# Academic Honesty and Societal Transformation[1]

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## Abstract

One of the particular challenges in creating a united South Africa is the continued discrimination levelled along racial, political and gender lines. An important aspect of this discrimination is the mental attitude present when assigning in or out group status to other individuals. Often, these implicit attitudes affect changes without even the conscious acknowledgment of their holder. Thus, the sense of identity an individual holds can play a significant role in their interactions with others. Using the paradigm of behavioural economics, this project sought to examine differences in the cheating behaviour of students based on their sense of identity, and the moral obligations they might owe an in and out group member. To this end, approximately 200 students were tested by either a black, or white, experimenter. The rates and severity of cheating amongst the participants was recorded, and compared in the case of each. Furthermore, differences in a number of other identity-forming factors were considered, including Age, Sex, Religion, Language Group and Qualification Sought. Although this study failed to reject the null hypothesis, numerous differences along racial, and other lines, were detected. The data's greatest importance lies in the overall pattern of cheating observed, which indicates a significant difference between hypothesised identity formation and honesty in previous studies using this paradigm. Participants also proved insensitive to more pronounced security measures. The study has raised numerous interesting questions which clearly show the potential value of, and need for, further research on the topic of identity and honesty.

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## Introduction

The project of transformation in South Africa has produced a number of political and economic practices for the amelioration of discrimination. Simultaneously, much work in the social sciences has focused on the racial identity that South Africans come to possess, and how this influences the actions they go on to perform. Despite the existence of both of these programmes, transformation has continued to be implemented only through highly legislative means. This ignores the root cause of discrimination: the categorisation of certain individuals into those deserving of regard, and those not. Behavioural economics presents us with the opportunity to integrate these disparate lines of research and examine the root cause of discrimination, as well as formulate methods of changing 'hearts and minds', rather than relying on legal penalties for the modification of behaviour. Fundamentally, the cause of discrimination may lie in general facts about cognition, and the altering of these processes may in turn mitigate the formation of beliefs mired in race-thinking.

## Behavioural Economics, Cognition & Morality

Cognition in human beings has been shown to differ dramatically from the traditional, reward maximising, conception of rationality assumed in the free market, as well as (to some degree), the social contract theories on which modern democracy was built. The process by which we have arrived at this understanding has taken decades of multidisciplinary research. Social psychology led the way, in discovering biases and persistent errors in the manner in which humans perceive and interact with the world. Early examples of these include the discovery of the Halo Effect (Thorndike, 1920) and numerous aspects of social conformity (Asch, 1946). The discipline of behavioural economics emerged only fairly recently, and is often considered "established" only following the publication of Tversky & Kahneman (1981). This landmark paper established the existence of further biases and heuristics in human cognition, and thus, a far more piecemeal decision making faculty than that proposed by the traditional conception of rationality. Coupled with the discipline of evolutionary psychology, the cognitive sciences enable us to probe human behaviour, and *how* we come to act as we do, in intriguing new ways. Addiction, for example, has been historically represented as a disease, improper conditioning, and even a bizarre form of rational risk/reward calculation. With the merging of psychological findings into economics, and economics into psychology (as in discounting models of reward valuation), the study of rationality, and its lapses, can now be shown to conform with the world to a far greater degree.

Dan Ariely's *Predictably Irrational* (2008) features a number of paradigmatic behavioural economics experiments into reward valuation and market activity – but couples this research with an investigation of behaviours ordinarily considered moral, from the same perspective. In this latter vein, Ariely discusses a number of ways in which our thinking is dramatically influenced by ostensibly irrelevant factors. For example**,** Ariely & Lowenstein (2006) demonstrated the effect of sexual arousal on the perceived permissibility (or desirability) of various acts. Whilst aroused, male college students rated various sexual practices (such as bondage) as more desirable than when in the unaroused condition. Most relevantly, otherwise average participants were dramatically more likely to pursue unethical or dangerous actions – such as encouraging a date to drink, or even the drugging of a date, to make sexual congress more likely (Ariely & Lowenstein, 2006: 94). Ostensibly, how you feel at any given moment should not affect the moral acceptability, or defensibility, of an action ("I was angry" is no excuse for assault, for example) but it quite clearly does at least change our perception of the permissibility of that act. The same results have been shown in other moral decision making literature, especially that of Greene (2007) which uses the classic philosophical "trolley problem" to demonstrate how the perceived permissibility of an action is often a function of the degree of emotional processing involved with the making of a decision. Finally, behavioural economists examined dishonesty and cheating behaviours, and how these represent myriad interlocking mental processes.

