

The Disconnected Mind

Unlocking secrets of healthy mental ageing

The Disconnected Mind aims to understand how changes in the brain's white matter – its connectivity – contribute to age-related cognitive decline in humans.

Newsletter 59: September 2022

Welcome to the Autumn 2022 Disconnected Mind Newsletter with news about the Disconnected Mind/Lothian Birth Cohorts team, our recent events, and latest publications.

A tribute to HM The Queen Elizabeth II

We were saddened to hear of the passing of Her Majesty the Queen, who was a great supporter of the University throughout her life. She will remain an inspiring model for all of us on how to grow older, with her continued interest in the world and a profound sense of commitment to her duties until two days before she died at the age of 96.

Here we remember one of her visits, now over twenty years ago, when she officially opened the [Wellcome Trust Clinical Research Facility](#) (WTCRF) at the Western General Hospital in Edinburgh where she met the clinical and research staff as well as some of the Lothian Birth Cohort participants to hear first hand about the study and its unique history and mission.



HM Queen Elizabeth II with an LBC participant, researcher and clinical staff at the official opening of the WTCRF in 2001

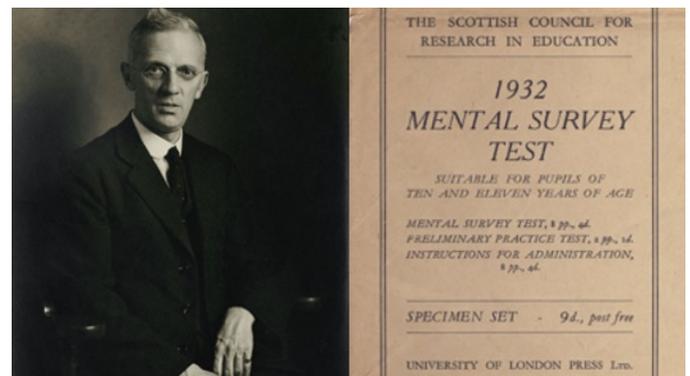
Professor Ian Deary recalls: *"It was an honour, and a long-lasting source of pride on behalf of the LBC team, to have met Her Majesty the Queen twice: first, over twenty years ago, at the start of the LBC research, when she opened the WTCRF, in which all LBC-ers have been tested; and then at Holyrood Palace in 2019 when she awarded me an OBE, for which the LBC can be proud. On each occasion I was impressed that, in short conversations, Her Majesty was able to ask so many well-aimed questions and make such insightful observations."*

Remembering Scottish Mental Surveys 1932 and 1947

Early June marked two big anniversaries in the history of the Lothian Birth Cohorts.

We celebrated 90 years since the 1932 Scottish Mental Survey which forms the foundation of the LBC1921 study, and 75 years since the 1947 Scottish Mental Survey which forms the foundation of the LBC1936 study.

Using the Moray House Test No. 12 constructed by Professor Godfrey Thomson and organised by the Scottish Council for Research in Education, both Surveys assessed thinking skills of almost the entire respective populations of 11-year-olds under the same conditions.



Professor Godfrey Thomson and the front cover of the 1932 Mental Survey Test

The significance of these events for our understanding of cognitive and brain ageing is undisputed. Once re-discovered by Professors Ian Deary and Lawrence Whalley decades later, the recorded intelligence test scores from thousands of Scottish 11-year-olds offered a rarely available baseline measure to investigate how childhood intelligence relates to cognitive ability, and mental, physical, and brain health in older age.

In the late 1990's Ian and Lawrence set on a course to trace some of the survivors of the Surveys. On the morning of the 1st of June 1998, they administered the original Moray House Test No. 12 in Aberdeen's Music Hall to the first group of 77 participants who had taken the test sixty-six years (to the day!) earlier.

This exercise provided the first evidence of large association between intelligence scores in childhood and older age, a discovery that has been since robustly replicated many times with LBC1921 and LBC1936, and the Aberdeen Birth Cohorts. This was the beginning of the longest – and one of the most thorough – studies of human cognition through the life span in the world with many important findings – published in hundreds of scientific articles – on cognitive and brain ageing.



