



Are you ready for SDK228?

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1 Introduction

If you are intending to study SDK228, you will want to make sure that you have the necessary background knowledge and skills to be able to enjoy the module fully. This will give you the best possible chance of completing it successfully. This material is designed to help you do just that.

SDK228 assumes only a basic awareness of biology, psychology and the health sciences. It is not essential to have much detailed knowledge of these subjects, as the module teaches you all you need to know to achieve the module learning outcomes. However some background knowledge would certainly help your enjoyment of the module. In particular, students who have very little biological background may find that assimilating the range of biological terms and concepts takes considerable effort.

Please read this material carefully, and work through the self-assessment questions. (The answers are given at the end of the booklet.) If you have studied other Open University modules, or other Higher Education modules, this material will serve as a reminder of some of the skills you already have. If you have not studied a university-level module recently, or at all, then it is essential that you establish whether your background and experience give you a sound basis on which to tackle the work.

This diagnostic material contains some sample tasks to show you the kind of exercises you may need to tackle in working through SDK228. If you find these questions difficult to understand or answer, this does *not* mean you should not attempt SDK228, but suggests that you might find it helpful to do some preparatory work around the academic material in the module and to review your basic study skills. To get the most out of this material you will need to spend two or three hours working on the text and the questions. You will need some paper, writing pens, coloured or highlighter pens and a simple calculator.

2 Previous study for SDK228

SDK228 is a 30-point Level 2 module. The module is interdisciplinary and integrates material from biology, psychology and the health sciences. It emphasises the importance of a biopsychosocial approach to provide an understanding of the causes and treatments of some mental health disorders. Thus, whilst the module focuses on the biological changes in the brain that occur in these disorders, it also shows how the social environment can affect psychological processes and thereby lead to these same biological changes occurring. The module also includes material on research methods in psychology and the health sciences. This includes learning about quantitative study design, and evaluating the presentation, methods, results and conclusions of scientific academic papers in the field of mental health.

It is not essential to have a scientific background to study SDK228, although clearly some knowledge of basic biology would be very useful. You do, however, need to have the study skills appropriate to progress on this challenging Level 2 module. SDK228 requires students to interpret diagrams, graphs and tables, analyse and present data in an appropriate way including using software packages to produce graphs, and write evaluative essays. In order to acquire the necessary skills before taking SDK228, the module team consider it essential for its students to have achieved a pass in one of the University's 60-point Level 1 modules, such as [Science: concepts and practice \(S112\)](#) (or the discontinued module S104), [Introducing the social sciences \(DD102\)](#) (or the discontinued module DD101), [Science and health: an evidence-based approach \(SDK100\)](#) (or the discontinued SDK125), [An introduction to health and social care \(K101\)](#) (or the discontinued module K100), [Investigating psychology 1 \(DE100\)](#).

SDK228 is suitable for students following biology, psychology or health

science programmes of study, as well as health practitioner foundation degrees including mental health nursing.

3 Module profile and demands

SDK228 concentrates on the affective disorders (depression and anxiety), addiction and the dementias. It considers the limitations of our knowledge of the causes and processes involved in mental health disorders. It asks such questions as, ‘What causes addiction? What changes in the brain occur when a person becomes depressed or suffers from dementia? How can we observe or measure the changes in the brain that occur?’. The module emphasises the role of observation and experiment and students will be expected to develop skills in evaluating experimental evidence described both within the module material and within academic papers. SDK228 develops study, written presentation, number and IT skills.

SDK228 is a 30-point module and thus involves about 300 hours of study spread over the 31 weeks of the module. This equates to roughly 9 hours of study per week. There are four Blocks, each comprising written material and online activities.

The module has two main aims:

- Using information from the biological, psychological and health sciences to present an integrated account of key issues in mental health.
- To develop the basic scientific skills, concepts and methods necessary for understanding and investigating mental health issues.

In order to do well in the assignments (TMAs) and end-of-module assessment (EMA) in this module, you will need:

- To read a large volume of material and study it quite quickly in order to keep up with the whole timetable of assignments over the year.
- The ability to write short pieces of prose concisely to answer factual or evaluative questions, or summarize a piece of text in your own words.
- The ability to organize and present material in a logical progression of linked points in a clear and concise manner to produce longer written accounts (essays).
- A basic mathematical competence and methodical approach to handling numbers (simple addition, subtraction, multiplication and division) and extracting information from data and statistics presented in various formats (such as tables, graphs, bar charts and scattergrams). In addition, a basic familiarity with standard units of measurement (SI units) is needed.
- Confident IT skills such that you would feel comfortable following module guidance to generate software produced graphs, or search online databases for data or academic literature. Note that you do not have to have done these things before, and you are not expected to already know how to do them. Guidance is provided within the module, and support will be available from a tutor.

