First-year Statistics for Psychology Students through Worked Examples

5. The Matched Pairs *t*-test and the Wilcoxon Signed-Ranks Test

Charles McCreery, D.Phil.

Formerly Lecturer in Experimental Psychology
Magdalen College
Oxford

Oxford Forum

Acknowledgements

I am grateful to the following for comments and guidance at various points in the evolution of this tutorial: Dr Fabian Wadel, Dr Paul Griffiths, and Professor David Popplewell.

I am also indebted to Andrew Legge for help with the formatting of mathematical formulae and symbols.

Most recently, I have become much indebted to Dr Ed Knorr, who very kindly read through the complete typescript and made numerous suggestions and corrections, both large and small.

Any remaining errors or omissions are my responsibility. I would be pleased to receive information from anyone who spots any error, mathematical or otherwise. I can be contacted via e-mail at:

charles.mccreery@oxford-forum.org

I should also be pleased to hear from anyone who finds this tutorial helpful, either for themselves or for their students.

Charles McCreery

General Introduction[1]

There are usually three complementary methods for mastering any new intellectual or artistic task; these are, in ascending order of importance:

- reading books about it
- observing how other people do it
- actually doing it oneself

These tutorials focus on the second of these methods. They are based on handouts that I developed when teaching first-year psychology students at Magdalen College, Oxford. The core of each tutorial is a worked example from an Oxford University Prelims Statistics examination paper. I have therefore placed this section in prime position; however, in teaching the order of events was different, and more nearly corresponded to the three-fold hierarchy of methods given above:

1. Students were invited to read one of the chapters on the Recommended Reading list, given at the end of each tutorial. They were also expected to attend a lecture on the topic in question at the Department of Experimental Psychology.

2. Students would attend a tutorial, in which we would go through the worked example shown here. They would take away the handouts printed as Appendices at the end of each chapter, which were designed to give structure to the topic and help them when doing an example on their own.

3. They would be given another previous examination question to take away and do in their own time, which would be handed in later for marking.

I am strongly in favour of detailed worked examples; following one is the next best thing to attempting a question oneself. Even better than either method is doing a statistical test on data which one has collected oneself, and which therefore has some personal significance to one, but that is not usually practicable in a first-year course.

I list three books in the General Bibliography at the end of this tutorial which give worked examples. One of these is Spiegel (1992), in which

[1] This is a general introduction to the series of six tutorials available here: http://www.celiagreen.com/charlesmccreery.html

each chapter has numerous ‘solved problems’ on the topic in question. These worked problems occupy more than half of each chapter. However, the solutions to the individual problems are not as detailed and discursive as the ones I give here.

Another book which is based on worked examples on each of the topics covered is Greene and D’Oliveira (1982), also listed in the General Bibliography. Their examples are as detailed as those I give here. However, they do not cover probability and Bayes’ theorem or Analysis of Variance.

Finally, I strongly recommend the *Introductory Statistics Guide* by Marija Norusis, designed to accompany the statistical package *SPSS-X*, and based on worked examples throughout. Even if the student does not have access to a computer with the *SPSS-X* package on it, this instruction manual contains excellent expositions of all the basic statistical concepts dealt with in my own examples.

The Matched Pairs *t*-Test and the Wilcoxon Signed-Ranks Test

Contents

1 The question:[2]

What are the advantages and disadvantages of paired or matched tests?

For nineteen patients scheduled to undergo surgery, blood samples were taken (a) 12-14 hours before surgery and (b) 10 minutes before surgery. The beta-endorphin levels were measured in fmol/ml (a femto-mole is 10^{-15} grams times the molecular weight of the substance) and reported by Hoaglin, Mosteller and Tukey (1985) as follows:

(a)	10.0	6.5	8.0	12.0	5.0	11.5	5.0	3.5	7.5	5.8
(b)	6.5	14.0	13.5	18.0	14.5	9.0	18.0	42.0	7.5	6.0

(a)	4.7	8.0	7.0	17.0	8.8	17.0	15.0	4.4	2.0
(b)	25.0	12.0	52.0	20.0	16.0	15.0	11.5	2.5	2.0

People have higher levels of beta-endorphin in the blood under conditions of emotional stress. It is required to investigate whether stress levels have increased as the time for the surgery approaches.

Plot the data and make a preliminary assessment.

Perform both a parametric and a non-parametric statistical test to investigate the increase in beta-endorphin level, in each case stating your hypotheses and conclusions clearly, and defining any symbols you use.

