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INDIVIDUAL DIFFERENCES PRACTICAL WORKBOOK:

A LECTURER'S GUIDE

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Introduction

Welcome to the Individual Differences Practical Workbook: A Lecturer's Guide. The last bit, the lecturers guide is the important bit. Here we have decided to reflect on some of the individual difference material we have been writing about over the last few years, and see whether we could provide some support to those teaching individual differences by suggesting some ideas and methods for carrying out practicals in Individual Differences.

Our main aim is to save you some time. We've both realised that if someone asked us tomorrow to run some practicals with an individual differences theme, we might be a little stuck. Therefore this workbook is for occasions such as those, and is an attempt to get you started on the sort of practicals you could do with students, centred on the many themes that can be studied in individual differences.

We have tried to write condensed and accessible accounts of possible practicals. We have not tried to be too directive so that you can build and adapt the material to suit your needs. Moreover, we tried to keep things simple. It would have been easy to suggest that you hook your 150 students to an EEG machine to measure arousal, but probably not the most useful to you. Therefore we have assumed that on most occasions you have large classes and very limited resources to run these practicals. If you have a range of better resources than we assume that is all well and good, you can employ them, but currently we feel it better to assume you are working on a limited budget.

We have tried to adopt a friendly tone, hopefully more so than patronising, and therefore we have tried to write a reflective rather than instructional piece, well aware we are talking to learned academics. However, we have also had to assume you know very little about the topic. To acknowledge these aspects, we have not gone into too much detail with concepts, but rather tried to use this workbook as a tool for generating ideas and saving you time. We then introduce the topic generally using heavily edited segments from our textbook and then use ideas and resources that are freely available to researchers.

We have relied heavily on our textbook because we feel a summary of the main issues that you can then read comprehensively in one resource at a later date will allow you, and students, to

consider things more carefully and with some focus, rather than refer you to a range of academic papers, some which you may not be able to get hold off. In a similar vein, we have also relied heavily on the International Personality Item Pool. If you've not heard of it, it's a free Internet resource (http://ipip.ori.org/ipip/) intended to provide rapid access to measures of individual differences. Consequently you can access a range of trait measures, including equivalent measures of all the main personality dimensions from a number of theories of personality.

So to the actual practicals. In all, we have developed 14 practicals (though sometimes there is more than 1 suggested method in a particular practical) that cover a spectrum of not only individual difference topics but also research methods and analysis. In terms of topics they are:

1. Personality Ratings
2. Trait versus State Behaviours
3. Family position, Birth order and Personality traits
4. Jungian Archetypes in Modern Culture
5. Introverts, Extraverts, Arousal and Lemon Juice
6. Animals and the Five Factor model of Personality
7. Personality and Culture
8. Heritability Estimates of Intelligence and Personality
9. Implicit Theories of Intelligence
10. Personality, Intelligence and Academic Achievement
11. Creativity: The 4 'p' s
12. Sex differences and Route Finding
13. Optimism and the Unsolvable Task
14. An Introduction to Psychometric Testing

We have presented each practical in a similar format. There is a summary (i.e. what is the main content covered in the practical), a brief summary of the literature and some sort of rationale for the practical. This latter section is less a statement of research aims, but more about our thinking about why this might be a good practical to cover. For some practicals this is just a simple re-run of an old experiment that we felt was particularly suitable for covering the topic, for other practicals we might suggest that there are research methods/analysis reasons for covering a particular area. We also outline a suggested method, detailing how and where materials can be obtained (and where we have

devised these we have included them with this pack) and a suggested analysis, in which we talk in broad terms about the particular approach that could be adopted. However, we would always suggest that you may want to adapt both the methods and analysis for your own purpose.

We have also included a dataset(s) for most of the practicals. We have only not done this when we thought a dataset would not be suitable. We thought developing datasets would be useful for two reasons. First you may not want to run the whole practical with your students and giving them a dataset to play with might be an useful option. This might help students with their independent learning, giving them an additional dataset to play with, allowing them to explore the hypotheses generated with a fairly clean dataset. Second, having these datasets may prove useful when students have missed the practical, or resitting the practical, and giving them a prepared dataset would perhaps make one's life a little easier in supporting the students on these occasions. Furthermore, to help you in this, we have, unless it seems redundant, a dataset that supported the alternative hypothesis and one that supports the null hypothesis. Of course you may want to play with the dataset itself to alter the findings or generate other variables, and by all means do so. It may also be a good idea for you to keep your datasets from year to year to build up a resource of datasets that you could use in future.

Finally we present for each practical, some suggestions for variations on the practical. We realise our initial idea might not suit your needs, or may be too simplistic, and therefore we have tried to think of other variations of the practicals that might be more appropriate for you. Again, there is no reason to suggest, that you can't extend the practicals in your own way or within your own critical framework. This latter point is important. When preparing this material we would have had no idea what the narrative of your lectures are, what constraints you are working within (lab space, class size, materials, number of weeks available to you), so you may have to alter this material to your own ends. Therefore we have kept the approaches and the material simple as a starting point and therefore please do use this material as the basis of your handouts if you so wish.

So finally to our underlying skills structure, the Skills Matrix on the next page outlines each of the practicals in terms of the research methods and analysis techniques they cover.

Skills Matrix

	Quantitative	Qualitative	Experimental/ Quasi-Experimental	Survey/Questionnaire	Thematic Analysis	Descriptive Statistics	Chi Square	Independent Groups t test	Dependent Groups t test	Correlation	ANOVA	MANOVA	Multiple Regression	Factor Analysis	Reliability	Validity
1. Personality Ratings	√	*		√	*	√										
2. Trait versus State Behaviours	√			√		√										
3. Family Position, Birth Order and Personality Traits	√			√				√			√					
4. Jungian Archetypes in Modern Culture		√			√											
5. Introverts, Extraverts, Arousal and Lemon Juice	√		√			√	√	√			√	√				
6. Animals and the Five Factor model of Personality	√			√		√		√	√	√	*				√	√
7. Personality and Culture	√		√	√					√	√					√	√
8. Heritability Estimates of Intelligence and Personality	√		*	√						√						
9. Implicit Theories of Intelligence	√	√		√	√	√								√		
10. Personality, Intelligence and Academic Achievement	√		√	√						√			√			
11. Creativity: The 4 ‘p’ s	√	√	√	√	√			√			√					
12. Sex Differences and Route Finding	√		√			√		√								
13. Optimism and the Unsolvable Task	√		√							√						
14. An Introduction to Psychometric Testing	√			√						√				√	√	√

(√ definitely evident, * a possible avenue is suggested or might be considered).

Practical 1

Personality Ratings

Summary: A practical in which participants answer and score themselves on key five factor domain and/or facet traits from the International Item Personality Pool.

1.1 Literature (From Chapter 7 of Maltby, Day and Macaskill, 2010).

Psychologists increasingly agree that five super traits may adequately describe the structure of personality. Costa and McCrae (1985, 1989, 1992, 1997) are arguably the most influential researchers in this area, and their factor solution has come to be called the Big Five Model. This approach requires large samples of participants to complete at least two personality questionnaires. The resultant data set is then factor-analysed to uncover clusters of traits. The consistent finding is the emergence of five factors or dimensions of personality.

These are the factors described by the American personality researchers Costa and McCrae (1992), who measured personality with their well-known Neuroticism, Extraversion, Openness Personality Inventory (NEO-PIR). The Big Five factors are Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. Details of each factor is below:

- **Openness** – This factor refers to the individual having an openness to new experiences. It includes the characteristics of showing intellectual curiosity, divergent thinking and a willingness to consider new ideas and an active imagination. Individuals scoring highly on openness are unconventional and independent thinkers. Individuals with low scores are more conventional and prefer the familiar to the new.

- **Conscientiousness** – This factor describes our degree of self-discipline and control. Individuals with high scores on this factor are determined, organised and plan for events in their lives. Individuals with low scores tend to be careless, easily distracted from their goals or tasks that they are undertaking and undependable. If you look closely at the trait descriptors included in conscientiousness, you will see that they are all attributes likely to become apparent in work situations. For this reason, they are sometimes referred to as the will to achieve or work dimension.
- **Extraversion** – This factor is a measure of the individual's sociability. Individuals who score highly on extraversion are very sociable, energetic, optimistic, friendly and assertive. Individuals with high scores are labelled extraverts. As with the Eysenck and Jung descriptions, individuals with low scores are labelled introverts. Introverts are described as being reserved, independent rather than followers socially, even-paced rather than sluggish in terms of their pace of work.
- **Agreeableness** – This factor relates very much to characteristics of the individual that are relevant for social interaction. Individuals with high scores are trusting, helpful, soft-hearted and sympathetic. Those with low scores are suspicious, antagonistic, unhelpful, sceptical and uncooperative.
- **Neuroticism** – This factor measures an individual's emotional stability and personal adjustment. Costa and McCrae (1992) suggest that although a range of emotions exists, individuals who score highly on one also rate highly on others. In psychological terms, the various emotional states are highly correlated. Thus, the individual who scores highly on neuroticism experiences wide swings in their mood and they are volatile in their emotions. Individuals with low scores on the neuroticism factor are calm, well adjusted and not prone to extreme maladaptive emotional states. (Indeed, in some 5-factor models of personality, this dimension is referred to as emotional stability.)

These are the five main dimensions popularly known as the Big Five. Within each of the main

dimensions there are more specific personality attributes that cluster together, and all contribute to the category score. These subordinate traits are sometimes called facets (Costa & McCrae, 1992). The Big Five model is a hierarchical model similar in concept to Eysenck's model. Each of the Big Five factors consists of six facets or subordinate traits. The facets included in the NEO-PIR (Costa & McCrae, 1992) are shown in Table 1.1 Thus, an individual's scores on the traits of fantasy, aesthetics, feelings, actions, ideas and values combine to produce their scores on the openness factor. The NEO-PIR then allows measurement at a general factor level or on more specific factors. Obviously, the more specific the measure, the greater the likelihood of using it to actually predict behaviour.

Table 1.1

The constituent facets of the Big Five factors.

Openness	**Conscientiousness**	**Extraversion**	**Agreeableness**	**Neuroticism**
Fantasy	Competence	Warmth	Trust	Anxiety
Aesthetics	Order	Gregariousness	Straightforwardness	Angry hostility
Feelings	Dutifulness	Assertiveness	Altruism	Depressions
Actions	Achievement striving	Activity	Compliance	Self-consciousness
Ideas	Self-discipline	Excitement seeking	Modesty	Impulsiveness
Values	Deliberation	Positive emotions	Tender-mindedness	Vulnerability

Source: Costa and McCrae (1985).

1.2 Rationale behind the Practical

This might provide a good introductory practical to get students into some of the simple rudiments of personality measurement. Many students seems to think that personality assessment involves some sort of categorization of personality types, but rather persons are often scored on a continuum across all personality dimensions. Therefore this practical introduces the five factor model of personality and how both the domains and the facets can be assessed. There would be no hypotheses per se, unless of course you were looking at demographics differences on some of the variables (e.g. see below under

possible variations). Therefore you will need to think about how this practical is pitched. This might be a suitable introductory practical, or a non-assessed practical, or a practical where you are focusing on the use of descriptive statistics.

1.3 Possible Method

A possible practical would involve the survey administration of either a measure of the five factor domains, or the five factor facets and domains (the latter covering both). As the Costa and McCrae (1992) versions of the factor measure are copyrighted you should use the International Personality Item Pool (http://ipip.ori.org/) measures (Goldberg, 1999; Goldberg et al. 2006) which are:

- Domains: http://ipip.ori.org/newNEODomainsKey.htm
- Facets and Domains: http://ipip.ori.org/newNEOFacetsKey.htm
- The scoring instructions for the scales are here: http://ipip.ori.org/newScoringInstructions.htm

1.4 Suggested Analysis.

As this is a simple practical there are only a few options available to you. However, one analysis is for students to independently compute and assess their own scores, simply comparing their scores on each of the domains. Of course you could do that at a class level, and compute the scores and profile the personality of the entire class. Of course this does not involve any significance testing. One thing you might be able to do is to compare correlations. For example, there generally should be significant correlations between the facet scales within each five factor domain, but not between the five factor domains from the prepared dataset (See Tables 1.2 and 1.3).

Table 1.2

Pearson Product Moment Correlations between the Extraversion facets

	1	2	3	4	5	6
1. Friendliness_ExtraversionFacet	1.000	.404**	.508**	.491**	.488**	.401**
2. Gregariousness_ExtraversionFacet		1.000	.311**	.319**	.336**	.243*
3. Assertiveness_ExtraversionFacet			1.000	.342**	.399**	.450**
4. ActivityLevel_ExtraversionFacet				1.000	.455**	.320**
5. ExcitementSeeking_ExtraversionFacet					1.000	.326**
6. Cheerfulness_ExtraversionFacet						1.000

*p < .05 ; ** p < .01

Table 1.3: Pearson Product Moment Correlations between the Five Factor domains.

	1	2	3	4	5
1. Neuroticism_Domain	1.000	.044	-.129	-.152	-.062
2. Extraversion_Domain		1.000	-.038	-.080	-.089
3. Openness_Domain			1.000	-.025	-.011
4. Agreeableness_Domain				1.000	.138
5. Conscientiousness_Domain					1.000

*p < .05 ; ** p < .01

1.5 Prepared Dataset (Practical 1.1 – Personality Ratings)

We have included a dataset of 96 respondents and their scores for the IPIP facets and domains (http://ipip.ori.org/newNEOFacetsKey.htm). We have included some demographic variables, sex/gender, age and degree course (business or nursing). In terms of general information about this dataset, there are as expected significant correlations between facet scales and no significant

correlations between the domains. Also, if you want to explore the *t* test statistic with students, you might want to compare five factor scores by demographic variables. Here there are no significant correlations for age or differences for sex. However, for degree type, nursing students score significantly higher than business students on the Agreeableness domain (and on trust, altruism and sympathy facets), while business students' score significantly higher than nursing students' on the Achievement-Striving facet of the Conscientiousness domain.

1.6 Possible Variations.

Though this is designed to be a simple practical, this practical could use the data administered to a large class and the practical might comprise the factor analysis of the responses to see if the five factor model emerges. You could extend this practical or amend the dataset to compare five factor model domains and facets by other demographic variables, however, we would warn about raising issues about differences between groups, particularly if students are completing the data.

Also you could visit the International Personality Item Pool (http://ipip.ori.org/) and devise a similar practical using other trait measures of behavior or personality model (e.g. leadership), however its worth remembering that the five factor model is a key model in personality. There is a more qualitative option you might explore with students. Get students to list as many attitudes and behaviours that they can think of and see whether you can theme them into the five factor model. This could be done as an individual, seminar group or class exercise. They may find it interesting to compare themselves to a fictional 'profile' of e.g. a clinical psychologist, or 'ideal' student or a criminal.

Also those who are looking for more opportunities to use statistics with this practical could use such data as a basis for teaching about scale transformation – e.g. raw score to Z score then to a T score. This sort of data can also be used to teach students about the standard error of measurement and standard error of difference too.

