MONTCLAIR STATE UNIVERSITY

Cognitive and Language Development Lab

Within the last year, your child participated in one of our research studies. We are writing, first, to **THANK YOU** for your participation. We could not do our research without your help, and we really appreciate your interest! We also wanted to let you know what we, as researchers, learned from the studies we conducted. In this newsletter, you will read about the results of different studies that we have completed in our lab over the past year.

If you have any questions about these studies or the lab in general, please feel free to call us at **(973)-655-4045** or email us at **Lakustalab@gmail.com**. We also have a webpage for the lab where you can find out more about our studies: **msudevlab.com**

Friend us on Facebook! https://www.facebook.com/laura.lakusta/

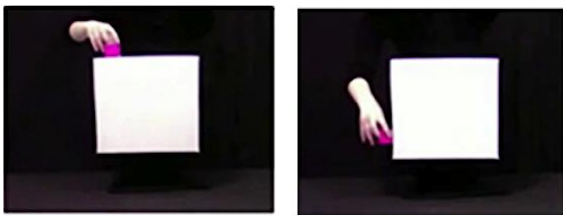
Also, if you found this experience to be positive and would like to recommend our studies to other parents with young children, we would be *grateful!* We are always looking for new participants! We hope to have you visit again soon! **Thank you!**

Infants' Understanding of Support Configurations

Support is one of the earliest spatial relations that infants understand. Support is typically thought of as a figure object being supported from below by a solid ground object like a rubber duck on top of a box. However, this definition of support is narrow and does not include other kinds of support configurations that exist in the world, such as adhesive support (a sticker on a car), suspension/hanging (picture on a wall), and embedding (polka dots on boots).

In this study, we ask how infants categorize support. One possibility is that early in development, infants' core representation of support is 'support from below.' This means that the earliest understanding of support is 'support from below' and only later in life do children gradually add other types of support relationships to their category of support. Alternatively, infants might immediately form a broader category of support at an incredibly early age that is inclusive of 'support from below' and other support configurations like support via adhesion.

We use a method called the Preferential Paradigm (PLP) to measure infants' categorization of support events. Infants are first shown several instances of either a 'support via side' event (left image) or a 'support from below' event (right image), which prepares them to think about their category of



support. Next, they are shown a split-screen where two new events of each support configuration are played simultaneously side-by-side. The amount of time they spend looking at each event is recorded. If infants have a narrow category of support ('support from below' is distinct from 'support via side'), we expect them to look longer at the novel event longer – the one they previously did not view. Our results thus far suggest that when 12- and 20-month-old infants are familiarized to 'support from below' and are then shown 'support from below' and 'support via the side', they look more at 'support via side' event, suggesting that the infants may have a category, 'support from below.'

A similar study using the same age groups examines not how infants categorize these support events, but whether children map the language "IS ON" preferentially to 'support from below' vs. 'support via the side.' The findings reveal that 20-month-olds map "IS ON" to 'support from below,' suggesting that 'support from below' may be preferred when mapping to "IS ON" language. We have published an article about our findings in *Infant Behavior and Development*!

We extended this research on support configurations to older children by examining how 2- and 3-year-olds understand the spatial language that is often used to describe them. Specifically, do children map "STICKS TO" to a 'support via the side' event, and do they map "IS ON" to the

'support from below' event? We explored these questions by asking children to point to what they heard during the experiment. Results demonstrated that older children apply "IS ON" broadly to both support from below and 'support via the side' events and apply the specific construction *"STICKS TO"* to a 'support via the side event' over a 'support from below' event.' These findings will be presented at the International Congress of Infant Studies Annual Conference in July 2022 in Ottawa, Canada.