What do you conclude?

Which of two tests you performed do you consider the more appropriate for these data? Why?

[2] The question is taken from the Preliminary Statistics paper for first-year psychology students at Oxford University, Hilary Term, 1998.

2 The answer

2.1 Advantages and disadvantages of paired or matched tests

The main advantage of matching pairs of subjects in statistical tests is that it controls for the effect of the variables that are not the subject of interest to the investigator. Examples of variables which are commonly matched are gender, age and social class.

A special case of matching pairs of observations for the purpose of making a statistical comparison between them consists of taking two measures of each subject, the measures being separated by a common interval of time: the 'repeated measures' method.

One potential disadvantage of this repeated measures procedure is the possible confounding effect of habituation or learning. For example, in the present experimental situation patients' anxiety levels may tend to rise when blood is taken, but this effect may diminish with repetition of the procedure, due to habituation. If this were the case, then any tendency for beta-endorphin levels to rise over time due to the stress of impending surgery might be masked, or at least diminished, by the stress response to the injection itself being reduced on the second occasion.

2.2 Plot of the data and preliminary assessment

Stem and leaf plot

12-14 hours <u>*before*</u>		*10 minutes* <u>*before*</u>
0000	0-4	00
000000000	5-9	0000
000	10-14	00000
000	15-19	0000
	20-24	0
	25-29	0
	30-34	
	35-39	
	40-44	0
	45-49	
	50-54	0

Preliminary assessment:

1) The modal value for beta-endorphin level increases from 5-9 to 10-14.
2) There is a 'tail' of four readings between 20 and 54 in the second measurement, whereas there was none before.

Both observations suggest there may be a statistically significant increase in beta-endorphin levels, implying an increase in stress, as surgery approaches.

2.3 The parametric test

Our prediction is that stress levels will increase with approach of the scheduled time for surgery.

For the parametric test on the data we will choose the matched samples *t*-test.

The table below sets out the data and preliminary calculations necessary to carry out the test.

[Students who have access to a scientific calculator with statistical functions will not need to work out for themselves the results in the last two columns of the Table below. Such a calculator can work out the standard deviation for you once you have plugged in all the data in the fourth column. However, I have included the final three columns for heuristic purposes, to show how the standard deviation is actually calculated.]

Table 1

Subject	***Condition A***	***Condition B***	***d = (B – A)***	$\bar{d}$	$d - \bar{d}$	$(d - \bar{d})^2$
1	10	6.5	-3.5	7.7	-11.2	125.44
2	6.5	14	7.5	7.7	-0.2	0.04
3	8	13.5	5.5	7.7	-2.2	4.84
4	12	18	6	7.7	-1.7	2.89
5	5	14.5	9.5	7.7	1.8	3.24
6	11.5	9	-2.5	7.7	-10.2	104.04
7	5	18	13	7.7	5.3	28.09
8	3.5	42	38.5	7.7	30.8	948.64
9	7.5	7.5	0	7.7	-7.7	59.29
10	5.8	6	0.2	7.7	-7.5	56.25
11	4.7	25	20.3	7.7	12.6	158.76
12	8	12	4	7.7	-3.7	13.69
13	7	52	45	7.7	37.3	1391.29
14	17	20	3	7.7	-4.7	22.09
15	8.8	16	7.2	7.7	-0.5	0.25
16	17	15	-2	7.7	-9.7	94.09
17	15	11.5	-3.5	7.7	-11.2	125.44
18	4.4	2.5	-1.9	7.7	-9.6	92.16
19	2	2	0	7.7	-7.7	59.29
Totals:	**158.7**	**305**	**146.3**			**3289.82**

[Calculating the standard deviation without using the statistical functions on a calculator:

1. Find the mean of the differences between the two successive measurements for each subject.

These differences are shown in column 4 of the table above. To find their mean, we sum them and then divide by the number of subjects.

Therefore the mean of the differences ($\bar{d}$) = 146.3 / 19 = 7.7

2. Next we have to find the deviation of each of the differences in column 4 from this mean difference ($\bar{d}$) of 7.7. The results of this calculation are shown in the penultimate column ($d - \bar{d}$).

3. Now we have to square each of these differences. The results of this operation are shown in the final column.

4. We then sum these squares, with the result shown at the foot of the column, i.e., 3289.82.

5. This sum of squares has next to be divided by (n – 1), where n is the number of pairs. In this case n =19, so (n – 1) = 18.

