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Myths and misconceptions about intelligence: A study of 35 myths

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ABSTRACT

This study is concerned with the extent to which people believe in, and endorse, various myths about intelligence and intelligence testing. It examined the prevalence of myths about intelligence as set out in a recent book (Warne, 2020). Participants (N = 275) completed a questionnaire in which they rated the extent to which they thought various statements/facts about intelligence were essentially true or false. In all, eighteen of these myths were rated as true (definitely or partly), two as definitely false and six probably false by the majority of the participants. There were no significant demographic or personality correlates of the total correct score (determined by rating the myth as false). The discussion considers why, in this important area of psychology, myths, misconceptions and ignorance seem so difficult to dispel. Limitations of this, and similar, studies are noted, and implications are discussed.

1. Introduction

There has long been an academic interest in psychological myths and misconceptions (Amsel et al., 2011; Arntzen et al., 2010; Furnham et al., 2002; Hughes et al., 2013; Kowalski & Taylor, 2009; McKeachie, 1960; Standing & Huber, 2003; Taylor & Kowalski, 2004; Vaughan, 1977). Nearly 100 years ago, Nixon (1925) surveyed prospective students' psychological knowledge prior to taking his course, and found an alarming level of misconceptions.

This is an important issue as, for instance , neuromyths have persisted in schools and colleges, often being used to justify ineffective approaches to teaching (Howard-Jones, 2014). A similar question concerns how myths about intelligence have shaped educational policies and the wide-spread use, misuse or neglect of intelligence tests. Over the years there have been a few studies on beliefs about intelligence: this study focuses on many of these myths and also where there are clear individual difference correlates of adhering to myths and misconceptions.

Some studies have reviewed research on myths/knowledge in particular areas. Furnham and Tsivrikos (2017) reviewed a number of studies which looks at myths about mind and brain myths; myths about happiness, alcoholism, suicide and sexuality. Nearly all studies in all areas have shown how ignorant the general public are, and endorse so many myths. Results have also shown high levels of misconception (40–70%) prior to formal education, are reduced, but only slightly, following specified and focused education (Hughes et al., 2015; LaCaille, 2015). It remains both a source of puzzlement and consternation that formal education and teaching in psychology, and related disciplines, only succeeds partially in dispensing myths. Indeed, a lot of this literature has attempted to assess public and student knowledge before trying to educate them. At the forefront of this effort has been the recent work of Lilienfeld (2012).

This research area has been greatly stimulated by Lilienfeld et al. (2010), *50 Great Myths of Popular Psychology* which reviewed, and hoped to dispel, 50 myths about psychological phenomena. Numerous studies have used the 50 myths and 250 "mythlets" to test various hypotheses in this area (Furnham, 2018; Furnham & Hughes, 2014; Swami et al., 2015). There is a section in the book about intelligence which looks at some myths like (15): "Intelligence (IQ) tests are biased against certain groups of people". The authors also suggest there are many more worth looking at like: "Extremely intelligent people are more physically frail than other people"; "IQ scores almost never change over time"; "IQ scores are unrelated to school performance"; "The SAT and other standardised tests are highly coachable"; "There's a close link between genius and insanity"; "Mental retardation is one condition"; "Most mentally retarded individuals are severely retarded"; and "There is no association between brain size and IQ".

In their analysis of these myths-lets Furnham and Hughes (2014) examined the extent to which people accepted these myths and found evidence that, for instance, over 75% of their respondents thought IQ

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test scores are coachable: that is, that intelligence can in some form be taught, or at least how to do better on tests.

Researchers have also developed new scales of general myths such as Gardner and Brown (2013) and Bensley et al. (2014). The Lilienfeld et al. (2010) book also inspired various other more specialised books with a very similar title and format (Hupp & Jewell, 2015; Jarrett, 2014; Johnson, 2016). Indeed, there is now a series of books by the same publisher all called *Great Myths of…*, and covers topics such as *Old Age* (Erber & Szuchman, 2015) and *Personality* (Donnellan, 2020) though the book that inspired this study was not in this series.

Further other recent books have been published looking at specific myths (De Bruyckere et al., 2015). Nearly all books and studies present statements that are evidence-based and true, and then ask participants whether they indeed think they are. Yet there does remain some doubt in the eyes of experts whether some statements require certain caveats or indeed whether the literature on the topic in unequivocal.