1.7 References.

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Practical 2

Trait versus State Behaviours

Summary: A diary study practical comparing the stability of traits versus state behaviours.

2.1 Literature Review (From Chapter 1 of Maltby, Day & Macaskill, 2010).

Psychological definitions of personality differ from lay definitions in that they define personality in terms of characteristics, or the qualities typical of that individual. Gordon Allport, a prominent early figure in personality psychology, popularised the term 'personality' and -provided a definition in 1961. He defined personality as 'a dynamic organisation, inside the person, of psychophysical systems that create the person's characteristic patterns of behaviour, thoughts and feelings' (Allport, 1961, p. 11).

Personality is conceptualised as being organised in some sort of internal structural system, and though there are many theories, the-*person's characteristic patterns* suggest that something relatively stable is being produced that becomes typical of that individual. The implied stability is important; without it, all attempts at measuring personality would be futile. *Behaviour, thoughts and feelings* refer to the fact that personality is a central component influencing, and being discernible in, a wide range of human experiences and activities.

Therefore, personality is perceived to be a relatively stable, enduring, important aspect of the self. People may act differently in different situations, but personality will have a major influence on their behaviour. For example, someone who is classified as being extravert will behave in a more outgoing fashion than a person who is introverted will, regardless of the social situation. The

differences in social behaviour between the two will be observable whether they are at a party or a funeral tea. Personality characteristics in this way are thought to exert a relatively consistent influence on behaviour in different situations. Personality characteristics in this way are enduring across different social contexts. While it is accepted that individuals can and do change over time, there is a contention that personality is relatively stable over time.

2.2 Rationale.

The main aim of this practical would be to clearly illustrate stability of trait personality variables against other state variables. However, another key idea you could use this practical for is to explore variability with students, particularly Standard Deviation.

2.3 Suggested Method

The method is a diary method where individuals would record their scores on a trait variable and a state variable over a period of time. In the dataset we have provided, we have used the 10-item Neuroticism trait measure from the International Personality Item Pool Database (Goldberg, 1999; Goldberg et al. 2006; http://ipip.ori.org/newNEODomainsKey.htm) and 10 negative affect items (irritable, distressed, ashamed, upset, nervous, guilty, scared, hostile, jittery, and afraid) from the 20-item PANAS scale (Watson, Clark & Tellegen, 1988). Full details on the extended version of the scale (see http://www.psychology.uiowa.edu/faculty/Clark/PANAS-X.pdf or http://www.psychology.uiowa.edu/Faculty/Watson/Watson.html). This similarly between the two scale presents a nice comparison because they are likely part of the same general domain (i.e. neuroticism) and also they have the same number of items and five point response formats, so the comparison seems equal. We would suggest over 4 days, but perhaps no longer than a week, but it all depends on the attention span of your class.

2.4 Suggested Analysis.

The idea is to show the variability over time of these two variables, with the variable trait expected to show low amount of variability and the state variable a greater degree of variability. What is

important is that the means of the variables may roughly stay the same if you're looking across a sample of people because scores will even themselves out, so the only way you might be able to show variability using scores on the scale if that students plotted their own scores across 5 days. So from this perspective this might make a good practical for getting students to do line graphs.

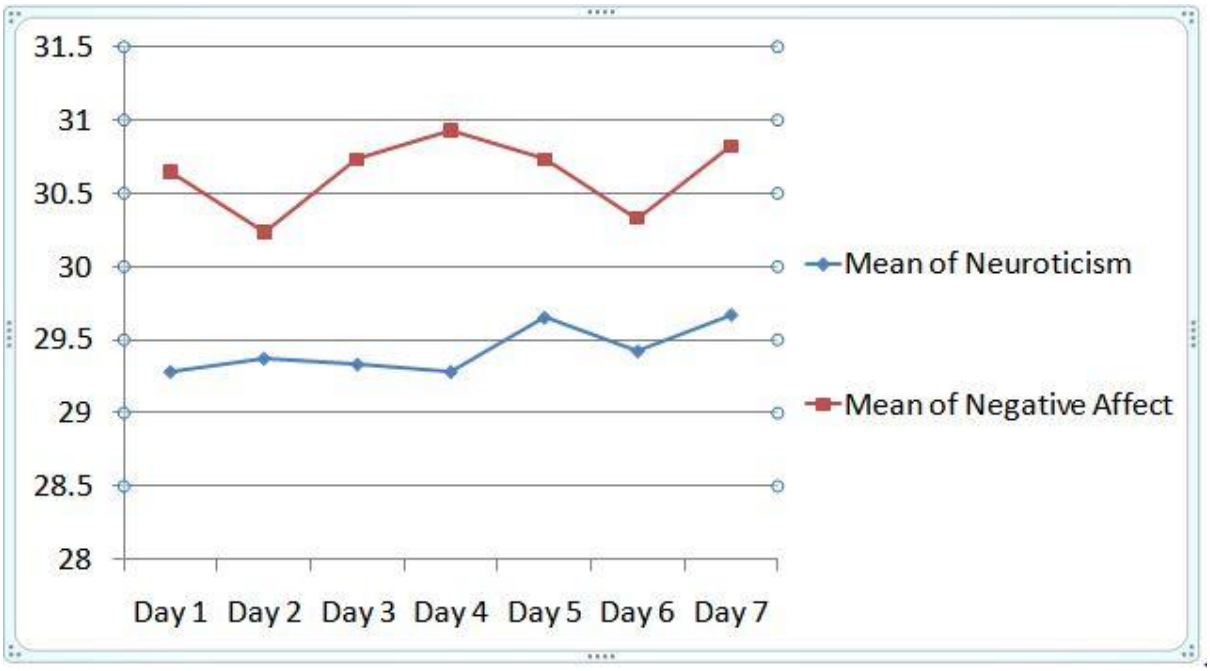
However if you have a sample then you will have to show variability via the amount to which scores change each day. This might cause a bit of a headache for students because it will involve dealing with changes in terms of both directions (i.e. negative and positive changes on different days). Therefore an easy way to illustrate this, but is rather crude, is to compute the changes as a score, and regardless of whether it is negative or positive, score it as positive, thereby higher scores represent a greater amount of change. Then what you can do is score average mean scores of change for the two variables (we have calculated such a variable with the data provided below). As we said this is crude. The best way, but it takes some explaining is to concentrate on the Standard Deviation (the extent to which a variable varies, with higher scores representing higher levels of variability). Again we have computed these variables in the dataset provided below.

2.5 Prepared Dataset (Practical 2.1 – Trait vs State)

The dataset details scores for a sample of 60 respondents of the Neuroticism and the 10 negative affect scales outlined above. The data was collect over a 7 day period, with scores for each variable for each day. The PANAS data is the first set of data, the Neuroticism data is the second set of data. The first set of variables are the scores, and you will be able to show that scores do not change across a sample over time because variability between scores will even themselves out over a sample (See Figure 2.1, we have also included this Figure in the pack).

Figure 2.1

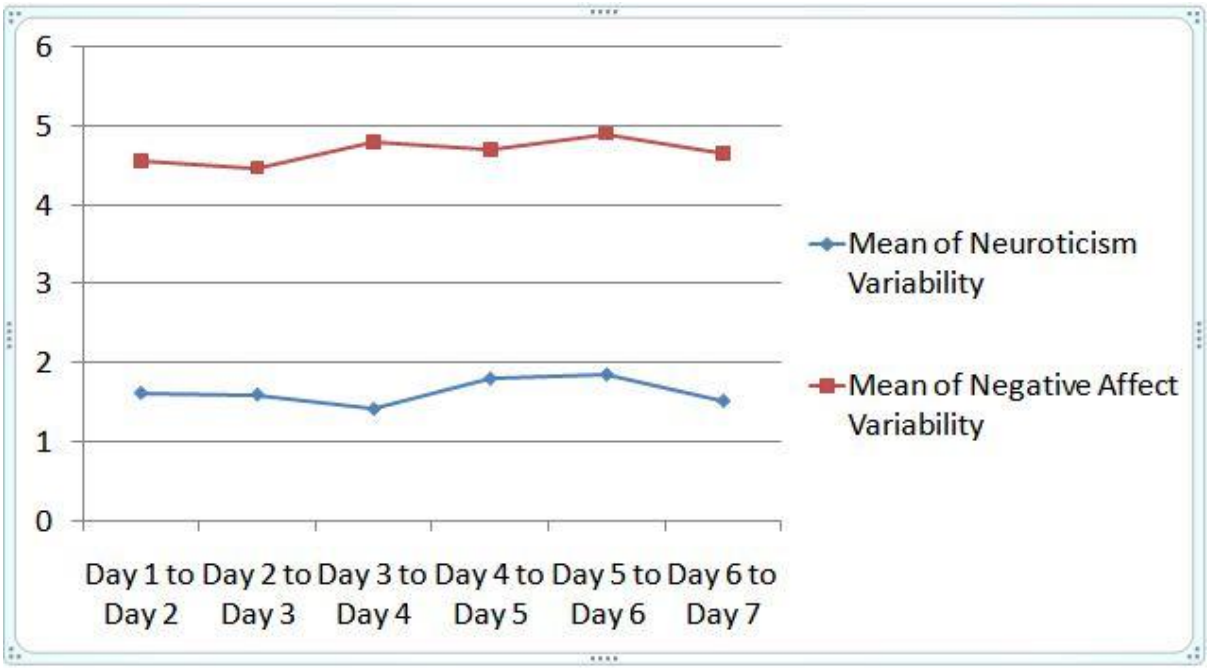
Plot of mean scores of Neuroticism and Negative Affect over 7 days.



Also included in this dataset are six data points for changes from day to day (i.e. Day 1 to Day 2, Day 2 to Day 3 etc etc). The values for the second set of variables (prefixed with Variability) are the extent that the score has changed from the previous day, regardless of whether it was positive or negative, and you should be able to plot means from these variables (See Figure 2.2, we have also included these Figures in the pack). You can see from Figure 2.2. the extent of the variability as calculated by average mean change is much higher for Negative Affect than it is for Neuroticism.

Figure 2.2

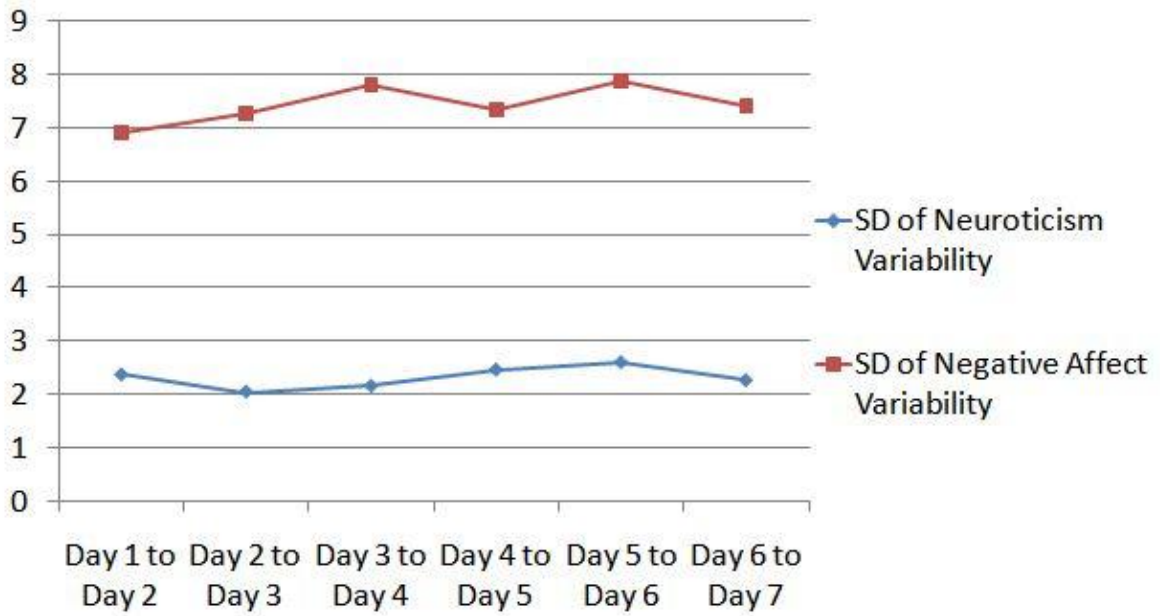
Plot of mean scores of Neuroticism and Negative Affect variability (negative and positive scores computed as a positive) over 7 days.



The previous calculation of variability is a rather crude calculation and really only meant for students who may have some difficulty in getting their heads around what variability actually is. The next set of scores are more satisfactory in terms of statistics teaching and are the Standard Deviation scores. These variables in the dataset are prefixed with Variability…… and suffixed with SD and can be used to show Standard Deviation by plotting the extent of variability of the variables by the use of Standard Deviation statistic (See Figure 2.3, we have also included this Figure in the pack). You can see from Figure 2.3. the extent of the variability as calculated by Standard Deviation is much higher for Negative Affect than it is for Neuroticism.

Figure 2.3

Plot of Standard Deviation scores of Neuroticism and Negative Affect variability over 7 days.



2.6 Possible Variations.

We used the 10 item IPIP neuroticism measure but there is a shorter 2 item measure contained within Gosling, Rentfrow, and Swann's (2003) 10-item measure of the Big Five (or Five-Factor Model) dimensions. Equally you might wish to shorten the PANAS items, but these shortening of measures might constrict the amount of variability. Equally, if there is no chance to do a diary study you might wish to get participants to answer the questionnaires within a number of real or imagined different situations (i.e. with your family, with your friends, out shopping, out with friends, in the morning, in the evening etc etc). You might then be able to test for differences between the variability of the trait/state variables by showing how these concepts change across the situations.

2.7 References

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Practical 3

Family position, Birth order and personality traits

Summary: This is a practical that explores birth order and its possible relationship to personality traits.

3.1. Literature (from Chapter 3, Maltby, Day and Macaskill, 2010).

A factor Adler (1927) emphasised was the effect of family position and birth order, claiming that it contributed significantly to the development of an individual's style of life. Each child is treated uniquely within the family depending on their order of birth. Adler was the first theorist to point out that the family is not experienced in the same way by every member within it. Family relationships change with each additional child. He suggested that how each new addition is handled is crucial. His views on birth order are summarised in Table 3.1.

3.2 Rationale

Aside from this being a neat little practical for 'testing' Adler's theory of birth order, this could be a nice simple practical that gets students into the idea of measuring traits without necessarily doing so within a particular model of personality. This would also be a particularly useful exercise as it could involve students engaging with Adler's theoretical descriptions of personality outcomes from birth order and then matching these descriptions with available empirical measures.

