Kate Nussenbaum

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Education and Training

2023 - present: **C.V. Starr Postdoctoral Fellow**
Princeton Neuroscience Institute
Advisor: Nathaniel Daw

2017 - 2023:   **Ph.D., Psychology**
New York University
Advisor: Catherine Hartley

2015 - 2017:   **M.Sc. by Research, Experimental Psychology**
University of Oxford
Advisors: Kia Nobre, Gaia Scerif

2011 - 2015:   **Sc.B., Cognitive Neuroscience (honors); Science & Society**
Brown University
Advisor: Dima Amso

Fellowships

2023 - 2026: **C.V. Starr Foundation Postdoctoral Fellowship**, Princeton Neuroscience Institute

2022 - 2023: **F31 Ruth L. Kirschstein National Research Service Award**, NIMH
The development of adaptive specificity in learning and memory

2018 - 2021: **NDSEG Fellowship**, U.S. Department of Defense
Neurocognitive mechanisms underlying optimal learning in dynamic environments

2015 - 2017: **Rhodes Scholarship**

Honors and Awards

2022:   **Dissertation Funding Award Honorable Mention**, Society for Research in Child Development

2021:   **Dissertation Research Award**, American Psychological Association

2021:   **Martin Braine Fellowship**, NYU Psychology

2020:   **Katzell Summer Fellowship**, NYU Psychology

2018, 2019: **NYU Dean's Student Travel Grant**

2017:   **Travel Award**, Flux Society for Developmental Cognitive Neuroscience

2017:   **Engberg Award** for an Outstanding Entering Graduate Student, NYU Psychology

2017:   **Grindley Grant**, Experimental Psychology Society

2016, 2017: **Murray Speight Research Grant**, Rhodes Trust

2016:   **Editor's Choice Award**, *Journal of Cognition and Development* (best 2016 paper)

2015:   **Marshall Scholarship** (declined)

2015:	**Whalen Award** for Undergraduate Research in Neuroscience, Brown University
2015:	**Research at Brown Travel Award**
2015:	**Sigma Xi**
2014:	**Undergraduate Teaching and Research Award**, Brown University
2014:	**Phi Beta Kappa** (*early election as a junior*)
2013 - 2014:	**Teaching-Research-Impact Lab Student Fellowship**, Brown University
2013:	**Solsberry Summer Research Fellowship**, Brown University
2011:	**United States Presidential Scholar** (*1 of 2 from Massachusetts*)
2011:	**National Merit Scholarship**

Journal Publications

Trainees working under my mentorship are <u>underlined</u>. The * denotes equal author contribution.

14. **Nussenbaum, K.** & Hartley, C.A. (accepted). Understanding the development of reward learning through the lens of meta-learning. *Nature Reviews Psychology.*
[contact for draft]

13. **Nussenbaum, K.***, Martin, R.E.*, Maulhardt, S., Yang, J., <u>Bizzell-Hatcher, G.</u>, <u>Bhatt, N.S.</u>, Scheuplein, M., Rosenbaum, G.M., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2023). Novelty and uncertainty differentially drive exploration across development. *eLife, 12*, e84260.
[pdf][data & code]

12. **Nussenbaum, K.**, <u>Velez, J.A.</u>, <u>Washington, B.T.</u>, <u>Hamling, H.E.</u>, & Hartley, C.A. (2022). Flexibility in valenced reinforcement learning computations across development. *Child Development, 93*, 1601-1615.
[pdf] [data & code]

11. Hartley, C.A., **Nussenbaum, K.**, & Cohen, A.O. (2021). Interactive development of adaptive learning and memory. *Annual Review of Developmental Psychology, 3*, 59 - 85.
[pdf]

10. **Nussenbaum, K.** & Hartley, C.A. (2021). Developmental change in prefrontal cortex recruitment supports the emergence of value-guided memory. *eLife, 10*, e69796.
[pdf] [data & code]

9. **Nussenbaum, K.**, Scheuplein, M., Phaneuf, C.V., Evans, M.D., & Hartley, C.A. (2020). Moving developmental research online: comparing in-lab and web-based studies of model-based reinforcement learning. *Collabra: Psychology, 6*(1), 1-18.
[pdf] [data & code]