**Cheating & Identity**

In a series of experiments, Ariely investigated cheating behaviour from a number of different perspectives. Again, traditional models of rationality predict that individuals would compute risk versus reward, and decide to cheat (and by how much) based on that calculation. What was found, however, was that a number of factors influenced cheating behaviour, and that the overall trend observed differed sharply from these predictions. For example, participants cheated more readily for cash-value tokens than for cash itself, even though the tokens would be exchanged for cash only a minute or two later. Furthermore, participants can also have their cheating behaviour ameliorated by priming with religious content, such as the Ten Commandments (Mazar et al., 2008). The two primary concerns to note here are a) the overarching conclusions generated by Ariely with regards to cheating, and b) the effect of group identification on the severity of dishonest behaviour. Dealing with b) first, participants who are exposed to an environment in which a confederate cheats openly, and to the maximum degree possible, are affected differently depending on their identification with the confederate. Participants who consider the confederate an in-group member often "follow their

lead" and cheat to a greater extent, whereas the perception of the confederate as an out-group member causes the opposite effect – participants reduce their cheating behaviour (Gino et al. 2008). This kind of interaction between group status and dishonesty suggests a significant determinate of cheating behaviour might consist of the social context in which individuals see their actions occurring.

Concern a), generally speaking, falls under what Ariely, and his associates, call "self-concept maintenance" (Mazar et al., 2008: 633). In the testing programme conducted by Ariely and his associates, participants very seldom cheated to the greatest degree they could, even when there was no danger of getting caught. In a series of testing conditions, participants either 1) had their test papers marked by an examiner (control condition), 2) self-marked their papers, 3) self-marked and took their papers with them, 4) self-marked and shredded their papers or, 5) in a final condition, were left in the room with the jar of money they would eventually be paid from, and instructed to take as much as they were owed. Whilst cheating was detected from condition 2 onwards, there was no substantial increase as chance of being caught decreased, as calculated by comparison with the average of the control group (Mazar et al., 2008). Only 4 in 2000 students cheated to the maximum degree possible in the same series of studies (Ariely, 2008: 221). That this is a difficulty for the traditional rationality model is secondary to what it is actually evidence *for*: participants are restrained by conscience. That is, participants cheat only by as much as they can get away with, and still affirm their status as "good people" to themselves. This theory helps explain why cheating takes the pattern it does, with participants cheating by only a small margin.

In short then, participants in cheating experiments are greatly influenced by their social, and internal, sense of identity. The perceived permissibility of moral behaviour is likewise subject to an identity effect. This sense of identity is of particular interest, however, when we move away from the homogenous populations tested in the American university samples. If it remains unclear, at this point, cheating behaviour is considered a moral behaviour as it is ordinarily evaluated as such, and involves the clear transgression of a stated principle of appropriate social conduct. The perception of one's obligation to obey such a principle may, at least partially, rest on identity.

**Cheating & South Africa: Race Thinking & Identity**

With both social and internal factors to consider, the determination of personal identity, as well as the ontology in which one organises oneself, will thus play a role in the type of cheating behaviour we observe in individuals. Those without the ability to regulate socially or with "self-concept", such

as those with antisocial personality disorders, would presumably cheat to an extreme degree, as would those undergoing suppression of the anterior prefrontal cortex (Karim et al. 2009). This kind of research has not yet been conducted, and though it would represent the extreme end of the spectrum, it follows that in areas with a history of strong social division, the effects of in/out group distinction might be more pronounced, again indicating why the testing of heterogeneous populations is important. Certainly, there is an abundance of literature which suggests that in/out group divisions can cause numerous cognitive and social effects. Identification with members of a group significantly influences the amount of social pressure and pain they feel in cases of social exclusion (Krill & Platek, 2009)**,** as well as how much empathetic response they generate when seeing others subjected to a painful stimulus (Xu et al., 2009). With group identity affecting individuals at such levels, it is reasonable to assume that this might, in turn, play a role in how individuals characterise their moral obligations. Acting against an unwanted oppressor, for example, may make dishonest behaviour against that oppressor morally permissible, if not demanded.

Race is an obvious contender for the in/out group identification proposed here. As needs no explanation, this dimension has been particularly harshly felt in South Africa. In this vein, the recent "Ministerial Committee on Transformation and Social Cohesion and the Elimination of Discrimination in Public Higher Education Institutions" report (June, 2009) highlights a number of lapses between the intended goals of transformation and its current state – despite institutional policy. The report, however, states that what prevents transformation is simply the lack of dissemination of the information regarding institutional policy on discrimination. This ignores the cognitive underpinnings of the way in which humans, and thus the institutions they create and staff, operate. Thus, this project is intended to evaluate the in/out group sensitivity of our participants, as well as examine how it might be possible to mitigate cheating behaviour. This latter aim is not merely the mitigation of dishonesty itself however, but a potential avenue for the modification of mindset along more subtle or persuasive means than information dispersal. An example of this kind of behaviour-cognition link is the facial feedback hypothesis, as recently demonstrated in Soussignan (2002). This research suggests that by instituting behavioural changes, mental states normally associated with these behaviours may themselves develop. With these intentions in mind, the hypotheses under consideration in this project are as follows.