Table 3.1

Adler's description of personality characteristics by family position and birth order

Family position	**Description of personality characteristics**
Eldest children	These children are the centre of attention, but with the birth of a sibling they may become what Adler called the 'dethroned monarch'. This child best understands the importance of power and authority, having experienced it and then lost it. Adult characteristics: conservative, support authority, maintain the status quo, excel in intellectual activities and attain high levels of eminence.
Second children	These children are likely to view the elder child as a competitor to be overcome. Their development is highly dependent on how the elder child treated them. If the older child is supportive, then healthy development is more probable. However, if the older child is resentful, problems arise. Adult characteristics: demanding of themselves, sometimes setting unrealistically high goals to ensure their own failure, as then they did not run the risk of upsetting their older sibling.
Youngest children	Remains to some extent the baby of the family, getting most attention, pampering and spoiling by parents. Adult characteristics: high dependency needs, a great need to excel and a need for praise.
Only children	With no sibling rivals and no sibling models, these children are likely to be pampered, especially by the mother. Adult characteristics: have a high need for approval, have great difficulty handling criticism and dislike, intellectually able and high achievers.

3.3 Suggested Method

As the middle born is dependent on how the elder child treats them, and that the variations that might occur within the class of being a middle child, then your main aims could be to compare first-borns, with youngest children, with only children as a main hypothesis, though you could collect data on middle children at the same time, thereby involving all the class (or using middle children as a

potential control group of sorts). However, when preparing this practical you need to consider that most individuals tend to only have one sibling and therefore comparing first-borns with youngest children might be most straight-forward and most useful to you.

You might then compare people on some scales using scales from the International Personality Item Pool (Goldberg et al., 2006) http://ipip.ori.org/newIndexofScaleLabels.htm. Scoring instructions for all measures placed here (http://ipip.ori.org/newScoringInstructions.htm). We've listed some below that we've picked out that match Adler's descriptions (with the different possible scales in brackets), but you might find others (and more suitable ones).

First born

- Conservatism (TCI: ST4), (MPQ: TR), (6FPQ: ME1)
- Intellect (AB5C: V+/V+), (NEO: O5), (CPI: Ai), (Big-Five Domain), (Big-7: 525), (16PF: B)
- Intellectual Breadth (JPI: Bdi)
- Intellectual Complexity (JPI: Cpx)
- Intellectual Openness (6FPQ: OP)
- Stability (AB5C: IV+/IV+), (CPI: So), (HPI: Adj)
- Conformity (JPI: Cpr)

Youngest Children

- Dependence (TCI: RD4), (HEX: E-Depe)
- Achievement-striving (NEO: C4), (TCI: P3), (MPQ: AC), (6FPQ: IT1)

Only Children

- Achievement-striving (NEO: C4), (TCI: P3), (MPQ: AC), (6FPQ: IT1)
- Sensitivity (16PF: I)
- Intellect (AB5C: V+/V+), (NEO: O5), (CPI: Ai), (Big-Five Domain), (Big-7: 525), (16PF: B)

- Intellectual Breadth (JPI: Bdi)
- Intellectual Complexity (JPI: Cpx)
- Intellectual Openness (6FPQ: OP)

Clearly there are some overlaps, e.g. achievement striving for youngest and only children, but this suggests that these groups should score higher than first born children (and middle children if included). However, given all these overlaps and this might be a source of confusion for students, it may be simpler just to pick one or two scales and compare these across the different groups. You may decide that it could be up to the students to choose the scales they wish to use.

3.4. Possible Analysis

The analysis would involve some sort of comparison of means. Depending on the number of groups you have, you might be using independent t tests to compare two groups (i.e. first born and youngest children) or an ANOVA to compare more than one group (first born, youngest and only children).

3.5. Datasets (Practical 3.1 – Birth OrderH1, Practical 3.2 – Birth OrderH0, Practical 3.3 – Birth OrderH1and Practical 3.4 – Birth OrderH0)

We have included 4 datasets to accompany the practical. We have had kept these datasets simple for the purposes outlined above, comparing groups of children for one variable.

The first set of two datasets explore differences in scores for conservatism (we have used the 9 item ST4: CONSERVATISM scale from the IPIP) between eldest and youngest children with the suggestion that elder children should score higher on conservatism (with one dataset reporting a significant difference [Practical 3.1 – Birth OrderH1] and the other data supporting the null hypothesis Practical 3.2 – Birth OrderH0).

The second set of two datasets explore differences in scores for sensitivity between eldest, youngest and only children, with the suggestion that only children should score significantly higher on Sensitivity. Here we have used the 10-item SENSITIVITY (Factor I: Sensitivity) from the IPIP and we have provided one dataset supporting the alternative hypothesis Practical 3.3 – Birth OrderH1] and the other data supporting the null hypothesis [Practical 3.3 – Birth OrderH0].

3.6. Variations

The main variations would be to get the students to pick their own scales (http://ipip.ori.org/newIndexofScaleLabels.htm) or find ones outside the IPIP (for example, the Higher Education Academy list a number of Public Domain Tests via the Psychological Test Resource (http://www.psychology.heacademy.ac.uk/s.php?p=256&db=77) . Again if you want to explore these ideas in greater depth then there are some further ideas you might explore. For example, you might examine constructs for the middle child in relation to their self-reported treatment by their eldest sibling and see to what extent it is related to healthy/unhealthy development, such as being demanding of themselves or setting unrealistically high goals. Finally there is some work covered in Chapter 14 of the Maltby et al textbook on birth order, family size and intelligence and describes the work of Zajonc (e.g. Zajonc, 1976; Zajonc & Markus, 1975). This might provide a focus for expanding the practical.

3.7. References

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Zajonc, R. B. (1976). Family configuration and intelligence: Variations in scholastic aptitude scores parallel trends in family size and the spacing of children. *Science, 192*, 227–236.

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Practical 4

Jungian Archetypes in Modern Culture.

Summary: This is a practical that suggests using thematic analysis to explore Jungian Archetypes in Modern Culture, and specifically film.

4.1. Literature (from Chapter 3, Maltby, Day and Macaskill, 2010).

Archetypes are universal themes or symbols that lie with the collective unconscious in the psyche and under certain conditions may be projected onto our current experiences. Jung (e.g. 1964) suggested that the collective unconscious is innate. It is a repository of inherited instincts and what he termed archetypes or universal symbols or themes, going beyond personal experience. He suggested that we are born with fears of the unknown, fears of the dark, knowing about death and so on. He suggested that only some hereditary factor like the collective unconscious could adequately explain the phenomena. It is the stored memories of our human and even pre-human ancestry. No matter how unique each mind may be, Jung suggested that it still has striking similarities to other minds because of our shared collective unconscious. More significantly, he suggested that these innate ideas in our collective unconscious result in human beings as a species, tending to organise their worlds in innately predetermined ways. He stressed the similarities in organisational structures and ideas in what appear to be very different cultures. Jung (1959) called these universal ideas that we are born with archetypes.

Jung (1959) cites the concept of God as an archetype. He points out that in every culture,

when individuals are placed in threatening or ambiguous situations with a lot of stressful uncertainty, they respond by appealing to some form of all-powerful being or God. Jung (1964) described many other archetypes, and some examples are given in Table 4.1. Jung (1959) suggested that these archetypes exert their influence, not only in dreams and fantasies, but also in real-life situations. For example, a man may project his anima archetype onto his relationship with a woman. He may need to see her as the universal mother or the ultimate expression of caring femininity, regardless of how she actually is. This results in him perceiving her initially as he would wish her to be rather than as she is. When experience leads to his misperceptions being uncovered, the relationship breaks down. The same argument would hold for a woman projecting her animus onto a male. Other archetypes include the mother, the father, the child, the wise old man, the wife, the husband, the hero and many others.

Table 4.1

Examples of archetypes (Jung, 1954, 1964).

Archetype	Description
Persona	The mask or role that we adopt to help us deal with other people. It helps us to disguise our inner feelings and respond in socially appropriate ways to others. We have personas for all our roles. It is largely an adaptive function, but when used to extremes, it may result in stereotypical behaviour.
Shadow	The dark sinister side of our nature, consisting of repressed material in our personal unconscious and universal images of evil from our collective unconscious. We never truly know the shadow side of ourselves, as it is too frightening for us to explore our potential to do harm or to think evil thoughts. It is expressed in unexplained moods such as uncontrollable anger, psychosomatic pain and desires to harm others and ourselves. Example: Dr Jekyll (persona) and Mr Hyde (shadow).
Anima	The feminine element in the male psyche, consisting of inherited ideas of what constitutes woman, derived from man's experience of women throughout evolution and their experience of their mother, the prototype for their female relationships. It consists of feminine qualities – emotionality, sensitivity, irrationality, vanity and moodiness.
Animus	The male element within the female psyche, which is similarly primarily derived from women's evolutionary experience and their experience of their father. These archetypes help males and females understand each other better. The animus has masculine qualities – reason, logic and social insensitivity.
Self	The potential that we all have to achieve the unique individuality that is within us, like Adler's goal of perfection. We reach it through a process of **individuation**, which entails creating balance within the psyche and of coming to accept oneself as one really is (Jung, 1959).

4.2. Rationale

Jung's assertion is that archytpes should be evident in modern culture and therefore we could explore these in terms of example of modern story telling, specifically films. We have to perhaps ignore the potential tautology that Jungian psychology has been so influential that it has permiated into films and just use the theory as his basis to explore Jungian themes in films.

4.3. Suggested Method and Analysis

This is clearly a qualitative practical, and perhaps could be build around which particular thematic analysis you wish to teach the students. To some extent, it would be easy for us to identify certain films that contain or propose a clear Jungian theme. For example, Self individuation is explored in Shawshank Redemption (and Legally Blonde), Star Wars deals with the Father Archetype, and Superman, Batman, Hulk, Full Metal Jacket, and the Fugitive deal with the Shadow. Furthermore, Star Trek and 2001: Space Odyssey deal the concept of the Creator / God. It would be easy to go on. Instead for your purposes it might be better to choose one film and get students to explore the various Jungian archetypes based not only on the elements of Persona, Shadow, Anima, Animus and the Self, but also the Mother, Father, child, wise old man, the wife, husband, hero, self and traveller.

It is without a doubt that the film that shows elements of all of these archetypes is Shawshank Redemption (1994; Directed by Frank Darabont, UK Certificate 15). The only caveat is that there are scenes of violence in this. This is an excellent and popular film and would provide an interesting basis for a thematic analysis for students to test out their qualitative analysis skills. However, you or your students might want to choose your own films.

4.4. Variations.

Clearly variations might be around other pieces of work, for example great works of literature, however, these might be rather lengthy to consider. Also you might if you wanted to extend out the practical consider other psychoanalytic thinkers (Freud, Adler and Horney are all covered in the Maltby et al. book) and discuss how the themes of these authors also emerge in the film/literature you are discussing.

4.5. References

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Jung, C. G. (1959). *The archetypes and the collective unconscious*. Princeton, NJ: Princeton University Press.

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Practical 5

Introverts, Extraverts, Arousal and Lemon Juice.

Summary: The practical suggests two experiments that examines Eysenck's theory of ascending reticular activating system, arousal and extraversion-introversion using the classic lemon juice experiment and task orientation.

5.1. Literature (from Chapter 8 of Maltby, Day & Macaskill, 2010).

Eysenck (1967, 1990) proposes that extraversion–introversion personality traits are related with the arousal of the reticulo-cortical circuit (incoming stimuli), and that extraverts' and introverts' Ascending Reticular Activating Systems (ARAS) operate in different ways, particularly when aroused. Eysenck explained that an introvert would have an ARAS that provides a lot of arousal, while an extravert would have an ARAS that does not provide a lot of arousal. Though this seems the opposite way to what one might expect, Eysenck explains that when an individual's ARAS continually makes them overly aroused, they will then attempt to avoid stimulation because they already have a lot of it. Consequently, this person will be introverted because they will avoid stimulation and exciting situations. On the other hand, when an individual's ARAS continually makes them under-aroused, they will seek stimulation. This person will be extraverted because they will always be seeking stimulation and exciting situations.

A classic example is the Lemon Juice demonstration (Corcoran, 1964). Here the experimenter ties a thread to the centre of a double-tipped cotton bud, the experimenter holds the thread which is tied to the cotton bud and the bud should hang perfectly horizontal. The participant swallows three times and then the experimenter puts one end of the swab on the participant's tongue for 30 seconds. The experimenter then places four drops of lemon juice on the tongue, and after the participant swallows

again the person places the other end of the double-tipped cotton bud on the same portion of tongue for a further 30 seconds. When removing it the double-tipped cotton bud will remain horizontal for extraverts, hang down on the lemon juice end for introverts.

The latter finding of the cotton bud hanging down for introverts is due to a relatively large amount of saliva produced in response to the lemon juice. It is a classic experiment and other empirical examination of Eysenck's theory using more sophisticated technology suggest conflicting results (see Chapter 8 of Maltby et al. 2010 for more information). Nonetheless this is a well-known and simple experiment.

Another well-cited experiment by Russell Geen (1984). Geen had two experimental groups, introverts and extraverts. He asked each group to choose the appropriate noise levels of some music to listen to while they were asked to do a difficult and boring task. As predicted, extraverts chose higher levels of music to listen to when working than introverts did. Geen found that both groups completed the task well under these chosen conditions. However, then he switched around the music level for the groups, so that introverts listened to the higher music level while working and extraverts listened to the lower levels of music while working. Under these conditions, extraverts very quickly got bored with the task while the introverts got upset, and both groups' performance at the task worsened.

5.2. Rationale

We are going to suggest you could use either of two experiments based on the Corcoran (1964) and Geen (1984) experiments described above.

5.3. Experiment 1: Cotton Bud and Lemon Juice Experiment.

5.3.1. Method and Analysis.

First of all you need a measure of Extraversion to facilitate high and low Extraversion groups. Eysenck's measures of Extraversion are not in the public domain (though a short measure is provided by Francis Brown, & Philipchalk,, 1992). However, the extraversion measure for Eysenck is found to

be highly correlated with the International Personality Item Pool measure of Extraversion (Goldberg et al., 2006; http://ipip.ori.org/newNEODomainsKey.htm), so the IPIP measure would do just as well. Therefore all participants would complete this measure and well as the procedure outlined above, but outlined step by step below

- The experimenter ties a thread to the centre of a double-tipped cotton bud, the experimenter holds the thread which is tied to the cotton bud so the bud hangs perfectly horizontal
- The participant swallows three times and then the experimenter puts one end of the swab on the participant's tongue for 30 seconds.
- The experimenter then places four drops of lemon juice on the tongue, and after the participant swallows again the person places the other end of the double-tipped cotton bud on the same portion of tongue for a further 30 seconds.
- When removing it the double-tipped cotton bud the experimenter will record whether the cotton bud remains horizontal or hangs down at the lemon juice end.

In terms of analysis, participants will need to be allocated as either introverts or extraverts. How you do this might be arbitrary. If participant numbers are small you might have to do it around the theoretical median split (scores above and below a score of 30 on the IPIP Extraversion measure). However, if you have larger number of participants, you might want to take the top 5%, 10%, or 15% of respondents either side of your distribution of scores. You would then perform a 2 by 2 chi-square for the two groups, introverts and extraverts and whether the cotton bud hanged down or not.