8. Cohen, A.O.*, **Nussenbaum, K.***, Dorfman, H.M., Gershman, S.J., & Hartley, C.A. (2020). The rational use of causal inference to guide reinforcement learning strengthens with age. *npj Science of Learning, 5*(16), 1-9.
[pdf] [data & code]

7. **Nussenbaum, K.***, Cohen, A.O.*, Davis, Z.J., Halpern, D.J., Gureckis, T.M., & Hartley, C.A. (2020). Causal information-seeking strategies change across childhood and adolescence. *Cognitive Science, 44*(8), e12888.
[pdf] [data & code]

6. **Nussenbaum, K.**, Prentis, E., & Hartley C.A. (2020). Memory's reflection of learned information value increases across development. *Journal of Experimental Psychology: General, 149*(10), 1919-1934.
   [pdf] [data & code]

5. **Nussenbaum, K.** & Hartley, C.A. (2019). Reinforcement learning across development: What insights can we draw from a decade of research? *Developmental Cognitive Neuroscience, 40,* 100733.
   [pdf]

4. **Nussenbaum, K.**, Scerif, G.*, & Nobre, A.C.* (2019). Differential effects of salient visual events on memory-guided attention in adults and children. *Child Development, 90*(4), 1369-1388.
   [pdf] [data & code]

3. **Nussenbaum, K.**, Amso, D., & Markant, J. (2017). When increasing distraction helps learning: Distractor number and content interact in their effects on memory. *Attention, Perception, & Psychophysics, 79*(8), 2606-2619.
   [pdf] [data]

2. Markant, J., Ackerman, L., **Nussenbaum, K.**, & Amso, D. (2016). Selective attention neutralizes the adverse effects of low socioeconomic status on memory in 9-month-old infants. *Developmental Cognitive Neuroscience, 18,* 26-33.
   [pdf]

1. **Nussenbaum, K.** & Amso, D. (2016). An attentional Goldilocks effect: An optimal amount of social interactivity promotes word learning from video. *Journal of Cognition and Development, 17*(1), 30-40.
   [pdf]
   Received Editor's Choice Award for journal's best 2016 article.

Submitted Manuscripts

4. **Nussenbaum, K.** & Hartley, C.A. (under review). Meta-learned models as tools to test theories of cognitive development. (Commentary on Binz et al). *Behavioral and Brain Sciences.*
   [contact for draft]

3. **Nussenbaum, K.***, Katzman, P.L.*, Lu, H., Zorowitz, S., & Hartley, C.A. (under review). Sensitivity to the instrumental value of choice increases across development.
   [preprint] [data & code]

2. **Nussenbaum, K.** & Hartley, C.A. (under review). Reinforcement learning increasingly shapes memory specificity from childhood to adulthood.
   [preprint] [data & code]

1. Jach, H.K., Cools, R., Frisvold, A., Grubb, M., Hartley, C.A., Hartman, J., Hunter, L., Jia, R., de Lange, F., Larisch, R., Lavelle-Hill, R., Levy, I., Li, Y., van Lieshout, L., **Nussenbaum, K.**, Ravaioli, S., Wilson, R., Woodford, M., Murayama, K., & Gottlieb, J. (in revision). Curiosity in cognitive science and personality psychology: Individual differences in information demand have a low dimensional structure that is predicted by personality traits.
   [preprint]

Manuscripts in Preparation

1. **Nussenbaum, K***, Hamling, H*., Zhu, H., Kerbl, L., Washington, B.T., & Hartley, C.A. (manuscript in preparation). Sensitivity to environmental volatility changes across adolescence: Evidence from behavior and pupillometry.

