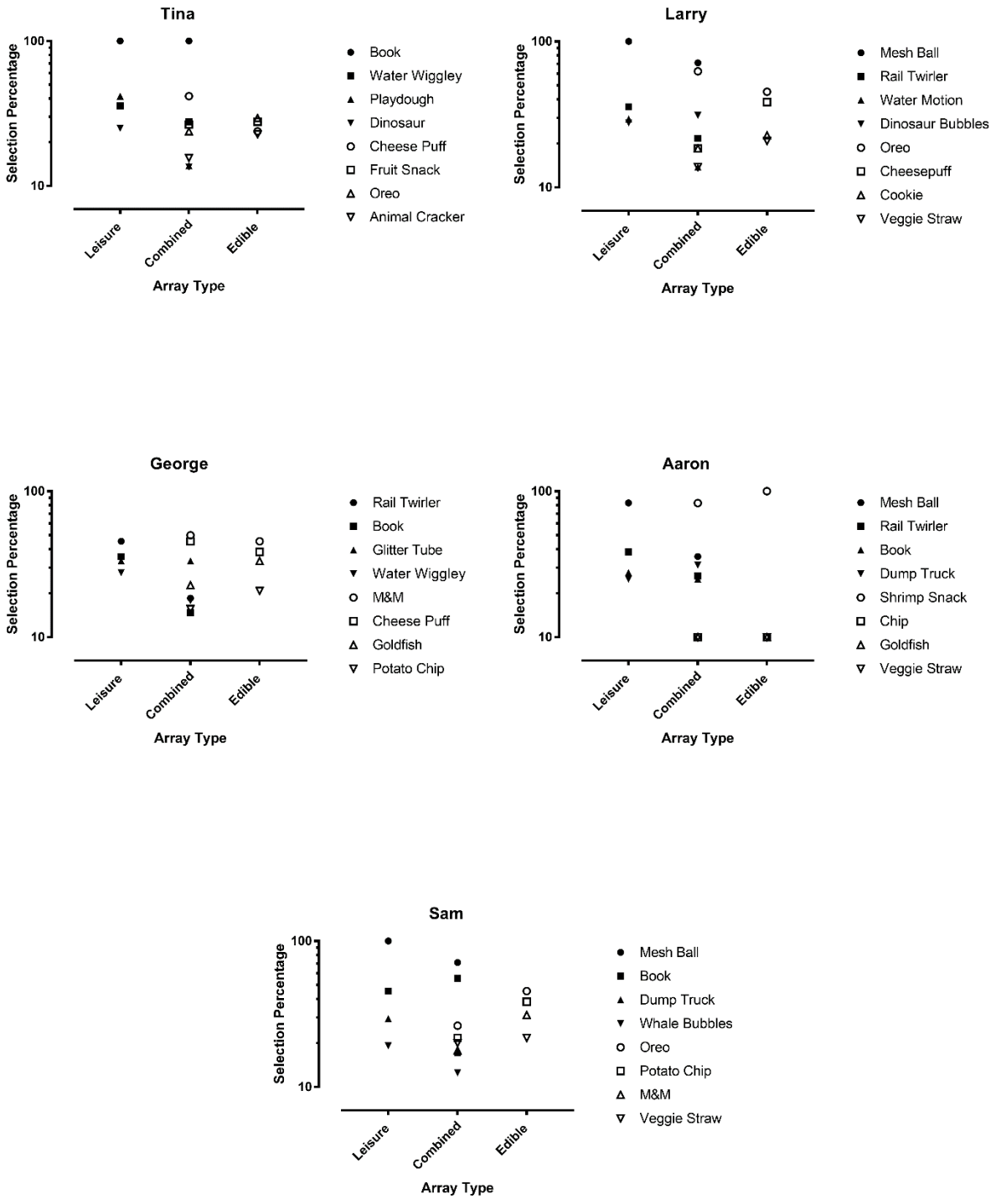

Figure 3. Mixed displacement observed in Tina, George, Larry, Aaron, and Sam.

