The University of Queensland, School of Psychology
Semester 1, 2003

PSYC3222: Psychophysiology: Methods and Applications

Course objective

The purpose of PSYC3222 is to introduce students to psychophysiological research, i.e., the use of physiological measures in the pursuit of psychological questions. In the lecture series, a range of physiological measures that are commonly used in psychophysiological research will be reviewed. In the teaching laboratory, students will acquire practical experience in the recording and scoring of physiological responses using state of the art equipment. After completing the course, students will have a working knowledge of the most frequently used psychophysiological measures and be able to critically evaluate their advantages and disadvantages for psychological research.

Note: The recommended prerequisites for PSYCY3222 are PSYC2020 and PSYC2050 (PY290, PY293).

Timetable for lectures

03.03.	Introduction: What is Psychophysiology?
10.03.	Electrodermal activity.
17.03. - 24.03.	Cardiovascular psychophysiology.
31.03.	Psychophysiological concepts: Stress, arousal, response/individual specificity.
07.04.	Electromyography.
14.04.	The ocular and the respiratory system.
28.04.	A short look at Psychoneuroimmunology and Psychoendocrinology.
12.05.	The sexual response system.
19.05. – 26.5.	Electroencephalography and evoked brain potentials.
02.06.	Brain imaging techniques.

Timetable for tutorials and practicals

(Practicals will be conducted in the week following the tutorial; the content of tutorials and practicals is the same)

03.03.	Introducing the equipment (have a go)
10.03.	Measuring skin conductance (SC)
17.03.	A little experiment involving SCRs
24.03.	ECG and heart rate (HR) measurement
31.03.	Finger pulse measurement
07.04.	Measuring blood pressure
14.04.	Biofeedback of skin temperature
28.04.	Measuring an electromyogram
12.05.	Vital capacity as measured with the Spirometer
19.05.	Respiration and its effects on SC and HR
26.05.	Where are you looking? The EOG
02.06.	Video: Brain imaging; Exam practice (no practical scheduled)

Assessment

The assessment consists of three parts

1) Final examination: 50%
   30 short answer questions. All questions are of equal value, i.e., one question contributes 1.66% towards the final mark. The examination will cover the material presented in the lectures. The purpose of the final exam is to assess whether you know about psychophysiology and can apply the concepts that are part of it.
2) Lab report: 35% (Maximum 35 marks)
   The lab report will be in format of a journal paper that is based on data collected in the practical sessions. The lab report must not be longer than 2000 words and must follow the APA

guidelines for publication. The initial version (hand in two copies) is due Tuesday, May 6th. Deadline for the recycled version is Monday, June 9th (for details see the section on the lab report below). The lab report will give you an opportunity to practice writing in Psychology similar to the writing you will do as part of a thesis. Moreover, you will practice giving feedback and how to use feedback to improve your writing.

3) Workbook: 15% (Maximum 15 marks)
The workbook is a record of your work in the laboratory. It consists of computer discs containing your recordings, protocol sheets, and written comments (see section on practicals). The workbook is due Friday, June 6th.

People involved in PSYC3222

- Dr. Ottmar Lipp: Ottmar is the course co-ordinator and will give all lectures and tutorials. His official contact hours are Tuesday, 2-4pm, Rm. 460, Psychology building. Phone: 3365 6385; e-mail: O.Lipp@psy.uq.edu.au
- Dr. Roderick Ashton: Roderick has offered to assist with trouble shooting during the laboratory sessions in PSYC3222, which are conducted in the teaching laboratory (Rm. 424).

Some information about PSYC3222

PSYC3222 covers the topic of Psychophysiology, which can be defined as the use of physiological measures in the pursuit of questions in psychology (there are different views of what Psychophysiology is, however. You'll see in the lectures). PSYC3222 consists of three components: Lectures, tutorials, and laboratory sessions.