Peer-Reviewed Conference Proceedings

5. Lu, H.*, Katzman, P.*, **Nussenbaum, K.**, & Hartley, C.A. (2023). Sensitivity to the instrumental value of agency increases across development. Cognitive Computational Neuroscience, Oxford, UK. **Poster presentation.** [pdf]

4. Zhang, A., **Nussenbaum, K.**, & Hartley, C.A. (2023). Development of non-local learning. Cognitive Computational Neuroscience, Oxford, UK. **Poster presentation.** [pdf]

3. **Nussenbaum, K.** & Hartley, C.A. (2023). Reinforcement learning influences memory specificity across development. Cognitive Computational Neuroscience, Oxford, UK. **Poster presentation.** [pdf]

2. **Nussenbaum, K.** & Hartley, C.A. (2020). Prefrontal-striatal circuitry supports adaptive memory prioritization across development. In: *Proceedings of the 42nd Annual Meeting of the Cognitive Science Society.* **Selected for talk.** [pdf]

1. **Nussenbaum, K.***, Cohen, A.O.*, Davis, Z.J., Halpern, D., Gureckis, T.M., & Hartley, C.A. (2019). Causal intervention strategies change across adolescence. In: *Proceedings of the 41st Annual Meeting of the Cognitive Science Society.* **Poster presentation.** [pdf] [data & code]

Additional Conference Presentations

Talks

Nussenbaum, K., Martin, R.E., Maulhardt, S., Yang, J., Bizzell-Hatcher, G., Bhatt, N.S., Scheuplein, M., Rosenbaum, G.M., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2023). Novelty and uncertainty differentially drive exploration across development. Lightning talk at the International Conference on Learning and Memory, Huntington Beach, CA.

Nussenbaum, K., Hamling, H.E., Zhu, H., Kerbl, L., Washington, B.T., & Hartley, C.A. Sensitivity to environmental volatility across development: Evidence from reinforcement learning and pupillometry. Symposium talk at the Society for Research in Child Development, Salt Lake City, UT.

Nussenbaum, K., Martin, R.E., Maulhardt, S., Yang, J., Bizzell-Hatcher, G., Bhatt, N.S., Scheuplein, M., Rosenbaum, G.M., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2022). Differential effects of novelty and uncertainty on exploratory choice across development. Poster spotlight at the multidisciplinary conference on Reinforcement Learning and Decision Making, Providence, RI.

Nussenbaum, K., Martin, R.E., Bhatt, N.S., Bizzell-Hatcher, G., Maulhardt, S., Rosenbaum, G.M., Scheuplein, M., Yang, J., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2022). Novelty and uncertainty differentially drive exploration across development. Data blitz at the Cognitive Neuroscience Society, San Francisco, CA.

Nussenbaum, K., Hamling, H., Washington, B., Velez, J.A., & Hartley, C.A. (2021). Adaptability of positive and negative learning rates across development. Symposium talk at the Flux Congress for Developmental Cognitive Neuroscience, virtual meeting.

Nussenbaum, K., Cohen, A.O., Davis, Z.J., Halpern, D.J., Gureckis, T.M. & Hartley, C.A. (2021). Causal information-seeking strategies change across development. Symposium talk at the Society for Research in Child Development, virtual meeting.

Nussenbaum, K., Valencia, D., Greer, J., Keathley, N., & Hartley, C.A. (2020). Prefrontal-striatal circuitry supports adaptive memory prioritization across development. Flash talk at the Flux Congress for Developmental Cognitive Neuroscience, virtual meeting.

Nussenbaum, K., Cohen, A.O., Davis, Z.J., Halpern, D., Gureckis, T.M. & Hartley, C.A. (2019). Changes in causal intervention strategies across adolescence. Lightning talk at the Workshop on Curiosity, Exploration, and Explanation, Princeton University, Princeton, NJ.

Nussenbaum, K., Prentis, E., Valencia, D., & Hartley, C.A. (2019). The use of past experience to guide memory increases across development. Talk at the Manhattan Area Memory Meeting, Princeton University, Princeton, NJ.

Posters

Saragosa-Harris, N., **Nussenbaum, K.**, Hartley, C.A., & Silvers, J. (2023). The effects of novelty and uncertainty on exploratory behaviors following early life adversity. Flux Congress for Developmental Cognitive Neuroscience, Santa Rosa, CA.