1.1. Myths about intelligence

This study concerns myths about intelligence. There are a number "one off" studies on this topic (Wellman, 1944). This modest, small-scale study examines beliefs about intelligence and testing today, when it remains so controversial particularly concerning issues of validity, group differences and consequent discrimination (Rindermann et al., 2017). As noted, the topic of intelligence, particularly group differences, is highly political and has many consequences, for instance in the use of tests in educational and work settings. It may well be that the general public are no better or worse informed about the psychological research in this, compared to other, areas but hold their beliefs more strongly. It is therefore an important area in which to attempt to dispel myths and inform about current knowledge in the field. It seems that the publication of popular books such as *The Bell Curve* stimulated a great deal of debate in the area,

This study examines 35 myths about intelligence. The topic of intelligence, particularly group differences, remains one of the most controversial in the whole of psychology (Frey, 2019). There is an extensive, but scattered, literature on myths, and misunderstandings about intelligence (Räty, 2015; Räty et al., 1993) which is difficult to compare in detail.

Sternberg (1985, 1990) proposed that the general population has a different conception, or implicit theories, of intelligence than most experts. That is, 'what psychologists study corresponds to only part of what people mean by intelligence in our [Western] society, which includes a lot more than IQ test measures' (Sternberg et al., 1981: 35). Sternberg (1990: 54) defined implicit theories of intelligence as 'constructions of people (psychologists or lay persons or others) that reside in the minds of these individuals, whether as definition or otherwise'. Sternberg (1996) in fact wrote a paper entitled "Myths, Countermyths and Truths about Intelligence" in response to the reactions to "Bell Curve". He discussed various myths like "Can intelligence be taught to any meaningful degree?" and "Do intelligence tests measure pretty much all it takes for success in school and on the job?" However, many have disputed Sternberg's conceptualisation of intelligence, and interpretation of the data, particularly his animosity to the concept of 'g' (general intelligence) and his attacks on conventional intelligence tests.

Over the years there has also been a particular interest in cross-cultural studies of lay or implicit theories of intelligence (Beyaztaş-İlhan & Hymer, 2018; Yamazaki & Kumar, 2013) as well as studies of particular groups such as gifted children, as well as experts (Rindermann et al., 2017). In one cross-cultural study Swami et al. (2008) asked students from three countries to rate for agreement 30 items about the nature, measurement, between-group differences and practical importance of intelligence. This was a 30-item scale derived from a summary of psychological research on intelligence signed by 50 (Western) experts in intelligence and allied fields (reprinted in Gottfredson, 1997). Nearly all statements were true and backed by scientific evidence. Thus, to disagree with the statement maybe thought as supporting a myth. An example of some items were: IQ is strongly related, probably more so than any other single measurable human trait, to many important educational, occupational, economic and social outcomes; intelligence can be measured and intelligence tests measure it well; while there are different types of intelligence tests, they all measure the same intelligence; intelligence tests are among the most accurate (in technical terms, reliable and valid) of all psychological tests and assessments.

An exploratory factor analysis revealed three factors: (1) stability, reliability and validity of intelligence tests; (2) practical importance of intelligence and (3) source and stability of within-group intelligence (Swami et al., 2008). Among other things, they found Malaysian participants were more likely than participants in Britain or the US to endorse intelligence tests as valid and reliable measures of intelligence and to view intelligence as having high practical value in everyday, applied settings. They found their participants agreed strongly with general statements about intelligence being a broad and deep mental capability but appeared to disagree most strongly with items that suggested between-group differences in intelligence and those that suggested that intelligence tests were valid and reliable. In short, they disagreed with many the accepted scientific wisdom on IQ tests as set out Gottfredson (1997).