   3289.82 / 18 = 182.77.

   This is the variance.

   (The reason for subtracting 1 from the number of pairs is that we are dealing here with only a sample, and that a small one, from the underlying population of all possible observations of this kind. The correction of n to (n – 1) is designed to reduce any possible bias that may be introduced by using such a small sample.

   For more on the important distinction between populations and samples, see Appendix 3 at the end of this tutorial.)

6. Finally we take the square root of the variance to get the standard deviation.

   In this case the square root of 182.76 is 13.52.

We now have all the numbers we need to calculate the value of Student's *t*.]

The formula for *t* in a paired samples *t*-test is:

$$t = \frac{\bar{d}}{S_d \,/\, \sqrt{n}}$$

where $\bar{d}$ is the mean of the differences (in this case the mean of the differences between the two successive measures on each subject), S_d is their standard deviation, and *n* is the number of pairs.

Therefore:

$$t = \frac{7.7}{13.519 \,/\, \sqrt{19}}$$

$$= \frac{7.7}{13.519 \,/\, 4.359}$$

$$= \frac{7.7}{3.10}$$

$$= 2.48$$

The degrees of freedom (d.f.) in a paired samples *t*-test = (*n* – 1), where *n* is the number of subjects. In this example the number of subjects is 19. Therefore there are 18 degrees of freedom.

Next we look up our value of *t* = 2.48, with 18 degrees of freedom, in a table of Student's *t* distribution (e.g. Table H on p. 174 of Green and D'Oliveira, 1982).

We find that for a one-tailed test the critical value for significance at the 1in 40 level is 2.10, and for significance at the 1 in 100 level it is 2.55. Our obtained value of 2.48 is greater than 2.10, but slightly less than 2.55. So we conclude that we may reject the null hypothesis, at the 1 in 40 level of significance, that stress levels do not increase as the time for surgery approaches.

[The reason why this was a one-tailed test is that the researchers were testing the prediction that stress *increases* over time as surgery approaches, rather than decreases or stays constant. I.e. a specific *direction* of change over time was being investigated. For a summary of points about the distinction between one-tailed and two-tailed tests, see Appendix 4 at the end of this tutorial.]

2.4 A non-parametric alternative to the matched samples *t*-test

For our non-parametric alternative to the *t*-test we choose the Wilcoxon signed-rank test.

The Wilcoxon test is used when two different experimental conditions are applied, either to matched subjects, or, as in the present case, the same subjects at different times.

As before, our prediction is that stress levels increase as the time for surgery approaches.

To carry out the Wilcoxon test we have first to rank order the differences between the two measurements of each subject, which we have already calculated for the first part of this question. These rank order numbers are given in column 4 below.

[Note that we omit any tied observations; therefore, in the present case we omit two subjects (highlighted in yellow in the table below) who had the same score in both the test and retest conditions.]

The next step is shown in Column 5: 'Rank of d'. The important thing to note about this column is that the scores are ranked *regardless of sign*. For example, the difference of (–5) recorded by Subject 14 ranks *higher* than the difference of 3 recorded by Subject 16.

[However, note also that we cannot afford to simply drop the signs and only record the magnitude of the differences, because in the final two columns (Columns 6 and7) we have to add together all the plus signs and all the minus signs *separately*.]

Table 2

Subject	***Condition A***	***Condition B***	***d (A – B)***	***Rank of d***	***Positive rank***	***Negative rank***
1	10	6.5	3.5	6.5	6.5	
2	6.5	14	–7.5	–12		–12
3	8	13.5	–5.5	–9		–9
4	12	18	–6	–10		–10
5	5	14.5	–9.5	–13		–13
6	11.5	9	2.5	4	4	
7	5	18	–13	–14		–14
8	3.5	42	–38.5	–16		–16
9	7.5	7.5	0	Omit tie		
10	5.8	6	–0.2	–1		–1
11	4.7	25	–20.3	–15		–15
12	8	12	–4	–8		–8
13	7	52	–45	–17		–17
14	17	20	–3	–5		–5
15	8.8	16	–7.2	–11		–11
16	17	15	2	3	3	
17	15	11.5	3.5	6.5	6.5	
18	4.4	2.5	1.9	2	2	
19	2	2	0	Omit tie		
				Totals:	**22**	**–131**

[The next step is to count the number of pairs to consider when looking up the probability of the observed result. This is the total number of pairs less the number of ties. In this case, we have 19 pairs, but two ties. Therefore:]

$n = 19 – 2 = 17$

At this point we *disregard* the sign of the sum of negative differences, and regard it as 131.We simply compare *the absolute magnitude* of the sum of positive versus the sum of negative differences.

