

# Can intelligence change?

*To what extent is intelligence malleable?*

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## **Abstract**

This essay investigated the research question: **To what extent is intelligence malleable?**

It was necessary to start by presenting the debate on defining intelligence since there is not a complete consensus among psychologists, however, this paper accepted a definition which is generally accepted by respected psychologists; that ‘intelligence is the ability to deal with cognitive complexity’ (Gottfredson, 1998). In presenting and analysing empirical evidence such as Howe (1997) supporting the thesis that intelligence can, in fact, change under the right conditions and given enough time, a strong indication of malleability is provided. Especially the Head Start initiative in the U.S.A. has indicated changeability as well as severely deprived orphans, who are adopted into stimulating and caring environments, have shown remarkable mental and physical catch-up. Furthermore, an increase in IQ scores over generations in several countries has been found by the researcher J.R. Flynn, which also hints at changeability.

Criticisms of malleability, which support the genetic approach and immutability, were presented and discussed as well as essential limitations to the genetic approach and its evidence, since it seemed that a strong genetic influence on intelligence exists but the environment cannot be disregarded. The sociological impact that research within the area of intelligence has had on political decisions was illustrated to show how the media can influence the impressionable public opinion, which might inhibit or derail further research.

The conclusion was that intelligence, measured as IQ, is malleable. It is important, though, to understand the conditions under which progress can be observed since no short or superficial method exists. Permanent gains can only be achieved if regular cognitive, emotional and physical stimulation is present on a continuous basis during the important formative years.

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## Introduction

Cognitive psychology refers to all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered and used (Ulrich Neisser, in Gross, 2001). It is within this intriguing paradigm that the ongoing debate on intelligence takes place. Perhaps being the most elusive and hence discussed topic of psychology because of difficulties in defining intelligence and how to measure it, I find it alluring to investigate this area. Recent findings have shed light on a, with hindsight, rather biased view on whether intelligence is determined solely by our genes or our environment. According to Eysenck (1998), this is due to larger and better selected samples and because of technological advances within molecular genetics.

In defining intelligence, most definitions reflect the psychometric approach (Gross, 2001), i.e. they deal with measuring differences in individuals through tests such as IQ tests. These definitions can be divided into those being somewhat narrow (Burt & Terman, in Gross, 2001), this is especially seen in the concept of general intelligence ‘g’ (Spearman, in Gross, 2001), and those suggesting a broader view (Binet & Wechsler, in Gross, 2001), which try to incorporate more than a purely cognitive point of view. There are also, on the other hand, those who reject the idea of intelligence as a noun but would advocate using the notion *intelligent activity* i.e. as an adjective instead (Heim & Ryle, in Gross, 2001). This continuing controversy must, of course, play an important role when trying to investigate whether this intangible concept is changeable because IQ scores are not necessarily the same as intelligence and this gives some limitations to the inferences. In spite of the limitations of the IQ tests, they are used in most research studies and the opponents of IQ have not come up with a sufficient alternative.

Howe (1997) argues that raising a person’s intelligence substantially and permanently necessitates a major investment in time and effort. This supports the idea that intelligence is malleable but also advocates that a half-hearted attempt will not produce sudden changes in IQ, i.e. it is not possible to get ‘a shot in the arm’. Further evidence supporting the idea of changeability comes from the Milwaukee Project (Heber et al., in Gross, 2001) and the Head Start initiative in the U.S.A., which yielded major gains in IQ scores of pre-school children suggesting changeability in intelligence as

measured via IQ. Adoption studies of extremely deprived children also suggest a rather significant environmental influence due to the considerable physical and mental catch-up after living in a stable and stimulating environment (Rutter et al., in Gross, 2001).

Not all empirical research point in the direction of environment being an important factor of intelligence, which might be due to a bias among psychologists within genetics i.e. they fail to take environmental factors into consideration when they hypothesise about intelligence. The findings of Bouchard and McGue (in Gross, 1994) suggest a positive correlation between genes and IQ. The larger the genetic relationship, the larger the IQ scores are likely to resemble each other, e.g. for monozygotic twins the correlation in average IQ score is above 0.8. The same findings also indicate that, over time, adopted children's average IQ levels resemble that of their biological parents and not that of their adoptive parents, again supporting the importance of genetics in cognitive development.