This study updates those in the area. It is based on the work of Warne (2020) and colleagues: Burton & Warne, 2020; Warne et al. (2018). In a relevant study Warne and Burton (2021) devised 85 questions about intelligence classified the questions into seven groups: (1) existence of intelligence, (2) components of intelligence, (3) biology of intelligence and life outcomes, (4) education and intelligence, (5) interventions to permanently raise IQ, (6) group differences, and (7) plausible causes of group differences. They compared American teachers and non-teachers and found participants' responses were generally aligned with research findings regarding the components of intelligence. Participants agreed with the empirical evidence that crystallized intelligence, logic, fluid intelligence, are all important components of intelligence: "The ability to retain and use learned knowledge is an important aspect of intelligence" (89.3% agreement). "The ability to think logically is an important aspect of intelligence" (88.6% agreement). "The ability to think abstractly and solve problems is important to intelligence" (84.2% agreement). There was however disagreement regarding the broader sense of what intelligence measures and what IQ scores represents, yet great confidence in the impact of interventions to raise IQ. The authors concluded that empirically unsupported beliefs about intelligence were common and that people are generally unaware of many of the empirically supported findings from intelligence research. They also noted that one consequence are erroneous beliefs about intelligence may result in decreased support for gifted programs, unrealistic expectations for interventions, or incomplete/inaccurate theories of giftedness.

In a recent book Warne (2020) outlined 35 myths about intelligence. It sought to determine the extent to which lay people understood these to be myths, nearly 25 years after the "statement" of Gottfredson (1997), namely the 50 leading intelligence researchers, which attracted so much attention. This study was provoked by the authors asking a number of intelligence researchers to predict the results: many said that it was a difficult task and there was considerable disagreement among them. Hence it was done to inform researchers in the area regarding the extent to which lay people still endorse myths about intelligence. While Warne's list of myths inevitably covered many that had been examined before it did list a number of new myths, particularly those associated with the political consequences of IQ testing.

2. Method

2.1. Participants

A total of 273 participants completed the questionnaire: 139 were men and 134 were women. They ranged in age from 18 to 64 years with

the mean age was 30.1 years and *SD* = 7.93 years. All participants had at least a secondary school education and 37% were graduates. 46.4% of the sample had children. They were all British. They were also asked to rate themselves on numerous variables: physical attractiveness, physical health, IQ, EQ, how optimistic and ambitious they were; religious and political beliefs; saving habits etc.

2.2. Measures

2.2.1. Myths

The myths and misconceptions were derived from a book by Warne (2020) where he noted 35 myths. Pilot studies on the comprehensibility of the statements led to a few being slightly reworded to make them clearer for lay people. Examples of changes were: IQ only reflects a person's wealth and social (vs socio-economic) status; intelligence tests are biased against ethnic minorities (vs diverse populations); intelligence's strong genetic links (high heritability) mean that raising IQ is impossible. They are shown in Table 1. We used similar instructions to those used in similar studies: "Below are a number of statements about intelligence and IQ testing. Please read each and indicate the extent to which you believe it is true or false". Response options were broken down into "probably" and "definitely" true or false allowing for greater information to be gleaned regarding the kinds of true and false responses. In addition, the "don't know" option improves upon some previous tests as participants could indicate a lack of knowledge, rather than guessing or leaving items unanswered (Arntzen et al., 2010). The myths were all presented in the same order, which occurred in the book.

2.2.1.1. Ten Item Personality Measure (TIPI; Gosling et al., 2003). This measures five personality traits, Emotional Stability, Extraversion, Openness, Agreeableness, and Conscientiousness using 2 items each. This measure was designed to maximise content validity and efficiency, but as a result, has a poor factor structure and reliability.

2.3. Procedure

Departmental ethical approval was gained prior to data collection (CEHP/514/2017) Participants completed the TIPI before the myths questionnaire and provided their personal data at the end. Data was collected on-line through *Prolific*, a platform like the better-known Amazon-Turk. This research team collected, in all studies using Prolific, a large number of personal details: demographic, ideological and self-rating. Participants were compensated for their time (receiving £1.00). Usual data cleansing and checking led to around 5% of the 300 recruited being rejected before further analysis. This was based on missing data and not discriminating between whole lists of questions. The study was run in September 2020.

3. Results

3.1. Prevalence of misconceptions

All of the items presented were myths, thus for all items, the "correct" answer was false (probably or definitely).

Table 1 shows that overall participants believed the myths to be "probably true". Indeed, for over 20 myths this was the most common response. Only 2 statements (4 and 11) showed a majority thinking the statement as definitely false; while for 6 items (1, 12, 13, 23, 33, and 34) they thought that they were probably false. Five statements (2, 5, 7, 19, 20) attracted a "definitely true" response for over 150 respondents.