**H0: Participants will cheat at no greater rate or severity for in/out group experimenters**

**H1: Participants will cheat less frequently and/or less severely for an ingroup experimenter**

**H2: Participants will cheat more frequently, and/or more severely for an outgroup experimenter**

**Exploration**: Factors relevant to identity formation (Age, Sex, Language, Religion and Degree Program) are recorded and probed for correlation with cheating behaviours. The potential mitigating effect of the increased security condition is also assessed, to determine if a security conscious mindset can deter cheating.

# Methods

### Participants & Recruitment

Over 300 individuals agreed to participate in the study, advertised on the University of KwaZulu-Natal's (UKZN's) notice system, through posters, and by announcement in lectures and during another research project. A high dropout rate meant that approximately 200 participants took part. Race was already a factor at this stage, as very few white participants responded to the advertisements, and eventually took part (*N*=5). As a result, the study used data from black participants only, with the final data pool consisting of 194 data points, with 63 in the control group (5 white), 65 in the black experimenter condition (A) and 66 in the white experimenter condition (B).

An approximate total of 188 individuals actually participated, but, despite instructions to the contrary, some individuals took part more than once by deceptive means – the details of which are contained in the discussion section of the paper. All participants were advised that the intent of the project was to ascertain how they worked with numbers, and was marketed under the heading "Earn up to R100 as a Research Participant" and under the title of "Numerical Cognitive Performance".

The actual title of the project, as represented on ethical clearance documentation, was "Making People Cheat". For obvious reasons, it was necessary to deceive the participants as to the behaviour being examined by the project. Deception occurred at two stages of the process. Firstly, the intent was misrepresented, as detailed above. Secondly, during the testing procedure, participants were advised to be careful when documenting their score as it could not be checked at any later stage.

### Design: Setting and Procedure

Participants were tested in a computer lab (LAN) on Howard College Campus of UKZN. Participants entered the room one at a time and recorded their name and student number on a register. They were then instructed to take a seat at a computer, and not to touch the computer until instructed to. Computers were set up such that the test program was already running when the participants were seated, and had a Consent Form, with attached Discounting Instrument (Appendix A), already placed next to the keyboard. The participant number on the consent form was pre-entered into a

box on the test program. Participants were informed that they could read and fill out the consent form while people took their seat, but that they should not move on to the next section of the form until the experimenter gave the instruction to do so. Participants were tested in a total of 11 groups of 15-30 participants each. Once all participants were seated, the experimenter (A or B) began to read from a one page script (Appendix B), describing the instructions for both of the tasks. Participants were asked to wait after completing the first task, so as to be given the relevant instructions immediately before the second task. After completing the computer-based task, participants recorded the number of questions answered correctly onto a small slip of paper stapled to their consent form. In both conditions, participants were asked to be especially careful when copying their number onto their slips of paper, as once the test was closed, we had no way of checking that they had copied the result accurately. Depending on whether the group was a Control or Target group, participants either had their numbers checked against the number displayed on the screen, and were then sent outside, or were sent outside immediately to collect their money. In both cases, the experimenter ceased to be involved once the participants left the room to collect their money. Thus, participants in the self-reporting condition had the opportunity to cheat by recording an incorrect number before taking their forms to the assistants outside. Cheating was assessed by the collection of data from the PCs, generated automatically by the software.

**Design: Task 1 – Discounting Instrument**

The discounting instrument is a set of 24 questions of the form “would you prefer R(x) now, or R(y) in z days time”. The instrument bounds the so-called “k” rate of an individual – the rate at which they devalue future rewards. Essentially, this is a measure of the impulsivity of an individual, and their tendency to prefer smaller rewards, available sooner, over larger rewards, available later. Impulsivity is a non-significant aspect of the research conducted for this project, but serves as data for a related project.

**Design: Task 2 – Computer Task (Appendix C)**

The computer-based task is the focal point of the study, and the task which measures honesty and cheating. Participants are shown a grid consisting of 12 numbers, each with a single digit and two decimal points (e.g. 3.45). Participants are asked to find the pair of numbers that add up to exactly 10 (e.g. 3.45 & 6.55). Grids are randomly generated, but include shaping towards the middle values (4 – 6), and odd decimals (.37 instead of .50) in order to increase difficulty. Participants are given 5 minutes to answer as many questions as they can, with the test only advancing following a correct

answer. The test will generate up to 20 grids per sitting, but this is highly unlikely to be necessary, considering the difficulty of the task. The test is self-timed to exactly 5 minutes, and terminates with a screen indicating the number of questions answered correctly, as well as the number of attempts taken. Participants were paid R5 for every question answered correctly, up to R100 if all 20 were answered. Unbeknown to the participants, the program generates a .txt file with these results, named for the participant number entered at the beginning of the test.