5.4. Experiment 2: Music, Levels and Tasks.

5.4.1. Method and Analysis.

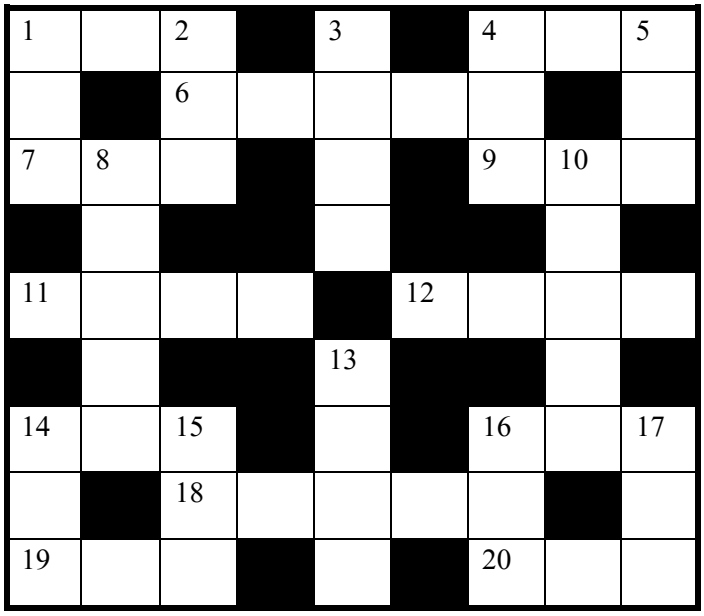
This study is perhaps best carried out in a laboratory, to ensure the methodology remains consistent. Again you need a measure of Extraversion to facilitate high and low Extraversion groups and the Extraversion measure from the International Personality Item Pool measure of Extraversion is suitable (Extraversion,Goldberg et al., 2006; http://ipip.ori.org/newNEODomainsKey.htm). Also Geen's

method will require a task which is long and boring. In Figure 5.1. we have presented a task, and the answer to this task, alongside a number of others are provided in the accompanying document (Practical 5 Puzzles.doc).

Figure 5.1.

Puzzle: Number-cross

Answer the clues just like a normal crossword, only using numbers instead of words. You can use a calculator if you wish.



ACROSS

1. Subtract 11 from a dozen score.
4. Add 360 to 318.
1. Add the cube of 34 to the square of 52, Subtract 6.
7. Treble 199, subtract 199.
9. Multiply the cube of 3 by 11.
11. Add the square of 87 to the cube of 6.
12. Double 4975, subtract 80.
14. Square of 29.
16. Average of 590, 626, and 716.

DOWN

1. Continue the sequence: 2184, 1092, 546, ---.
2. Subtract 13 from the square of 31.
3. 12342 divided by the square root of 36.
4. Subtract 219 from 841.
5. Add 158 to the square of 27.
8. Add 36821 to 55893.
10. Add 38466 to 61238.
13. Add 3579 to 3398.
14. Multiply 189 by 5, subtract a fifth of 355.
15. Divide 39483 by 321, and add 1.

18. Add the cube of 27 to the square of 84.
19. Divide 8228 by 17.
20. Multiply the product of 4 and 9 by 7.
16. Divide 204832 by 296.
17. Square 22, subtract 2.

In following Geen's experiment any of the following variations could be used

- Asking participants to choose the appropriate noise levels of some music to listen to while they were asked to do the task. Respondents could select the level via a dial on the stereo, with perhaps off being scored as 0. This would lead to an analysis strategy of using an independent group t test to compare mean level scores.
- You could ask participants whether they want music on or off while doing the task? This would lead to an analysis strategy of using the chi-square test to compare extraverts and introverts on whether they had the music on or off.
- Or you could take a group of extraverts or introverts, and these could be allocated into two groups where music is either played or not played, with extraverts and introverts balanced for each condition. The experimenters could then measure how long each participant then spends on the task. This would lead to a 2 x 2 group factorial MANOVA analysis comparing mean effects for the two conditions (introverts/extraverts and music and no music) for length spent on the task.

5.5. Datasets

We have provided 8 datasets that could be explored (Practical 5.1 – Lemon JuiceH0 to Practical 5.8 – MusicTaskH1).

- Two datasets relating to Experiment 1 (lemon juice) that explore the relationships between a group split between introverts and extraverts (with their scores on an extraversion measure) and whether the cotton bud hanged down or not. One of these datasets accepts the null hypothesis (Practical 5.1 – Lemon JuiceH0), while the other accepts the alternative hypothesis (Practical 5.2 – Lemon JuiceH1).

- Two datasets relating to Experiment 2 (music task) that explore the relationship between a group split between introverts and extraverts (with their scores on an extraversion measure) and whether they turned the music on or off when completing a task. Again, one of these datasets accepts the null hypothesis (Practical 5.3 –MusicTaskH0), while the other accepts the alternative hypothesis (Practical 5.4 –MusicTaskH1).
- Two datasets relating to Experiment 2 (music task) that explore the relationship between a group split between introverts and extraverts (with their scores on an extraversion measure) and the level they set the music at (scored 0 to 10 on a volume dial) when completing a task. Again, one of these datasets accepts the null hypothesis (Practical 5.5 –MusicTaskH0), while the other accepts the alternative hypothesis (Practical 5.6 –MusicTaskH1).
- Two dataset relating to Experiment 2 (music task) that detail a group comprising extraverts and introverts (with their scores on an extraversion measure), and these groups counterbalanced into two groups where music is either played or not played, and resulting time spent on a task. Again, one of these datasets accepts the null hypothesis (Practical 5.8 –MusicTaskH0), while the other accepts the alternative hypothesis, with an interaction between the two group conditions (Practical 5.8 –MusicTaskH1).

5.6. References

Corcoran, D.W.J. (1964). The relation between introversion and salivation. *American Journal of Psychology*, **77**, 298–300.

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Practical 6

Animals and the Five Factor model of Personality

Summary: This practical explores the concepts of reliability and validity constructs around the notion that one can assess non-human animal personality within the five factor model of personality.

6.1. Literature (from Chapter 9 of Maltby, Day & Macaskill, 2010).

So how accurate are tests of animal personality? Well, if we were to treat these measures like any other measure, we would judge them by two criteria:

- reliability, of which there are two forms: internal reliability and reliability over time (test retest reliability)
- validity; which is concerned with assessing whether the test measures what it claims to measure.

6.1.1. Reliability of animal personality rating.

Gosling (2001) presents an overview of a number of studies that deal with the issues of internal reliability and reliability over time in animal personality studies. Internal reliability refers to whether all the items used in the measure are measuring the same concept. Therefore, we would expect items of the same measure to be positively correlated with each other. Gosling states that there are ways of establishing internal reliability in animal personality studies, for example, *Inter-observer agreement* – the extent to which two or more observers agree in their personality rating between a number of animals or *Within subject reliability* – the extent to which two or more observers agree in their personality rating for one animal, for example, is that animal more one type of personality than

another personality. An indicator of observer agreement is usually a correlation. There is evidence that both forms of reliability occur in animal personality studies (Gosling, 2001). For example, for inter-observer studies, three studies (Crawford, 1938; Hebb, 1949; King & Figueredo, 1997) have found acceptable levels of inter-observer agreement in measuring dominance (observer correlation = .70), friendliness (observer correlation = .90) and dominance among chimpanzees (observer correlation = .61).

Test-restest reliability assesses reliability over time, so for example we might hope that two personality ratings for the same animal would be correlated on two or more occasions. This would also suggest some reliability in assessment of personality because on two separate occasions a similar personality assessment was given. Again, there does seem to be evidence for this type of reliability. Crawford (1938) found a correlation statistic of .71 for confidence and .81 for cheerfulness for chimpanzees over a four-week period. Stevenson-Hinde (1980a; 1980b) found that three personality traits in rhesus monkeys – excitability, sociability and confidence – were found to be consistent (above r = .7) over four years of observation, even though different raters were used at different times.

6.1.2. Validity of animal personality ratings

You will remember that validity is concerned with whether the test is measuring what we claim it is measuring. There is evidence to suggest that animal personality ratings do show validity.

- Capitanio (1999) tested the validity of animal personality measures on 42 rhesus monkeys and found that ratings of sociability were found to be negatively associated with antagonistic behaviour three years later.
- Gosling (1998) found that female hyenas scored higher on an assertiveness dimension than male hyenas. This finding is consistent because hyenas live in a matriarchal society (where females rule the family).
- Feaver Mendl and Bateson(1986) found that cats who had been rated as aggressive previously spent more time in conflict situations (hitting or chasing) than other cats that had been previously

rated as not aggressive.

- Stevenson-Hinde (1983) found that monkeys who had been rated as confident were correlated to the amount of time they spent outside the reach of their mother.

6.2. Rationale

One important aspect of Gosling's work has been the finding that core personality dimensions among animals are similar to those of core personality dimensions that have been found among humans. A huge number of traits, species and methods are used to study animal personality. Gosling and John (1999) suggest that the five-factor model of personality might provide an adequate context to consider animal personality. The current practical whether animals can be rated and understood within the five factor model of personality. This study would allow students to consider the concepts of reliability and validity of the rating of personality of animals.

6.3. Suggested Method

The Practical would be for pairs of students to observe a chosen animal. It might be a good idea for the class to agree types of animals that might be assessed. Such a study would involve using the 50-item International Item Personality Pool Five Factor Personality Measure of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness (Goldberg et al., 2006; http://ipip.ori.org/newNEODomainsKey.htm). These five subscales each comprise 10 items to measure the five main personality domains. Items are scored on 5-point Likert scale, anchors ranging from 1 = Very Inaccurate to 5 = Very Accurate (http://ipip.ori.org/newScoringInstructions.htm). Both raters would be asked to score the animal on this scale, thereby creating data for inter-rater reliability, and on two occasions, thereby creating data for test-retest reliability.

In terms of validity you will have to explore certain validity constructs depending on the animals you are looking at. One way would be to follow the studies that explore validity within each species and develop objective validity tests of constructs (e.g. to investigate ideas of agreeableness you might get an independent assessment of how much time the animals spent in conflict situations on

another occasion). However, you may be able to develop some validity criteria based on different species, depending on those you chose, for example, dogs may be described as more aggressive than goldfish.

6.4. Suggested Analysis

There are a number of reliability aspects that could be considered. Correlation coefficients can be used across the class to test inter-rater reliability and test-retest reliability across pairs of data (i.e. Raters 1 and 2/Time 1 and Time 2). You may wish to use dependent groups/paired samples t test to explore whether ratings are significantly different from Time 1 to Time 2 if that is a preferred strategy of yours, but we would recommend the correlation and report it as test-retest reliability. You might want to extend internal reliability estimates and see to what extent internal reliability occurs for the different scales. For example, internal reliability estimates for the 10 neuroticism items for each domain by species, would examine whether these constructs are reliable within these different species. However, you may wish to avoid this type of analysis on this occasion so not to over complicate the practical. In terms of validity, the analysis would depend on the criteria you've devised, but would either involve examining constructs within species or across species.

6.5. Dataset (Dataset 6.1)

We've included a dataset (Dataset 6.1) of five factor personality ratings for 5 species of animals (Giraffe, Elephant, Chimpanzee, Wolf and Penguin) with 10 members per species. Within this dataset we have included the rating for two raters for two animals on two occasions. Now you may not wish to use the ratings for both occasions, but we have computed the average score across the two raters for each occasion (Average____RatingTime1 and Average____RatingTime2). We have also to that end, computed the average scores across the two raters, across the two occasions (Average____Rating). We've also included three validity criteria for all the animals that supposedly reports behaviour recorded on a different occasion and by different persons.

- how many approaches did the animal make to initiate contact within an one hour period (this is positively correlated with extraversion),

- how many conflicts did the animal initiate during a 1 hour period (this shares a negative correlation with agreeableness)
- how many minutes did they spend carrying out 'work' (e.g. looking after their young, building a nest, and hunting) during a 5 hour period (this is positively correlated with conscientiousness).

Table 6.1 shows the mean scores for the five factor domains by each of the animal species.

Table 6.1

Mean and Standard Deviation scores for the five factor domains by each of the animal species

	Giraffe		Elephant		Chimpanzee		Wolf		Penguin	
Personality Dimension	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Neuroticism	27.38	5.1	27.95	6.8	30.93	5.2	28.96	6.3	33.38	5.5
Extraversion	36.30	4.8	35.20	4.5	37.75	7.0	34.00	4.5	35.57	6.8
Openness	36.45	7.0	36.30	6.0	37.05	6.1	37.33	5.0	36.82	5.6
Agreeableness	39.05	8.0	34.45	9.0	35.70	9.7	27.92	7.5	32.29	10.0
Conscientiousness	42.05	5.3	39.10	5.8	34.10	7.1	41.08	5.4	38.68	3.0

6.6. Variations

There are some variations to this practical. Of course there is no need to simply use the five factor personality domains, this could be extended, to include the facets of the five factor personality model; thereby providing a more detailed description, or any personality model or trait measures. The biological models of Eysenck, Gray or Cloninger (detailed in Chapter 8 of Maltby et al, 2010) seem particularly apt here. All personality models and measures can be found here on the International Personality Item Pool (http://ipip.ori.org/ipip/) with multiple personality models being placed here (http://ipip.ori.org/newMultipleconstructs.htm) and single constructs listed here (http://ipip.ori.org/newSingleconstructs.htm). Scoring instructions for all measures placed here

(http://ipip.ori.org/newScoringInstructions.htm). Of course if you've got the enthusiasm, you could use this practical to invent the first individual difference field trip and carry these observations out at the Zoo. The last suggestion is a little tongue in cheek, put perhaps a film or documentary regarding different animals that students could observe might serve the same purpose.

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Practical 7

Personality and Culture.

Summary: This is a neat little practical that looks at Personality and Culture by looking at perceptions and assessments of five factor model of personality among populations.

7.1. Literature (from Chapter 10, Maltby, Day & Macaskill, 2010**)**

Robert R. McCrae and Antonio Terracciano explored whether perceptions of a nation's national character fitted the personality of individuals within that nation. (McCrae & Terracciano, 2006). To explore the national character, McCrae and Terracciano used the personality characteristics of the five factor model.

This research went through two stages. The first stage was to measure individuals' perceptions of their own national character, For example, Australian people's perceptions of the Australian national character or Spanish people's perceptions of the Spanish national character. The second stage was to then compare these perceptions to individual participant's view of their own personality. To complete the first stage, the authors used the National Character Survey. The National Character Survey is a measure developed by Terracciano that asks respondents to make judgments about a hypothetical ''typical'' member of a culture. It consists of a set of 30 bipolar scales intended to parallel the 30 facets (that then comprise the five factors, 6 facets each) of the main measure of the five factor model of personality. For example, a U.K. respondent taking the test would be asked "How extraverted is the typical U.K. person". The authors then also administered the NEO-PI-R (a measure of the five factors of personality) to individuals as well. Therefore the researchers had a measure of an

individual impression of the national character that could be understood within the five factor personality traits, and an actual measure of each individual's personality within the five factor personality traits. So our U.K. respondent mentioned above would be asked to fill in NEO-PI-R themselves.