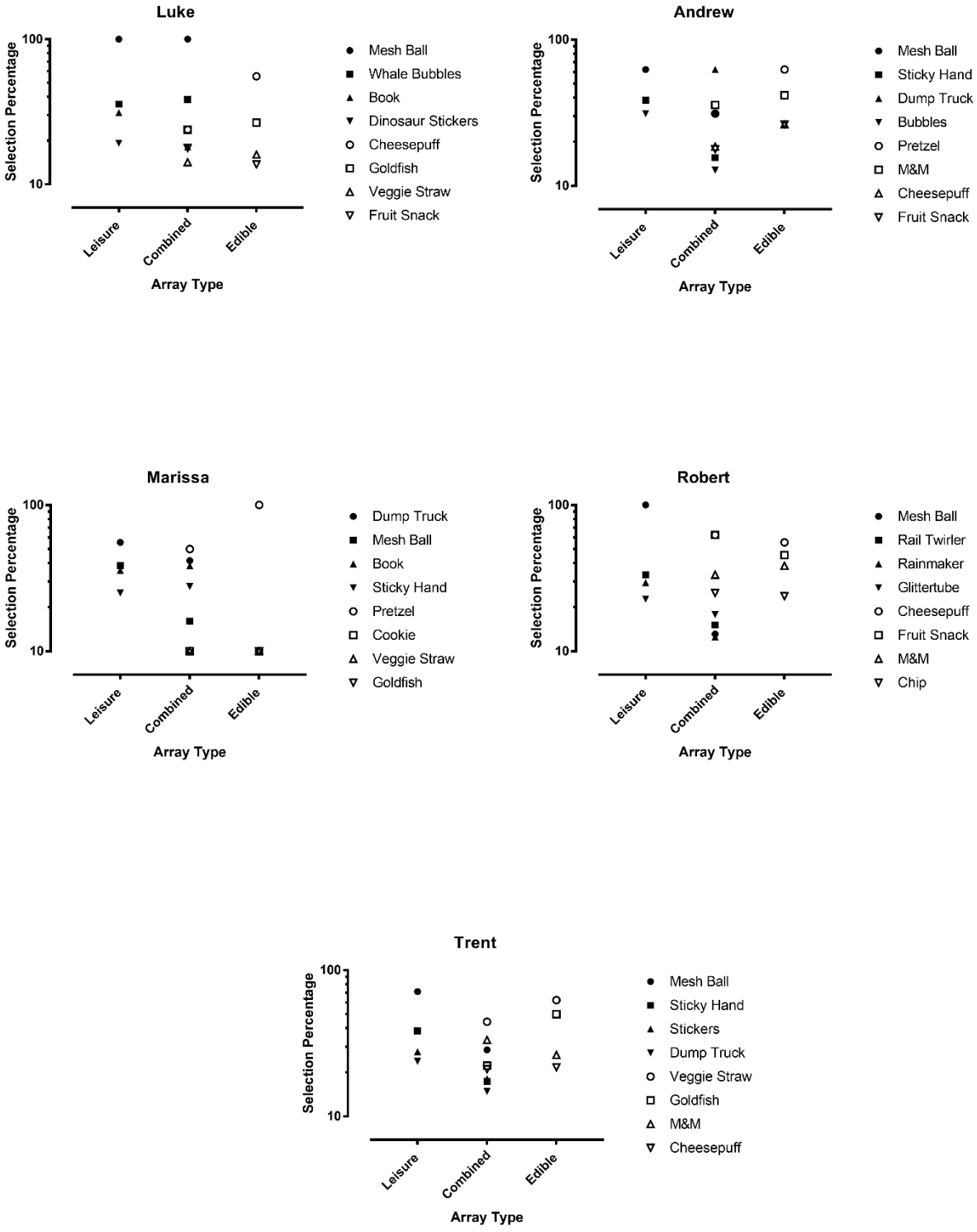

Figure 4. Mixed displacement observed in Luke, Marissa, Andrew, Robert, and Trent.