2.5 The check

There is a check we perform at this stage. The sum of the positive ranks and the negative ranks should equal:

$$^{1}/_{2}\, n(n + 1)$$

In this case:

$$17/2 \text{ x } (17 + 1)$$
$$= 8.5 \text{ x } 18$$
$$= 153$$

which agrees with the sum of the absolute values of the positive and negative totals for the ranks in the table above; i.e. 22 + 131 = 153.

2.6 Assessing the significance of the result

We first look for the *smaller* of our two numbers for the sum of ranks in the table above. This is for the sum of positive ranks, i.e. 22. This will be our test statistic, *W*.

Next we look up this smaller sum of ranks in a table of significance levels for Wilcoxon's *W* (for example Table A, on p. 161 of Green and D'Oliveira, 1982). To reach significance at a given level, *W* must be *less than or equal to* the tabulated value.

As mentioned above in connection with the matched samples *t*-test, this was a one-tailed test, because a prediction was made as to the direction of change in stress over time. (The question asked us to 'investigate whether stress levels have increased as the time for the surgery approaches'.)

In our case, we find that our test statistic, *W*, of 22 is just within the value required for significance at the 0.005 (i.e. 1 in 200) level, one-tailed, given that n = 17. We conclude, therefore, that we may reject with some confidence the null hypothesis that the approach of surgery does not raise stress levels.

3 Conclusions

Both the parametric and non-parametric tests confirm the initial impression gained from inspecting the raw data and drawing the plot: namely that there is a significant increase in anxiety levels as the date of the surgical procedure approaches.

The parametric test is the more appropriate for this data, for the following reasons:

- Although we are not given any background information about the physiology of endorphin levels, it is reasonable to assume that each individual's level fluctuates over time around a mean that is characteristic for that individual level, in a similar way to other physiological variables, such as blood pressure.

- Furthermore, we may reasonably assume that, given a larger sample of subjects, we would find that their individual mean endorphin scores would form a normal distribution, as do other physical variables, such as height and weight.

- Given these assumptions, the parametric test is preferable because it uses more of the information contained in the data. The measure of endorphin levels is an interval measure, i.e., truly quantitative and continuous, so it is appropriate for the *t*-test. By contrast, the non-parametric Wilcoxon test treats the data as if it were discontinuous and only capable of being rank ordered.

[In relation to the point being made in this last paragraph, please refer to Appendix 5 at the end of this tutorial, where the various types of measurement are tabulated and compared.]

4 Recommended reading

Greene, Judith and D'Oliveira, Manuela (1982). *Learning to Use Statistical Tests in Psychology.* Milton Keynes: Open University Press, Chapter 8.

Howell, David C. (1997). *Statistical Methods for Psychology* (4th edition). London: Duxbury Press, pp 182-187.

Appendix 1

Summary of steps in a paired samples *t*-test

1. Work out the difference between the scores of each pair.

2. Find the mean of these differences.

3. Find the standard deviation of these differences; i.e.,
   (a) Find the deviation of each difference from the mean difference found in Step 2.
   (b) Square these deviations.
   (c) Sum them.
   (d) Divide by (n − 1), where n is the number of pairs.
   (e) Take the square root of the resulting number.

4. Compute the following formula for t (paired samples):

$$t = \frac{\bar{d}}{S_d \;/\; \sqrt{n}}$$

where $\bar{d}$ is the mean of the differences (from 2.), S_d is their standard deviation (from Step 3), and n is the number of pairs.

5. Look up the resulting t-value in a table giving Student's t distribution, e.g., Table V in Hoel (1976, p. 334).

N.B. d.f. = (n − 1), where n is the number of pairs.