Data was analysed from over 4000 individuals from 49 countries (including Argentina, Australia, Brazil, Canada, China, U.K, Germany, France, Spain, Italy, India, New Zealand, Russia and the U.S.A) crossing six continents, with the scale translated into different languages when necessary. Terracciano and his colleagues then compared the data from the National Character Survey with the NEO-PI-R personality inventory for each individual country. Figure 7.1 shows the average correlation between the dimensions that could be gained from the National Character Survey and NEO-PI-R. There were some significant relationships between the National Character Survey and NEO-PI-R, for example there are medium to large sized significant positive correlations in Polish, Lebanese and Australian samples, and medium to large sized significant negative correlations in English, Denmark and Belgium samples. However, across the large majority of the samples, the correlations were low. If you average out the correlations across these samples, the average correlation is $r = -0.02$. What this means is that personality profiles for individuals generally do not resemble profiles for what they believe to be typical culture members.

Figure 7.1.

Mean Correlations (averaged across the five factors) between the five factors of personality and the National Character Survey (from McCrae & Terracciano, 2006)

Country	Mean Correlations between National Character Survey and the NEO-PI-R	Country	Mean Correlations between National Character Survey and the NEO-PI-R	Country	Mean Correlations between National Character Survey and the NEO-PI-R
Argentina	-08	Hong Kong	.29	Portugal	-.01
Australia	.38*	Iceland	-.06	Puerto Rico	.10
Belgium	-.45*	India	-.06	Russia	-.35*
Botswana	-.11	Indonesia	.06	Serbia	.08
Brazil	.00	Italy	.05	Slovakia	.14
Burkina Faso	-.16	Japan	.05	Slovenia	.25
Canada	-.03	Kuwait	-.07	South Korea	-.09
Chile	-.33	Lebanon	.39*	Spain	-.10
China	-.02	Malaysia	.13	Switzerland	.06
Croatia	-.16	Malta	.25	Switzerland	-.29
Czech Republic	-.16	Morocco	.25	Turkey	.00
Denmark	-.40*	New Zealand	.36*	Uganda	.28
Estonia	-.10	Nigeria	-.12	UK: England	-.57**
Ethiopia	-.09	Peru	.13	UK: N. Ireland	.29
France	.27	Philippines	.14	United States	.23
Germany	-.04	Poland	.40*		

What McCrae and Terracciano are keen to point out is that national character studies show reliability but not validity in terms of national character. Reliability regards consistency between the different aspects of any measurement, be it items of a questionnaire or different people rating certain behaviours, while validity refers to whether the phenomena you are measuring is accurate. That is, that individuals in many cultures are consistent in terms of identifying a national character for their own country (i.e. they are reliable) however these national characters bear no relation to the actual personality types of individuals within these countries (they are not valid).

7.2. Rationale

This is a neat little practical that looks at Personality and Culture using a methodology that links straight into the five factor model of personality. Also this study gets students using the concepts of reliability and validity outside the realms of psychometric test development.

7.3. Suggested Method

It would be easy to explore U.K. culture and personality, but this might prove problematic particularly if you have overseas students. So how about personality of psychology students? Or, students in your faculty or university if your class doesn't simply comprise of psychology students. Though you may feel the last group might provide too wide a consideration, and you may have to devise another common prefix.

Such a study would involve administering the *Five Factor Model of Personality* which is assessed via the 50-item International Item Personality Pool Five Factor Personality Measure of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness (Goldberg et al., 2006; http://ipip.ori.org/newNEODomainsKey.htm). These five subscales each comprise 10 items to measure the five main personality domains. Items are scored on 5-point Likert scale, anchors ranging from 1 = Very Inaccurate to 5 = Very Accurate (http://ipip.ori.org/newScoringInstructions.htm). The scale needs to be administered twice. On the first occasion respondents fill it answering the items as they pertain to them. They then fill it in a second time for their imagined 'typical' student (be it psychology, or university based).

7.4. Suggested Analysis

The suggested analysis follows that of McCrae and Terracciano (2006) in which the first stage is to perform reliability analysis on responses for each personality for each set of responses. In terms of the set of responses for the 'typical' or student it is important to perform internal reliability analysis (i.e. Cronbach's alpha) for each of the personality domains. This suggests the reliability for the construct as scores are converging together across the group. By the same token and for reason for completeness, it would be necessary to compute reliability statistics for self-rated responses.

The next stage is to examine the validity. Here you will simply use Pearson Product moment correlation coefficients to compare students own scores on the five personality domains with those

corresponding ratings for the 'typical student'. Clearly positive correlations between corresponding domains would indicate some levels of validity.

Finally you might wish to explore where differences may occur between the rating (i.e. do students rate the typical student as more agreeable than they themselves actually are). Here you would perform a series of dependent groups/paired samples *t* tests for each personality domain.

7.5. Dataset (Practical 7.1 - SigCorrelations and Practical 7.2 - NonSigCorrelations).

We have provided two datasets to accompany the above study that contains rating for a self and 'typical' (prefixed FFSF) for the five factor model for both items and final scale scores. However, in essence it could be for any scenario of your choosing (e.g. rating for any population, sample). For both datasets the ratings are reliable (it seemed pointless to provide an unreliable dataset). However, for one dataset there are significant positive correlations between the corresponding domains (Practical 7.1 - SigCorrelations), while for the other there are no significant positive correlations between the corresponding domains, with conscientiousness showing a small negative correlation between corresponding scores providing students something to discuss in their write-up (Practical 7.2 - NonSigCorrelations).

7.6. Variations.

Of course there is no need to simply use the five factor personality domains; this could be extended to include the facets of the five factor personality model, thereby providing a more detailed description, or any personality model or trait measures. All personality models and measures can be found here on the International Personality Item Pool (http://ipip.ori.org/ipip/) with multiple constructs being placed here (http://ipip.ori.org/newMultipleconstructs.htm) and single constructs listed here (http://ipip.ori.org/newSingleconstructs.htm). Scoring instructions for all measures placed here (http://ipip.ori.org/newScoringInstructions.htm).

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Practical 8

Heritability estimates of Intelligence and Personality

Summary: Explores material relating to Heritability Estimates of Intelligence and Personality with two prepared datasets.

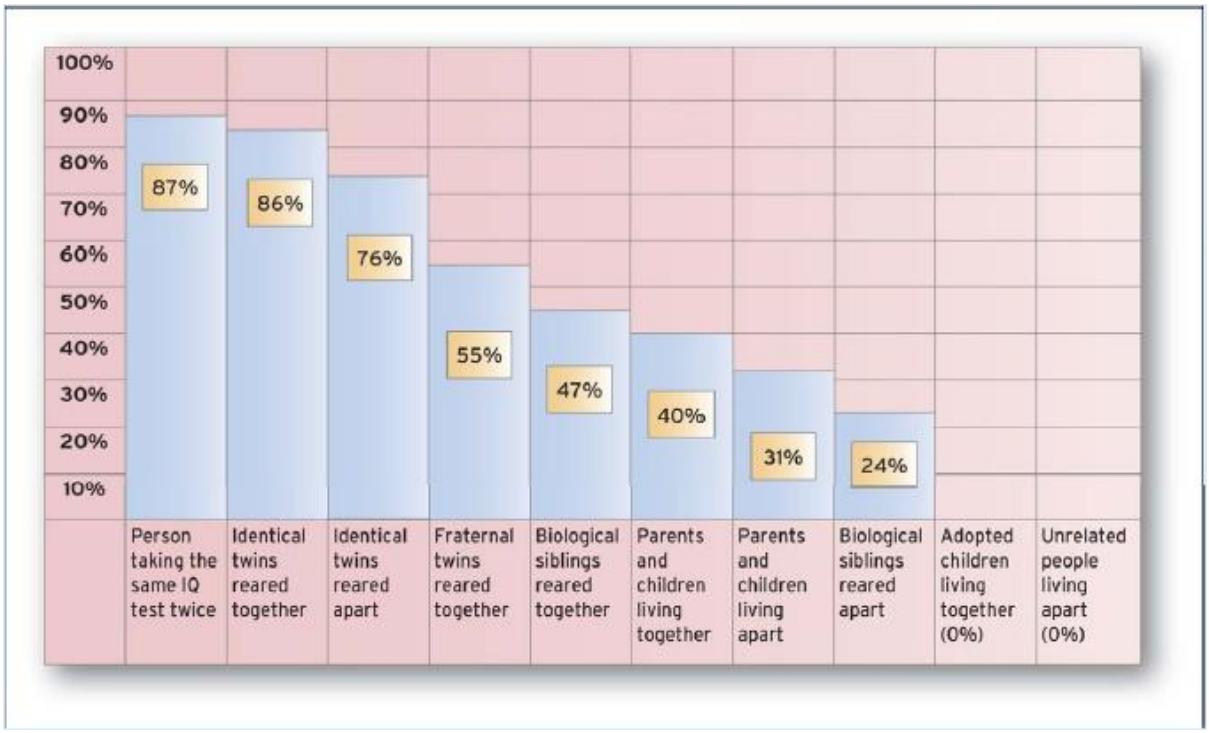
8.1. Literature (from Chapters 8 and 14 of Maltby, Day & Macaskill, 2010).

There is material in the individual difference literature relating to heritability estimates of individual difference variables, namely intelligence and personality. This literature deals substantially with definitions of heritability and methods for assessing genetic heritability.

However, key to this area is heritability estimates of individual variables, and two key factors here to consider are intelligence and personality. For example, there have been a number of findings from Bouchard's Minnesota Study of Twins Reared Apart (overseen by US behavioural geneticist Thomas Bouchard). This research involves not only the medical and psychological assessment of identical (monozygotic) and fraternal (dizygotic) twins separated early in life and reared apart, on which figures are given, but also their intelligence. A well-cited documentation of these studies was provided by behavioural geneticist journalist Matt Ridley (Ridley, 1999). Ridley put together all the modern family, twin and adoption studies, which mainly included the findings of Bouchard and McGues' meta-analysis of 111 studies (Bouchard & McGue, 1981). The following analysis by Ridley (1999) is the concordance rate of IQ (the presence of the same intelligence level between two individuals) from all these studies (with the concordance rate given by Bouchard and McGue's meta-analysis)

Figure 8.1

Concordence rates of intelligence scores taken from Ridley (1999).



Evidence such as this, coming from studies throughout the century, was consistent, and researchers were able to make estimates on the level of genetic heritability of intelligence. You can see from evidence like this how people would tend to estimate the influence of genetics on intelligence as in some instances relatively high, because the evidence for heritability, in some instances, is over 80 per cent. For example, Hans Eysenck (Eysenck, 1979) used this sort of evidence to suggest that the estimation of heritability of intelligence was around 69 per cent in the general population.

There is also a similar consideration with personality variables. For example, there are the findings of German behavioural geneticist Rainer Riemann and his colleagues (Riemann, Angleitna & Strelau, 1997), who looked at over a thousand pairs of German and Polish twins and compared monozygotic and dizygotic twins on the 5-factor model of personality. These findings are summarised in Table 8.1. Within this table you will see that the correlations between monozygotic twins for the

five factors of personality range from .42 to .56, and the correlations between dizygotic twins for the five factors of personality are smaller and range from .13 to .35. This type of finding is evidence for the genetic heritability of personality.

Table 8.1 Correlations on the five-factor model of personality between monozygotic and dizygotic twins reared together.

Personality dimension	Monozygotic (MZ; identical) twins	Dizygotic (DZ; fraternal) twins
Extraversion	.56	.28
Neuroticism	.53	.13
Agreeableness	.42	.19
Conscientiousness	.54	.18
Openness	.54	.35

Source: Adapted from Riemann et al. (1997)

8.2. Rationale for Practical.

Clearly there is no way in which you can actually explore this material as a practical, but the research of this area is interesting, and it would be nice to actually set up a situation where students can at least simulate exploring this material. Furthermore, this material allows you to explore and compare correlation statistics using twin and family estimates. Perhaps, crucially this is an excellent practical to explore the use of effect size to compare the magnitude, rather than the statistical significance, of the correlations. When it comes to correlation statistics, the *r* value is considered the indicator of effect size, where *r* = .1 and below are viewed as small, *r* = .3 as medium (or moderate) and *r* = .5 as large. Therefore we are suggesting that students in this practical would just explore a dataset looking at concordance rates for intelligence or personality (or both) across a number of different pairs of people.

8.3. Dataset (Practical 8.1 Intelligence and Practical 8.2 Personality).

The dataset provided present data for two sets of individuals. The first is a dataset (Practical 8.1 Intelligence) for a sample of pairs of 500 people that simulates Bouchard and McGue's (1981) analysis using the same groups (n = 50 per group), thereby combining twin and family estimates. Here 10 sets of 50 pairs of people, matched for sex and age (clearly so it is comparable for twins) have their scores on the Raven's Matrices. The *Raven's Advanced Progressive Matrices* (Raven, Raven, & Court, 2000) was used to measure general intelligence. The advanced form of the matrices contains 48 items, presented as a set of 12 (set I), which are normally used to familiarize people with the test, and then a set of 36 (set II) items, which can be computed to produce raw scores to measure general intelligence. Items become increasingly difficult as the participant progresses through set II. It is regarded as the best psychometric measure of general intelligence by researchers such as Jensen (1998).

The second dataset (Practical 8.2 Personality) simulates Riemann, Angleitna and Strelau (1997) analysis and compares monozygotic and dizygotic twins reared together thereby concentrating on twin studies. Here we have 100 pairs of individuals (n = 50 for monozygotic and dizygotic twins) who have completed the *Five Factor Model of Personality* was assessed via the 50-item International Item Personality Pool, Five Factor Personality Measure of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness (Goldberg et al., 2006;http://ipip.ori.org/newNEODomainsKey.htm). These five subscales each comprise 10 items to measure the five main personality domains. Items are scored on 5-point Likert scale, anchors ranging from 1 = Very Inaccurate to 5 = Very Accurate (http://ipip.ori.org/newScoringInstructions.htm). Internal reliability for the scales has been demonstrated to range from .77 to .86. Convergent validity for the scales has been demonstrated through correlations ranging from .85 to .92 with the NEO Personality Inventory, when corrected for attenuation due to imperfect reliability (Goldberg et al., 2006).

8.4. Suggested Analysis

The aim of this analysis would to simple compare correlation statistics for each of the groups. You may not feel that significant levels are important here, but rather the effect size of the correlation. For the intelligence data you will get a set of correlation statistics as follows in Figure 8.2.

Figure 8.2.

Concordence rates of intelligence scores across each of the family groups.

Pairs of People	Correlation statistic: *r* =
Identical twins reared together	.86
Identical twins reared apart	.82
Fraternal twins reared together	.77
Biological siblings reared together	.55
Parents and children living together	.48
Parents and children living apart	.41
Biological siblings reared apart	.32
Cousins	.25
Adopted children living together;	.01
Unrelated people living apart.	.02

For the personality data you will get a set of correlation statistics as follows in Figure 8.3.