# Results

Participants in the experiment engaged in dishonest behaviour in one of two ways. The first was the straightforward, expected, dishonesty in the test condition, the second was dishonesty regarding their identifying information or their prior participation. Of the 11 groups tested, 4 constituted the control group, 4 were tested under condition A and 3 were tested under condition B.

### Control

The control condition participants (*N*=63) averaged 3.42 (SD=3.23) questions correct for the computer-based task. 75% of the participants scored between 0 and 5 questions. The highest score obtained was 12 (*N*=2). Two participants managed to cheat in the control condition, both in Group 1. One participant closed the test before their number was checked, but was nevertheless allowed to leave with their claimed number. Another participant managed to leave the room with a claimed number by unknown means. In these two cases, both participants had achieved 0, and claimed 7 and 5 questions respectively.

### Condition A (Black Experimenter)

Participants under condition A (*N*=65) averaged 2.37 (SD=2.18) questions correct for the computer-based task. 89% of participants scored between 0 and 5 questions. The highest score obtained was 9 (*N*=1). 67% of all participants cheated under this condition. Participants cheated, on average, by 6.18 (SD=5.60) questions.

### Condition B (White Experimenter)

Participants under condition B (*N*=66) averaged 2.48 (SD=2.64) questions correct for the computer-based task. 85% of participants scored between 0 and 5 questions. The highest score obtained was

12 (*N*=1). 53% of all participants cheated under this condition. Participants cheated, on average, by 4.70 (SD=5.12) questions.

**Interactions, Hypothesis H1 and H2**

Rate and severity, the test statistics for **H1** and **H2,** were not normally distributed, and as such were tested for significance by means of non-parametric tests. In comparing rates of cheating between condition A and B (67 & 53 percent respectively), using a Pearson Chi Square test, no statistically significant difference was found $\chi^2$ (1, *N* = 131) = 2.941 *p* = .086. Likewise, the difference in severity of cheating was found to be statistically insignificant when tested with a Mann-Whitney test *U* = 1774, *Z* = -1.77, *p* = .077. Although insignificant, *p* values for both statistics neared significance, which suggests that future research may still detect an existing effect. A number of comments and suggestions on the protocols used in this project are considered under the Discussion section.

**Exploratory Statistics**

Other factors involved with identity, and thus, the potential tendency to cheat, were all examined in comparison with cheating behaviours. Biographical data is missing for 6 participants, who used aliases or false student information in order to take part. *N* = 125 is thus the maximum sample size for the statistics listed below.

**Age**: The age of participants was recorded by date of birth, as opposed to actual age. The mean birth year of participants was 1988.32 (SD = 2.42). Age was correlated with severity of cheating at r = .198 p < .027 (*N*=125).

**Sex**: The average severity of cheating was 6.31 questions (SD = 5.38) for females (*N*=89), and 3.06 for Males (SD = 4.77) (*N*=36). Despite this difference in severity, this result proved statistically insignificant, $\chi^2$(17, *N* = 125) = 19.82 *p* = .284.

**Language**: Of the 125 participants included in the cheating condition, 112 were Zulu home-language speakers. These were distributed as 57 in condition A and 55 in condition B, with mean cheating rates of 6.02 (SD = 5.69) and 5.11 (SD = 5.24) respectively. Unsurprisingly, considering the percentage of the total sample they constituted, this difference was also insignificant U = 1392.5, Z=-1.05, *p* = .29. The remaining 13 participants represented a further 6 languages, and as such could not be fruitfully examined for severity and significance.

**Religion**: Three subgroups in the religion category were large enough to examine for significance. Catholics (*N* = 11), Other Christian Religious (*N* = 29) and n/a (*N* = 74). Catholic M = 2.09 (SD=3.30), Other Christian Religious M =5 (SD = 4.95), and n/a M = 5.84 (SD = 5.65). A Kruskal-Wallis analysis of

these means was conducted, and indicated that the difference was not significant H(2) = 4.60 *p* =.10 Mean Rank Catholic 38.27, Other Christian Religious, 57.47, n/a 60.47.

It is important to note that the category "n/a" is by far the most prevalent entry for religion in student records. It is thus suggested that n/a does not in fact constitute agnosticism or atheism, but rather a catch-all term for several different religious groups that do not match other available categories. A potential explanation for the insignificance of this aspect of testing is the nature of the Kruskal-Wallis test, which operates most reliably when sample sizes per group are roughly the same.

**Degree Type:** Of the 125 participants in the cheating condition, only two groups were sufficiently large to warrant testing. All others contained below 10 participants. The two categories tested were Bachelor of Social Science (General) (*N* = 36) and Bachelor of Social Work (*N* = 34). The mean cheating severity of BSS students was 3.31 (SD = 4.24), and 9.70 (SD = 4.34) for BSocWork students. This result was both unexpected, and highly significant, at U = 199, Z = -4.92 *p* < .000.