The lectures will cover Psychophysiology using a systemic approach, i.e., the lectures will cover most of the response systems that have been used in psychophysiological research - and you would not believe where some people put measurement devices. An alternative would be a content driven approach, e.g., cognitive psychophysiology or the use of physiological measures in clinical psychology. The systemic approach was chosen because it includes examples from a wide variety of content areas, habituation, conditioning, psychology of emotion, clinical psychology, social psychology to name a few. In addition, the systemic approach emphasises the physiological system that provides the dependent measures. Some knowledge of the underlying physiology is essential if you want to apply physiological measures successfully. For each system covered in the lectures there will be three parts: a) a short introduction of the physiology, b) coverage of the measurement technique and related methodological issues, and c) examples that illustrate the use of the measure in research. For each section of PSYC3222 listed in the timetable there is a set of topics that are covered (see below). In addition, you are provided with learning objectives and recommended readings. The learning objectives are to highlight important issues and questions and to aid in the preparation for the final exam. Make sure that your responses to the objectives are more than just 'I know that'. You should be able to give elaborate answers that would be sufficient to explain what the objectives are all about to someone who knows nothing about psychophysiology (best way to

check whether you know something: can you explain it to someone else?). The recommended readings are thought to supplement the lectures, i.e., do them if you missed something in class or if you want to know more about a certain topic (that happens whether you believe it or not).

The tutorials consist of demonstrations of the equipment used in psychophysiological recordings, e.g., Biopac student lab, spirometer. They will introduce equipment that you will use during the laboratory part of the course and provide some guided practice. In addition, there will be demonstrations of scoring techniques (computerised or other) etc. Depending on the class size repeat tutorials may be offered.

In the laboratory sessions, you will use the equipment you have seen in the tutorials to collect physiological data. Depending on the measure you look at, the laboratory sessions may involve simple measurements of functions or little experiments. The laboratory sessions will take place in Rm. 424 (Psychology building), the Psychophysiology Teaching Laboratory (lab). To do the laboratory sessions you will team up with a fellow student who serves as your subject and vice versa (it is rather difficult to operate the Biopac while you are sitting in the next room all hooked up). The laboratory can be booked for one hour at a time. A weekly booking sheet for the lab will be at the door. This part of the course has the potential to turn into a catastrophe of biblical proportion, the equipment can break down, there are public holidays when access to the lab is limited etc. However, with a bit of common sense it should be possible to get through the program and to have an interesting time on top of it (it worked just fine last year).

Recommended text for PSYC3222 is the volume by Cacioppo, Tassinary, & Berntson (2000), or its predecessor, Cacioppo & Tassinary (1990). The 2000 version is currently the best book on the topic (but also has 1000 pages and costs about $200). The 1990 edition (900 pages, $80) is ok as well, but it lacks some of the newer sections on content and applications. Both are available in multiple copies in the SS&H Library and there is no need to buy them. If you want other papers accessible – let me know and I place them there. The prerequisites should guarantee that you are familiar with the content areas to which psychophysiological methodology has been applied. You may, however, want to read up on two areas that are essential for Psychophysiology, basic electronics (don't worry, it is really basic!) and physiology. Re electronics: there is a chapter in Cacioppo & Tassinary (1990), which is quite good. There are also some pages from a book by Duffy et al. in multiple copies in the Psychology Course Centre that are worth having a look at. Re Physiology: I drew most of my knowledge from Schmidt & Thews, but any other comparable physiology text will do. Relevant chapters will be announced with the references for each topic. For starters it might be good to refresh your memory on the autonomic nervous system.

Marshall-Goodell, B.S., Tassinary, L.G., & Cacioppo, J.T. (1990). Principles of bioelectrical measurement. In J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 113-148). Cambridge: Cambridge University Press. (Quite simple booster session).

Duffy, F.H., Iyer, W.G., & Surwillo, W.W. (1989). Clinical electroencephalography and topographic brain mapping. New York: Springer. (pp. 11-41; 54-59 are in multiple copies in the Course Centre. Really easy introduction).

Schmidt, R.F., & Thews, G. (1989). Human Physiology. Berlin: Springer.

The PSYC3222 website

You will find copies of the slides used in PSYC3222 on the Web (go to the Psychology homepage **http://www.psy.uq.edu.au** and click on 'Student information', and 'Course materials'. Access is restricted and the Username and Password are your my.UQ username and password; then select 'PSYC3222'). PSYC3222 is a dynamic subject that is under constant development. The slides used in the lectures will be posted, but may be updated during the semester. Hardcopies of the slides may also be placed in the Psychology Course Centre, if desired.