Figure 8.3.

Concordence rates for personality scores across Monozygotic and Dizygotic twins.

Personality dimension	Monozygotic (MZ; identical) twins	Dizygotic (DZ; fraternal) twins
Extraversion	.46	.21
Neuroticism	.47	.14
Agreeableness	.54	.19
Conscientiousness	.48	.22
Openness	.55	.25

8.5. Variations.

Very little variations you could do, but if you wished you could alter the datasets for any variable you wished. In the personality data there a 5 scales with 10 items scored on a 5-point scale. You could easily substitutes one or more scale for a trait measure from the International Personality Item Pool (http://ipip.ori.org/)

8.6. References

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Practical 9

Implicit theories of Intelligence

Summary: This is a practical that explores implicit theories of attitudes and behaviour, but with a particular focus on intelligence.

9.1. Literature (from Chapter 11, Maltby, Day & Macaskill, 2010).

Within psychology, the lay theories/implicit theories approach to consider the everyday ideas that surround a particular phenomenon allows the elucidation of everyday beliefs in a scientific and systematic way (Sternberg, 2001). Implicit theories are defined as personal interpretations, constructions and beliefs about phenomena that reside in the minds of individuals, and are also described as folk theories - essentially lay ideas that surround a particular topic area.

Sternberg (2001) suggests three reasons why implicit theories are important to study that are applicable to the current proposal. First, they are important in understanding everyday life because they drive the way in which we perceive and evaluate our own beliefs and those of others. Such perceptions and evaluations are then used to draw conclusions about ourselves and others, and to make judgments about everyday life. Second, implicit theories can provide the necessary detail for the construction of more formal theories, which provide a framework for future research. Psychologists have studied implicit theories in a variety of domains, most famously in cross-cultural considerations of intelligence (Berg & Sternberg, 1992; Sternberg, 2001) but also in creativity (Puccio & Chimento, 2001), fame (Maltby et al., 2008) and stereotype formation (Levy, Stroesser, & Dweck, 1998). Implicit theories are influenced, in part, by cultural traditions and expectations (Runco & Johnson, 2002) and are found to be highly stable over time (Franiuk, Cohen, & Pomerantz, 2002).

Robert J. Sternberg and three colleagues (Sternberg, Conway, Ketron & Bernstein, 1981) investigated individuals' conceptions of intelligence in a series of experiments. In the first experiment, 61 people studying in a college library, 63 people entering a supermarket, and 62 people waiting for a train in a railway station were asked to list behaviours that were characteristic of 'intelligence', 'academic intelligence', 'everyday intelligence', or 'unintelligence'. Then 122 other people were asked to rate how well each of behaviours listed in the first experiment reflected aspects of intelligence. Then Sternberg and his colleagues used a data reduction technique, like factor analysis, to look for underlying factors under these ratings. Sternberg and his colleagues found three dimensions of intelligence among this sample:

- **Practical problem solving** – Practical problem solving is the ability to be practical and logical with regard to the problems we all face in various situations and relationships.
- **Verbal ability** – This is the ability to express yourself and converse with others confidently and with some eloquence.
- **Social competence** – This ability refers to the skills necessary to be accepted and fulfilled socially. Someone who has high social competence demonstrates high levels of knowledge, understanding, competency, motivation and confidence in terms of themselves and others.

9.2. Rationale

The practical not only introduces ideas around implicit theories of attitudes and behaviours, with a focus on intelligence, but can also be used to introduce how qualitative and quantitative methods can be mixed, and introduce students to the use of factor analytic techniques.

9.3. Suggested Method.

The central aspect of the work carried out into implicit theories of any concept is the combination of qualitative and quantitative survey methods to establish the identification of everyday ideas around the construct. Stripped down, a research method would comprise two stages:

- The first stage uses interview and qualitative analysis to generate possible descriptors to describe the social phenomena. Typically in these studies, smaller samples (n = 50) from each population group will be asked to provide adjectives to describe the phenomena. A number of these descriptors will be compiled.
- The second stage uses questionnaire survey and exploratory factor analysis to explore among a large population sample the underlying factors to these descriptors. Typically in these studies, for a practical, large samples of respondents (n > 100) will be asked to rate descriptors and these rating are used as the basis of identifying key factors underlying the descriptors.

You could choose any phenomena to study. However, it might be prudent to examine intelligence because students will be able to compare your findings with the literature that is detailed in Chapter 11 of Maltby et al.

Therefore the first stage is to generate descriptors and there is no reason why you couldn't use the method of Sternberg et al (1981) who asked people to list behaviours that were characteristic of 'intelligence', 'academic intelligence', 'everyday intelligence', or 'unintelligence'. These responses then need to be compiled, and one would suggest, that to make it manageable, when compiling the list, look for overlaps and similar meanings so you can potential get rid of duplicate or similar terms. Another way of shortening the list would be to only include a descriptor if more than a certain number of people (e.g. 5) had provided that particular descriptor.

Once you have your descriptors its time to administer the list to a much larger sample. In this part of the study you present the descriptors and ask to what extent the descriptor is characteristic of an ideal 'intelligent' person. Respondents are asked to indicate on a scale of 1 ('not characteristic at all') to 9 ('extremely characteristic').

9.4. Suggested Analysis

It is the second lot of data that would comprise the analysis, i.e. the rating of the descriptor. Simply it would be a matter of performing whatever factor analysis extraction and rotation techniques you wish to teach and asking students to report and interpret the final factor structure.

9.5. Dataset (Practical 9.1 - Implicit)

We have included a dataset (n = 1202) for a number of intelligence descriptors. There are 20 variables, prefixed with 'desc'. The descriptors in this dataset are:

1. Does things for other people
2. Shows empathy for others
3. Practical
4. Good critical analysis skills
5. Understanding
6. Good listener
7. Is kind to others
8. Able to express oneself
9. Good with numbers
10. Objective
11. Logical
12. Hardworking
13. Eloquent
14. Conducts him/herself well
15. Has good communication skills
16. Able to solve problems
17. Is able to speak with confidence
18. Interested in other people
19. Has positive relationships with others
20. Is able to make friends easily

This dataset has a two factor solution, though we haven't tested all the different possibilities from using different Extraction and Rotation techniques. The pattern matrix for maximum likelihood extraction with oblimin rotation is shown in Figure 9.1. Our interpretation, if we use Sternberg's original findings as a possible guide, that Factor 1 is a combination of Verbal and Social Competence, and Factor 2 is Practical Problem Solving. This would allow some discussion to the extent of congruence between our findings and Sternberg's original findings.

Figure 9.1
Factor Analysis (Maximum Likelihood Extraction with Oblimin Rotation) of the 20 descriptors.

	1	2
1. Does things for other people	.492	.272
2. Shows empathy for others	.822	-.111
3. Practical	.162	.627
4. Good critical analysis skills	.116	.614
5. Understanding	.819	-.110
6. Good listener	.821	.024
7. Is kind to others	.676	.082
8. Able to express oneself	.751	-.021
9. Good with numbers	.170	.660
10. Objective	-.006	.690
11. Logical	.073	.668
12. Hardworking	-.201	.710
13. Eloquent	.583	.193
14. Conducts him/herself well	.505	.245
15. Has good communication skills	.767	.020
16. Able to solve problems	.281	.535
17. Is able to speak with confidence	.540	.086
18. Interested in other people	.379	.233
19. Has positive relationships with others	.718	.042
20. Is able to make friends easily	.647	-.115

9.6. Variations

Clearly you could explore any concept using this methodology (one reviewer of this text suggested that list of descriptors resembled personality traits and the two factors seemed to be conscientiousness and agreeableness, so you could adapt the practical in this way). Furthermore, as noted above, this approach has been used with creativity (Puccio & Chimento, 2001), fame (Maltby et al., 2008) and stereotype formation (Levy, Stroesser, & Dweck, 1998). Therefore you could do this with any construct. Also available on the Higher Education Academy Psychology Network miniproject website is a study looking at Psychology students' implicit theories of being a psychologist, extending to many of the main professions within the discipline (go to http://www.psychology.heacademy.ac.uk/s.php?p=256&db=76). If you look at the report there are a number of initial descriptors that could be used as a basis of a practical if needs be.

Finally the use of factor analysis may be a little complicated or advanced for your class. Why not then just gather the descriptors and get students to simulate what a factor analysis does and group, cluster or allocate (on the basis of vote) under certain themes.

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Practical 10

Personality, Intelligence and Academic Achievement

Summary: The practical explores the hypothesis of whether personality predicts academic achievement after controlling for intelligence and other suggested variables.

10.1 Literature (from Chapter 16 of Maltby, Day and Macaskill, 2010).

In terms of the relationship between intelligence and academic achievement, evidence suggests that general intelligence shows a strong relationship with academic achievement. There are a number of reviews by psychologists. Jencks (1979) reported correlations between general intelligence and academic achievement ranging from $r = .40$ to $r = .63$ for six longitudinal studies in the U.S.A. US psychologists Alan Kaufman and Elizabeth Lichtenberger (Kaufman, 1990; Kaufman & Lichtenberger, 2005) provide a review of key papers that have looked at the correlation between general intelligence and school attainment and achievement. The authors conclude that the average correlation between IQ scores and a number of school indicators is around $r = .50$.

However, authors, such as Chamorro-Premuzic and Furnham (2006), have suggested that intelligence factors are not the only factors that predict academic success. These researchers suggest that conscientiousness personality traits lead students to be organised, disciplined and motivated to succeed. To support this view, conscientiousness has emerged as a particular predictor of academic achievement, with the other Big Five personality traits implicated to a lesser degree. O'Connor and Paunonen's (2009) review of major studies in the area found that academic achievement was

consistently significantly correlated with conscientiousness (average r = .22), but inconsistently related with openness to experience, extraversion, agreeableness, and neuroticism (average rs for each trait ranged from |.05| to |.06|).

10.2. Rationale

This study aims to determine whether personality, and specifically conscientiousness, provides incremental validity in predicting academic achievement over general intelligence. Therefore this practical can be used to explore the use of the hierarchical multiple regression technique.

10.3. Method and the Dataset (Practical 10.1 SigPred and Practical 10.2 NonSigPred)

Now, perhaps a word of caution. It might be best to build this practical around the dataset. IQ tests are expensive and time-consuming and therefore this may not be a practical to use. Furthermore, as would be expected in this research, we have included a measure of final degree mark that, of course, your students would not have achieved yet. So it may be a matter that one of the datasets provided is the main focus of the practical and this practical might be most useful when time is short or you want the analysis to be the main focus. We have made suggestions about the sort of variables you might create if you wanted to collect data in the 'Variations' section below.

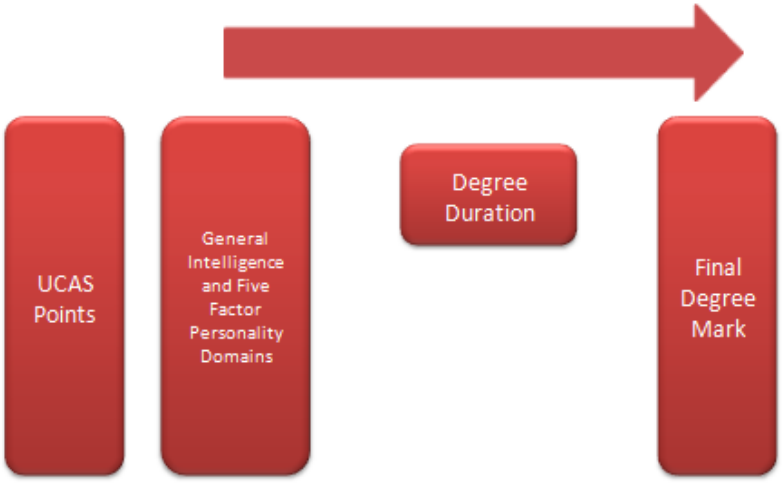
In the datasets we have included the following variables, final degree mark, a measure of intelligence and the five factor personality domains. The *Raven's Advanced Progressive Matrices* (Raven, Raven, & Court, 2000) was used to measure general intelligence. The advanced form of the matrices contains 48 items, presented as a set of 12 (set I), which are normally used to familiarize people with the test, and then a set of 36 (set II) items, which can be computed to produce raw scores to measure general intelligence. Items become increasingly difficult as the participant progresses through set II. It is regarded as the best psychometric measure of general intelligence by researchers such as Jensen (1998). The *Five Factor Model of Personality* was assessed via the 50-item International Item Personality Pool, Five Factor Personality Measure of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness (Goldberg et al., 2006;

http://ipip.ori.org/newNEODomainsKey.htm). These five subscales each comprise 10 items to measure the five main personality domains. Items are scored on 5-point Likert scale, anchors ranging from 1 = Very Inaccurate to 5 = Very Accurate (http://ipip.ori.org/newScoringInstructions.htm). Internal reliability for the scales has been demonstrated to range from .77 to .86. Convergent validity for the scales has been demonstrated through correlations ranging from .85 to .92 with the NEO Personality Inventory, when corrected for attenuation due to imperfect reliability (Goldberg et al., 2006).

In addition, we have provided an assessment of previous academic achievement, UCAS points scores ('A' level/Scottish Highers), so to control for this variable. In addition we have included gender/sex and age variable so these may be controlled for as well. The overall timeline for this study is detailed in Figure 10.1.

Figure 10.1.

General Time line for collecting data across the student university life time.



10.4. Possible Analysis and the Dataset

Zero order correlations between, intelligence, personality, and both academic achievement variables could be documented. To test the hypothesis that personality is a unique predictor of academic

achievement a hierarchical regression analysis could be conducted in which final degree score served as the dependent variable and each of the predictor variables can be entered into the model in the following order: (1) sex and age; (2) UCAS point scores; (3) Raven Progressive Matrices scores; and then (4) the five factor personality variable scores.

There are two datasets that accompany this practical, one (Practical 10.1 SigPred) that shows conscientiousness predicts academic achievement after controlling for sex/gender, age, past UCAS point scores, and general intelligence (See Figure 10.2 for final output of the regression analysis), and one (Practical 10.2 NonSigPred) that finds it does not predict academic achievement (See Figure 10.3 for final output of the regression analysis), despite sharing a significant correlation with academic achievement (r = .20, p < .05)

Figure 4.2.

Final SPSS output for data that show conscientiousness predicts academic achievement after controlling for sex/gender, age, past UCAS scores, and general intelligence.

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
	Variable	B	Std. Error	Beta	t	sig
Step 1	Sex	-1.083	1.370	-.070	-.791	.431
	Age	-.665	1.004	-.059	-.662	.509
Step 2	A level points	.078	.011	.523	6.878	.000
Step 3	General Intelligence	.324	.086	.305	3.755	.000
Step 4	Neuroticism	-.042	.070	-.043	-.603	.548
	Extraversion	.113	.075	.105	1.499	.137
	Openness	-.054	.081	-.050	-.665	.507
	Agreeableness	.045	.078	.041	.578	.565
	Conscientiousness	.298	.074	.310	4.050	.000

Figure 4.3.

