HL IB Psychology

Genetics & Behaviour – Animals

Contents

Two Key Studies Genetics & Behaviour: Animals

Key Study One: Weaver et al. (2004)

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Note: *You learned about* ***genes*** *in the SL Biological Approach (see the RNs on this site which cover the topic) using research by Brunner et al. (1993) and Caspi et al. (2003) which both investigate the role of genes in human behaviour. Key Study 1 on this RN looks at* ***epigenetic changes*** *in rats and Key study 2 looks at* ***gene-environment interaction*** *in mice so make sure that you DON'T use it when answering a question on genes in relation to human behaviour i.e. only use this research for a HL Extension question on Paper 1 Section B*

Aim: To investigate how **maternal behaviour** in rats may be linked to **epigenetic** changes in the offspring seen in **DNA methylation** (a process which is necessary for normal development in an organism). Epigenetic modifications can be **inherited** and passed to offspring at the genetic level.

Subjects: Rats taken from the Charles River in Canada by the researchers and raised in **captivity** i.e. most of the rats were raised in **laboratory environments**.

Procedure:

- The researchers divided the rats into groups according to whether the **pups** (baby rats) had been raised by a mother who scored highly (as **rated** by the researchers) on **nurturing maternal behaviours** e.g. licking and grooming (**LG**) and arched-back nursing (**ABN**): these mother rats were known as **high LG-ABN** mothers
- The other type of rat mothers in the study were termed **low LG-ABN** mothers as they did not nurture or care for their pups in the same positive way as the high LG-ABN mothers
- DNA methylation was measured by the researchers when the pups were one week old and this continued during the course of the rats' lives
- The pups who had been raised by a high LG-ABN mother were then given to a low LG-ABN mother - and vice-versa - so that each pup experienced the opposite type of maternal care from their rat 'foster mother'
- The researchers swapped mothers (with the attendant types of care) to see if LG-ABN was **reversible** and would show epigenetic changes in the pups

Results:

- The pups who had experienced high levels of LG-ABN showed more differences in their DNA methylation than the pups who had experienced low LG-ABN i.e. the pups who had originally been raised by a nurturing biological mother showed more epigenetic changes than the pups who had been raised by an unloving mother

- The DNA methylation changes were observed to be **long-lasting**, going from the first week of the pups' lives well into adulthood
- The high LG-ABN pups exhibited a **reduced stress response** compared to the low LG-ABN pups.

Conclusion: Epigenetics can change the state of specific genes and this can occur through learnt experiences either early or later in life. These changes are also reversible.

Evaluation of Weaver et al. (2004)

Strengths

- This study demonstrates a clear link between epigenetics and nurture, providing insight into gene-environment interactions across a lifespan i.e. that maternal responses to stress become 'programmed' within the offspring
- The use of a **standardised procedure** in **lab conditions** mean that the findings of this study could be tested via multiple **replications**

Limitations

- The results of this study cannot explain exactly why the epigenetic changes occurred: they could have been due to an **array of variables** which had nothing to do with LG-ABN: this decreases the **internal validity** of the study
- The sample of rats used was taken from a laboratory facility so the experience of nurture and stress is likely to be different to animals in the wild who will have far more threats and danger to contend with i.e. it lacks **ecological validity**

Key study 2: Lassi & Tucci (2017)

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Aim: To investigate whether the **attachment styles** shown by mice would reflect the maternal behaviours of their **biological mothers** compared to foster mothers.

Subjects: 8 **litters** of mouse pups who had been born to either a 'good' mother with nurturing maternal behaviours or to a 'bad' mother with unloving maternal behaviours. Each litter contained between 6–10 pups; 4 litters were raised by 'good' and 'bad' biological mothers; 4 litters were raised by 'bad' foster mothers. The total sample size was 140: 64 pups had been fostered; 76 were raised by their biological mothers.

Procedure:

The researchers used a modified version of a study known as the **Strange Situation (SS)** in which a young infant undergoes testing for **separation anxiety, stranger anxiety, exploratory behaviour and reunion behaviour** under conditions such as the mother leaving them alone or with a stranger. Because the SS is a study designed for human behaviour it was adapted accordingly to observe **mouse-equivalent** behaviours (e.g. how much the pup explored the stranger; how much the mother groomed the pup).

Results:

- The mice who had been raised by their biological mothers exhibited behaviours that were reflective of a **secure**, positive attachment to the parent e.g. preferring the mother to a stranger
- The offspring of foster mothers did not show a full set of secure attachment behaviours, exhibiting some signs of **insecure** attachment e.g. showing little interest in the mother when reunited with her
- Most of the pups who had been raised by their biological mothers displayed a higher number of secure attachment behaviours compared to those raised by foster mothers, in line with their **genotype**
- Pups raised by foster mothers showed attachment styles that were linked to the genetic paternal line e.g. fostered pups who had 'good' biological fathers were more likely to show secure attachment

Conclusion: Genes may interact with the environment to determine future attachment styles.

Evaluation of Lassi & Tucci (2017)

Strengths

- The results of this study agree with previous research (e.g. guinea pigs seek proximity to their mother; maternal presence lowers stress in offspring) so it could be said to have **concurrent validity**
- The findings have good **application** to parenting generally (i.e. positive nurturing can be seen in a secure attachment style) which could be used in human settings

Limitations

- Measuring maternal mouse behaviour is open to **interpretation** e.g. the researchers cannot know with any real confidence that what they are observing is positive behaviour as, not being mice themselves, they can only **infer** the type of behaviour on display
- The Strange Situation is an **artificial** procedure – even when applied to mice – and it may not reflect the ways in which mice behave in **non-experimental** attachment scenarios