The PSYC3222 Web site also offers information about the tutorial component of the subject and all sorts of interesting links and stuff. You are welcome to suggest links that can be placed on the site. In addition, the web site contains a forum (Click on 'Forum' to get there). The forum is password protected (because some idiot saw it necessary to post offensive materials). Username and password are as above (my.UQ username and password). A forum is an electronically maintained facility for the exchange of information. The big idea is as follows: Usually people have questions about issues relating to the lectures, the tutorials, the assessment, everything. One way of dealing with these is to ask a tutor or the lecturer. That usually answers the question for the one student, but leaves the others in the dark. Moreover, some people find it very stressful to ask tutors or lecturers - or these people may not be available. This is where the forum comes in.

The forum can work like a message board. You can either open a new line of discussion by introducing a new topic, or reply to an existing thread of messages. Your message/reply will be added to the forum. The point of the forum is that all visitors of the site can see the messages sent to the list. If you have a question, suggestion, query, post it. Other visitors will reply to your message and the answer will be posted as well (the subject co-ordinator receives a copy of all postings via e-mail). You can use the forum also to communicate with other people in the subject - find people to work with etc. Information will be distributed very efficiently and widely.

The following basic rules apply in PSYC3222

1) All parts of the assessment have to be completed to pass PSYC3222, however, it is not necessary to pass each individual component, i.e., one can get 5 out of 15 for the workbook and still pass PSYC3222.
2) The lab report has to meet the requirements for written work in Psychology. These requirements, mainly with regard to format, may differ from the requirements that apply in other disciplines. They are outlined comprehensively in guidelines published by the APA (see the 'Publication manual of the American Psychological Association', 5th edition). The lab report has to have a cover sheet bearing at least your student number and the number of words you have written. Please use the cover sheets that will be distributed in the tutorials.
3) Lab reports and workbooks are to be handed in to the Psychology Course Centre. They will be returned to you in the tutorials if possible. For ease of handling, you can hand in a self-

addressed stamped envelope with your assignments and we will post it back to you. Make sure the envelope is large enough and bears enough postage.

4) Lab reports, which exceed the specified limit of words, will lose marks. You are required to count the number of words and to note this number on the cover sheet.
5) Assignments which are handed in late will be marked, but will lose marks. For each day after the due date, one mark will be subtracted from the final mark that the assignment would have received.
6) Extensions can been sought from the course co-ordinator for medical and other valid reasons. If you need an extension contact the course co-ordinator as early as possible, i.e., well before the due date. Extensions cannot be backdated, i.e., the late policy applies for assignments that are handed in after the due date even if they are accompanied by a medical certificate.
7) If you think that the mark for your assignment is not appropriate then see the course co-ordinator for an explanation. Assignments can be remarked if this consultation does not yield a satisfactory outcome. As a result of a remark, a mark can stay the same (as happened in most of the previous cases) or can be increased or decreased. It is not possible to resubmit an assignment.
8) Unless explicitly indicated, all assessment items are to be individually written or produced for this course only, and sources should be fully acknowledged. Plagiarism and collusion (working closely on an assignment with someone else) are serious academic offences, and will be discussed in tutorials related to assessment. If in doubt, consult your tutor. For further information on collusion and plagiarism, see Appendix G of the 2003 School Handbook (pp 241-242; see http://www.psy.uq.edu.au/student/handbook/2003/index.html). See also http://www.library.uq.edu.au/ssah/useits/plaguseit.html.
   Keep in mind that offenders are no longer put in the stocks - people have been caught cheating although that is not publicised.
9) In general: If you have questions, are not sure about something, or have a complaint - contact the course co-ordinator (First hand information is always more reliable than hearsay).
10) Special examinations are awarded only on very strong grounds. These, and the procedure for applying for special examinations, are outlined in Appendix H of the 2003 School Handbook on pp. 249-251. Students can access the handbook via the web (http://www.psy.uq.edu.au/student/handbook/2003/index.html).
11) Any student with a disability who may require alternative academic arrangements in the subject is encouraged to seek advice at the commencement of the semester from a Disability Adviser at Student Support Services.