Additionally, we have examined the role of *parent input* in the development of children's spatial vocabulary. Parents of children who participated in the studies above were asked to watch clips of the videos that were shown to their children and describe what happened in the videos to them. The results indicate that parents' show distinctions in the type of verb they use to describe support from below vs mechanical support events, such that light verbs (e.g., *put, place*) are used more for support from below events, while the manner of attachment verbs (MoA verbs, e.g., *stick, attach*) are used more to describe mechanical support events. This relationship also depends on the age of the child, such that parents of older children used more MoA verbs and fewer light verbs than parents of younger children. These findings suggest that parents are sensitive to the developmental level of their children and shape their child's spatial vocabulary by using words that are more difficult in meaning as children get older. Results have been published in the *Journal of Cognition and Development*!

Children's Understanding of Spatial Verbs

Few studies have examined how children learn the meanings of complex spatial verbs, such as 'dangle' and 'perch.' In this study, we ask if children can learn how to use specific spatial verbs in sentences and detect when these verbs are used correctly. We focused on two types of spatial verbs: spatial configuration verbs and spatial direction verbs. Spatial Configuration verbs refer to putting an object in a specified location. Spatial configuration verbs used in this study were hang, dangle, and perch (see examples below- a yo-yo that is dangling from a hand is 'below' the hand). In contrast, spatial direction verbs refer to putting an object somewhere by moving it in a specified direction. These verbs use prepositions that indicate a direction (e.g., ONTO or INTO), and these verbs require an agent to perform the action in each sentence (e.g., a ball will not raise itself into the air, but a person raises a ball in the air). Spatial direction verbs used in this study were drop, hoist, and raise (see examples below).

"Jessica **dropped** her water bottle."

"Jessica **hoisted** her backpack."

"Jessica **raised** her teddy bear."

"Nicholas **hung** his jacket on the back of the bench."

"Jessica **dangled** her yo-yo from her hand."

"Jessica **perched** her doll on the top of the steps."

We ask how well children learn the meaning of new spatial verbs from hearing multiple example sentences. There are two key mechanisms of interest that relate to our research questions: syntactic bootstrapping (e.g., using context clues from a sentence to learn verb meaning; Gleitman, 1990) and structural alignment (e.g., examining a scene to learn verb meaning; Gentner, 1983).

Adults and 3- and 4-year-old children were presented with a video about what children did at

a park (training video). In this video they heard sentences with the spatial configuration and spatial

direction verbs. Afterwards, they heard two sentences (one that used the verb correctly, and another that used the verb incorrectly), and were asked which sentence was better. This was repeated for each verb. Another group of children heard the set of sentences for the same verbs, but they were *not* presented with the training video.

We found that children who heard the training sentences were able to detect when spatial direction verbs were used incorrectly. Our results are consistent with the two current theories of verb learning: syntactic bootstrapping and structural alignment. These findings were presented at the Cognitive Development Society Conference in April 2022. Our next steps are to build on these findings with other types of verbs. We look forward to telling you more about this when we have the studies ready!

The Language of Mechanical Support in Children: Is it 'Sticking,' 'Hanging,' or simply 'On'

Physical support, where one object keeps another object from falling, is an integral concept in daily life. For example, think about how the table supports your coffee mug, how your purse hangs in the closet, or how your notes are pinned to the bulletin board. These are all examples of how support is necessary for everyday interactions, and children understand support early on in development. Other studies in our lab have looked at how infants understand support. We have found that infants and children differentiate between support from below (e.g., cup on table), and mechanical support (e.g., purse hanging on hook; note pinned on bulletin board). Specifically, children tend to use BE on to describe support from below (e.g., cup on table) and tend to use lexical verbs (e.g., hang, stick, clip, tape, etc.) to describe mechanical support (e.g., purse hanging on hook; note pinned on bulletin board).
We are interested in how children learn and speak about mechanical support events. We explored how 4- and 6-year-old children and adults describe dynamic events of mechanical support via attachment (for example, picture put on a door with tape). We predicted that 4-year-olds will prefer to use lexical verbs that describe the resulting spatial configuration (e.g., hang) over those verbs that describe the mechanism of attachment (e.g., tape).

We presented participants with videos showing a paper toy being attached to a door with either a visible or hidden mechanism (tape and clip) (see examples below). We told adults and children that one of the experimenters' sisters was playing with the toys, and their job was to describe what she did with each toy.