Appendix 2

Summary of characteristics of the *t*-test generally

- **Two sorts:**

  1. 'independent samples'
  2. 'matched samples' (knowing about one member of a pair tells you something about the other member; e.g., the two members are matched for age, gender or social class)

- **Purpose of the independent/two-sample *t*-test:**

  - to tell if two samples have been drawn from same population

- **Assumptions of the independent-samples *t*-test**:

  - the samples are random
  - the variances of the two samples are equal

- **Assumption common to both sorts of *t*-test:**

  - each sample is drawn from a normally distributed population (though the samples themselves may be too small to look normal)

Appendix 3

The Theoretical Distinction between Samples and Populations

Its importance: '*Statistical methods may be described as methods for drawing conclusions about populations by means of samples.'* Hoel, 1976, p.2

	Samples		**Populations**
Nature of measures:	Always empirical *(a posteriori)*		May be theoretical *(a priori)* (e.g., mean IQ score, or predictions from binomial); or, if unknown, may have to be represented by a sample.
Represented by:	English alphabet		Mainly Greek alphabet
Examples:	$\overline{x}$	Mean	μ
	s^2	Variance	σ^2
	s	Standard deviation	σ
	$\hat{p}$	Proportion	p

SAMPLING - Key concepts

Sampling error[3]

- the variability from sample to sample due to chance

Sampling distribution of a statistic

- 'the most basic concept underlying all statistical tests' (Howell, 1997, p.90)

[3] N.B. Does not imply any mistake

- tells us 'what degree of sample-to-sample variability we can expect by chance as a function of sampling error' (Ibid.)

- or 'the distribution of values obtained for that statistic over repeated sampling' (Ibid.)

- derived mathematically rather than empirically

Sampling distribution for the mean

- 'distribution of means of an infinite number of random samples' (Howell, 1997, p.90)

Standard Error

- the standard deviation of a sampling distribution of a statistic

Appendix 4

One-tailed versus Two-tailed Tests

Synonyms: - one-sided vs. two-sided
- directional vs. non-directional

	One-tailed	**Two-tailed**
Definitions:	We reject H_0 in only one tail of a distribution (e.g., Z).	We reject H_0 in both tails.
Context in which applicable:	We have made a prediction concerning the *direction* of the effect under H_0.	We have made no prediction about the direction of the effect.
Typical criterion of significance:	5% at one end of the distribution constitutes the rejection region for H_0.	2.5% at each end

N.B. If you have looked up the significance of your result in a table of values for two-tailed tests but have in fact made a prediction, then you should divide by 2 the probability you find in the table for your result.

Appendix 5

How to recognise what type of test to do

Type of measure	Nature of data	Examples	Suitable tests
Nominal	Discontinuous/categorical, having no regard for order	Gender Eye-colour	Non-parametric Chi-square
Ordinal	Discontinuous, but rank ordered	Social class Extraversion	Non-parametric, e.g., Chi-square. Parametric if plenty of ranks and normally distributed data
Interval	Truly quantitative and continuous, so intervals all equal; but zero point arbitrary	Fahrenheit Centigrade	Parametric
Ratio	Truly quantitative and continuous; intervals equal, and zero point not arbitrary, so, for example, a doubling of the measure obtained implies a doubling of the underlying quantity measured	Kelvin Age Weight Height	Parametric

General Bibliography

Textbooks of the kind listed below are usually updated every few years. If the reader finds there is an edition later than the one listed here, he or she is recommended to buy the latest version.

Greene, Judith and D'Oliveira, Manuela (1982). *Learning to Use Statistical Tests in Psychology*. Milton Keynes: Open University Press.

Hays, William L. (1994). *Statistics* (5th edition). Orlando, Florida: Harcourt Brace.

Hoel, Paul G. (1976). *Elementary Statistics* (4th edition). New York: Wiley.

Howell, David C. (1997). *Statistical Methods for Psychology* (4th edition). London: Duxbury Press.

Norusis, Marija J. (1988). *SPSS-X Introductory Statistics Guide, for SPSS-X Release 3*. Chicago, Illinois: SPSS Inc.

Spiegel, Murray R. (1992). *Schaum's Outline of Theory and Problems of Statistics* (2nd edition). New York: McGraw-Hill.

Tabachnick, Barbara G. and Fidell, Linda S. (1983). *Using Multivariate Statistics*. London: Pearson Education Ltd.

Charles McCreery is a Research Director at Oxford Forum, an independent association of academics, set up to research and publish in currently neglected areas of psychology, theoretical physics, philosophy and economics.

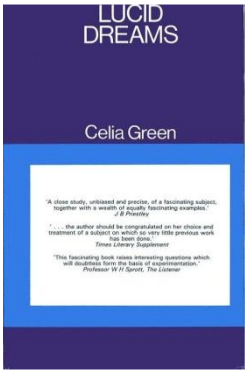
If you feel have derived some benefit from the preceding tutorials, please consider making a donation to Oxford Forum's work, via the PayPal button on the following webpage:
https://celiagreen.blogspot.co.uk/

Some other publications by members of Oxford Forum are described in the following pages.