The Don't Know responses varied from 2 to 33% with ten over 20%. For one item only (10) it was a majority response: this concerned bias in

Table 1
Frequencies of each answer across Intelligence Myth items. Total N = 275.

	Definitely false	Probably false	Probably true	Definitely true	Don't know
1. Intelligence is whatever collection of tasks a psychologist puts on a test	(28%)	**(31%)**	(25%)	(7%)	(8%)
2. Intelligence is too complex to summarize with one number	(1%)	(7%)	(26%)	**(64%)**	(2%)
3. IQ does not relate/correspond to brain anatomy or functioning	(5%)	(22%)	**(36%)**	(25%)	(13%)
4. Westernised views on intelligences are not relevant in non-western cultures	**(34%)**	(24%)	(18%)	(7%)	(16%)
5. There are multiple intelligences in the human mind	(1%)	(6%)	(27%)	**(63%)**	(4%)
6. Practical intelligence is a real ability separate from general intelligence	(1%)	(8%)	**(42%)**	(37%)	(12%)
7. Measuring intelligence is difficult	(4%)	(8%)	(25%)	**(60%)**	(4%)
8. Content on intelligence tests is trivial and cannot measure intelligence	(2%)	(25%)	**(40%)**	(22%)	(12%)
9. Intelligence tests are imperfect and cannot be used or trusted	(2%)	(26%)	**(41%)**	(21%)	(9%)
10. Intelligence tests are biased against ethnic minorities/diverse publications	(22%)	(23%)	(19%)	(12%)	**(24%)**
11. IQ only reflects a person's wealth and social status	**(43%)**	(31%)	(14%)	(4%)	(8%)
12. Intelligence's strong genetic links (through heredity) mean that raising IQ is impossible	(24%)	**(36%)**	(18%)	(8%)	(14%)
13. Genes are not important for determining intelligence	(18%)	**(41%)**	(24%)	(8%)	(8%)
14. Environmentally driven changes in IQ mean that intelligence is changeable/malleable	(1%)	(12%)	**(46%)**	(23%)	(17%)
15. Social interventions can drastically raise IQ	(2%)	(16%)	**(46%)**	(19%)	(17%)
16. Brain training programs can raise IQ	(2%)	(9%)	**(50%)**	(27%)	(11%)
17. Improvability of IQ means intelligence can be equalized	(4%)	(21%)	**(38%)**	(11%)	(27%)
18. Every child is gifted	(13%)	(24%)	**(26%)**	(25%)	(11%)
19. Effective schools can make every child perform well/proficient academically	(6%)	(20%)	**(47%)**	(25%)	(4%)
20. A pupil's environment and personality has powerful effects on academic achievement	(0%)	(7%)	(32%)	**(56%)**	(5%)
21. Admissions tests are a barrier to college for underrepresented students	(5%)	(16%)	**(44%)**	(21%)	(13%)
22. IQ scores only measure how good someone is at taking intelligence tests	(3%)	(15%)	**(40%)**	(33%)	(9%)
23. Intelligence is not important in the workplace	(30%)	**(41%)**	(17%)	(7%)	(4%)
24. Intelligence tests are designed to create or maintain a current power systems	(17%)	(23%)	**(27%)**	(10%)	(24%)
25. Very high intelligence is not more beneficial than moderately high intelligence	(7%)	(24%)	**(39%)**	(17%)	(13%)
26. Emotional intelligence is a real ability that is helpful in life	(1%)	(7%)	(26%)	**(59%)**	(7%)
27. IQ Scores are distributed evenly between men and women	(7%)	(20%)	**(28%)**	(16%)	(28%)
28. Racial/Ethnic group IQ differences are completely environmental in origin	(8%)	(22%)	**(30%)**	(11%)	(29%)
29. Unique influences operate on one group's intelligence test scores	(1%)	(16%)	**(40%)**	(9%)	(33%)
30. Stereotype threat explains score gaps among demographic groups	(6%)	(17%)	**(35%)**	(12%)	(29%)
31. Controversial or unpopular ideas should be held to a higher standard of evidence	(8%)	(19%)	**(40%)**	(12%)	(21%)
32. Past controversies taint modern research on intelligence	(5%)	(18%)	**(41%)**	(14%)	(22%)
33. Intelligence research leads to negative social policies	(12%)	**(29%)**	(24%)	(11%)	(24%)
34. Intelligence research undermines the fight against inequality	(14%)	**(28%)**	(23%)	(9%)	(26%)
35. Everyone is about as smart as I am	(26%)	(25%)	**(26%)**	(8%)	(15%)