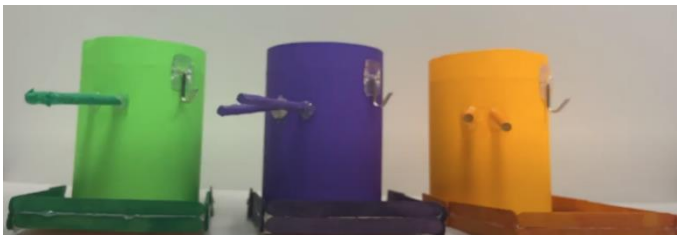
We found that many different types of verbs were used to describe the events. Four-year-old children used lexical verbs that describe the resulting spatial configuration ("hang") most of the time, while 6-year-olds and adults preferred to use verbs that describe how the toys were attached (e.g., clip, tape, stick).

Given these results, we have developed three studies to further explore children's use of mechanical support verbs, and if there is a preference for a set of verbs over another. These studies and our pilot data have been submitted to the *Journal of Child Language* as a Registered Report. We are awaiting peer review, and after we will begin data collection for the three studies. We look forward to telling you more about this project in the future!

Does the Mechanism of Surprise help Children Learn New Support Verbs?

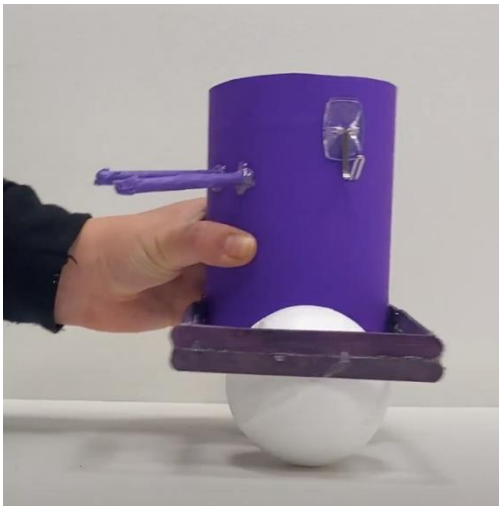
Previous research has demonstrated that the mechanism of surprise help with learning of novel words. Surprising events, those that go against expected outcomes, lead children to learn novel words better than unsurprising events. We explore whether surprise plays a role in the learning of new verbs that refer to one object preventing another from falling - i.e., support from below (a cup on a table). We predicted that children who watch an unexpected event (surprise event) will better learn a novel verb compared to children who watch an expected outcome.

We presented 3- to 6-year-old children with three sets of videos of unexpected and expected events that were each paired with a novel verb. For example, participants saw videos of a novel device (see picture) that included a hook, two pegs, and a shelf. For each video, children watched a ball being



supported by one of the parts of the device (hook, pegs, or shelf) while a novel verb was uttered. Half of the children were shown an expected event and the other half were shown an unexpected event. For the expected event, children were shown the shelf on the device, and a ball being placed on the shelf. When the device was lifted the ball was

lifted/supported by the shelf. While this occurred, children heard "This is fepping the ball. Look what happened. This fepped the ball!" The other group of children were also shown the shelf on the device and a ball being placed on it. However, when the device was lifted, the ball was not supported and 'appeared' to pass through the shelf. The ball was not lifted as expected due to a hollow shelf (the shelf appeared normal to the child sitting in front of it, they did not see



the hollow middle). These children also heard the same sentences with the novel verb "fep."

All other videos followed this format but with a different device and novel verb. After each set of videos, children were presented with all the devices that they saw and were asked to identify the one that performed the action, i.e. "If I wanted to 'fep' the ball, which one should I use? Which one will 'fep' the ball?"

We examined how well children learned the novel support verb based on whether they saw the expected or unexpected event. Overall, children who viewed the surprise event were better able to identify the correct device associated with the novel support verb.