# Discussion

### American & South African results

With the large number of subjects taking part in this experiment, it is somewhat surprising that the major factors in determining identity interacted so weakly, if at all, with cheating behaviour. There are, however, a few conclusions to draw based on the data collected, as well as the manner in which subjects participated. South African participants appear to differ significantly from the American subjects in severity of cheating, as well as in the form that their dishonesty took – involving exploitation of the system outside of the confines of the test itself. This first difference may be attributable to the modification of the paradigm used in this experiment, which (unlike the American model) is able to attribute dishonest behaviour to individuals, and as such calculate rate as well as severity of cheating. The average cheating (calculated in the same manner as the American sample) across all 131 participants was 5.44 questions (SD = 5.40), but perhaps skews the interpretation of the results by conflating rate with severity. When participants who did not cheat are excluded from the sample, the true *severity* of cheating is 9.01 (SD = 3.99) *N*=79. Simply, in our test, 60% of those who took part cheated, and those 60% were claiming an additional R45 (45%) over and above what they had honestly achieved. In terms of total opportunity for gain, this remains far from the rational, self-interested, extreme, but is nonetheless a worryingly severe statistic.

The second major difference between the South African and American studies is the degree to which participants would ignore rules and/or instructions to facilitate their cheating. In this study, 6 participants provided false information, and attempted to attend numerous testing sessions, despite the instruction that individuals could only take part once. Fortunately, these participants were detected in their second test, although they were allowed to take part to avoid priming others for concern over cheating/dishonesty. All of these participants used aliases and falsified student numbers on their return visit, as well as verbally declaring that they had not taken part before. The final two test conditions included a severely heightened security condition, where experimenters checked student information against a database, and transcribed the participant's student number and name themselves. This heightened sense of security did not mitigate cheating behaviour in the sample, though it is believed to have guaranteed that only new participants were tested. In the case of the American experiments, there is no reported instance of this type of behaviour occurring.

**Social Contagion & Social Work**

Cheating increased sharply after the first bout of testing, and remained consistently high thereafter, suggesting a social contagion effect was at work in attracting further participants to the study. Further evidence for this is suggested by the surprising dishonesty of the Bachelor of Social Work participants, who not only cheated severely in their own right – but comprised almost the entirety of those retaking the test under false pretences. In addition to this, the proportion of Social Work students in later testing groups was suspiciously high. The average cheating severity for Social Work students was, as described above, significantly higher than any other well-represented group in testing. This also suggests a social contagion effect, where the first few Social Work participants rapidly spread the word about an opportunity for dishonesty. Only 3 of the 34 Social Work data points refrained from cheating, whereas 15 of the 36 BSS students were honest. Whilst it is important to remember that the "34" number is skewed by the deception of the participants, that one form of dishonesty may be concealing the severity of another is of small comfort. If nothing else, the interaction of social contagion and cheating behaviour reiterates the old adage of bad apples, although this cannot fully account for the results, as the cheating observed suggests that the later participants are highly pliable, or dishonest themselves. That being said, though, that the most extreme dishonest behaviour occurred amongst those studying to be Social Workers is itself a significant, worrying, result, and perhaps worthy of a future ethics investigation.

**Statistical Measures & Protocol**

The results found in this study are, as mentioned earlier, unfortunately insignificant with regards to the effects of race and/or identity on cheating behaviour. The statistical measures of our primary concern, however, very nearly achieved significance. What is perhaps most striking about the results generated for this project is the combination of sometimes substantial size with a lack of statistical robustness. A number of amendments can be made for larger scale studies to potentially confirm the effect sizes of this isolated case. First, and foremost, participants should be tested by multiple experimenters in condition A or B. This kind of modification is highly likely to remove enough noise from the data to achieve significance in the detection of race effects. Secondly, testing will need to be conducted on a much wider scale, and completed far more rapidly, to avoid the social contagion that affected this study. Thirdly, the same wider scale may help to produce raw data closer to a normal distribution. This will mean that statistical analysis will no longer require the use of non-parametric tests, further enhancing the likelihood of achieving significance on variables of interest. Finally, apathy on the part of those approached to participate in the study has meant that a number of modifications on the study, especially those designed to mitigate cheating behaviour, were not attempted. Redoing the study with a larger budget may allow for the increasing of participant reward/incentive and thus, ease of recruitment.