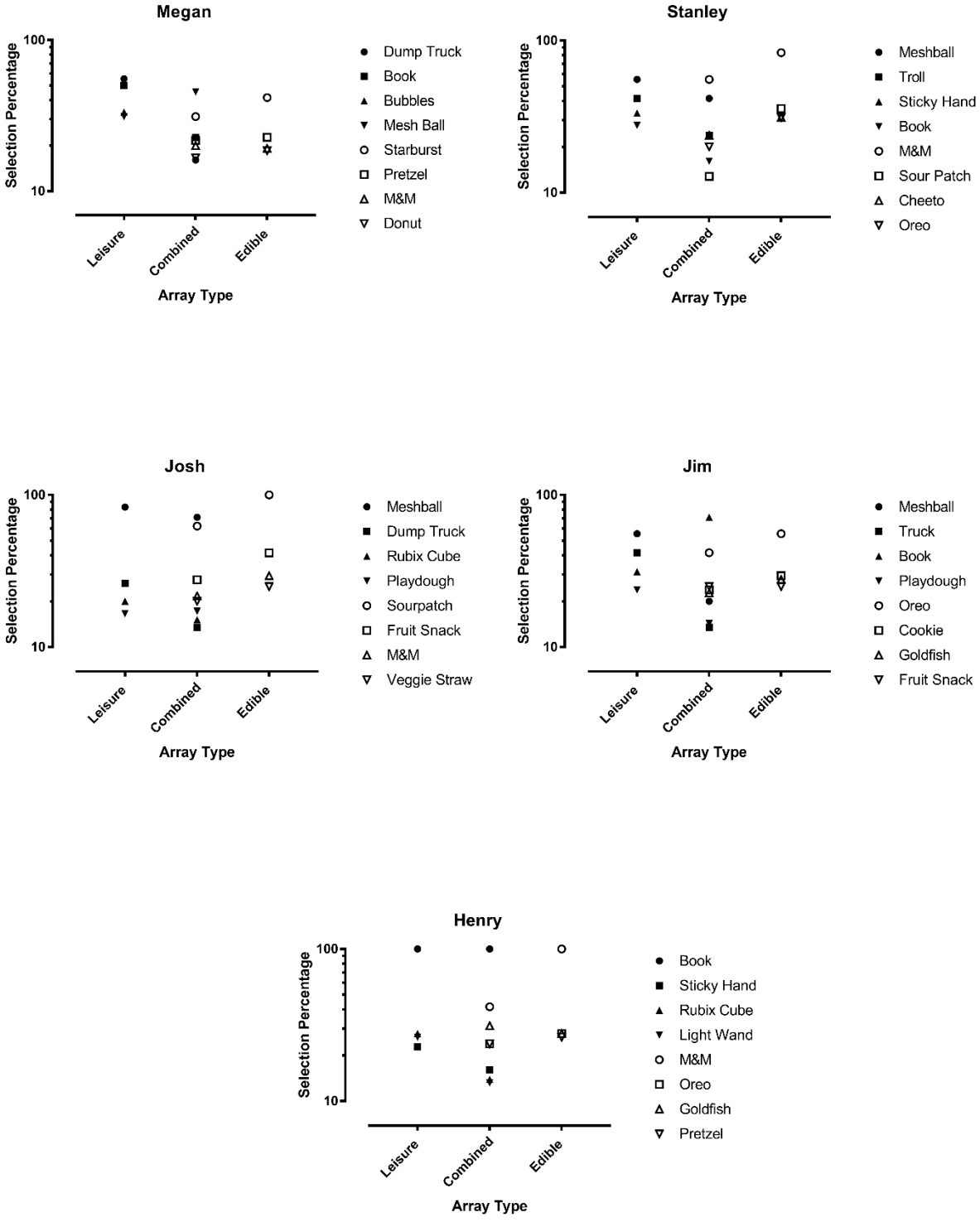

Figure 5. Mixed displacement observed in Megan, Josh, Stanley, Jim, and Henry

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