Zhang, A., **Nussenbaum, K.**, & Hartley, C.A. (2023). Development of non-local planning behavior. International Conference on Learning and Memory, Huntington Beach, CA.

Nussenbaum, K., Hamling, H.E., Zhu, H., Kerble, L., Washington, B.T., & Hartley, C.A. (2023). Sensitivity to environmental volatility during learning changes across development. International Conference on Learning and Memory, Huntington Beach, CA.

Nussenbaum, K., Martin, R.E., Maulhardt, S., Yang, J., Bizzell-Hatcher, G., Bhatt, N.S., Scheuplein, M., Rosenbaum, G.M., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2022). Novelty and uncertainty differentially drive exploration across development. Society for Neuroeconomics, Crystal City, VA.

Nussenbaum, K., Martin, R.E., Maulhardt, S., Yang, J., Bizzell-Hatcher, G., Bhatt, N.S., Scheuplein, M., Rosenbaum, G.M., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2022). Differential effects of novelty and uncertainty on exploratory choice across development. Conference on Reinforcement Learning and Decision Making, Providence, RI.

Nussenbaum, K., Martin, R.E., Bhatt, N.S., Bizzell-Hatcher, G., Maulhardt, S., Rosenbaum, G.M., Scheuplein, M., Yang, J., O'Doherty, J.P., Cockburn, J., & Hartley, C.A. (2022). Novelty and uncertainty differentially drive exploration across development. Cognitive Neuroscience Society, San Francisco, CA.

Scheuplein, M., **Nussenbaum, K.**, Phaneuf, C.V., Evans, M.D., & Hartley, C.A. (2020). Developmental differences in model-based learning and abstract reasoning: an online replication study. Flux Congress for Developmental Cognitive Neuroscience, virtual meeting.

Nussenbaum, K., Valencia, D., Greer, J., Keathley, N., & Hartley, C.A. (2020). Prefrontal-striatal circuitry supports adaptive memory prioritization across development. Flux Congress for Developmental Cognitive Neuroscience, virtual meeting.

Nussenbaum, K., Valencia, D., Greer, J., Keathley, N., & Hartley, C.A. (2020). Neural mechanisms underlying the use of learned value to guide memory across development. Context and Episodic Memory Symposium, virtual meeting.

Nussenbaum, K., Valencia, D., Greer, J., Keathley, N., & Hartley, C.A. (2020). Neural mechanisms underlying the use of learned value to guide memory across development. Cognitive Neuroscience Society, virtual meeting.

Nussenbaum, K., Cohen, A.O., Davis, Z.J., Halpern, D., Glover, M., Valencia, D., Shen, X., Gureckis, T.M., & Hartley, C.A. (2019). Causal information-seeking strategies change through adolescence. Flux Congress for Developmental Cognitive Neuroscience, New York, NY.

Cohen, A.O., **Nussenbaum, K.**, Dorfman, H., Glover, M., Valencia, D., Shen, X., Gershman, S.J., & Hartley, C.A. (2019). Developmental change in the influence of causal judgments on reinforcement learning. Flux Congress for Developmental Cognitive Neuroscience, New York, NY.

Nussenbaum, K., Cohen, A.O., Davis, Z.J., Halpern, D., Gureckis, T.M., & Hartley, C.A. (2019). Causal intervention strategies change across adolescence. Cognitive Science Society, Montreal, Canada.

Nussenbaum, K., Cohen, A.O., Dorfman, H., Glover, M., Valencia, D., Shen, X., Gershman, S.J., & Hartley, C.A. (2019). Developmental change in the use of causal inference to guide reinforcement learning. Conference on Reinforcement Learning and Decision Making, Montreal, Canada.

Cohen, A.O., **Nussenbaum, K.**, Dorfman, H., Shen, X., Sardar, H., Valencia, D., Glover, M., Gershman, S.J., & Hartley, C.A. (2019). Age-related change in the effects of causal judgments on learning from reinforcement. Social and Affective Neuroscience Society, Miami, FL.

Nussenbaum, K., Prentis, E., & Hartley, C.A. (2018). Strategic encoding of useful information across development. Society for Neuroeconomics, Philadelphia, PA.