## Conclusion: **Identity and Honesty**

Perhaps the most important result found in this study was that the rate and severity figures of South African participants appear to contradict accounts of self-concept maintenance offered as explanations of irrational cheating behaviour. The sample featured more dishonest than honest subjects, and the severity of cheating amounted to cheating for approximately R45 per cheating participant. That this is the threshold for self-concept maintenance is possible, but seems more of a stretch than the 'two to three questions' cheated on by American participants (Mazar et al. 2008)**.** Further, the data collected strongly showed a social contagion effect, as well as a general feeling of permissibility towards both a black and white experimenter. It is, further, difficult to imagine how the organised dishonesty exhibited by Social Work students could be interpreted under a condition of self-concept maintenance. The combination of these factors suggests that self-concept may not be a sufficiently exhaustive description of cheating behaviour amongst South Africans. Finally, the direction of the behaviour recorded for **H1** and **H2** suggests that something altogether more peculiar

may be occurring, in that participants cheat *more* in the in-group condition. One potential explanation for this is the need to save face if one has performed poorly on the task. This can be assessed by a modification in the instructions specifying what constitutes a “bad” “okay” or “good” score. As yet, however, the aims of the study remain partially unfulfilled, due to a number of features of the participant pool, and the relative noisiness of our local project. This does, however, represent one of the first applications of the behavioural economics paradigm in addressing honesty and identity in a heterogeneous setting, and a significant step in the adjustment and appropriation of these tools for use in varied circumstances. A number of suggestions to expand and reinforce the tentative steps made by this project have been discussed, and it remains to be seen what other differences and effects might be extracted from non-American participants as these methods gain wider acceptance throughout the world. What is certain, however, is that South Africans have already presented an interesting challenge to previous work on this subject, and with further research, may generate interesting hypotheses for the full explanation of cheating behaviour, and how the categorisation of self and other may (yet) influence how honest and dishonest interactions occur.

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# A Informed Consent Document

**Title of Research Project:** Numerical Cognitive Performance

**School**: Philosophy and Ethics

**Supervisor:** Prof. David Spurrett (UKZN)

**Investigator:** Jeffrey Martin (UKZN)

## Purpose

The project **Numerical Cognitive Performance** is meant to examine how individuals think about numbers, and which numbers are most easily worked with.

### Method

For the purpose of this project, participants will be required to take part in two tests, both conducted in a LAN, one on PC, and the other on paper. Tests one and two take only 4-5 minutes each, but the entire experiment will take roughly 30 minutes, including the sign-up time, and the payment of rewards after the test. Test one involves basic arithmetic; Test two asks questions regarding your preferences for different amounts of money, over time. Test one is the only test for which there is actual monetary reward.

### Risks and Discomforts

There are no obvious reasons why this experience would be an unpleasant one, but as a subject, you are welcome to back out of the study at any point in proceedings without any penalty. In the event of your not wishing to continue or begin the study, any personal information you have provided, as well as any results generated so far will be ignored for the study, and destroyed to protect your confidentiality.

### Confidentiality

Your name, contact details and subject number will be known by the Investigator of this research project, any other individuals seeing the data will only be presented with the subject number, and will not know to whom this information relates. There will be no personally identifying information in the research report or any other documents beyond that seen by the Investigator.

In agreeing to participate in this study, it is also necessary that we are granted permission to collect certain demographic information from the university computer system, which may include your subject choices and marks. This study focuses on an overall trend, and thus will not single out any individual participants. Further, any information collected for this purpose will be protected as in the confidentiality agreement listed above.

**Costs and Remuneration**

The only cost in this study is the time spent taking the tests. For each correct answer on the arithmetic test, you will be paid the sum of R5 (Five ZAR), up to a maximum of R100.

**Questions**

Any questions about the project may be directed to Jeffrey Martin at +27724354226 or at drcogsci@gmail.com. His supervisor, Prof. David Spurrett, is available at spurrett@ukzn.ac.za

The phone number of the school of Philosophy and Ethics is 031 260 2292

**I hereby declare that I ……. (full name) agree to participate in the study and consider myself informed of the relevant particulars of the study. I am also aware that I am free to decline the offer, as well as withdraw at any time, without prejudice.**

**_____ (Signature of Participant)**

**_____ (Signature of Investigator)**

Student Number:

**Subject Number:**

## *2*

We now ask you to choose repeatedly between two hypothetical amounts of money, one to be received immediately, the other at some delay. Please choose as though you were actually going to be receiving the money.

For each option please place a cross in the box corresponding to your preferred option.