The lab report

The purpose of the lab report is to assess whether you are able to summarise and present a complex issue in a concise and comprehensive manner according to the standards that apply in a 3rd year psychology course. These standards concern both the content and the formal presentation of

the report with the primary emphasis on content. You will write up an experiment that you have conducted in the lab sessions. The topic of the experiment is 'stimulus modality change and the orienting response'. The data from several people will be collated to provide you with something to analyse, draw and discuss. The big idea is that you will have to do some research on the topic (review the literature, collect data, and write up the report), i.e., you will do something that is fairly similar to the things you would do for a thesis. The formal aspects concern the use of APA format for your writing (see the 'Publication manual of the American Psychological Association', 4th edition). In addition, you will get an opportunity to give feedback on someone else's work and to improve your work incorporating feedback.

The big idea of writing this lab report is to practice scientific writing. To ensure that you get some practice, the lab report will be marked in two steps. Initially, it will be read by the co-ordinator (who marks it out of 25 according to the marking sheet presented below), and one of your fellow students. Both readers will provide you with 'critical and constructive feedback'. Based on this feedback, you will rewrite and resubmit the report - together with the feedback that you received from the student reader. The resubmitted version will earn 5 marks if it addressed the issues raised by both readers to satisfaction. The feedback sheet provided by the student reader will earn 5 marks for the reader, if the feedback is deemed 'critical and constructive'. Thus, the 35 marks for the lab report split into 25 (initial report) + 5 (revision) + 5 (your feedback on someone else's work).

The workbook

The workbook (or folder) documents the work you have done in the lab. At the end of the semester it will contain several discs with your recordings, the scoring of the responses, and some comments you are asked to make on occasions, as well as some bits of paper (see ‘For your workbook’ sections in the descriptions of the practicals). As outlined in the marking sheet provided below, you will receive marks for each of the items in your workbook up to a total of 15.

Marking sheet: Lab report in PSYC3222

Name: .....

1. Formal aspects and style (Organisation and format; Writing style and clarity; Referencing)

/5

2. Abstract

/1

3. Introduction (Introduces theoretical background for problem under study; discusses relevant literature and results; provides appropriate rationale for present experiment; provides suitable hypotheses)

/5

4. Method (Subject; Apparatus; Procedure; Design mentioned anywhere)

/4

5. Results (Complete; Correct and in sufficient detail to support conclusions; Tables and Figures included and referred to correctly)

/4

6. Discussion (Main results briefly stated; Clear statement about hypotheses; Results interpreted correctly/correct inferences drawn; Remarks on weaknesses of study; States contribution of present study and relates it to research question/theory; Suggestions for future research)

/6

Total /25

Marking sheet: Lab workbook in PSYC3222

Name: .....

Practical No.

1 Record shows (approximately) correct values for R-R interval and pulse.
0---0.5---1

2 Measurement of SC; scoring of SCRNS and SCL.
0---0.5---1---1.5

3 Measurement of SC, scoring of SCRNS and SCRs, results handed in.
0---0.5---1---1.5

4 Recording of ECG; scoring of ECG components in 4 conditions.
0---0.5---1---1.5

5 Measurement of finger pulse, scoring R-R intervals and pulses. 0---0.5---1---1.5

6 Measurement of BP with the two methods, report of the results of two experiments.
0---0.5---1---1.5

7 3 graphs with comments. 0---0.5---1---1.5

8 Measurement of raw EMG, integrated EMG. 0---0.5---1

9 Spirometer: Measurement of volumes, calculation of VC in two ways, interpretation.
0---0.5---1---1.5

10 Measurement of respiration, SC and cardiotachograph; comments on results.
0---0.5---1---1.5

11 EOG measurements: 2 x horizontal and vertical. 0---0.5---1

Total: /15

Lectures in PSYC3222

Introduction

Topics

- What is psychophysiology: Definitions, definitions.
- Why do psychologists measure physiological responses?
- Some general remarks about physiological measurements in psychology.