The self-assessment questions in this booklet are designed primarily to make you aware of some of the skills you will need to master in order to make the most of SDK228.

In addition to attempting these questions you can prepare yourself for the module by working through *The Sciences Good Study Guide* (A. Northedge, J. Thomas, A. Lane and A. Peasgood (1997) The Open University, ISBN 0-7492-3411-3). [The](#)

[Good Study Guide](#) (2005), also by A. Northedge, is an adequate alternative and is available online through the Help Centre, but is much less science-oriented and it does not give such good coverage of the skills required for SDK228.

Also, the following publications would provide some sound background reading for the module. These are by no means compulsory and the module does not assume prior knowledge in these areas.

Pilgrim, D. (2009) *Key Concepts in Mental Health* 2nd edition Sage

Johnstone, L. and Rowe, D. (2000) *Users and Abusers of Psychiatry: A Critical Look at Psychiatric Practice*, Routledge

Toates, F. (ed) (2007) *Pain*. Oxford University Press, Oxford.

4 Reading, writing and comprehension skills

The extracts below (paragraphs (a) to (g)) are based on material from a predecessor Open University module, SD226 *Biological psychology: exploring the brain*. To answer the questions with them you will need to understand the arguments used, to extract relevant information from the text, to use reasons to support your answers, and to summarize material concisely and accurately. The questions are of differing levels of difficulty. As a rough guide, if you can answer half or more of the questions, you should be well-prepared to take on SDK228. If you can answer only the occasional question, you may need to work on the skills mentioned above before you can tackle the module with confidence, or you may need to allow extra time to study the module successfully. In this case you may find it helpful to contact your Student Support Team for further guidance. Contact details for your Student Support Team can be found under 'Student Support Team' on [StudentHome](#).

A familiar face?

- (a) The term **agnosia** (from the Greek *without knowledge*), was coined by Freud in 1891 to refer to a family of conditions in which a person loses the ability to recognize objects. There are several different types of agnosia, but they all share the common feature that the person sees an object, and can clearly perceive the individual features that it has, but cannot judge what it is.
- (b) Interest in face perception was sparked off in the 1970s, when it was discovered that in the monkey, there were neurons (that is, nerve cells) in the temporal lobe (a region of the brain) that fired off rapidly in response to the presentation of a face (of a human or another monkey). These cells did not respond to a paw, or to an inanimate object of similar size and shape to a face (a lavatory brush, for example). Nor did they respond to an image made from a jumble of parts of faces. This last demonstration is particularly important, since the jumbled image had all the elements of a face, just a different configuration. This meant that the cells were specially tuned to the particular whole formed by a face, not the parts that make it up.
- (c) Many studies of face recognition in humans have been carried out. Face recognition is very fast, and it also shows what is known as an inversion cost. If a picture of a face is turned upside-down, our ability to recognize this face is much more strongly impaired than say, a picture of a car or animal turned upside down. Brain imaging studies have shown that an area of the temporal lobe is much more strongly activated when looking at faces than when looking at words, animals, objects or the backs of human heads. This area has become known as the **fusiform face area** (FFA) and corresponds to the location of the face-specific neurons identified in the monkey brain.
- (d) Most strikingly, there are people with damage in this region, who lose their ability to recognize faces. The name for this syndrome is **prosopagnosia**. As

with other agnosias, it is not a loss of general knowledge or intellectual ability, since these people can recognize the voices of, and talk knowledgeably about, the people whose faces they cannot recognize. They simply cannot tell who someone is from seeing their face alone. Prosopagnosia is not necessarily accompanied by agnosia relating to other types of object. There is also at least one individual known who is severely impaired on reading and object recognition, but absolutely fine when it comes to recognizing faces.

Question 1

Distinguish between agnosia and prosopagnosia.

Question 2

In which lobe of the brain is the FFA?

Question 3

Which three pieces of evidence suggest that the FFA is a brain area that is specialized for processing information about faces?

Question 4

From the information given above, what would you infer about the brain pathway involved in face recognition and the brain pathway involved in the recognition of other objects? (This is a harder question.)