Considering the research question: **To what extent is intelligence malleable?**, this essay will argue that the debate on intelligence cannot easily be solved but empirical evidence suggests that intelligence is not completely fixed. Under the right conditions, it seems possible to improve a person's intelligence but it necessitates a major investment as do all acquired skills e.g. a foreign language or musical skills.

## **Intelligence defined**

“All men are created equal” is an extract from the Declaration of Independence and is one of the building blocks of the American society. It was on this premise that speakers of freedom such as Abraham Lincoln and Martin Luther King, Jr. devoted themselves to the perilous war against inequality. Perhaps M.L. King, Jr. knew that the Afro-Americans in America were at the bottom of the society because they did not have equal rights and consequently did not receive the same amounts of education as Caucasians; it was not because they were born that way. This historical event is one of many that show how the debate on intelligence has possibly been connected to norms and prejudices in societies.

According to Gross (2001), it is the psychometric approach which has predominated the debate on defining intelligence until fairly recently. The psychometric approach deals with mental measurement and is often associated with the IQ test. A supporter of the 'g', i.e. that intelligence can be seen as a whole and not in separate abilities, Linda S. Gottfredson (1998), argues that IQ scores are important predictors for academic and life success, which makes the IQ test seem quite practical. According to Sternberg (1998), IQ tests are a fairly good measure of analytical and verbal abilities but have difficulties when it comes to measuring creativity and practical knowledge. This implies that there must be more to intelligence than IQ but at the same time that IQ seems to reflect some of the qualities of a person that the average human being would consider intelligent traits such as analytical and verbal abilities.

Being a reductionist in this context means that one cannot take all factors which might belong to intelligence into account but it makes the comparison between before and after any attempts to improve intelligence has taken place much easier. The theory of multiple intelligences has gained much support in the educational system but when examining changes in intelligence, the assumption that intelligence cannot be measured, makes the theory unsuitable. When trying to establish evidence for or against malleability, it is very convenient to compare before any attempt has been made to change intelligence with after. For that reason, I choose to accept the psychometric approach's definition of intelligence, which Gottfredson is an example of and she defines intelligence in the following way: 'the ability to deal with cognitive complexity' (Gottfredson, 1998) and consequently this essay will deal with the traditional conceptualisation of IQ.

### **IQ can change**

It seems that there is convincing evidence that IQ scores can increase. Michael J.A. Howe (1998) argues that: "Under the right conditions, and given the opportunity, a young person's intelligence can be increased considerably." One such example is the Head Start initiative in the U.S.A., where the Milwaukee Project (Heber et al., in Gross,

2001) is well known. Mostly black families were involved in the intervention programme, which began at birth and continued until the children started school. Half of the mothers received job training and were sent to school so as to improve the children's environment. When the children started school, the 'experimental group' had an average IQ of 120.7 whereas the control group's average was 87.2 (an IQ score of 100 is average with a standard deviation of 10-15 points). Over time, these scores closed in on each other. At age 10, they were 104 and 86 respectively and at age 12-14, they were 100 and 90 respectively. These IQ scores reflect the average of the lower levels of the city of Milwaukee, which indicates that the environment can be attributed to a change in IQ. The results were promising since it seemed that we are not necessarily determined e.g. by being born into the lower classes of society and that under the right conditions, considerable changes can be observed; thus, the results clearly supported malleability of intelligence measured as IQ. This is further supported by Rutter & Rutter (in Gross, 2001) who concluded that a prolonged intervention can increase disadvantaged children's IQ scores.