Numbers in bold represent the highest number of responses in that category.

testing. Based on the distribution of the scores, the items which attracted most varied responses were 10, 18, 24, 33, 34 and 35.

Four scores were then computed for each individual: total of definitely false and total of definitely plus probably false responses, as well as definitely true and definitely plus probably true. All four scores were then correlated with all the variables we had on the participants: sex, age, education, Big Five personality scores and self-evaluations. In all our studies we collect these as personal details. In total there were 14 correlations with each of the four subtotal scales. There were few than chance significant correlations between our individual difference variables and these scores. Hence it was concluded that there was no systematic relationship between the individual difference variables (demography and personality) and the extent to which they endorsed myths about intelligence.

4. Discussion

From an academic point of view, following Warne's (2020) analysis, the "correct" answer to all the questions was "definitely false". Yet for only two statements was this a majority response: the idea that intelligence was a western concept inappropriate to other cultures and that IQ reflected wealth and status, presumably in some way causing them. Only six statements (1, 12, 1, 23, 34, 35) did a majority believe the statement was probably false: they referred to the genetic components of intelligence as well as the social consequences of intelligence research which may please those working in the field. The average total score of definitely plus probably false was 12.48 (12/35 items) almost exactly a third of the statements.

Many of the items that are thought of as true concern IQ testing (2, 7, 8, 9, 22, 27). The idea is that though various forms of intervention it is possible to raise intelligence and thus IQ scores which is a very optimistic, though unsubstantiated, claim that goes back to the 1960s. There also remains the widespread belief that tests are neither reliable nor valid, despite the fact that psychometricians argue the intelligence tests are among the most robust and useful in the whole of psychology (Eysenck, 1998; Furnham, 2021). Interestingly however one of the few statements that attracted a high level of don't know and a wide spread of reactions was statement 10 which maintained that tests were/are biased against minority groups. It could be that people are particularly nervous about being accused of racism and choose this response to avoid expressing their real opinions.

There is also evidence that the participants accept the multiple/emotional/practical intelligence model (items 5, 6, 26). Nearly 2/3 rejected the concept of "g" being a parsimonious and accurate summary variable, though accept the fact that measurement is difficult. Two statements accepted as probably or definitely true were 5 (90%) and 26 (85%) both of which referred to multiple (emotional) intelligence which has excited great debate among intelligence researchers for over 20 years.

Most of all they appear to embrace to Dweck growth model that suggests you can increase your intelligence by a variety of interventions (items 14 to 19) (Dweck, 2006). This remains a very contested area in differential psychology: namely whether intelligence (and personality) does change much over time (i.e. adulthood) and if so what can cause it to increase. It seems that many people want to, and do believe the "plastic" rather than the "plaster" hypothesis about change, namely that it is possible to actually raise/increase intelligence (as opposed to simply getting higher IQ test scores). It is not clear whether this refers to fluid as opposed to crystallized intelligence which is important as no doubt experts would suggest it is easier to raise the latter as opposed to the former type of intelligence.

Also most participants accepted the many myths about group (sex, race, demography) IQ (items 27 to 30), namely that either there are no differences or else these are attributable to environmental rather than biological factors. This remains still the most controversial area of research into intelligence (Plomin, 2018).

Interestingly they understand this to be a very "hot" topic (item 32) and feel that intelligence researchers should be put under greater levels of scrutiny than for most other researchers (item 31). Were they more likely to endorse "politically sensitive" vs "technical measurement myths"? They were about equal. In all 71% disagreed that intelligence was not important in the work-place. Interesting over 40% did not believe in the negative consequences of intelligence research: (33) Intelligence research leads to negative social policies; (34) Intelligence research undermines the fight against equality; these were rated definitely or probably false by around 45% of the respondents. This should be of particular interest to readers of this journal.