Final SPSS output for data that shows conscientiousness does not academic achievement after controlling for sex/gender, age, past UCAS scores, and general intelligence.

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
	Variable	B	Std. Error	Beta	t	sig
Step 1	Sex	-1.083	1.370	-.070	-.791	.431
	Age	-.665	1.004	-.059	-.662	.509
Step 2	A level points	.078	.011	.523	6.878	.000
Step 3	General Intelligence	.324	.086	.305	3.755	.000
Step 4	Neuroticism	-.026	.074	-.026	-.348	.728
	Extraversion	.074	.078	.070	.949	.345
	Openness	-.061	.086	-.056	-.707	.481
	Agreeableness	-.007	.081	-.006	-.086	.931
	Conscientiousness	.133	.077	.135	1.712	.090

10.5. Variations.

The possible variation is to find other measures of current achievement (last essay, estimated first year mark… perhaps best recorded confidentially, and though these are self-reported, and therefore bias, they would not represent an invasion of the data protection act). Simply control for self-reported UCAS scores (and any other variables you wish to include) and administer the public domain measure of personality. Of course there is no need to carry out the multiple regression. A much easier analysis might be simply to correlate five factor scores/IQ scores with final academic achievement, presenting a much more straightforward practical if you feel this might serve you better.

10.6. References

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Practical 11

Creativity: The 4 'p' s

Summary: The study aims to use either simple ratings or thematic analysis to explore creativity among the Wikipedia biographies/description of the lives or work of creative people.

11.1. Literature (from Chapter 16, Maltby, Day & Macaskill, 2010).

Psychologists have studied creativity from a number of psychological perspectives. The most worthwhile distinctions in individual differences was made by Rhodes (1961/1987), and later used in a review of the area by Runco (2004) , who have suggested four different approaches in the study of creativity: namely the 4 P's; Person, Process, Press, and Product. The use of person, process, press, and product by Rhodes is a way of conceptualising all studies on creativity. We will now briefly describe each category and give you examples of theory and research which fall under each category.

11.1.1. Person

The Person category of creativity includes theory and research that concentrates on the personal characteristics on the person. For example, a theory or research that looked at the motivation or particular traits as core characteristics of creative persons. The person category reflected in research has looked at the personality traits creative individuals typically possess by looking at a number of various creative domains, such as Art, Literature and Music. This has led to the development of traits measures such as the Composite Creative Personality scale (Harrington, 1972, 1975). In measures like

these a number of traits would be listed that would define creativity such as; active, artistic, assertive, clear thinking, clever, curious, demanding, enthusiastic, idealistic, imaginative, independent, insightful, inventive and original.

11.1.2. Process

The Process category focuses on the thought, actions and behaviours that underpin the creative process. In terms of formal theories of creativity that describe the process of creativity, one of the first to be published was by Graham Wallas (Wallas 1926). In this model Wallas described creativity as a process comprising 5 stages arising when a problem is presented including preparation, incubation, intimation, illumination and verification. Another theory that describes the process to creativity is perhaps one of the most influential in the literature on creativity. Guilford (1967) made the distinction between convergent and divergent production, which has been later recognised as convergent and divergent thinking. Convergent thinking is when an individual tries to develop a single and correct solution to a problem. Divergent thinking is a thought process that involves the generation of ideas to a problem. So examples of divergent thinking include being able to brainstorm, breaking problems into parts, showing great thinking, understanding causality, identifying importance with topics, being able to appreciate known and unknown qualities. For many psychologists, divergent thinking is the best example of creativity (Glazer, 2009).

11.1.3. Press

The Press category focuses on the relationship between the creative individual and their environment. Press refers to the *press*ures on the creative process or on creative persons. Therefore this category considers the environmental influence such as cultural, organisational or family or peer pressures. For example are the individuals' friends creative and influence the person to be creative? Or does being creative result from the state of interpersonal relationships, e.g. being in love or a relationship breaking up? (Runco, 2004).

11.1.4. Product

The Product category focuses on outcomes or results of the creative process. So this might be studies of decisions made or ideas by the creative person or it may be publications, art, writing of the creative person. Often the study of eminent persons (i.e. great artists or thinkers) is a large feature within this category.

11.2. Rationale

The aim of this study is to concentrate on different aspects of the creative process by exploring conceptions and measurement of creativity. We are suggesting two practicals you could develop. The first that leans to a more quantitative approach and focuses on the creative person literature. The second, leans towards a more qualitative approach that focuses on the overall use of the '4' ps.

11.3. A Quantitative Approach: The Person.

11.3.1. Method and Analysis

In this practical you could use descriptions or biographies of creative persons and participants could use current measures of scales to rate the person of creativity. Today the measurement of Creativity can be found on the International Personality Item Pool (IPIP; Goldberg, et al, 2006; http://ipip.ori.org/ipip/) and you could use any one of these scales.

- http://ipip.ori.org/newAB5CKey.htm#Creativity
- http://ipip.ori.org/newHPIKeys.htm#Creativity
- http://ipip.ori.org/newHEXACO_PI_key.htm#Creativity
- http://ipip.ori.org/newVIAKey.htm#Originality_Creativity

Possible sources for biographies can be found on Wikipedia (a caveat might be necessary to warn students about the reliability of information on internet sites) and we have listed some examples below, but clearly this list could go on….

Artists

http://en.wikipedia.org/wiki/Andy_Warhol

http://en.wikipedia.org/wiki/Banksy

http://en.wikipedia.org/wiki/Beethoven

http://en.wikipedia.org/wiki/George_Gordon_Byron,_6th_Baron_Byron

http://en.wikipedia.org/wiki/Jane_Austen

http://en.wikipedia.org/wiki/Mary_Shelley

http://en.wikipedia.org/wiki/Salvador_Dali

http://en.wikipedia.org/wiki/Van_Gogh

http://en.wikipedia.org/wiki/Miles_Davis

Scientists and Inventors

http://en.wikipedia.org/wiki/Albert_Einstein

http://en.wikipedia.org/wiki/Florence_Nightengale

http://en.wikipedia.org/wiki/Frederick_McKinley_Jones

http://en.wikipedia.org/wiki/Garrett_Augustus_Morgan

http://en.wikipedia.org/wiki/Leonardo_da_Vinci

http://en.wikipedia.org/wiki/Marie_Curie

http://en.wikipedia.org/wiki/Thomas_A._Edison

http://en.wikipedia.org/wiki/Isaac_Newton

http://en.wikipedia.org/wiki/Ada_Lovelace

Thinkers or Theorists

http://en.wikipedia.org/wiki/Anna_Freud

http://en.wikipedia.org/wiki/Aristotle

http://en.wikipedia.org/wiki/Carl_Jung

http://en.wikipedia.org/wiki/Ghandi

http://en.wikipedia.org/wiki/Hypatia

http://en.wikipedia.org/wiki/Karen_Horney

http://en.wikipedia.org/wiki/Martin_Luther_King

http://en.wikipedia.org/wiki/Plato

http://en.wikipedia.org/wiki/Sigmund_Freud

The analysis for this practical could vary. For example you could examine how well the scales operate in describing creative persons by calculating internal reliability statistics for the scales.

However, for a simple practical, you may just simple want to use the data to produce descriptive statistics to see how well the individuals score on each of the scales, and this would help you examine whether we can use psychometric scales to describe creative persons. A more high level analysis might look for differences between persons, or groups of persons and therefore mean comparisons could be used. For example, you might want to use comparison of average scores (t test statistics) to see who is statistically significantly the most creative person. You might extend this to groups of persons, i.e. an ANOVA, comparing thinkers versus artists versus scientists for their scores on the creative scale.

11.4. A Qualitative Approach: Thematic Analysis of Creativity – the 4Ps.

Given the 4 P's provides 4 themes by which to describe creativity, a suggested practical would be to perform a qualitative thematic analysis on descriptions or accounts of being creative. There may be many sources for descriptions of the creative process, but a useful source might be Wikipedia again. Again we have listed some possible examples below, clearly there are many more that you or your students might identify:

- http://en.wikipedia.org/wiki/Sistine_Chapel
- http://en.wikipedia.org/wiki/Hamlet
- http://en.wikipedia.org/wiki/Terracotta_Army
- http://en.wikipedia.org/wiki/The_Last_Supper
- http://en.wikipedia.org/wiki/Sgt._Pepper%27s_Lonely_Hearts_Club_Band
- http://en.wikipedia.org/wiki/Bouncing_bomb
- http://en.wikipedia.org/wiki/Telephone
- http://en.wikipedia.org/wiki/Frankenstein
- http://en.wikipedia.org/wiki/Space_race

11.5. Variations

There are a number of variations to this practical. First you could choose any creative person or instance and analyse that. We have picked some fairly high-brow people, but you might want to set it in the context of more modern people or instances. Also students could be encouraged to find an example of creativity and analyse one of their choosing. In our suggested practicals, we have made a distinction between the person and the other 3Ps, but a thematic analysis of creative person's biographies may throw up other evidence and suggest a question to what extent can creativity be attributed to one of the other 'Ps' other than the person. Finally, there are other models of creativity outlined in Chapter 16, notably Sternberg's (2005) model of creativity which might provide sources of terms and context to analyse aspects of creativity.

11.6. References

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Practical 12

Sex differences and route finding.

Summary: This practical examines sex differences in route finding skills derived from the sex differences in spatial ability literature.

12.1. Literature (From Chapter 15 of Maltby, Day & Macaskill, 2010).

Some of the intelligence literature explores sex difference in spatial ability. One of the studies that explores this issue was carried out by Jean Choi and Irwin Silverman on the study of gonadal hormones (testosterone and estradiol) and spatial ability (Choi & Silverman, 2002). Choi and Silverman's work starts from a general finding in the literature that male and female humans and non-humans use different strategies to learn routes. Routes through the environment require individuals to use spatial ability. Previous findings suggest there is a sex difference in the way men and women use routes (Choi & Silverman, 1996). Women tend to use relative directions (left, right, front and back) and landmarks (buildings, bridges, traffic lights etc.) to learn routes (for example, 'you turn left at the bridge and then right at the next traffic light'). Men use distance (mileage, metres) and cardinal (the four principal compass points – north, south, east and west) directions (for example, 'you head down there for about 100 metres and then head west until you get to the next turning 50 metres down that road, and then head north'). Williams and Meek (1991) found that, among rats, differing concentrations of testosterone and estradiol have different effects on the male and female organisation of the brain, particularly in their perception of the environmental cues that can be used to solve spatial problems. Choi and Silverman (1996) then examined this idea among humans.

The authors gave 46 male and 60 female undergraduate students a route-learning task, which

comprised of a map depicting a fictional town, with various landmarks and streets, a compass indicator and a distance scale. Participants were asked to learn the shortest route from one point to another on the map in 2 minutes, and then they were asked to recall the route back to the experimenter. The experimenter then coded the number of times the participants made a reference in their route to landmarks, relative direction, cardinal directions and distance. Respondents' testosterone and estradiol levels were measured by taking some of their saliva. Choi and Silverman found that estradiol is not related to strategies for route learning. However, they found among men – but not among women – that the testosterone level is positively related to the use of male-biased route-learning strategies (the use of distance and cardinal rules).

12.2. Rationale

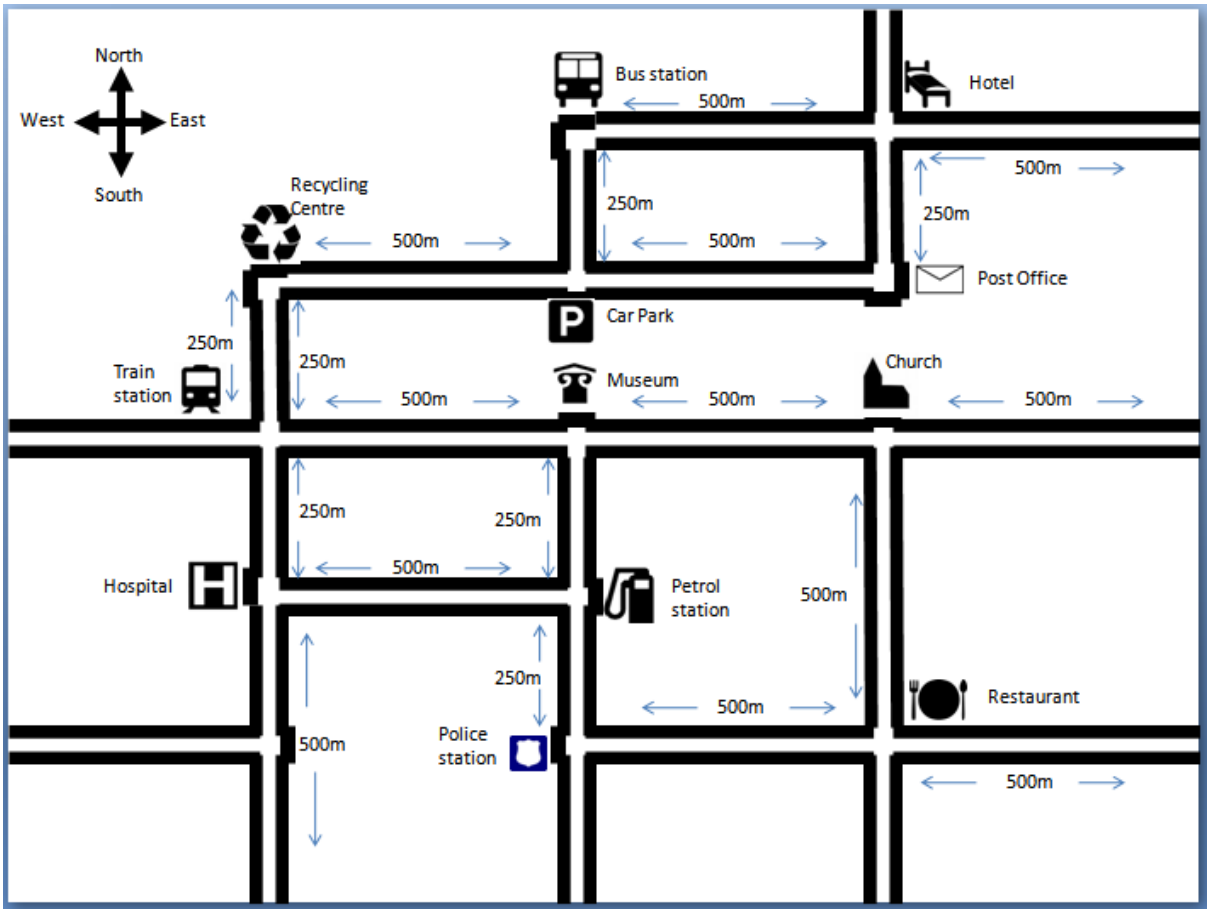
The issue of sex differences in intelligence is potentially a controversial one, particularly when teaching a psychology class who are predominant female. Nonetheless the study by Choi and Silverman (2002) sets up a nice little experiment that would simply explore sex differences in route finding. Now we are assuming, like many of our experiments, that obtaining testosterone and estradiol levels is far too complicated for a class practical, but just exploring whether there are sex differences in the use of using landmarks, relative direction, cardinal directions and distance would provide a nice simple practical for students.