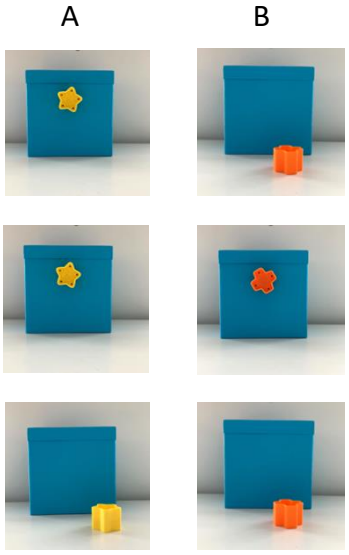
So far, our results suggest that surprising events lead to better support verb learning compared with expected events, therefore surprise may serve as a mechanism for learning. These findings were presented at the Eastern Psychological Association Conference in New York in March 2022. We are currently building on these findings and getting ready to launch Part 2 of this study which will further examine the relationship between surprise and verb learning by testing if children understand the meaning of the novel verb by explaining its meaning to another person. We look forward to telling you more about this study in the next newsletter!

Children's Explanations of Events: Inconsistencies in Adhesion Configurations

What do children understand about adhesion (e.g., toy stuck to box)? And how do children explain inconsistent adhesion events? Children explain events they don't quite understand, and these explanations may play a critical role in learning (Legare, Gelman, & Wellman, 2010). Past research has shown that children are more likely to explain events when the outcomes are inconsistent (e.g., object on box elicits light, then no longer elicits light), rather than consistent with prior knowledge[1]. Children's explanations also appear to refer to unobserved functional properties (e.g., batteries inside object) and explanatory processes (e.g., new batteries needed), which could aid learning (Legare et al., 2010). Therefore, how children explain events may function as an important mechanism for integrating inconsistent information with their previous experiences or their existing knowledge.

We aimed to assess whether children's explanations may play a role in learning about *mechanical properties* of objects that can cause one object to adhere to another, such as glue. The mechanical properties allowing support (adhesion) to occur are labeled as hidden mechanisms as they are not visible to participants. Following past research we ask, 1) do children provide more explanations when viewing consistent (object A adhering to object B in all events) or inconsistent events (object A adhering to object B in initial event and no longer adhering in following events). And 2) what types of explanations do they provide?

Preschool children were shown videos of an object (A) adhering to another object (B) or not, followed by an event demonstrating object A acting consistently or inconsistently with the initial event. Then children were



asked about *why* these inconsistencies occurred.

We found that two thirds of children explained both the inconsistent and consistent events, followed by a third of children who explained only the inconsistent events. No children explained only the consistent events. In addition, most children's explanations referred to the internal properties of the object (e.g., glue application).

So far, these findings suggest that 1) children explain inconsistent events more than consistent events, and 2) their explanations refer to hidden causal functions of the object (a hidden mechanism that is sticky). This finding opens the door for future research to assess exactly how explanations may promote children's learning about mechanisms responsible for support.

Recently we presented our findings at the Eastern Psychological Association conference in New York City in March 2022. We are currently expanding this study to include training with the objects to help the child understand the object's properties. Children will also see other types of support events like objects hanging from a string.

FUNDING AND PUBLICATIONS

Most of the research reported in this newsletter was funded by the National Science Foundation, grant #1650861. We have presented our research at several professional conferences and published our results in peer-reviewed journals. These presentations and publications would not be possible without your participation! Thank you!!!!

Presentations from Fall 2021-Summer 2022

Lakusta, L., Wodzinski, A., Williams, N., Hussein, Y., Hauss, J., Elgamal, K., & Landau, B. (2022, July 7-10). Learning the language of designed actions of physical support. [Poster presentation]. International Congress of Infant Studies Conference, Ottawa, Canada.

Hauss, J., Bragger, T., Bell, V., Smith, G., Swearengin, P., Childers, J., & Lakusta, L. (2022, April 21-23). The role of syntax in children's acquisition of spatial language: Verbs of direction and spatial location [Poster presentation]. Cognitive Development Society Conference, Madison, WI.

Elgamal, K., Ferrer, E., Spivak, S., & Lakusta, L. (2022, March 3-5). *Children's explanations of events: Inconsistencies in adhesion configurations* [Poster presentation]. Eastern Psychological Association Conference, New York, NY.