Nussenbaum, K., Prentis, E., Ocampo, J.D., & Hartley, C.A. (2018). Developmental changes in the use of environmental statistics to strategically modulate memory. Flux Congress for Developmental Cognitive Neuroscience, Berlin, Germany.

Nussenbaum, K. & Hartley, C.A. (2018). Developing the ability to remember information with high future reward. Social and Affective Neuroscience Society, New York, NY.

Nussenbaum, K. & Hartley, C.A. (2018). Developing the ability to remember useful information. UC Irvine International Conference on Learning and Memory, Irvine, CA.

Nussenbaum, K., Nobre, A.C., & Scerif, G. (2017). Salient visual events disrupt memory-guided attention in adults but not children. Flux Congress for Developmental Cognitive Neuroscience, Portland, OR.

Nussenbaum, K., Nobre, A.C., & Scerif, G. (2017). Memories and exogenous cues interact differently across age groups to influence attentional orienting. Society for Research in Child Development, Austin, TX.

Nussenbaum, K., Myers, N., Nobre, A.C., & Scerif, G. (2016). Developmental changes in memory-guided and exogenously cued attention. Autumn School in Cognitive Neuroscience, Oxford, UK.

Nussenbaum, K., Markant, J., & Amso, D. (2016). Increasing distractor set size reduces conceptual interference during target encoding. Cognitive Neuroscience Society, New York, NY.

Nussenbaum, K. & Amso, D. (2015). An attentional Goldilocks effect for children's word-learning from digital media. Society for Research in Child Development, Philadelphia, PA.

Invited Talks

2023: Human Neuroimaging Group, UNC

2023: Aging Well Lab, UT Dallas (PI: Kendra Seaman)

2023: Program in Cognitive Science, Dartmouth College

2022: Institute of Child Development Computational Modeling Reading Group, University of Minnesota

2021: Computational Modeling in Development Workshop, Flux Congress

2021: Department of Psychology, NYU

2020: Affective Brain Lab, University College London (PI: Tali Sharot)

2020: Developmental Affective Neuroscience Lab, Columbia University (PI: Nim Tottenham)

2020: Developing Brains in Context Lab, University of Oregon (PI: Kate Mills)

2020: Learning and Brain Development Lab, Tulane University (PI: Julie Markant)

2019: Department of Psychology Miniconvention, NYU

2019: Concepts and Categories Seminar, NYU

2018: Department of Psychology Miniconvention, NYU

Teaching

Summer 2021:   **Guest Lecture**, Developmental Psychology, *Developing cognitive control*

Spring 2020:   **Guest Lecture**, Developmental Psychology, *Memory development*

Spring 2020:   **Teaching Assistant**, Developmental Psychology, NYU (Dr. Karen Adolph)

Spring 2015:   **Teaching Assistant**, Human Cognition, Brown University (Dr. Joe Austerweil)

Mentoring

2022 - present: **Alice Zhang**, Hartley Lab Manager

2020 - 2023:   **Juan Velez**, NYU undergraduate
- Collegiate Research Initiative Scholar
- Dean's Undergraduate Research Fund award (x2)

2020 - 2022:   **Hannah Hamling**, NYU undergraduate → Ph.D. Student, University of Minnesota
- Honors thesis: Learning in volatile environments across adolescence
- Coons/Leibowitz Research Award
- Hillary Anne Citrin Memorial Award for Outstanding Departmental Honors Thesis
- Glushko Prize for Outstanding Honors Thesis in Minds, Brains, and Machines
- Dean's Undergraduate Research Fund award (x3)

2021 - 2022:   **Naiti Bhatt**, Hartley Lab Manager → Ph.D. Student, University of Edinburgh

2021 - 2022:   **Haoze Zhu**, NYU Shanghai undergraduate → M.Sc. Student, Donders Institute

2020 - 2022:   **Lia Washington**, NYU undergraduate → MIT Research Scholars Program
- Wasserman Center Internship Grant recipient (x2)
- Dean's Undergraduate Research Fund award (x2)

2021 - 2022:   **Linda Kerbl**, visiting MA student → Ph.D. Student, MPI for Human Development

