Biosocial concepts and Frameworks

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Background

Why am I talking about sociological criticisms to biosocial research?

- ESRC-BBSRC SOC-B (Social-Biological) CDT programme
- ESRC NCRM missing biological data in surveys WP
- ESRC International Centre for Lifecourse Studies in Society and Health ICLS
What is biosocial?

• Biosocial research examines the interplay between social, behavioural and biological factors
• Attempts to resolve challenges in isolating causal processes

Different meanings and definitions

• disciplinary perspectives
• funders of research
What is biosocial research?

Umbrella term

• Biological anthropology
• Human sciences
• Sociogenomics
• Neurosociology
• Neuroeconomics
• Cognitive neuroscience
What is biosocial research?

ESRC: Biosocial research...

- is concerned with the dynamic interplays between biology, experiences and behaviours over the life course.
- encompasses multidisciplinary science, brings together expertise from the biological, medical and social sciences.
- enables understanding of the complex pathways and mechanisms that shape physical and mental health, social behaviours and outcomes, and genomic, neurological and physiological systems.
Intradisciplinary to Transdisciplinary
What is a social science discipline?

- Anthropology?
- Psychology?
- Public health?
- Sociology?
- Economics?
- Linguistics?

https://esrc.ukri.org/about-us/what-is-social-science/social-science-disciplines/
ESRC social science disciplines- 1

Demography and social statistics, methods and computing

- **Demography** is the study of populations and population changes and trends, using resources such as statistics of births, deaths and disease.

- **Social statistics, methods and computing** involves the collection and analysis of quantitative and qualitative social science data.

**Development studies, human geography and environmental planning**

- **Development studies** is a multidisciplinary branch of the social sciences which addresses a range of social and economic issues related to developing or low-income countries.

- **Human geography** studies the world, its people, communities and cultures, and differs from physical geography mainly in that it focuses on human activities and their impact - for instance on environmental change.

- **Environmental planning** explores the decision-making processes for managing relationships within and between human systems and natural systems, in order to manage these processes in an effective, transparent and equitable manner.

**Economics, management and business studies**

- **Economics** seeks to understand how individuals interact within the social structure, to address key questions about the production and exchange of goods and services.

- **Management and business studies** explores a wide range of aspects relating to the activities and management of business, such as strategic and operational management, organisational psychology, employment relations, marketing, accounting, finance and logistics.

**Education, social anthropology, and linguistics**

- **Education** is one of the most important social sciences, exploring how people learn and develop.

- **Social anthropology** is the study of how human societies and social structures are organised and understood.

- **Linguistics** focuses on language and how people communicate through spoken sounds and words.
ESRC social science disciplines- 2

Law, economic and social history

- **Law** focuses on the rules created by governments and people to ensure a more orderly society.
- **Economic and social history** looks at past events to learn from history and better understand the processes of contemporary society.

Politics and international relations

- **Politics** focuses on democracy and the relationship between people and policy, at all levels up from the individual to a national and international level.
- **International relations** is the study of relationships between countries, including the roles of other organisations.

Psychology and sociology

- **Psychology** studies the human mind and try to understand how people and groups experience the world through various emotions, ideas, and conscious states.
- **Sociology** involves groups of people, rather than individuals, and attempts to understand the way people relate to each other and function as a society or social sub-groups.

Science and technology studies

- **Science and technology studies** is concerned with what scientists do, what their role is in our society, the history and culture of science, and the policies and debates that shape our modern scientific and technological world.

Social policy and social work

- **Social policy** is an interdisciplinary and applied subject concerned with the analysis of societies' responses to social need, focusing on aspects of society, economy and policy that are necessary to human existence, and how these can be provided.
- **Social work** focuses on social change, problem-solving in human relationships and the empowerment and liberation of people to enhance social justice.
The biosocial lifecourse

Emerging framework with multiple disciplinary perspectives

- Bronfenbrenner (1977) bioecological model
- Dahlgren & Whitehead (1991) proximal and distal influences
- Krieger (1994) embodiment/ecosocial approach
- Kuh & Ben Shlomo (1997) lifecourse framework
- Hertzman (1999) biological embedding
- Kubansky, Seeman & Glymour (2014) biologically plausible mechanisms
Bronfenbrenner bioecological model

- **Microsystem**
  - e.g. family, peers, school

- **Mesosystem**
  - i.e. interaction of extended levels of microsystems

- **Exosystem**
  - e.g. media, services, neighbours

- **Macrosystem**
  - e.g. society, culture
Dahlgren & Whitehead proximal and distal influences

Source: Dahlgren and Whitehead, 1991
Krieger embodiment/ecosocial approach
Hertzman biological embedding
FIGURE 14.1: Biological pathways linking social conditions and health.