The same researchers (Rutter et al., in Gross, 2001) studied 111 institutionalised Romanian children who were adopted into English families before the age of two and found remarkable mental catch-up. The children had experienced severe psychological deprivation and compared to English standards, there were deficiencies in weight, height and head circumference. Despite this horrible start, the children showed significant mental and physical catch-up by the age of four, resembling their English peers at this point; moreover, the earlier the children had been adopted, the greater the opportunities for catch-up. Rutter et al. (in Gross, 2001) also concluded that the effects of malnutrition appeared to be dependent of the psychological privation in spite of the data, which did not allow such a clear differentiation. If intelligence was fixed, these Romanian orphans would be doomed to live a life in the lower classes of society without any possibility of advancing; however, this study showed impressive improvements to almost every aspect of the children's lives. This is a strong empirical evidence supporting malleability of intelligence and, in fact, physiological development as well. At the same time, the study shows that changes in mental abilities are not easily accessible since the unfortunate children spent years in environments providing them with the necessary comfort and

love, the correct schooling and the possibility to socialise with their peers before they experienced mental and physiological catch-up.

There is a problem, however, in that most of the gain seems to be lost in the years following the end of the programme, such as Head Start, if stimulation is not continued and this is related to what has been called the ‘fading’ objection. Critics such as Herrnstein and Murray (in Howe, 1998) argue that IQ gains diminish over time and in some cases even disappear and therefore proclaim that the money spent on these intervention studies is given to a lost cause. According to Howe (1998), it is a fact that the increases in IQ scores diminish after the intervention programmes have ceased because the stimulation of the children is not continued and like any skill, intelligence must be developed actively. The children involved in the Milwaukee project lived in poverty and were deprived psychologically, which are conditions where the probability of fading is high. Again, the environment is of utmost importance for maintaining or improving one’s mental ability. No miracle cure, which boosts intelligence, exists. That is, undergoing a course or intervention programme is not likely to produce *permanent* IQ gains. Intervention programmes have produced considerable IQ gains but have also produced considerable losses because there was no attempt to stimulate further after ending the programmes. It is indisputable, though, that the results of the programmes support malleability of IQ because there was a change in the IQ scores. The same can be said about the subsequent decrease in IQ scores; it supports the idea that IQ is malleable.

Another problem with the rise in IQ scores is the belief that there has been a complete ‘failure’ to increase IQ (Jensen, in Gross, 2001). Arthur Jensen proclaimed that such intervention programmes as Head Start had failed, which was probably not completely incorrect since the majority of Head Start initiatives up until his critique lasted no longer than two months. This evidently supports the premise that the conditions for change must be right and a programme as short as two months is far from the required conditions. As an answer to this, it is worth noting that even if a failure to increase IQ scores was experienced by the majority of researchers, it would not suffice as evidence against malleability of intelligence. It is comparable to the search for extraterrestrial life forms, which has so far been unfruitful; however, it cannot serve as conclusive evidence for never finding life other places than earth. So even though Jensen might have been

right in his objection to early intervention programmes, it does not contradict malleability of intelligence. A second argument contradicting the 'failure' objection is that: "it takes a very long time and plenty of effort to achieve high levels of expertise, even in relatively narrow skill areas." (Howe, 1998). This is supported by a comparison to acquiring musical expertise, where Ericsson et al. (in Howe, 1998) found that it takes around 10,000 hours to achieve professional standards. When this amount of time is compared to the early intervention programmes, which is markedly lower, it is easily observed that the programmes were far from comprehensive enough. Even if a Head Start programme consisted of 36 weeks with four hours a day five days a week, the total number of hours would be a modest 720 hours. A quite comprehensive programme but compared to the large amount suggested by Ericsson et al. (in Howe, 1998), it would be surprising if the children had experienced substantial and permanent gains in IQ scores.

