

Research Fellowship Report (October 2019 - April 2021)

After securing additional funding, setting up the lab space, and building my research team within the newly established Cambridge Babylab (<https://www.babylab.psychol.cam.ac.uk/meet-labs/embodied-attention-learning>) in the first year of my fellowship, I planned to focus on data collection in the academic years 2019/20 and 2020/21. Unfortunately, due to the Covid-19 pandemic, we have not been able to return to the lab since March 2020 as we work with vulnerable populations (young children with genetic syndromes). I am very grateful to Newnham College for recognising the severe impact this has had on my research and extending my fellowship. This has enabled me to focus on establishing a new (Covid-proof) research stream, complementing my lab work, and thus strengthening my research programme.

Research programme. My research focuses on the early development of attention and motor abilities, and how these interact with parental behaviour in real-world environments over developmental time and constrain other domains (such as language). Children with various neurodevelopmental disorders often present with attentional and motor difficulties early in development, yet we know very little about how this constrains their everyday interactions, affects their learning, and potentially changes their developmental pathways. My research programme consists of two parallel but complementary streams of research:

- (1) *Lab-based*: focused on understanding the fine-grained dynamics of learning in young children with and without genetic syndromes (Down syndrome and Williams syndrome) in interaction with their parents using learning paradigms and specialist state-of-the-art head-mounted eye-tracking technology (<https://www.youtube.com/watch?v=vCWKNtMOKJA>);
- (2) *Home-based* (Covid-proof): capturing the everyday experiences of infants and toddlers with and without genetic syndromes by using miniature head-mounted cameras and special language-recording devices (the language environment analysis [LENA] system; <https://www.youtube.com/watch?v=UKq6gudBILs>).

The combination of these research streams powerfully allows both the detailed study of mechanisms in tightly controlled laboratory environments and probing of the ecological validity of these findings. Understanding how learning emerges through interaction between the developing child and parent, and how it is constrained by attentional and motor difficulties, are necessary steps for building a basis for future interventions and evidence-based practices. The integration of my research programme through collaborations across disciplines (<https://www.ucl.ac.uk/london-down-syndrome-consortium/research-themes>) will ultimately lead to a more comprehensive understanding of developmental processes – and shift the way we think about human development.

Other academic positions. I am an Affiliated Lecturer in the Department of Psychology, University of Cambridge and an Associate Research Fellow at Birkbeck, University of London.

Grant funding. I am a Co-Investigator in a team that was awarded Research Council (ESRC) funding (£560k). This is in addition to charity funding I obtained in 2018/19, which demonstrates that my research is of interest to a range of stakeholders.

Invited talks and conferences. Due to the Covid-19 pandemic, my invited talks at UCL, King's College London, Aston University, and Trinity College Dublin were cancelled or rescheduled to be delivered virtually later this year. This was also the case for many of the conferences I had planned to attend.

Teaching and academic service. As in the first year of my fellowship, I have very much enjoyed being involved in teaching, despite the added challenge of adapting teaching to online delivery. As a Module Leader with Dr Sarah Foley, I co-designed PBS6 Module 1 (*Understanding development: moving beyond the nature-nurture debate*), a series of eight lectures (of which I delivered four) and associated supervisions. I have been a Supervisor and an Assessor for PBS6. Furthermore, I have been a Research Supervisor for six internship/placement students, five BSc students, two MPhil students, and a PhD student (and an advisor to an additional two PhD students). I have also been an Admissions Interviewer in PBS for Newnham College and Corpus Christi College. As a Guest Lecturer on undergraduate and postgraduate modules, I delivered a number of lectures and seminars at various universities in the UK and abroad, including Birkbeck, University of London; Masaryk University, Czech Republic; and UCL Institute of Child Health.

Outreach. As part of student outreach, I have continued to organise and deliver the PBS Sutton Trust Summer School and participated in the Oxford and Cambridge Collaborative Outreach Conference. For my research outreach, in response to the Covid-19 pandemic, I adapted our annual World Down Syndrome Day celebrations for online delivery (<https://www.babylab.psychol.cam.ac.uk/world-down-syndrome-day-2021-celebration>).