Source: Kubansky LD, Seeman TE & Glymour MM 2014
Homeostasis, Allostasis, Robustness, and Weathering
Biological Embedding/Developmental Origins of Health and Disease

• Fetal origins/birthweight
• Imprinting models
• DOHAD
• Differential susceptibility to context-dandelions vs orchids
Group discussion

What is stress?
How do you measure stress?
Is stress a psychosocial factor?
What is a psychosocial factor?
Sociological perspectives on biosocial research


Criticisms of biosocial research

• Deterministic
• Reductionist
• Normative
Determinism

- Genetic determinism
- Biosocial science and Eugenics
- Intelligence- nature vs nurture debates
Sunday 29th October 2017

Are there any limits to what schools can achieve?

Can schools do anything to raise children’s general cognitive ability? The answer is maybe, but we haven’t yet discovered how to do it. Intelligence is a highly heritable characteristic, which is to say that more than half the variance in IQ at a population level is due to genetic differences, with less than half due to environmental differences. It’s true that the heritability of IQ is lower among children than it is among adults, with the environment playing a bigger role during adolescence. But the impact of the environment on children’s attainment, even during these formative years, is still fairly negligible – lower than most educationalists believe. Overall, children’s genes account for between 60 and 70 per cent of the variance in GCSE results, with IQ accounting for about half that genetic influence.

So what are the things that schools cannot change? Having immersed myself in psychology, particularly psychometrics, I’ve reluctantly come to the conclusion that it is naïve to think schools can do much to ameliorate the effects of inequality. I don’t just mean socio-economic inequality; I also mean differences in intelligence. A child’s general cognitive ability is the
Key points

- Until 2017, genome-wide polygenic scores derived from genome-wide association studies (GWAS) of intelligence were able to predict only 1% of the variance in intelligence in independent samples.

- Polygenic scores derived from GWAS of intelligence can now predict 4% of the variance in intelligence.

- More than 10% of the variance in intelligence can be predicted by multipolygenic scores derived from GWAS of both intelligence and years of education. This accounts for more than 20% of the 50% heritability of intelligence.

- Polygenic scores are unique predictors in two ways. First, they predict psychological and behavioural outcomes just as well from birth as later in life. Second, polygenic scores are causal predictors in the sense that nothing in our brains, behaviour or environment can change the differences in DNA sequence that we inherited from our parents.

- Polygenic scores for intelligence can bring the powerful construct of intelligence to any research in the life sciences without having to assess intelligence through the use of tests.
Genetic determinism

Genes → Intelligence → Educational Attainment
But what about?

- Genes
- Intelligence
- Educational Attainment

Parents

Diagram showing the relationship between factors influencing educational attainment.
making it the largest GWAS for any trait to date. Preliminary results from this GWAS have identified more than 1,000 significant associations and a GPS, EA3, that predicts more than 10% of the variance in years of education in independent samples (P. D. Koellinger, personal communication). Hence, the EA3 GPS is expected to predict more than 10% of the variance in intelligence. The effect size of the EA3 GPS for predicting intelligence is likely to rival that of family socio-economic status, which is indexed by parents' years of education. Across studies, the correlation value for parents' education with children's intelligence is 0.30, implying that it accounts for 9% of the variance in children's intelligence. However, this association is confounded by genetics because children inherit the DNA differences that predict their intelligence from their parents. Furthermore, parental phenotypes, such
Association between parental SES and intelligence is confounded by genes.

Diagram:
- Genes
  - Parents
    - Genes
    - Intelligence
    - Educational Attainment
Genetic determinism vs environmental confounders and effect modifiers

- Genes
- Intelligence
- Educational Attainment
- Environmental Confounders & Effect Modifiers
Reductionist

the social invoked is a ‘rather mangy-looking beast — an animal quite alien to the rich and fat understanding of a century-old anthropology or sociology’

Those from the social and human sciences rightly identify the impoverished sense in which ‘social relations’ are reduced to interactions between dyads that can be experimentally simulated in a laboratory and in a scanner.


To trigger a discernible peak of chemical changes in my brain that would correlate with my emotional state, one of the scientists, midway through the laborious hour-long procedure, drew a modest bouquet of five-pound notes from his top pocket: ‘They’re yours, Simon,’ he exclaimed. ‘A present! Keep them, the money’s just a nice little extra surprise!’ He thrust them into my hand, while I continued to lie as motionless as possible, my head compressed by foam padding, surrounded by the scanner as the scientists rushed around to mark the precise time of the event onto a chart. Throughout, blood was still being extracted from my arm (which had begun to get quite sore), and my head remained as still as possible as I continued to peer at the TV. The purpose of this improbable moment was to produce a dramatic emotional transformation that could be treated as demonstrable evidence of my subjective experience. The pen mark on the timeline would be used to isolate the changes of my internal state—effectively defining it temporally.