12.3. Suggested Method

In this experiment participants will be asked to describe verbally the route they might take on a fictitious map from one point to another (see Figure 12.1, we have also include a Powerpoint file with this map, one that could be used or edited for such an experiment). Participants should record the sex and the number of times participants use landmarks, relative direction, cardinal directions and distance to describe their route. It may be an idea for students to record the narrative so they go back over it at a later date.

Figure 12.1.

Map that makes use of landmarks, relative direction, cardinal directions and distance



12.4. Suggested Analysis

Where two or more experimenters are involved then it may be suitable to compare the ratings in someway for each person, i.e. a correlation between scores to establish some inter-rater reliability. In terms of the main aim of the study, you could use independent group *t* tests comparing males and females to compare mean scores for the number of times they provided use landmarks, relative direction, cardinal directions and distance to describe their route

12.5. Datasets (Practical 12.1 RouteH1 and Practical 12.2 RouteH0).

We have included 2 datasets, each containing 60 participants (30 males and 30 females), for scores on landmarks, relative direction, cardinal directions and distance to describe a route. One dataset (Practical 12.1 RouteH1) provides support for a hypothesis that women use relative directions and

landmarks and men use distance and cardinal directions, while the other does not (Practical 12.2 RouteH0).

12.6. Variations

Of course if you have the capacity to measure testosterone and estradiol levels then this would be a more direct examination of Choi and Silverman's work. Students might also describe their routes through a real life settings, i.e. particular routes from Point A to Point B on campus.

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Practical 13

Optimism and the Unsolvable Task

Summary: This practical examines whether there is a relationship between dispositional optimism and the tendency to persevere in goal directed behaviour, even when it is impossible, because they expect favourable outcomes.

13.1. Literature (From Chapter 15 of Maltby, Day & Macaskill, 2010).

According to Seligman's theory, people mostly have a tendency to be either pessimistic or optimistic. Although people have the same life experiences, it is how they handle and think about those experiences that set them apart from each other. Seligman (1998) reports that he first identified Learned helplessness in the late 1960s (Overmier & Seligman, 1967; Seligman & Maier, 1967). In this research, dogs were placed in a box and were repeatedly exposed to a tone that was then followed by a mild electric shock. The purpose of this research was to teach the dogs to learn to associate the tone with a shock, with the aim that the dogs were afraid of the tone, even when no shock was presented. However, rather than learning to jump out of the box to avoid the shock, the experimenters found that the dogs became 'helpless', tending to just lie down, be somewhat passive, waiting for the electric shock to occur. From this the term 'learned helplessness' was coined. Seligman (1998) reports he discovered something else among other dogs. He found that dogs who learned initially, as puppies, that they could avoid the shock, did not learn to be helpless like the other dogs. He found that this occurred even when they experienced other adverse stimuli in later experiments. Seligman concluded that these dogs had learned to expect that they could avoid any adverse stimuli and had learned to be optimistic (learned optimism); and what is more, he found that

the optimistic dogs never learned to show helpless behaviours.

This work led to later work into dispositional aspects of optimism. Charles Carver and Michael Scheier (Carver & Scheier, 1981; Scheier & Carver, 1985), explained individual differences in the theory of optimism and pessimism by identifying the concept of dispositional optimism. They defined dispositional optimism as a person's *general predisposition to be optimistic* in their mood or their temperament. This predisposition leads a person to 'expect' either favourable or unfavourable outcomes depending on whether they are optimistic or pessimistic. So while Seligman emphasised the explanatory style as part of learned optimism to *explain* future events, the **dispositional optimist** will *expect* good events. A dispositional optimist will tend to continue to work towards attaining their goals, instead of simply giving up, because they will always expect outcomes to be favourable. A dispositional pessimist will always expect outcomes to be poor and may as a result give up on their goals (Scheier & Carver, 1985).

13.2. Rationale.

We clearly cannot invoke learned helplessness in people by presenting the sort of adverse stimuli involved in learned helplessness experiments. Not only would this involve giving negative feedback, it would invoke a more behaviourist experiment than an individual differences one. However, we can combine these two perspectives, but focus on the work around dispositional optimism, to show how optimistic individuals may act differently in goal behaviour when they are blocked from attaining a goal. Here, we need to look at optimism as a predictor variable of behaviour, and to what extent it is able to predict continued behaviour in response to the blocked goal. A suitable stimulus for a blocked goal would be an impossible task. The rationale here is that while people who are low on optimism (pessimism) will tend to give up more easily on the impossible task because they will tend not to *expect* a favourable outcome, while those who are optimistic may persevere in the task because they *expect* a favourable outcome. This practical also employs a simple experimental methodology and makes use of the correlation statistic.

13.3. Suggested Method

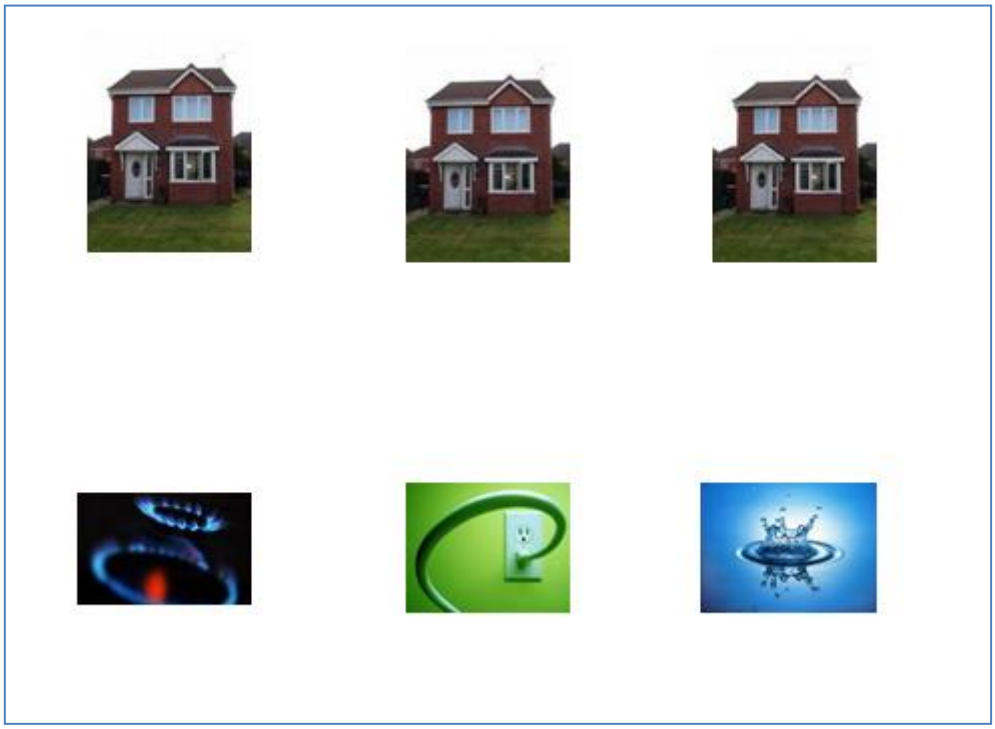
The method would involve first administering a measure of optimism and an impossible. The LOT-R is a good measure of optimism (Scheier, Carver & Bridges, 1994) and can be found in the public domain at http://www.psy.miami.edu/faculty/ccarver/sclLOT-R.html, with the 6 items required to measure optimism also published in Chapter 18 of the Maltby et al. book. Responses are scored on a five point scale; ranging from 'I agree a lot' to 'I disagree a lot'. This is essentially a 6-item measure (ignoring the filler items) of optimism (versus pessimism). Normally all the items are computed together (after reversing the pessimism items) to compute an overall score of optimism.

The impossible task would be the classical mathematical puzzle known as water, gas, and electricity, or the (three) utilities problem **(**http://en.wikipedia.org/wiki/Water,_gas,_and_electricity). The problem is stated to the participant as

> "There are three houses on a map and each of the houses need to be connected to the gas, water, and electric companies. Without using a third dimension or sending any of the connections through another company or house are disallowed. Is there a way to make all nine connections without any of the lines crossing each other?" (See Figure 13.1 for a suggestion of the map).

There is no correct solution, it is impossible to connect the houses with the three different utilities without at least one of the connections crossing another. The researcher would then time, in seconds, for how long the individual persevered with the problem.

Figure 13.1. Figure for Water, gas, and electricity problem.



13.4. Suggested Analysis

The analysis is fairly straightforward and would involve correlating overall optimism score with the time taken to complete the experiment. Of course whether you use a Pearson's or Spearman's correlation technique will depend on whether you have parametric data or not, and/or your own view regarding choosing which particular correlation test to use.

13.5. Dataset (Practical 13.1 – OptimismH1 and Practical 13.2 – OptimismH0).

We have included a dataset that supports the alternative hypothesis (Practical 13.1 – OptimismH1) and one that supports the null hypothesis (Practical 13.2 – OptimismH0) that optimism will/will not be significantly related to the time spent persevering with the problem. The items for the optimism measure dataset have already been recoded into a positive direction and an overall score for optimism computed. The time taken on the problem is in seconds.

13.6. Variations.

You may wish to make a distinction between the optimism and pessimism items on the test. There is no real reason to do this, as all the evidence suggests the scale measures an optimism versus pessimism continuum. That said you might wish to make this variation and see if there is a difference.

13.7. References.

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Practical 14

An Introduction to Psychometric Testing

Summary: The aim of this practical is to introduce the students to item writing, reliability analysis and validity testing.

14.1. Literature (from Chapter 25 of Maltby, Day & Macaskill, 2010)

The aim of this practical is slightly different from the others presented in this book because we have already made suggestions and presented material in Chapter 25 of the Maltby, Day & Macaskill (2010) book. Moreover, as this chapter does not delve into a key area of literature in psychology (the literature you will use will depend on what sort of measure you are developing), it is more a skills practical and therefore we need to direct you to a more appropriate sources of material for developing your practical. Chapter 25 outlines many of the concepts that you will need to teach a practical in developing a psychometric test and also provides an actual example (with data) to work through. Therefore, so not to repeat ourselves (we couldn't if we wanted to, the material is copyrighted), we are simply going to highlight and discuss the areas that could be covered in a simple (this chapter) and perhaps a more advanced practical (suggested in variations) on psychometric testing with reference to the material contained in Chapter 25. The practical should consider three aspects:

- Item writing and response formats
- Reliability
- Validity

14.1.1. Item writing and response formats (covered from pages 639-646).

Paul Kline (Kline, 1986), a United Kingdom psychometrician, points out that the secret to developing a very good scale is writing very good questions. For Kline, if you do not write good items then you will never develop a good psychometric scale. Therefore, for Kline, developing the items is a crucial part of the process. Therefore in Chapter 25 of Maltby et al. (2010), hereafter known as Chapter 25, we detail the following guidelines/stages of item writing including:

- Setting the scene: Open versus Closed format questions.
- Sources in writing items: the literature, experts and colleagues.
- Re-writing items.
- How many items.
- Skills in item writing; clarity, leading, embarrassing, hypothetical, and reverse questions. This might be a main focus of the work.

However, you will also need to cover thinking about instructions for administering the test and possible formats for responses (e.g. 'yes-no' format or a 'true-false' format, frequency of behaviour, 'Strongly Agree' to 'Strongly Disagree' formats, Indications to how much the statement describes them, or the extent of certain feelings or behaviours).

14.1.2. Reliability (covered on page 646 and 652-653).

In psychometric testing, there are two forms of reliability: internal reliability and reliability over time (test-retest reliability). Internal reliability (or consistency) refers to whether all the aspects of the psychometric test are generally working together to measure the same thing. Test-retest reliability assesses reliability over time. Researchers interested in constructs that are concerned with individuals being relatively *consistent* in their attitudes and behaviours over time are interested in Test-restest reliability. In the personality, intelligence and individual differences literature, which is a literature interested in traits, you will see reference to the stability of tests over time.

14.1.3. Validity (covered from pages 653-656).

Validity is concerned with whether a test is measuring what we claim it is measuring. Traditionally, a number of validity criteria can be applied to psychometric tests. These different types of validity include

- Convergent validity.
- Concurrent validity.
- Discriminant validity.
- Face validity.
- Content Validity.
- Predictive validity.
- Third person rating of the individual.

14.2. Suggested Method

Usually this practical involves students developing a measure of their own, or the class developing a construct to measure. It would be best if you could generate a number of responses to a number of items, form a scale and test it against some measures of validity (though probably not all aspects of validity). All these steps are provided in Chapter 25 and it is perhaps up to you to choose which aspects to include. We also give advice on collecting data, but clearly in the classroom setting and the number of responses you can get in Chapter 25 (pages 646-647). It is probably best, for practical report writing, that you choose a topic that has a theoretical literature.

14.3. Suggested Analysis

Any development of any psychometric test should include some examination of the reliability of the items, with some item selection. Using Internal Reliability to select items is detailed on pages 649 to 652 of Chapter 25. Also there should be some use of inferential statistics to test your developed test against your validity criterion. Again examples of this are provided on pages 656 to 658 of Chapter 25.

14.4. Dataset (Practical 14.1 Psychometric).

There is an accompanying dataset (Practical 14.1 Psychometric) for this work which details the development of an Academic Vindictiveness Scale which provides the basis of Chapter 25. We have included a copy of this dataset with this book.

14.5. Variations

Of course there are ways that you can extend this practical, particularly if you demanding a higher level of engagement with psychometric testing, both in terms of (1) item selection and reliability analysis and (2) validity.

The first is the use of factor analysis rather than internal reliability analysis to select items. Factor analysis is a multivariate (multiple variables) 'data reduction' statistical technique that allows us to simplify the correlational relationships between a number of variables. What may be important about using factor analysis in terms of item selection is that you may identify a number of subscales to your measures reflecting different dimensions of a concept, rather than selecting items for a single dimension, which is what would occur if you selected items through the use of Internal Reliability to select items. Therefore in Chapter 25, between pages 660 and 668 we outline exploratory factor analysis[1] including

- Extraction: Eigenvalues, Scree Test and Parallel Analysis.
- Rotation: Oblimin and Orthogonal

In terms of validity you might develop advanced thinking by using the MultiTrait-MultiMethod Matrix which we detail on pages 658-659 in Chapter 25. The multitrait-multimethod matrix establishes the construct validity of two or more constructs by two or more methods of assessment.

[1] A natural progression is Confirmatory Factor Analysis but we don't detail that process in the book as one needs specialist software to do this.

What the multitrait-multimethod matrix does is establish the convergent and discriminant validity for a measure by comparing the level of correlations between the different constructs by the different methods.

14.6. References

Kline, P. (1986). *A handbook of test construction: Introduction to psychometric design*. London: Methuen.

Maltby, J., Day, L. & Macaskill, A. (2010). *Personality, Individual Differences and Intelligence*. (2nd Edition). Harlow: Prentice Hall (Pearson Education).