Ferrer, E., Spivak**,** S**.**, Elgamal, K., & Lakusta, L. (2022, March 3-5). *Can surprise foster learning of novel verbs that refer to spatial support?* [Poster presentation]. Eastern Psychological Association Conference, New York, NY.

Past Presentations

Lakusta, L., Wefferling, J., Hussein, Y., Wodzinski, A., & Landau, B. (2020, July). Getting support for 'Support': The privileging of 'Support-From-Below' in early spatial language acquisition. [Paper presentation]. Virtual International Congress on Infant Studies Conference.

Wodzinski, A., Moya, G., Lakusta, L., & Landau, B. (2020, July). The language of support: Parents' verb uses in descriptions of support. [Poster presentation]. Virtual International Congress on Infant Studies Conference.

Hauss, J., Bracken, A., Wefferling, J., Wodzinski, A., & Lakusta, L. (2020, May). The role for a core representation of support in early language development. [Poster presentation]. Montclair State University Virtual Student Research Symposium, Montclair, NJ.

Lakusta, L., Wefferling, J., Hussein, Y., & Landau, B. (2019, October). Delineating the semantic space for support (ON) in early language development. [Poster presentation]. Cognitive Developmental Society Conference, Louisville, KY.

Lakusta, L., Brucato, M., Kobezak, H., Iroldi, C., & Landau, B. (2018, July). A core concept of support for infant cognition and language learning. [Paper presentation]. International Congress on Infant Studies Conference, Philadelphia, PA.

Lakusta, L., Brucato, M., Bindra, A., Polen, M., & Landau, B. (2016, May). The language of support in young children's spontaneous speech. [Poster presentation]. International Congress of Infant Studies Conference, New Orleans, LA.

Lakusta, L., Spinelli, D., & Farese, S. (2016). The mapping of preverbal thought to language: Infants' categorization of goal paths in motion events. [Poster presentation]. International Congress on Infant Studies Conference, New Orleans, LA.

Brucato, M., Bindra, A., Polen, M., Lakusta, L., & Landau, B. (2016, March). The language of support in young children's spontaneous speech. [Poster presentation]. Eastern Psychological Association Conference, New York, NY.

Bindra, A., Garcia, O., Ponton, D., & Lakusta, L. (2015, April). Infants' comprehension of spatial prepositions. [Poster presentation]. Montclair State University Student Research Symposium, Montclair, NJ.

Publications from Fall 2021- Summer 2022

Lakusta, L., Hussein, Y., Wodzinski, A., & Landau, B. (2021). The privileging of 'Support-From-Below' in early spatial language acquisition. *Infant Behavior and Development,* 65, 101616.

Lakusta, L., Wodzinski, A., & Landau, B. (2021). Providing support for 'Support': Parents' use of verbs and prepositions when describing support configurations to their children. *Journal of Cognition and Development,* 1-10.

Past Publications

Lakusta, L., Brucato, M., & Landau, B. (2020). Evidence for a core representation for support in early language development. *Language Learning and Development,* 16(2), 180-195.

Lakusta, L., Spinelli, D., & Garcia, K. (2017). The relationship between pre-verbal event representations and semantic structures: The case of goal and source paths. *Cognition,* 164, 174-187.

Lakusta, L. & DiFabrizio, S. (2016). And, the winner was…A visual preference for end points over starting points in infants' motion event representations, *Infancy.*

Lakusta, L., Muentener, P., Petrillo, L., Mullanaphy, N., & *Muniz, L., (2016). Does making something move matter? Representations of goals and sources in causal motion events. *Cognitive Science.*

Lakusta, L., & Carey, S. (2015). Twelve-month-old infants' encoding of goal and source paths in agentive and non-agentive motion events. *Language Learning and Development,* 11(2), 152-175.

To view these and other posters and publications, please refer to our webpage at: msudevlab.com

Thanks again for your participation!
We hope to see you and your little one again in the future!