Is there anything in these preliminary results which may give some "comfort" to an intelligence researcher? There are indeed a number: first participants see the universality of the concept (statement 4),and accept the usefulness of the concept in the workplace (statement 23). They appear to recognize the relevance of genetic factors (items 12 and 13).

The results of this study, indeed like many others in this area, pose the question as to why the public seem so poorly informed about the results of scientific studies on intelligence. The topic of intelligence, particularly group differences, is frequently in the media, and often academics are called about to clarify issues, though many will no longer comment given adverse reactions to their statements. Indeed, the publications of books like the *Bell Curve*, published 25 years ago (Herrnstein & Murray, 1994) caused such a sensation that it lead the world's top researchers to write a response published in both an academic paper but also taken up by the media such as the *Wall Street Journal*. More recent examples can be seen in some reactions to Robert Plomin's latest book which takes a strong evidence-based response to the heritability of intelligence (Plomin, 2018).

There have been over the years many "popular" books written by academic psychologists trying to explain the theories and data on intelligence particular the nature-nurture and group differences (particularly race and sex) (Deary, 2001; Kaine, 2016; Plomin, 2018; Ritchie, 2015). However, it is perhaps the "hottest" topic in the whole of psychology where ideology meets empiricism. Inevitably the hottest topic remains sex and race differences which have been investigated for over 50 years and where there is relatively little academic debate (Furnham, 2017).

It would be most interesting to know whether these myths are changing over time. Ideally to do this one would need studies done with large, representative samples at different points in time. Alas, this does not exist and it is therefore very difficult to determine whether indeed beliefs were changing and why. Certainly, the publication of popular high profile books like the *Bell Curve* stimulates a great deal of debate which gives better insight into lay beliefs about intelligence. It would therefore be most interesting to repeat this study every decade to trace the acceptance and rejection of myths about intelligence.

There were limitations to this modest study: it would have been better to have a much bigger population and to have more details on each of them, particularly details of their education and specialisation and profession. We used the ten-item TIPI which has very modest reliability and would have been preferential to use a longer and more robust instrument. It would have been better to have a mix of truthful as well as false statements about intelligence. Also, participants could be asked about how much education they may have had on this topic; and indeed their personal experience of intelligence testing. Further, it is possible that some researchers would argue that there is insufficient data to label each statement and clearly (or even probably) an untrue myth.

There remains however one very serious issue namely the statements are rated as "false" by Warne as there is no necessary agreement about this even from experts. It is possible that academics, in some disciplines, *actively* promote these falsehoods (both in their courses and publications) as if there was incontrovertible evidence to that effect. That is, some myths and misconceptions cannot be an either/or proposition: i.e. some myths are only partially false. As regards the myths in this study it may be that many experts would want to caveat many of them with

suggestions as to more specific context in which they apply. Further, it could be that many participants were not familiar with a number of issues yet loath to report "Don'ts know". Similarly some of the items were also nearly tautological like item 21.

This issue for intelligence researchers is how to improve popular awareness and knowledge of the topic, in part because of its consequences in the use of tests in educational and occupational selection. For most it the writing of popular books such as the one that inspired this study (Warne, 2020). However, as many writers have found, they often receive considerable hostile reviews and abuse on the web and that they are not always supported by their colleagues who the consequences of taking an "unpopular" though perfectly scientifically defensible position on this topic. A number of researchers have been sacked from the university positions (Chris Brand; Helmuth Nyborg, Richard Lynn) for public statements on various aspects of intelligence research. Indeed, along with any references to group differences (age, sex, race), those who defend traditional approaches to theorising about, and experimenting in intelligence, have to be prepared to face considerable public outrage, sometimes by fellow psychologists (Furnham, 2017).

Data availability

This is obtainable from the first author upon request.

Registration

This paper was not pre-registered with the journal.

Ethics

This was sought and obtained (CEHP/514/2017).

Informed consent

Participants gave consent for their anonymised data to be analysed and published.

CRediT authorship contribution statement

Furnham: Visualisation, Writing -review & editing
Horne: Data analysis, Proofing.

Declaration of competing interest

There is no conflict of interest.

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