2021:   **Leticia Wood**, Brown University undergraduate → UX Researcher, Duolingo
- NYU Center for Neural Science REU participant

2018 - 2020:   **Daphne Valencia**, NYU masters student → Research Coordinator, Mt. Sinai Hospital
- MA thesis: Memory prioritization across development

2019:   **Nora Keathley**, Emory University undergraduate → Research Coordinator, Imagen

2019:   **Jamie Greer**, Vassar College undergraduate → Ph.D. Student, Harvard

2019:   **Michael Parola**, NYU undergraduate → J.D. Student, Georgetown

2018 - 2019:   **Euan Prentis**, NYU undergraduate → Ph.D. Student, University of Chicago
- Honors thesis: Episodic memory's role in decision-making across development
- Doris Aaronson Award for Outstanding Departmental Research
- Dean's Undergraduate Research Fund award (x2)

2018:   **Sree Panuganti**, Marvin Ridge High School → B.S. Student, Purdue University
- NYU GSTEM program participant

2018:   **Daryl Ocampo**, NYU undergraduate → Assistant to the Chair of Psychology, NYU

February 12, 2024

Service

Ad Hoc Peer Review

Journals

Cerebral Cortex

Child Development

Clinical Psychological Science

Cognitive, Affective, and Behavioral Neuroscience

Communications Psychology

Current Opinion in Behavioral Sciences

Developmental Psychology

Developmental Science

Journal of Experimental Child Psychology

JEP: General

JEP: Learning, Memory, and Cognition

Mind, Brain, and Education

Nature Communications

Nature Scientific Reports

Neurobiology of Aging

Neuroscience and Biobehavioral Reviews

PLOS Biology

PLOS Computational Biology

PLOS One

Psychology of Popular Media

Psychonomic Bulletin & Review

Science Advances

Social Cognitive and Affective Neuroscience

Trends in Cognitive Sciences

Conferences

CEU Conference on Cognitive Development

Cognitive Computational Neuroscience

Cognitive Science Society

Society for Research on Adolescence

Volunteer Positions

2023:   **Member**, Brown University Keasbey Scholarship Committee

2020 - 2022: **Selector and mentor**, Brown University U.K. Scholarships Committee

2021 - 2022: **Reviewer**, NYU Global Awards Summer Application Development Cohort

2021 - 2022: **Student representative**, Psychology and Data Science faculty search committee, NYU

2021:   **Project reviewer**, RISE Global Scholarship

2018 - 2020: **Trainee Committee co-chair**, Flux Society for Developmental Cognitive Neuroscience

2020:   **Doctoral Admissions Working Group member**, NYU Psychology Department

2020:   **Expenses and Reimbursement Working Group member**, NYU Psychology Department

2020:   **Research experience leader**, NYU Psychology Department virtual summer internship

2017 - 2020: **Volunteer**, braiNY

2019 - 2020: **Social events co-chair**, Cognition & Perception Graduate Program Student Board, NYU

2017 - 2018: **Volunteer**, Scientist Action and Advocacy Network, NYU

2016 - 2017: **Speakers Committee member**, Global Scholars Symposium, Cambridge, UK

2015 - 2016: **Logistics Committee member**, Global Scholars Symposium, Oxford, UK

2013 - 2014: **Co-organizer**, Healthy Early Childhood Development Symposium, Providence, RI

Panel Events

2021:   What is a Ph.D.? Panel for NYU Undergraduates in Psychology

2020:   Applying to the Rhodes Scholarship, Panel for Brown University undergraduates

2018:   Expectations for Graduate School in STEM, Panel for NYU Undergraduates

2015:   Applying for Research Fellowships, Panel for Brown University Women in Science & Engineering

2015:   Applying to U.K. Fellowships, Panel for Brown University undergraduates

Other Training

2022:   Kavli Summer Institute in Cognitive Neuroscience

2019:   Methods in Neuroscience at Dartmouth

2018:   NYU Science Communication Workshop

2016 - 2017: Oxford Center for Functional Magnetic Resonance Imaging Graduate Training Programme