Professor Ian Deary (bottom centre) with LBC participants at the 2017 reunion

Professor Deary reflects on the events: *“I think back almost a quarter of a century to that June 1st 1998 morning in the Aberdeen Music Hall with pain, poignancy, and pride. Pain, because a couple of weeks beforehand, I had smashed up both my elbows in a bicycle accident and my arms were immobile in plaster casts. My daughter Elayne had to accompany me to Aberdeen to manage basic things like doors; however, I managed to read the Moray House Test instructions to the returning participants after 66 years. Poignancy, because the two-and-a-bit decades after that were so busy and fruitful, with the assembling of the wonderful LBCs’ participants and team members and collaborators. The years flew by. Pride, because I think we repaid the LBCs’ participants’ generosity and commitment by producing a lot of high-grade, useful scientific results about human ageing, we trained many super young scientists, and because the LBCs continue at full steam with lots still to discover.”*

Wave 6 Data Collection Update

The team are continuing to make great progress with Wave 6 of the LBC1936 study, with a total of 254 participants at the average age of 86 years returning for cognitive testing at the Wellcome Trust Clinical Research Facility (WTCRF), and 146 for an MRI brain imaging scan at the Edinburgh Imaging Facility, at the time of writing. Kudos to the LBC1936 participants, testers, CRF nurses, and radiographers for this significant achievement!

Dementia Ascertainment at Wave 6

The most recent 6th wave of the LBC1936 study includes an exciting and important new measure: for the first time, the team have ascertained the dementia status of almost the entire cohort, including participants who no longer attend in-person assessment.

This is an important new development at a time when LBC1936 participants (now an average age of 86 years) are at substantially increased risk of developing dementia.

This valuable work was supported by our close colleagues and long-term collaborators in the Alzheimer Scotland Dementia Research Centre (ASDRC), directed by LBC study Chief Investigator and medic Dr Tom Russ. In their capacity as clinicians, higher trainees from the ASDRC team reviewed LBC1936 participants’ NHS medical records and provided the LBC1936 team with an up-to-date picture about each participant’s health and medical status, diagnoses of dementia, and recommendations about their capacity to consent to take part in the study.



Dr Tom Russ at the 2019 LBC reunion

This procedure was conducted prior to participants being invited to join Wave 6, and ensured that the LBC team put in place any additional support which might be required for participants before their visit to the WTCRF.

In addition, the ASDRC team have supported the study by conducting follow-up home appointments for participants whose cognitive test performance has shown changes that may be indicative of mild cognitive impairment or dementia, or to confirm dementia subtype in those already diagnosed.

This new measure is an invaluable resource for those interested in determining factors related to the development of dementia and the relationship between dementia status and other important ageing-related outcomes.

The LBC team are very grateful to the team at ASDRC for their support throughout the wave, offering their time to conduct follow-up appointments, and their hard work in creating this fantastic ascertainment resource. Well done, team!

Staff updates

Beth Jones joins the team!

In July, we welcomed a new member of the team, Beth Jones. Beth joined the Lothian Birth Cohorts as a member of the cognitive testing team and administrative assistant. She studied Neuroscience at the University of Leeds, where she undertook a placement year with the Born in Bradford project – a cohort study similar to the LBC studies, looking into childhood cognition and predictors of health and intelligence. This experience sparked a deeper interest in cognitive neuropsychology that she now pursues as a part-time student on the MSc course in Human Cognitive Neuropsychology at the University of Edinburgh, alongside her LBC role.



Beth Jones (left) with an LBC participant at the WTCRF

Beth hopes to use LBC data to pursue her interest in hearing impairments and associated effects on cognition and language deterioration as part of her MSc dissertation project, and also hopes to get involved with the MRI analysis. We are delighted to have Beth on the team and hope she will find her experience stimulating and rewarding!

Beth said: *"I have found the whole team incredibly welcoming and have really loved being at the clinic and meeting such a committed and friendly cohort. I look forward to getting stuck in and being involved with such a wonderful project."*

Congratulations to Dr Chloe Fawns-Ritchie!