They are available from Amazon UK and Amazon USA.

Celia Green

Lucid Dreams
Foreword by Professor H.H. Price, FBA



The original pioneering study of lucid dreams: dreams in which the subject is aware that he or she is dreaming, and sometimes able to control the course of the dream.

"A fascinating subject together with a wealth of equally fascinating examples."
J.B. Priestley

"The author should be congratulated on her choice and treatment of a subject on which so very little previous work has been done."
Times Literary Supplement

"This fascinating book raises interesting questions which will doubtless form the basis of experimentation."
Professor W.H Sprott, The Listener

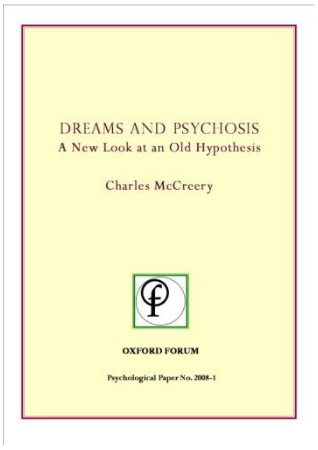
"[Lucid dream research] rests almost entirely on the meticulous descriptions and classifications of types and subtypes put forward by Green in her initial publications ... All of us 'second generation' researchers have found ourselves continuously in her debt."
Professor Harry Hunt, Brock University

Hamish Hamilton, reissued by Institute of Psychophysical Research

ISBN 978 09000760 08 (hardback)

Charles McCreery

Dreams and Psychosis
A new look at an old hypothesis



This paper proposes a theory of psychosis based on a link between sleep and hyperarousal. It is argued that the phenomenological similarities between psychosis and dreams arise from the fact that sleep can occur, not only in states of deafferentation and low arousal, but also in states of hyperarousal resulting from extreme stress.

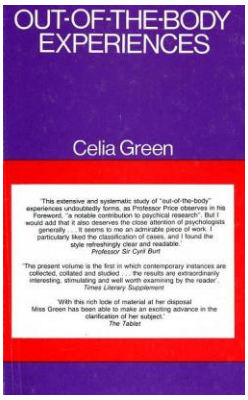
It is proposed that both schizophrenic and manic-depressive patients are people who are prone to episodes of hyperarousal. Various sorts of electrophysiological evidence are adduced for this proposition, drawn from the fields of electroencephalography, studies of the galvanic skin response and studies of smooth pursuit eye movements. In addition, it is suggested that a key finding is the apparently paradoxical one that catatonic patients can be aroused from their seeming stupor by the administration of sedatives rather than stimulants.

It is proposed that a tendency to hyperarousal leaves certain individuals vulnerable to 'micro-sleeps' in everyday life, with the attendant phenomena of hallucination and other sorts of reality-distortion. Delusional thinking may follow as an attempt to rationalise these intrusions of dream-phenomena into daylight hours.

Oxford Forum
Price £4.95; 34 pages
ISBN 978 09536772 83

Celia Green

Out-of-the-Body Experiences
Foreword by Professor H.H. Price, FBA



An analysis of four hundred first-hand case histories in which people seemed to leave their body and see it from outside.

"While there had been stories of out-of-body experiences for centuries, Green was the first to systematically examine a large number of first-hand accounts, from more than four hundred people..."
Professor Oliver Sacks, *Hallucinations*

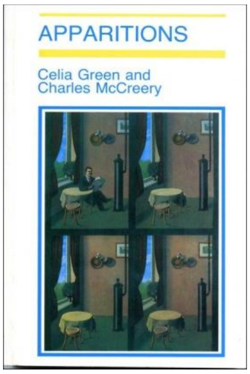
"The present volume is the first in which contemporary instances are collected, collated and studied … the results are extraordinarily interesting, stimulating and well worth examining by the reader."
Times Literary Supplement

"With this rich lode of material at her disposal [Green] has been able to make an exciting advance in the clarification of her subject."
The Tablet

Hamish Hamilton,
reissued by Institute of Psychophysical Research
ISBN 978 09000760 15 (hardback)

Celia Green and Charles McCreery

Apparitions



An analysis of eighteen hundred first-hand accounts of experiences in which people saw, heard or sometimes even seemed to touch people or things that were not really there.

The authors advance the hypothesis that some, or even all, apparitional experiences are 'metachoric', meaning the whole of the visual field is hallucinatory.