That changes can take place was also demonstrated by James R. Flynn (in Howe, 1998) who found that IQ scores are rising in several countries by approximately three points per decade. This imposes an interesting question: Are we really more intelligent or smarter than our grandparents? Researchers do not agree as to what has caused this rise and therefore not on how to interpret these findings. Flynn does not believe that the rise is real since the time span is too short for genetics to interfere; nonetheless, the rise in IQ scores undermines genetic determinism. Flynn has tried to account for the rise by suggesting that better social and educational opportunities in many countries might be the reason. Ulrich Neisser suggests that our exposure to more complex visual images might be the reason for scoring higher than earlier. Furthermore, Neisser et al. (in Howe, 1998) believe that a general improvement in nutrition and health might account for the Flynn effect. An example of the much debated Flynn effect was demonstrated by Daley (in Bower, 2003) who found an 11 point increase in IQ scores from 1984 to 1998 in Kenyan farm children. The results were accounted for as a result of better literacy in adults and consequently more interest in their children's schooling; moreover, improved nutrition and a decrease in childhood amnesia were present. The conditions were right for improvement of intelligence, which means that the Flynn effect might be real. In addition, Howe (1998) interprets Flynn's findings as a support for the malleability of intelligence albeit they do not show individual IQ increases.

## **Criticisms of malleability**

In spite of overwhelming evidence supporting malleability of intelligence, some researchers do not support the idea and these are primarily adopting a genetic approach. McGurk (in Gross, 2001) argues that because genetic inheritance is constant, it should be possible to find a high degree of continuity in IQ in a person's life if IQ scores are found to be determined by genetics. For that reason, it is very important as to whether empirical research supports McGurk's premise, that IQ scores are genetically determined, because that would go against malleability of intelligence.

According to Gross (2001), IQ stability coefficients, which seem to be impressive, are based on large numbers and therefore seem to blur individual differences. A study investigating IQ stability found that IQ changed on average 28 points from the age of two-and-a-half to seventeen (McCall et al., in Gross, 2001). For the study to support IQ stability, an average change of 28 points is too much and in contrast to a large change, one would expect very small changes. The study can therefore not support the previous assumption that IQ scores are genetically determined.

A study that supports IQ scores as genetically determined is the key study within genetics reviewing twin studies performed by Bouchard and McGue (in Gross, 1994). The study indicates that the more genes two individuals share, the more their IQ scores are likely to resemble each other i.e. MZs (monozygotic twins) have a stronger correlation ( $>0.8$ ) than ordinary siblings (0.5). In a later study, Bouchard et al. (in Gross, 2001) point at an important genetic advocate: MZs reared apart (MZAs) are more similar in IQ scores than same-sex DZs (dizygotic twins) reared together (DZTs). DZs are no more a like, genetically, than two ordinary siblings; however, this notion supports a strong genetic relationship – at least stronger than the environment's influence. Albeit supporting genetic determinism, the study does not indicate the IQ scores are entirely determined by genetics. That is, some part of the IQ score must be accounted for by the environment and as has been shown, the environment can be manipulated in order to improve IQ scores.

In general, there are some important limitations to twin studies such as that of Bouchard and McGue (in Gross, 1994), which make them somewhat less trustworthy.

MZAs are supposedly reared apart in different environments; thus, enabling researchers to establish a cause-effect relationship on the basis of this. This is often not the case, however, since MZAs are likely to have very similar environments even though they are reared apart. The similarity in environments can be due to the fact that adoption agencies try to match the families adopting the MZs. In fact, Newman et al. (in Howe, 1998) found that when the environments are very different, there are noticeable IQ differences between the MZAs. And even if the twins are reared in different environments, they have still experienced the same prenatal environment, which might explain the IQ resemblance (Howe, 1997). Another objection to twin studies is the use of different IQ test, which obviously makes the comparisons difficult since it is not known as to whether the tests measure the same abilities. These objections to twin studies do not add to their credibility. A limitation specific for Bouchard and McGue's twin study (in Gross, 1994) is the sampling. The researchers used the media to attract twins and this method of 'self-referrals' might be criticised for attracting unrepresentative twins who enjoy the attention of the media (Kaprio, in Horgan, 1993).