We are delighted to hear that Dr Chloe Fawns-Ritchie, a close collaborator of the Lothian Birth Cohorts, is moving to a permanent teaching position at the University of Dundee. Congratulations on your achievement, Chloe! Chloe has had a stellar post-PhD career with Generation Scotland. She joined their team as a Postdoctoral Research Fellow and led the development of the online questionnaires administered to the participants.



Dr Chloe Fawns-Ritchie at the 2019 Lothian Birth Cohorts reunion

Chloe's connection to the LBC goes back to the Centre for Cognitive Ageing and Cognitive Epidemiology when she worked as the cognitive testing officer and completed her PhD under the supervision of LBC's founding director, Professor Ian Deary, on functional health literacy and its relation to cognitive ability. Chloe continues publishing on topics related to the psychological correlates and predictors of health with many of the LBC team members. We will miss her and wish her all the best as she joins the University of Dundee, and we are delighted she will retain her affiliation with the University of Edinburgh and maintain her ties to the LBC!

LBC team news

Professor Duke Han visits Dr Simon Cox and the LBC

In June Dr Simon Cox and the LBC team welcomed our first academic visitor after two years, Dr Duke Han! [Duke Han, PhD](#) is a director of neuropsychology in the Department of Family Medicine and a professor of family medicine, neurology, psychology and gerontology at the Keck School of Medicine of the University of Southern California and, amongst many other roles, an inaugural Governance Committee member of [The Global Council On Brain Health](#). His research examines the factors that affect cognition and decision making in aging, with special interests in using novel neuroimaging and statistical approaches to better understand these factors.

During his visit at the University of Edinburgh he presented his findings on the possible links between brain changes and financial exploitation vulnerability in older adults. His recent work on financial altruism and Alzheimer's disease has been featured in multiple media outlets, including [Alzheimer Europe](#) and [EurerkAlert.org](#).



Duke Han (left) with Simon Cox in 7 George Square

Simon said: *“It was an unqualified pleasure to host Professor Duke Han during his visit to the LBCs, and to share with him our ongoing work. Duke has a vast and impressive research portfolio, and we were delighted to hear more about his world-leading research on financial decision making and scam susceptibility. He also had some great research and clinical perspectives during our regular team meetings which he sat in on, and even found time to meet with several of the LBC Co-Is as well as the wider research team. It was a packed and enthralling visit – we look forward to welcoming Duke back again in future.”*

Duke said: *“The LBC is one of the most impactful studies of aging and cognition in history. As a clinical neuropsychologist and cognitive aging researcher, findings from the LBC were considered cannon during my training. It was truly an honor to meet with Dr. Simon Cox and other LBC investigators during my visit. There is an immense amount of cutting-edge work being done, and I look forward to hearing about the exciting new discoveries from the study in the future.”*

Scientific Highlights

Blood test could predict future risk of leukaemia



LBC1936 participant gives blood sample for research

Leukaemia is often the result of the disruption to the fine balance in blood cell production where new cells are manufactured and old blood cells die. As we age, mutations in blood stem cells can mean that the altered cells can have a growth benefit over other blood cells and outnumber them in what is referred to as fitness advantage.

Researchers from the Universities of Edinburgh and Glasgow investigated how changes in fitness advantage that occur in blood production might provide clues to risk of developing leukaemia depending on the type of mutation that occurs. To properly understand these changes, rare longitudinal data are needed.

They measured changes in the blood samples of 83 older individuals of the Lothian Birth Cohorts, taken every three years over a 12-year period. They used this complex genomic data with machine learning to link different mutations with different growth speeds of blood stem cells carrying these mutations.

[The study](#), now published in *Nature Medicine*, found that specific mutations give distinct fitness advantages to stem cells measured in people without leukaemia. This can then be used to forecast how quickly the mutated cells will grow, which determines leukaemia risk.

This exciting new discovery received significant attention from the press and media and, as of this August, reached the Altmetric of 185, which is in the top 5% of all research outputs ever tracked. Congratulations!

You can read more about the study and Dr Kristina Kirschner, co-lead author of the paper in [this article by Leukaemia UK](#).

Social mobility is not the answer for better health in later life



Upward intergenerational social mobility is a desirable target for many societies across the world, as higher socio-economic positions are consistently associated with better health and wellbeing.