- (e) It is often concluded that the fusiform face area has evolved as a specialized face-detection module. This is certainly one interpretation which seems plausible, as rapid recognition of individual faces in social primates such as ourselves and monkeys has obvious advantages during social interactions. However, another possibility is that the fusiform face area is a specialized module for making fine discriminations between individual items belonging to the same category. Most other object-recognition tasks, mentioned above, just involve saying the category to which something belongs (horse, arm, iron, etc.), and the differences between the different items are large. In face recognition, we are dealing with small differences between individuals within the same category (e.g. human faces). It could be that the fusiform face area is for any category (e.g. flowers, garden birds, metamorphic rocks) where subtle differences between individuals are important, rather than for faces as such.

We have, then, two interpretations of the activity of the fusiform face area:

- 1 it is for all types of individual discrimination, and
- 2 it is dedicated to faces.

To test between these two interpretations it is necessary to devise a task where the participants have to discriminate between many different, similar individuals of the same general category (e.g. flowers).

Question 5

What would you predict for the activity of the FFA in such a task, i.e. discriminating between different types of flowers, e.g. rose, daisy, petunia, etc. if:

- (a) interpretation 1 above was correct?
- (b) interpretation 2 above was correct?

Question 6

What would you predict for the performance of prosopagnosic individuals if:

- (a) interpretation 1 above was correct?
 - (b) interpretation 2 above was correct?
-

- (f) These predictions have been investigated. Isabel Gauthier and her colleagues have conducted studies with participants who are experts in recognizing either birds or cars, using brain scanning techniques. The participants look at pictures on a screen which may be everyday objects, cars, birds or faces, and try to identify them. The investigators found that for all the participants, faces activated the FFA strongly. However, for the bird experts, pictures of birds activated the FFA more than did pictures of cars, and for the car experts, pictures of cars activated it more strongly. The implication of these findings is that the FFA is not so much dedicated to faces, as used for making judgements of individual identity for objects we are expert at discriminating, regardless of whether those objects are faces or not. For this reason, Gauthier has suggested that 'FFA' would be better taken to mean 'flexible fusiform area' rather than 'fusiform face area'! Perhaps the FFA evolved for rapid face recognition, which as we have mentioned above is important in primates such as monkeys and humans. However, it is possible it can be turned to other uses, for instance when fine discrimination and recognition of individuals is needed in other categories of items.
- (g) Another source of evidence comes from prosopagnosia. If the FFA is more generally involved in object recognition than just the recognition of faces, then prosopagnosic individuals should show impairments on *all* types of expert discrimination, not just face recognition. It is true that many prosopagnosics have a broader agnosia, but of course this may be because the brain damage is broader than just the FFA. (After all, nature is rarely a neat experimenter.) One well-known prosopagnosic individual was a keen bird-watcher before the accident, and lost the ability to recognize bird species. Others however show an opposite pattern, such as retaining the ability to discriminate between many different types of car. One prosopagnosic even became a shepherd after his accident, and became adept at recognising his individual sheep, despite his inability to recognize the individual faces of his friends and family.

Question 7

Which piece of evidence suggests that the FFA may *not* be specialized for face recognition but may have a more general function?

Question 8

On balance, what do you think the function of the FFA might be? (This is a more difficult question.)

5 Mathematical and statistical skills

Chapters 4 and 5 of *The Sciences Good Study Guide* (see Section 3) provide useful advice on basic mathematics. The following online Open University resources will also help you to develop your basic mathematics skills; [Reading and writing maths](#) in the [Help Centre](#), which can be accessed via your [StudentHome](#) page; OpenLearn maths modules [Ratios, proportions and percentages](#) and [Diagrams, charts and graphs](#) available via the [OU Maths Help](#) site.

5.1 Percentages, ratios and means

Table 1 shows the duration of deep sleep, during a sleep period of 3 hours, in participants 1–10, under two different conditions: a night when they had no drug (C1) and a night when they were given a drug (C2).

Table 1 Duration of deep sleep, during a sleep period of 3 hours under two different drug conditions.

Participant	Deep sleep duration / min	
	no drug condition (C1)	Drug condition (C2)
1	17.6	69.9
2	3.6	4.2
3	12.7	49.2
4	4.6	7.2
5	36.0	112.5
6	6.1	14.6
7	2.1	3.4
8	12.4	40.2
9	5.2	12.3
10	22.5	91.5

Question 9

What percentage of the sleeping period does participant 10 spend in deep sleep during condition C2?

Question 10

Calculate the mean duration, and indicate the range, of deep sleep in condition C2.

Question 11

What is the ratio of deep sleep : non-deep sleep for participant 5 in condition C1?

5.2 Interpreting data

Tabular data

Question 12

Look at Table 1 and identify, in a sentence or two, the main finding apparent

from these data.