### **Response to criticisms**

The criticisms of changeability of intelligence have not been able to dispute the fact that intelligence is malleable. Research within the genetic approach including twin studies has indicated an important genetic influence in inherited IQ scores but this does not rule out that the environment plays a significant role and, as said previously, this was not taken properly into account in the twin studies reviewed by Bouchard and McGue (in Gross, 1994).

The 'failure' objection turned out to be problematic in that later research clearly showed how *continuous* stimulation is necessary to maintain any gains and the 'fading' objection showed up to be correct under certain conditions such as poverty, poor social circumstances, insufficient stimulation etc. where it was not possible to rehearse newly acquired skills sufficiently. In fact, the supporters of genetics have generated solid research the problem is simply that their findings are not able to refute changeability of

intelligence; the research has instead showed that genes are very important when intelligence is connected to inheritance.

There is an important reason as to why any conclusion concerning intelligence tests should be made with care; the findings of intelligence research have had and will have large social impacts, especially because of the race and IQ question. An example is the social impacts surrounding the publication of *The Bell Curve* in 1996 (Murray and Herrnstein) or *A nation of morons* in 1981 (Gould), which raised an outcry in the media. *The Bell Curve* provoked a heated discussion in the media because the authors suggested, among other things, that intelligence is mostly inherited and the large amounts of money spent on intervention programmes was wasted because it would be impossible to change intelligence.

The problems of adhering uncritically to IQ testing were demonstrated by Gould in the article *A nation of morons* where he showed that the average mental age for American men was 13! He was referring to the study by Yerkes during WW1, which contained serious methodological errors such as a culture bias in the questions, which actually influenced the immigration restrictions in the U.S.A. in the period between WW1 and WW2 i.e. groups of people scoring low on IQ tests were less likely to enter the country. These historical events show how ‘scientific’ findings might influence the society and how scientists are important as an authority and especially what can happen if they are wrong. The problems arise when scientists publish controversial research and the media decides to broadcast it. In this context, the media is a powerful tool to influence the impressionable public opinion into to something which is not the general opinion among scientists.

A more contemporary view on this matter is provided by Sternberg (1998) who argues that we are able to construct a better intelligence test. It is suggested that the conventional tests be used still but should be supplemented with performance-based tests requiring solving of real-life problems to measure an individual’s practical intelligence. Furthermore, the research done in improving tests is criticised since ‘We have the means’, Sternberg argues.

## Conclusion

In conclusion, it seems from evidence that **intelligence, measured as IQ, under the right conditions and given enough time, is malleable.** By the ‘right conditions’, appropriate and regular emotional and educational stimulation is meant. Substantial and permanent gains will not be seen over a summer holiday, on the other hand, stimulation of both verbal, mathematical, spatial etc. abilities at regular intervals over a long period of time is likely to improve a person’s IQ and here stimulating families and proper schooling play an enormous role. An improvement is especially seen in children suffering from both psychological and physiological privation. It seems that with a much worse starting point, e.g. adoptive children exposed to very poor conditions, it is possible to show remarkable catch-up when put into foster homes that consist of caring parents, appropriate cognitive stimulation and opportunities to socialise with peers. Martin Luther King, Jr. wished for the society to consist of individuals with equal rights so *everyone* would have the possibility of fulfilling their potential and ideally take an active part in deciding in which direction society should go.

This paper accepted intelligence as a measure of IQ. This somewhat reductionist approach has allowed an actual conclusion, which would have been difficult without it, only with the premise that intelligence should be measured as IQ. Upon completing this investigation, it became clear that intelligence is a branch of psychology which is still changing and where new comprehensive research might support contemporary theories of intelligence and possible ways of measuring intelligence such as the practical test supplementation to conventional tests suggested by Sternberg (1998). According to Gross (2001), Bouchard is in the process of investigating separated and non-separated twins who are given both psychological and medical tests and are asked to answer some 15,000 questions. Such research might shed new light on twin studies investigating various genetic correlates of behaviour. There are still unresolved questions within the scientific study of intelligence, however, based on existing empirical evidence, there is no reason to believe that it will ever be possible to prove that intelligence is a fixed entity.

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