But the health impact of upward social mobility is not clear: on one hand, it can offer improved access to resources that support healthy behaviours, but on the other it can lead to stress as one adjusts to the new socioeconomic position, taking its toll on one's health.

To investigate the effect of social mobility on health and wellbeing it is necessary to separate out the contribution of social mobility from the contribution of one's socioeconomic origins (in childhood) and destination (in adulthood).

This is why Matthew Iveson, Simon Cox and Ian Deary applied a novel approach in the unique longitudinal LBC1936 data and used the non-linear diagonal reference model (DRM) to examine whether the later-life health and wellbeing of those that moved social class (e.g., 1 > 2) best resembled that of people who stayed in the same origin (e.g., 1 > 1) or destination (e.g., 2 > 2) social class. The study found no evidence that social mobility affects later-life health once the contributions from socioeconomic origins and destinations are taken into account.

To support healthy ageing, the authors suggest, policy needs to focus on other sources of health inequality, including improving early-life conditions.

[The study is now published in the *Journals of Gerontology*.](#)

Neighbourhood characteristics affect our health in older age

Frailty is a condition that can make older people feel weak and reduce their ability to recover from illness and injury. Age UK estimates that around 10% of people aged over 65 live with frailty. This figure rises to between 25% and 50% for those aged over 85.

Understanding factors leading to frailty – and identifying what and how to prevent it— is of critical importance. Neighbourhood features have been postulated as one of the key predictors.

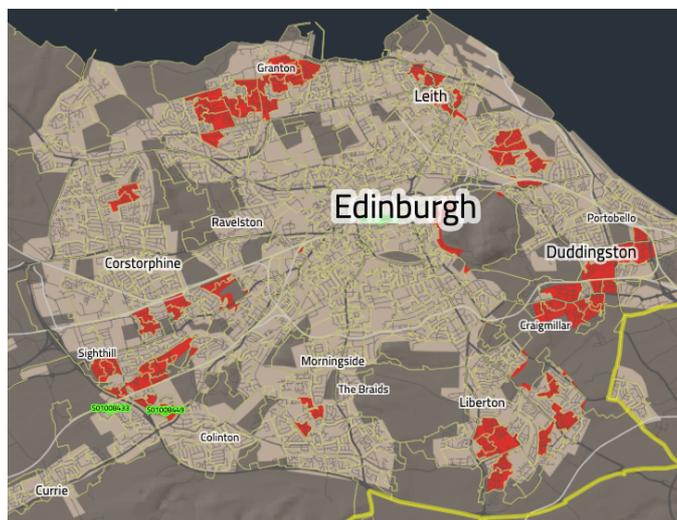
Objectively assessing the impact of our neighbourhoods on our health across the life course has been challenging as it requires longitudinal data that combine information about the places in which we have lived over our lifetimes, and frailty measures. The Lothian Birth Cohort 1936 is one such resource.

Using the LBC data, Gergő Baranyi and his colleagues at the School of GeoSciences at the University of Edinburgh, along with the LBC team, were able to conduct the first study exploring the effect of neighbourhood-level factors on frailty and, specifically, the association between neighbourhood social deprivation (NSD) across the life course and frailty and frailty progression in older adults.

The study suggests that people who spend part of their life living in more socially deprived neighbourhoods are more likely to be frailer in old age.

The results indicate that the more time men spent living in deprived areas during their childhood and mid- to late adulthood, the greater the chances they would be frail by age 70. Women living in disadvantaged neighbourhoods in mid-to-late adulthood were more likely to become frailer more quickly after the age of 70.

[The study has been published in the American Journal of Epidemiology.](#)



Map of Edinburgh with most deprived areas in red

Dr Gergő Baranyi, of the University of Edinburgh's School of GeoSciences, who led the study, said: *"The United Nations expects that by 2050 the number of older adults will double worldwide and many of them will suffer from age-related conditions, including frailty. Identifying aspects of our lives that might slow the decline in health and functioning is crucial, and our research shows that the neighbourhoods where we live are one of these.*

Our study is the first to ask whether places across our entire life course matter for healthy ageing. People growing up and getting old in more advantaged neighbourhoods of Edinburgh were less likely to be frail as older adults."