"An excellent piece of documentation, soberly treated, and well worth reading."
Anthony Powell, *Daily Telegraph*

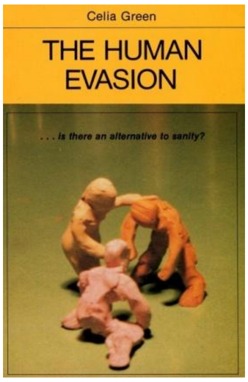
"Enthralling"
Manchester Evening News

"A fascinating and thought-provoking book."
Coventry Evening Telegraph

Hamish Hamilton,
reissued by Institute of Psychophysical Research
ISBN 978 09000760 91 (hardback)

Celia Green

The Human Evasion
Foreword by R.H. Ward



Hamish Hamilton, reissued by Oxford Forum
ISBN 978 09536772 45 (paperback)

An attack on the way of thought of contemporary man, revealing the patterns of prejudice which underlie his most cherished and sacrosanct opinions.

For all its seriousness, the book is written with sustained wit and intellectual audacity. Surveying the whole field of modern thought, the author reveals the same disease at work in modern Christianity as in theoretical physics.

"A subtle and sustained attack on contemporary ways of thought."
Times Literary Supplement

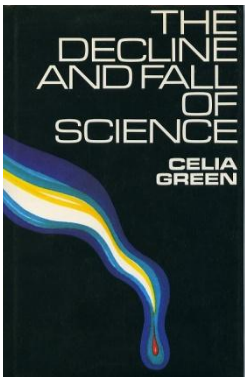
"Few books, long or short, are great ones; this book is short and among those few."
R.H. Ward

Hamish Hamilton,
reissued by Institute of Psychophysical Research

ISBN 978 09000760 91 (hardback)

Celia Green

The Decline and Fall of Science



An attack on the attitudes of the contemporary scientific and intellectual establishment, including a vigorous and controversial defense of capitalism and private incomes.

"The central thesis is absolutely valid."
New Society

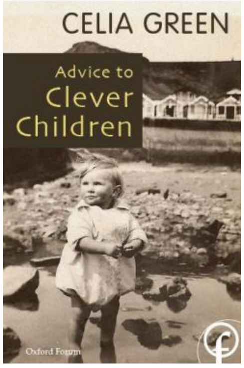
"None can fail to acknowledge the brilliance of the author's writing."
Hampstead and Highgate Express

Hamish Hamilton, reissued by Oxford Forum

ISBN 978 09536772 52 (hardback)

Celia Green

Advice to Clever Children



Reflections on education, religion and the human predicament.

"Celia Green has written an important and mentally stimulating book which goes far beyond its title."
Lord St. John of Fawsley

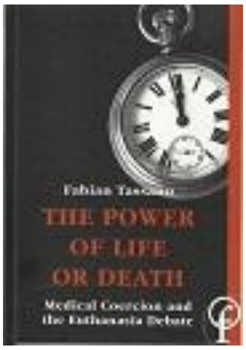
"What this aggressive, stimulating book does is to make us face up to some of the polite fictions we have come to accept."
Ralph Yarrow, *Phoenix*

Institute of Psychophysical Research,
reissued by Oxford Forum

ISBN 978 09536772 21 (hardback)

Fabian Tassano

The Power of Life or Death:
Medical Coercion and the Euthanasia Debate



A book which argues against medical paternalism and suggests that the increasing power given to doctors to give or withhold treatment represents a dangerous infringement of individual liberty.

"A terse, clear, incisive, intellectually first-class study of the growing power of doctors and of the lack of effective checks upon the too easily concealed but surely numerous abuses of that power."
Professor Antony Flew

"I would not recommend this book as comfortable bedtime reading. ...If you like an intellectual challenge this one is for you."
British Medical Journal

"His view goes straight to the medical jugular."
Nature

"Tassano presents hair-raising case studies ... his book is a timely polemic."
Literary Review

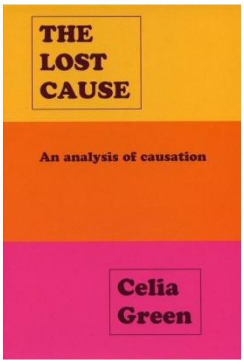
Duckworths, reissued by Oxford Forum

ISBN 978 09536772 07

Celia Green

The Lost Cause
Causation and the Mind-Body Problem

Foreword by Professor Howard Robinson



"Celia Green has succeeded in bringing together considerations from a wide range of disciplines: philosophy, obviously, but also psychology, neuroscience and fundamental physics, making skilful use of her own empirical investigations ... most impressive."
Dr Michael Lockwood, University of Oxford