**Petty Cash and the Neuroscientific Mapping of Pleasure**

Simon Cohn
Volunteer A

Scientist: I want you to look at the images that’ll be above your head. There’ll be a lot of different things. Look at them, and let yourself respond to them, but try not to think too much...

Volunteer: Think too much?

Scientist: Yes, you know.... We want to study how you react, not what you’re thinking ...

Volunteer: Oh ...

Volunteer B

In truth, I think I know that they were trying to study how I responded to images of things I like, and things I don’t. So all the time in there, I was thinking to myself, well—do I like this really, or not? But they were changing the pictures so fast that sometimes I was thinking about that when another picture was showing.
Normative

Underlying assumptions about the “social”

Biologists working at the level of the molecular are less prone to question the normative contentions shaping scientific agendas and interpretations of findings.

Scientists have scaled up without context findings about rat ‘mothering’ and gene profile to the human world.

Policy recommendations on:
Need to break the cycles of insensitive and insufficiently attentive parenting among the poor.

Targeting pregnant women and new mothers as the core mediators of their children's development.
Policy implications of biosocial research

What is our society going to make of the notion that ... the socially disadvantaged are also (epi)genetically damaged?

What will disadvantaged groups do with this flurry of epigenetic studies concerning their own condition?

How does it change a social worker’s understanding of parenting if they see a sensitive child as an epigenetically compromised individual, damaged in utero by a ‘neurotic’, low-nurturance mother, herself biologically broken as a result of the carousing of a feckless grandfather?

Epigenetic research suggests greater opportunities for big pharma and possibly fewer for social policy interventions

Poor people are not poor because of inequality, disadvantage or plain bad luck. They are biologically altered for the worse, and may be fixed with a pill.
SOC-B research: primarily within the social sciences

Some examples of biosocial research questions on..

- DOHAD
- Fertility
- Smoking

Remember, at least 50% of the research is within the social sciences!
Recommendations for better biosocial research?

1. Let’s have a bit more “social” in biosocial research
   - Examine how the social can influence the biological (SOC-B)
Genome-wide association study identifies 74 loci associated with educational attainment

Aysu Okbay, Jonathan P. Beauchamp [...] Daniel J. Benjamin

*Nature* 533, 539–542 (26 May 2016)
doi:10.1038/nature17671

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“stringent controls” used by the cohorts: Gender, Birth cohort, World War II dummy
Recommendations for better biosocial research?- 2

2. Move away from heritability estimates

- Nature vs Nurture does not make sense in a postgenomic context
- Rutter (2002): G×E studies are “the relatively easy part”
- The tough bit is understanding “what these genes do” in relation to other biological processes and endophenotypes and how these various biological activities shape responses to environmental factors.
Recommendations for better biosocial research?- 3

3. Don’t be afraid of population heterogeneity
   - Understanding what makes the sample unique and non-representative
   - Have a better understanding of how selection of biosocial samples can influence estimates
Sampling frame:
Adults aged 40–69 years who lived within 25 miles of Edinburgh, Glasgow, Newcastle-upon-Tyne, Middlesbrough, Leeds, Bury, Manchester, Altrincham, Liverpool, Sheffield, Nottingham, Stoke-on-Trent, Birmingham, Oxford, Bristol, Reading, central London, Hounslow, Croydon, Cardiff, Swansea and Wrexham
In the UK Biobank cohort, 94.6% of participants were of white ethnicity, which was similar to the national population of the same age range in the 2001 UK Census (94.5%) but somewhat higher than in the 2011 Census (91.3%; Table 1).

- However, less than 70% of the urban population in the sampling frame were of White ethnicity in the 2011 census
- We lose the rich (social) detail of who are and are not included in biosocial studies by ignoring non-response and population representation
Recommendations for better biosocial research? - 4

4. Move towards transdisciplinary research
   - Adopt more cross-disciplinary perspectives
   - Publication in social science journals
Disciplinary rankings by purity

FIELDS ARRANGED BY PURITY

Sociology is just applied psychology.
Psychology is just applied biology.
Biology is just applied chemistry.
Which is just applied physics. It's nice to be on top.
Oh, hey, I didn't see you guys all the way over there.

Sociologists  Psychologists  Biologists  Chemists  Physicists  Mathematicians
But it’s good to think outside the box
Acknowledgements