Dr Gergő Baranyi

Knowledge Exchange and Impact

Lothian Birth Cohorts mentioned in a report on the medical effects of air pollutants



In recent years, there has been increasing interest in the impact of air quality on our health. In July, [the Committee on the Medical Effects of Air Pollutants \(COMEAP\)](#) published [a report](#) examining the possibility that exposure to outdoor air pollution could increase the risk of cognitive decline and dementia. The government research group reviewed nearly 70 epidemiological studies on the possible links between air pollution and cognitive function in older age, and its effects on the brain, including [a systematic review](#) on environmental risk factors for dementia co-authored by our collaborator Dr Tom Russ, Director of the Alzheimer Scotland Dementia Research Centre. The report concluded that air pollution is likely to increase the risk of accelerated cognitive decline and of developing dementia in older people. The experts suggest this is due to the impact of pollutants entering the circulatory system, affecting blood flow to the brain.

The Committee has not made recommendations on how to estimate the effects of air pollution on dementia, but the Lothian Birth Cohorts is identified as one of three existing UK cohorts that can provide evidence on this important topic, specifically, the long-term relationship between exposure to air pollution and cognition.

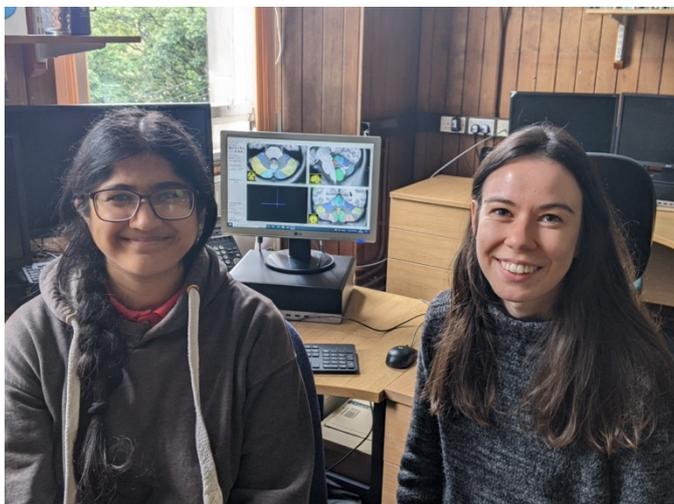
Dr Tom Russ was invited to comment on the report with Tom Swarbrick of the Leading Britain's Conversation talk radio. Tom discussed his research and findings on the relationship between air pollution and its impacts on the brain and cognition, and his [recent study](#) published in 2021 in *the Journal of Alzheimer's Disease*, based on the LBC longitudinal data that shows that air pollution in early life and in utero was associated with a negative impact on cognition in later life.

A high-school graduate connects with LBC researchers

Back in March 2022 the LBC team participated in the first in-person public event after two years of the pandemic with hands-on activities at [the Beautiful Brain Conference](#).

One of the attendees who approached us with a host of excellent questions and a lot of insight into the study was a Boroughmuir Highschool graduate, Priyanka Gopalkaje. Priyanka's knowledge of the LBC both surprised and delighted us. She was well-aware of the project, its history, and the science behind it. How come? The reason behind her knowledge and interest became clear when she revealed her work experience with Professor Tara Spires-Jones for her Gold Crest Award. The aim of these Awards is to allow young people to participate in longer-term projects to hone their investigative skills and employ the scientific method to conduct their own piece of research.

At the conference, Priyanka expressed interest in getting more research experience with the LBC team and three months later she joined Dr Joanna Moodie for a summer work experience project. Her role was to perform quality checks on the results of several cerebellum parcellation algorithms with LBC images, a win-win experience arising from a public engagement event and an excellent example of knowledge exchange in the team!