Graphical data

A *placebo* is a harmless substance given to someone who believes it to be a medicine. It is often an innocuous substance such as sugar or salt. An experiment was carried out to determine the effects of an analgesic (pain-relieving) drug on pain thresholds to electrical stimuli. (The **pain threshold** is defined as the lowest stimulus intensity – in this case of the electrical stimulus – required for the stimulus to produce a sensation that is distinctly, but just, painful.) All the subjects were told they would receive an analgesic drug. Half of the subjects did receive an analgesic, dihydrocodeine, but the remainder were unknowingly given a placebo, a glucose pill identical in appearance to the analgesic. Pain thresholds were then measured in both groups over time. The results are shown in Figure 1.

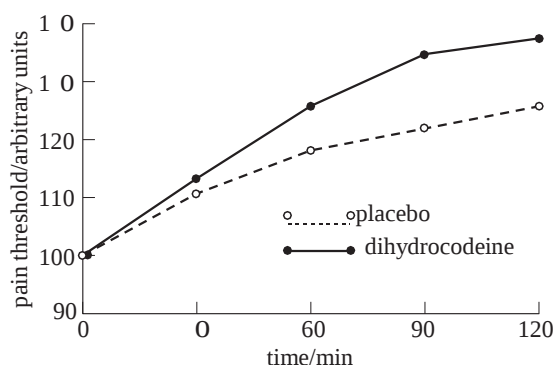


Figure 1 The placebo effect. The graph shows the mean results from 300 subjects of the effects of an active analgesic drug, dihydrocodeine and a placebo on the pain threshold to an electrical stimulus. The drugs were administered at time 0, and pain thresholds were measured at time 0 and every 30 minutes thereafter.

Question 13

How did the pain threshold change for each treatment group over the course of the experiment?

Question 14

How were the pain thresholds affected by the analgesic and the placebo?

Question 15

How did the intensity of the electrical stimulus used vary over the course of the experiment? Justify your answer using the graphical and other information presented above. (This is a more difficult question.)

Histogram data

A researcher interested in the effects of ageing on memory for words in a word list compared the performance of a group of young people (aged 20–30 years) with a group of older people (aged 60–70 years). The researcher decided to vary the speed of presentation so that one list was presented at the rate of 12 words per minute (i.e. 1 word every 5 seconds) and one list was presented at the rate of 6 words per minute (i.e. one word every 10 seconds). Figure 2 shows typical data for this kind of experiment.

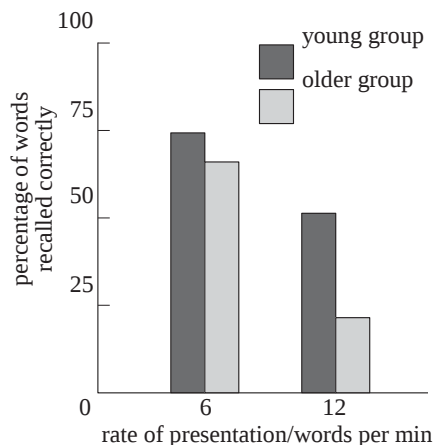


Figure 2 Typical data from a memory experiment testing recall of words by young (20–30 years) and older (60–70 years) groups, and varying the rate at which words were presented.

Question 16

In which of the following were the words on the list presented faster?

- (a) when the rate was 12 words per minute
- (b) when the rate was 6 words per minute.

Question 17

In four or five sentences, describe the findings shown in the histogram (Figure 2).

Question 18

What could a researcher conclude from this result? (This is a harder question.)

Question 19

Which *one* of the following statements is *incompatible* with these results?

- A Younger people can pick information up more quickly.
 - B Aging brains process information more slowly.
 - C Older people cannot recall new information.
 - D The rate at which information is presented affects accuracy of recall.
-

Final note

On SDK228 we do expect you to be able to calculate a percentage value, and you do need to be able to extract general points from tables and graphs, as you have been doing in the above questions. If you got any of the calculations wrong, you will find it helpful to work through relevant sections of *The Sciences Good Study Guide* or the [Maths Help](#) modules [Ratios, proportions and percentages](#) and [Diagrams, charts and graphs](#) available through OpenLearn.

6 Answers to self-assessment questions

Question 1

Agnosia is the inability to recognize objects, whereas prosopagnosia is the inability to recognize faces (paragraphs (a) to (d) in Section 4).

Question 2

The fusiform face area is in the temporal lobe of the brain (paragraph (c)).