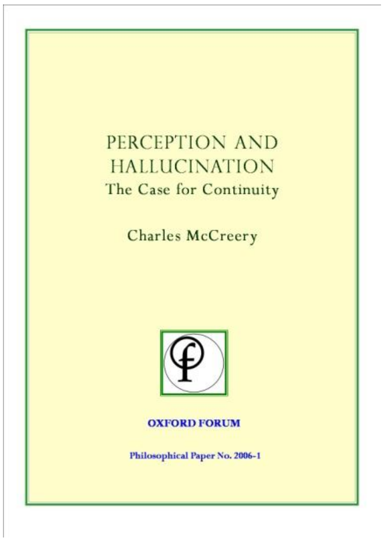
"A worthwhile reminder of the various problems which surround the physicalism which currently dominates the philosophy of mind ... Green does a good job of exposing the dogmatic underpinnings of current materialism, adherence to which makes mental causation seem deeply problematic."
The Human Nature Review

Oxford Forum

ISBN 978 09536772 14

Charles McCreery

Perception and Hallucination
The case for continuity



An analysis of empirical arguments for representationalism.

"I think the present paper is a very lucid and useful article … This is the best case I know of, of an attempt to make an empirical – as opposed to a 'philosophical' – argument against direct realism."
Howard Robinson
Professor of Philosophy, Central European University

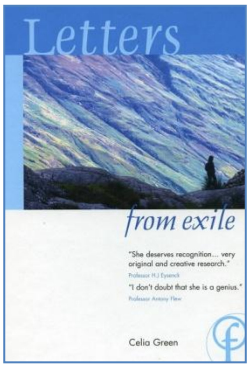
Oxford Forum

Price £4.95
32 pages

ISBN 978 09536772 76

Celia Green

Letters from Exile
Observations on a Culture in Decline



A collection of letters and essays written by Celia Green during the period 1990 to 1999, containing trenchant analyses of education, collectivised medicine, and modern ethics. The final section of the book introduces a provocative and original distinction between tribal and territorial morality.

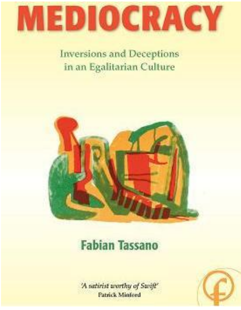
"I have no doubt she is a genius."
Professor Antony Flew

Oxford Forum

ISBN 978 09536772 38

Fabian Tassano

Mediocracy
Inversions and Deceptions in an Egalitarian Culture



A devil's dictionary for the twenty-first century, and a guide to analysing the ideology often hidden behind contemporary culture.

"A witty exposure of left wing foibles."
Sir Samuel Brittan

"A marvellous counterblast against the psychobabble emanating from the politically correct pseudo-intellectuals who now infest British academia."
Frederick Forsyth

"Delightfully dissects the language of modern egalitarianism and political correctness. Witty, biting and definitely not to be read by New Labour."
Professor Patrick Minford

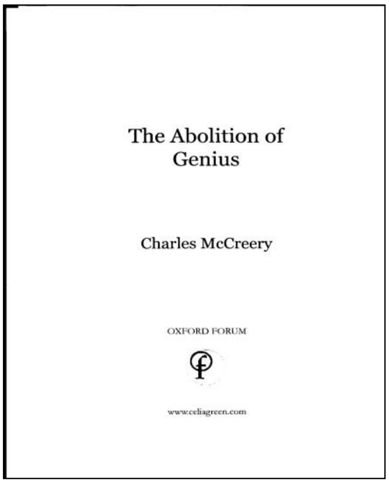
"Read this book and gain important insights into the way that the cultural elite's language works to disorient public debate."
Professor Frank Furedi

Oxford Forum
ISBN 978 09536772 69

Charles McCreery

The Abolition of Genius

Foreword by Professor H.J. Eysenck, PhD, DSc



An analysis of the relationship between genius and money. Dr McCreery puts forward the controversial thesis that the possession of a private income, either by the genius or by his or her patron, has been a necessary condition of the productivity of the great majority of geniuses throughout history.

"This is a courageous, well-argued and timely book …"
H.J. Eysenck

Oxford Forum

ISBN 978 09536772 69

Free online PDF at:

http://www.celiagreen.com/abolition6.pdf