Publications

Journal articles

- D'Souza, D., & D'Souza, H. (under review). Bilingual adaptations in early development. *Trends in Cognitive Science*.
- D'Souza, D., Brady, D., Haensel, J. X., & D'Souza, H. (2021). Early bilingual experience is associated with change detection ability in adults. *Scientific Reports*, 11(1), 1-9. <https://doi.org/10.1038/s41598-021-81545-5>
- D'Souza, D., Brady, D., Haensel, J. X., & D'Souza, H. (2020). Is mere exposure enough? The effects of bilingual environments on infant cognitive development. *Royal Society Open Science*, 7(2), 180191. <https://doi.org/10.1098/rsos.180191>
- D'Souza, D., D'Souza, H., Horváth, K., Plunkett, K., & Karmiloff-Smith, A. (2020). Sleep is atypical across neurodevelopmental disorders in infants and toddlers: A cross-syndrome study. *Research in Developmental Disabilities*, 97, 103549. <https://doi.org/10.1016/j.ridd.2019.103549>
- D'Souza, D., D'Souza, H., Jones, E. J., & Karmiloff-Smith, A. (2020). Attentional abilities constrain language development: A cross-syndrome infant/toddler study. *Developmental Science*, e12961. <https://doi.org/10.1111/desc.12961>
- D'Souza, H., Lathan, A., Karmiloff-Smith, A., & Mareschal, D. (2020). Down syndrome and parental depression: A double hit on early expressive language development. *Research in Developmental Disabilities*, 100, 103613. <https://doi.org/10.1016/j.ridd.2020.103613>
- D'Souza, H., Mason, L., Mok, K. Y., Startin, C. M., Hamburg, S., Hithersay, R., ... & Thomas, M. S. C. (2020). Differential associations of apolipoprotein E ϵ 4 genotype with attentional abilities across the life span of individuals with Down syndrome. *JAMA Network Open*, 3(9), e2018221. <https://doi.org/10.1001/jamanetworkopen.2020.18221>
- Farran, E., Bowler, A., D'Souza, H., Mayall, L., Karmiloff-Smith, A., Sumner, E., ... & Hill, E. L. (2020). Is the motor impairment in Attention Deficit Hyperactivity Disorder (ADHD) a co-occurring deficit or a phenotypic characteristic?. *Advances in Neurodevelopmental Disorders*, 4, 253-270. <https://doi.org/10.1007/s41252-020-00159-6>
- Glennon, J. M., D'Souza, H., Mason, L., Karmiloff-Smith, A., & Thomas, M. S. C. (2020). Visuo-attentional correlates of Autism Spectrum Disorder (ASD) in children with Down syndrome: A comparative study with children with idiopathic ASD. *Research in Developmental Disabilities*, 104, 103678. <https://doi.org/10.1016/j.ridd.2020.103678>
- Mayall, L. A., D'Souza, H., Hill, E. L., Karmiloff-Smith, A., Tolmie, A., & Farran, E. K. (2020). Motor abilities and the motor profile in individuals with Williams syndrome. *Advances in Neurodevelopmental Disorders*, 1-15. <https://doi.org/10.1007/s41252-020-00173-8>
- Startin, C. M., D'Souza, H., Ball, G., Hamburg, S., Hithersay, R., Hughes, K. M., ... & LonDownS Consortium. (2020). Health comorbidities and cognitive abilities across the lifespan in Down syndrome. *Journal of Neurodevelopmental Disorders*, 12(1), 4. <https://doi.org/10.1186/s11689-019-9306-9>
- Thomas, M. S. C., Alfageme, O. O., D'Souza, H., Patkee, P. A., Rutherford, M. A., Mok, K. Y., ... & LonDownS Consortium. (2020). A multi-level developmental approach to exploring individual differences in Down syndrome: genes, brain, behaviour, and environment. *Research in Developmental Disabilities*, 104, 103638. <https://doi.org/10.1016/j.ridd.2020.103638>
- D'Souza, D., & D'Souza, H. (2019). Emergent and constrained: Understanding brain and cognitive development. *Journal of Neurolinguistics*, 49, 228-231. <https://doi.org/10.1016/j.jneuroling.2018.04.011>
- Farran, E. K., Bowler, A., Karmiloff-Smith, A., D'Souza, H., Mayall, L., & Hill, E. L. (2019). Cross-domain associations between motor ability, independent exploration and large-scale spatial navigation; Attention Deficit Hyperactivity Disorder, Williams syndrome and typical development. *Frontiers in Human Neuroscience*, 13, 225. <https://doi.org/10.3389/fnhum.2019.00225>

Book chapters

- D'Souza, H., Brady, D., Wiseman, F. K., Good, M. A., Thomas, M. S. C., & The LonDownS Consortium (in press). Aligning cognitive studies in mouse models and human infants/toddlers: The case of Down syndrome. In M. S. C. Thomas, D. Mareschal & V. C. P. Knowland (Eds.). *Taking development seriously: Neuroconstructivism and the multi-disciplinary approach to understanding the emergence of mind. A Festschrift for Annette Karmiloff-Smith*. Routledge Books.
- D'Souza, H., & D'Souza, D. (in press). The emerging phenotype in infants with Down syndrome: Adaptations to atypical constraints. In J. Edgin & J. Burack (Eds.), *The Oxford Handbook of Down Syndrome and Development*. Oxford University Press.

Newnham features about my research

Dr Hana D'Souza – Developmental psychologist

<https://150.newn.cam.ac.uk/celebrating150/the-now-the-next/dr-hana-dsouza-developmental-psychologist/>

Dr Hana D'Souza explores how bilingual babies make sense of the world

<https://www.newn.cam.ac.uk/newnham-news/dr-hana-dsouza-explores-how-bilingual-babies-make-sense-of-the-world/>