Question 3

The three pieces of evidence are:

- 1 Neurons in the FFA in the monkey brain are much more strongly activated when the individual is looking at faces of other monkeys or of humans than at images of other objects – such as a paw (paragraph (b)).
- 2 The elements of a face, if jumbled up in a different configuration, do not activate the FFA. This suggests that the cells in the FFA are responding to the face as a whole – all the elements need to be arranged to make a ‘normal’ face (paragraph (b)).
- 3 People with damage in the FFA lose their ability to recognize faces (prosopagnosia) (paragraph (d)).

Question 4

You would infer that the brain pathways involved in face and object recognition are separate and distinct. (If they were the same it would not be possible to distinguish between agnosia and prosopagnosia.)

Question 5

- (a) If interpretation 1 of paragraph (e) is correct, the fusiform face area would be active during the flower discrimination task.
- (b) If interpretation 2 is correct, the fusiform face area would be active only in tasks involving faces; it would not be active during the flower discrimination task.

Question 6

- (a) If interpretation 1 of paragraph (e) is correct, prosopagnosic individuals would have problems with the flower discrimination task.
- (b) If interpretation 2 is correct, prosopagnosic individuals would do well on the flower discrimination task, but would have problems with tasks involving faces.

Question 7

The piece of evidence is:

The FFA is active when car experts discriminate between different cars, or bird experts discriminate between different birds, so it is not active just when faces are being discriminated (paragraph (f)).

Question 8

The answer is not totally clear. Some evidence (see the answer to Question 3) supports the idea that the FFA is specialized for face recognition.

However, other evidence (see the answer to Question 7) seems to suggest that cells in the FFA could have a more general function – namely recognition of different but similar items within the same broad category.

Perhaps a compromise is possible: the FFA is usually used to process faces, which are one of the most significant kinds of stimuli in the human environment, but it seems it can be recruited to other tasks when individuals become particularly interested in or expert in them.

Question 9

The answer is 50.8%, to one decimal point. (This could be rounded up to 51%.)

To work out a percentage you need the total sleep duration. The total is given in the first paragraph of the section and in the table heading. It is 3 hours, or 180 minutes. The time spent in deep sleep by participant 10 in C2 is 91.5 minutes. So the percentage is 91.5 divided by 180 minutes and multiplied by 100.

Question 10

The mean duration of sleep in C2 is 40.5 minutes. The range is 3.4 to 112.5 minutes.

The mean is the average and it is obtained by adding up all the sleep durations in C2 (405 minutes) and dividing by the number of participants (10).

Question 11

The ratio of deep sleep to non-deep sleep in participant 5 is 1 : 4.

The total duration of sleep is 180 minutes. The duration of non-deep sleep is (180 – 36) minutes, that is 144 minutes. Hence for participant 5 in condition C1, the ratio of deep sleep: non-deep sleep is 36 : 144. This can be simplified (divide each side by 36) to 1 : 4.

Question 12

You may have commented on the huge differences in deep sleep duration between the participants, or the range in the size of the differences between C1 and C2, for different participants. However, the main finding is that taking the drug (i.e. condition C2) leads to an increase in the duration of deep sleep during the 3 hour sleeping period; every single participant shows an increase!

Question 13

The pain threshold increased for both treatment groups.

Question 14

Both the analgesic and the placebo raised the mean pain thresholds in the two hours following administration. The analgesic had a greater effect, particularly after 30 minutes.

Question 15

The intensity of the electrical stimulus used *increased* during the experiment. This must have been the case because the graph shows that the pain threshold increased over the course of the experiment and given the definition of ‘pain threshold’ above, an increase in pain threshold means an increase in stimulus intensity needed to find the threshold.

Question 16

The answer is (a). 12 words per minute is a faster rate of presentation than 6 words per minute.

Question 17

The young group recalled a greater percentage of words than the older group in both conditions.

The results also show that when words in a list were presented relatively fast (12 words per minute), older people were considerably worse at recalling them than were younger people. However, when the words were presented more slowly (6 words per minute), people in the older and younger groups were much more similar in their accuracy of recall. Both younger and older people had better recall when words were presented more slowly, but the improvement was much more pronounced for older people.

Question 18

The results show that age is not the only factor that affects recall – the rate at which information is presented also has a pronounced effect, particularly on older people.

Question 19

Statement C is *incompatible* with the results and is hence the answer – older people clearly can recall new information, though how well they recall it depends on the speed at which it is presented.

A is compatible – young people picking up information more quickly could explain why the difference between older and younger people is greatest when the speed of presentation is high. B is also compatible – it could be that the speed of processing in the brain underlies the differences in recall between older and younger people. D is clearly compatible, and is illustrated by the results for both older and younger groups.