**Please make a choice for ALL of the options below.**

Now make a selection in each of the following cases:

| | | | | |
|---|---|---|---|---|
| Would you prefer: | ☐ **R52 now** | or | ☐ **R105 in 66 days time?** |
| Would you prefer: | ☐ **R54 now** | or | ☐ **R75 in 95 days time?** |
| Would you prefer: | ☐ **R159 now** | or | ☐ **R255 in 76 days time?** |
| Would you prefer: | ☐ **R16 now** | or | ☐ **R90 in 21 days time?** |
| Would you prefer: | ☐ **R102 now** | or | ☐ **R255 in 50 days time?** |
| Would you prefer: | ☐ **R84 now** | or | ☐ **R105 in 119 days time?** |
| Would you prefer: | ☐ **R163 now** | or | ☐ **R225 in 93 days time?** |
| Would you prefer: | ☐ **R42 now** | or | ☐ **R240 in 11 days time?** |
| Would you prefer: | ☐ **R27 now** | or | ☐ **R90 in 40 days time?** |
| Would you prefer: | ☐ **R180 now** | or | ☐ **R225 in 119 days time?** |
| Would you prefer: | ☐ **R30 now** | or | ☐ **R255 in 9 days time?** |
| Would you prefer: | ☐ **R55 now** | or | ☐ **R90 in 80 days time?** |
| Would you prefer: | ☐ **R30 now** | or | ☐ **R75 in 50 days time?** |
| Would you prefer: | ☐ **R19 now** | or | ☐ **R75 in 26 days time?** |
| Would you prefer: | ☐ **R221 now** | or | ☐ **R240 in 155 days time?** |
| Would you prefer: | ☐ **R115 now** | or | ☐ **R225 in 62 days time?** |
| Would you prefer: | ☐ **R92 now** | or | ☐ **R105 in 132 days time?** |
| Would you prefer: | ☐ **R15 now** | or | ☐ **R105 in 14 days time?** |
| Would you prefer: | ☐ **R210 now** | or | ☐ **R240 in 132 days time?** |
| Would you prefer: | ☐ **R69 now** | or | ☐ **R75 in 156 days time?** |
| Would you prefer: | ☐ **R53 now** | or | ☐ **R240 in 16 days time?** |
| Would you prefer: | ☐ **R15 now** | or | ☐ **R90 in 6 days time?** |
| Would you prefer: | ☐ **R58 now** | or | ☐ **R255 in 30 days time?** |
| Would you prefer: | ☐ **R74 now** | or | ☐ **R225 in 35 days time?** |

**B**

Hello and thank you for agreeing to take part in this experiment.

There are two parts to this test. For the moment, please leave the computers alone, and look at the pieces of paper next to your computers. On these pieces of paper, you will find the consent form, as well as a sheet detailing a number of different amounts of money. Please carefully read the consent form, and write your full name, signature and student number on them. Once you have done this, look at the next sheet, and for each pair of options, pick the one you would rather have, if you were getting the money. As an example, you might be offered R1 today, or R2 tomorrow. Depending on what you would rather have, you must tick either the box for the R1 today or the R2 tomorrow. There are 24 of these choices on the sheet, and you must pick an answer for each one. We will all wait until that part of the task is finished, and then we will move on to the next part of the test. When you have finished, put your pen down and look this way, so I know that you are done.

Are there any questions? **(answer any questions)**

**WAIT UNTIL ALL PARTICIPANTS HAVE FINISHED WRITING**

Thank you. For this part of the test, you will need to use your computers. WITHOUT CLICKING, please move the mouse of your computer. You should have a plain white screen, with black writing telling you the instructions of the test. DOES ANYONE NOT HAVE THIS ON THEIR SCREEN? **IF YES, CHECK FOR PROBLEM, FIX.** The next thing you need to do is check that your participant number is the same on the test screen as it is on your piece of paper. DO THIS NOW.

We are almost ready to begin the actual test. When we start, you will see a grid of 12 numbers, on their own clickable buttons. Your task is to find the two numbers in that grid which add up to exactly 10. For example, if you have 4.3 and 5.7 on the grid, you will click each of those numbers and then push next. You can only move on to the next question once you have got the correct answer to the first one. If you click next and the numbers do not change, it means that you have not chosen the correct two numbers. When you have finished the test, two numbers will appear on your screen. The top number will tell you how many questions you got right, please copy this number clearly onto the small piece of paper stapled to the form you filled in. **LIFT UP FORM TO DEMONSTRATE SMALL PIECE OF PAPER.** When the test ends, I will come around and check to see you have copied the number correctly, DO NOT CLOSE THE WINDOW, as we have no way of checking that you have copied the number correctly once it is gone. We cannot pay you for your answers if you close the window before we have checked that you have copied it correctly. Once I have checked your number, please close the window, stand up, and take your form to the man standing outside, who will pay you. Please do this in an orderly fashion, and line up properly.

Are there any questions? **(answer any questions)**

You may click Go whenever you are ready. Good Luck.