Priyanka (left) with Jo in the office in 7 George Square

Priyanka, who will start studying medicine at the University of Cambridge this October, said: *"This has been very valuable work experience. I really enjoyed working on the project and I now have a deeper understanding of the research process, brain ageing and cerebellar anatomy. I am extremely grateful for the opportunity. I am sure any future research that I do will benefit from the experience I gained working with the LBC."*

Jo added: *"It's been excellent working with Priyanka this summer. She has made valuable contributions to the project and will be missed!"*

Judy Okely's research on music is making the headlines



In our June Newsletter we announced that Judy Okely's article examining associations between musical experience and cognitive ageing in LBC1936 was accepted for publication. [The study](#) found a small, but statistically significant positive association between experience of playing a musical instrument and change in general cognitive ability between ages 11 and 70.

Specifically, LBC1936 individuals with more musical-instrument experience in childhood were likely to show greater gains in general cognitive ability.

The findings, now published in *Psychological Science*, have been featured in multiple press and media outlets, local, national and international, including [The Guardian](#), [The Times](#), [The Independent](#) or [The Economist](#), reflecting keen interest in understanding what factors and experience can make our lives more positive in later life.

Marginal gains with Alan Gow at the Cabaret of Dangerous Ideas



The sun was shining more than its usual share in Edinburgh this summer, to the delight of the locals and visitors alike! We were equally delighted by the return of the Edinburgh Festival Fringe with [the Cabaret of Dangerous Ideas](#) (CoDI).

In its tenth year, the CoDI invites academics to share their cutting edge research with audiences at the Stand Comedy Club.

Professor Alan Gow, a former LBC graduate and our close collaborator, is a regular and this year he presented two shows and a double bill, alongside Professor Antonella Sorace. Alan's show, Marginal Gains for Brighter Brains!, was inspired by [Dr Janie Corley's seminal paper](#) based on the LBC, and invited the audience to explore how thinking skills change with age and what might predict those changes.

The key message of the show was that though there's no single "secret" ingredient, that's maybe a good thing: there are many dozens of factors that might be important, and if we can identify those, we can start making small and perhaps more manageable changes to those.

New publications

Accepted/In press

Barnes, A. et al. (2022). [Topological relationships between perivascular spaces and progression of white matter hyperintensities: a pilot study in a sample of the Lothian Birth Cohort 1936](#). *Frontiers in Neurology*.

Online ahead of print

Baranyi, G. et al. (2022). [Is life-course neighborhood deprivation associated with frailty and frailty progression from ages 70 to 82 Years in the Lothian Birth Cohort 1936?](#) *American Journal of Epidemiology*.

Bernal, J. et al. (2022). [Assessment of perivascular space filtering methods using a three-dimensional computational model](#). *Magnetic Resonance Imaging*.

Iveson, M.H., Cox, S.R. and Deary, I.J. (2022). [Intergenerational social mobility and health in later life: Diagonal reference models applied to the Lothian Birth Cohort 1936](#). *The Journals of Gerontology: Series B*.

Lahti, J. et al. (2022). [Genome-wide meta-analyses reveal novel loci for verbal short-term memory and learning](#). *Molecular Psychiatry*.

Okely, J.A., Overy, K. and Deary, I.J. (2022). [Experience of Playing a Musical Instrument and Lifetime Change in General Cognitive Ability: Evidence From the Lothian Birth Cohort 1936](#). *Psychological Science*.

Yang, Y. et al. (2022). [Epigenetic and integrative cross-omics analyses of cerebral white matter hyperintensities on MRI](#). *Brain*.

Published

Huan, T., Nguyen, S., Colicino, E., Ochoa-Rosales, C., Hill, W.D., et al. (2022). [Integrative analysis of clinical and epigenetic biomarkers of mortality](#). *Aging Cell*.

Lee, M., Huan, T., McCartney, D.L., Chittoor, G., de Vries, M., et al. (2022). [Pulmonary Function and Blood DNA Methylation: A Multi-Ancestry Epigenome-Wide Association Meta-Analysis](#). *American Journal of Respiratory and Critical Care Medicine*.

Robertson, N.A., et al. (2022). [Longitudinal dynamics of clonal hematopoiesis identifies gene-specific fitness effects](#). *Nature Medicine*.

Welstead, M., et al. (2022). [Heterogeneity of frailty trajectories and associated factors in the Lothian Birth Cohort 1936](#). *Gerontology*.

Contact

You can contact the LBC team by email, and keep up with our latest news on our website and Twitter.



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