**ONCE EVERYONE HAS STARTED THE TEST, CHECK EACH SCREEN ONCE TO MAKE SURE THERE ARE NO RED HIGHLIGHTS ON ANY OF THE BUTTONS. IF THERE ARE, CANCEL THAT TEST AND START A NEW ONE**

**IF THERE IS NO RED, WAIT FOR THE TIME TO ELAPSE, THEN GO AROUND THE ROOM CHECKING THAT THEY HAVE COPIED THE NUMBER CORRECTLY. SEND THEM OUT TO BE PAID AFTER CHECK.**

**Cheating Condition**

When the test ends, please copy the TOP number in the box onto the small piece of paper attached to the second sheet of your consent form. **INDICATE WITH EXAMPLE PAPER**

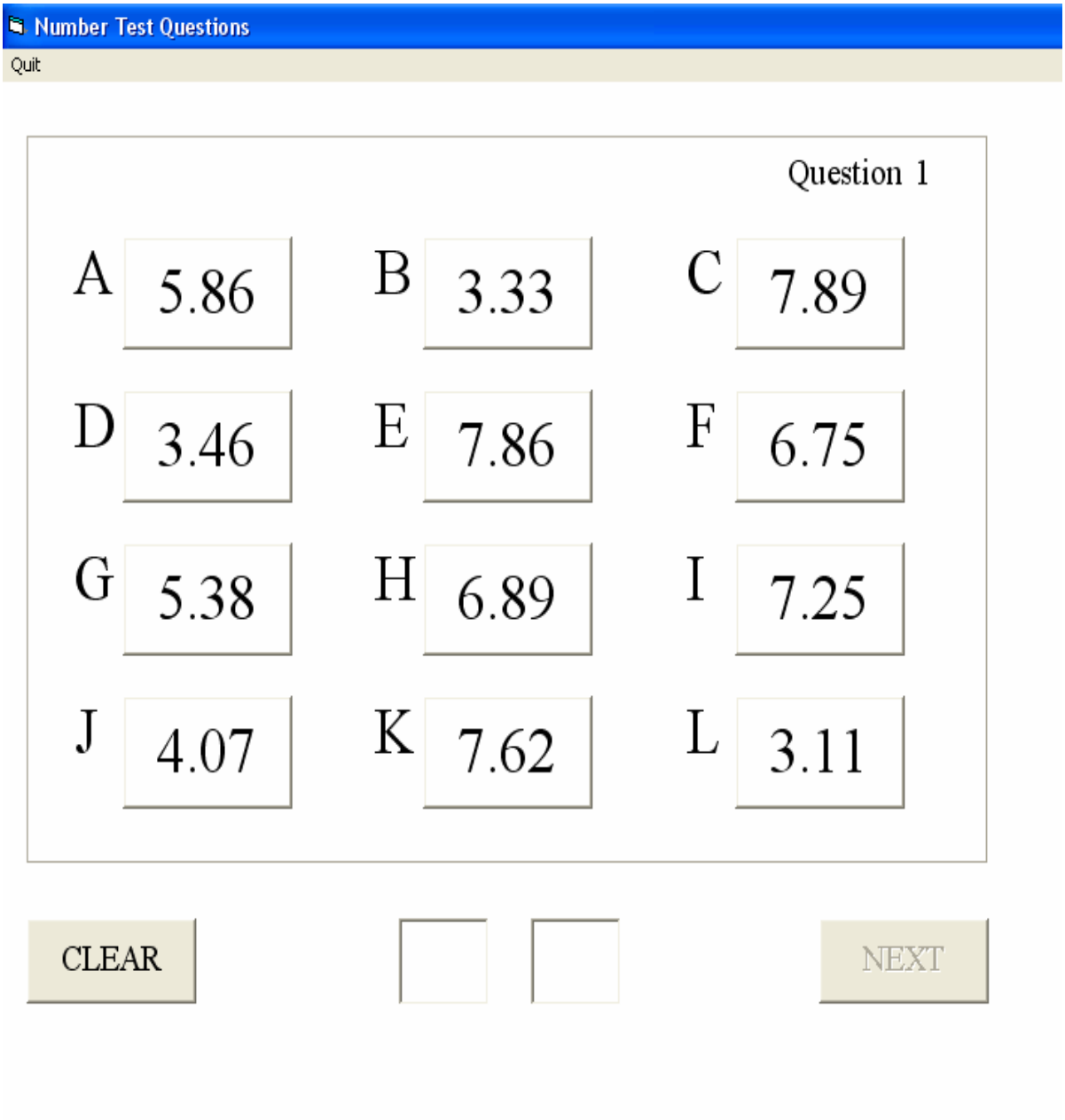
Please bear in mind that we have no way of checking your accuracy once you close the results window, and as such, you need to be very careful to copy down the number correctly – as well as legibly and clearly, for the people outside. When you have copied down the number, you can close the results window, stand up and take your paper to the people waiting outside – who will pay you for your answers.

Are there any questions about what to do after the test?

Are there any questions about the instructions to the test itself?

You may click Go whenever you are ready, Good Luck.

# C


Number Test Questions
Quit
Question 1
A 5.86
B 3.33
C 7.89
D 3.46
E 7.86
F 6.75
G 5.38
H 6.89
I 7.25
J 4.07
K 7.62
L 3.11
CLEAR
NEXT