Learning objectives: You should be able to do the following

* Distinguish the different concepts of psychophysiology, and distinguish psychophysiology from other sub-disciplines of psychology.
* Discuss critically what physiological measures can do for psychologists - and what they cannot.
* Summarise the ethical problems that researchers in the area of psychophysiology encounter and discuss how these problems can be solved.
* To be familiar with the bits and pieces that make up the recording equipment and to know what they do.

References

Cacioppo, J.T., Tassinary, L.G., & Berentson, G.G. (2000). Psychophysiological Science. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 3-23). Cambridge: Cambridge University Press. **OR**

Cacioppo, J.T., & Tassinary, L.G. (1990). Psychophysiology and psychophysiological inference. In J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 3-33). Cambridge: Cambridge University Press.

Electrodermal activity

Topics

- The physiological basis of electrodermal activity.
- Measurement and methodology: Skin conductance, skin resistance, and skin potential. Electrodes and gels.
- Quantification of electrodermal activity: Level, amplitude, latency.
- Tonic and phasic measures, the law of initial value.
- An example: Skin conductance in research on habituation.

Learning objectives: You should be able to do the following

* Describe in your own words what electrodermal activity reflects.
* Differentiate endosomatic from exosomatic and tonic from phasic measures.
* Explain the basics of the measurement and scoring of electrodermal activity.
* To know what the law of initial value is and why it is of importance for psychophysiology.

* Discuss critically the advantages and disadvantages of electrodermal measures.
* To list and discuss some applications of the measures taken from this response system.

References

Boucsein, W. (1992). Electrodermal Activity. New York: Plenum Press. (Covers everything you never wanted to know about electrodermal activity).

Dawson, M.E., Schell, A.M., & Filion, D.L. (2000). The electrodermal system. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 200-223). Cambridge: Cambridge University Press. **OR**

Dawson, M.E., Schell, A.M., & Filion, D.L. (1990). The electrodermal system. In J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 295-324). Cambridge: Cambridge University Press. (Good, short summary).

Fowles, D.C. (1986). The eccrine system and electrodermal activity. In M.G.H. Coles, E. Donchin, & S.W. Porges (eds.), Psychophysiology: Systems, processes and applications (pp. 51-96). Amsterdam: Elsevier. (Good description of the physiological basis, but heavy going).

Fowles, D.C., Christie, M.J., Edelberg, R., Grings, W.W., Lykken, D.T., & Venables, P.H. (1981). Publication recommendations for electrodermal measurements. Psychophysiology, 18, 232-239. (The Society for Psychophysiological Research attempts to standardise methodology. Such guidelines have been published for most response systems).

Cardiovascular system

Topics

- The cardiovascular system: Heart and circulatory system.
- Measurement and methodology:
  * Measures of cardiac activity: The ECG and what we can do with it; ventricular contractility; respiratory sinus arrhythmia.
    A short excursion: Time series analysis.
  * Hemodynamics: Plethysmography; Blood pressure measurement.
- Examples of research in cardiovascular psychophysiology: The psychology of emotion; Behavioural medicine: Hypertension.

Learning objectives: You should be able to do the following

* Describe the basic physiology of the cardiovascular system.
* Explain the basics of measurement and scoring of cardiac activity, blood pressure, and blood flow.
* To know the measures of vagal and sympathetic cardiac activity.
* To explain in your own words the techniques of averaging and time series analysis - pointing out their assumptions and their potential advantages.

* Discuss critically the advantages and disadvantages of heart rate and blood pressure as measures in general and in psychophysiological research in particular.
* Explain why the use of multiple physiological measures may be advantageous.
* To list and discuss some applications of the measures taken from this response system.

References

Brownley, K.A., Hurwitz, B.E., & Schneiderman, N. (2000). Cardiovascular Psychophysiology. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 224-264). Cambridge: Cambridge University Press. **OR**

Papillo, J.F., & Shapiro, D. (1990). The cardiovascular system. In J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 456-512). Cambridge: Cambridge University Press. (Good summary of the basics in cardiovascular psychophysiology).

Schmidt, R.F., & Thewes, G. (1989). Human Physiology. Berlin: Springer. (pp. 439-467). (General physiology).

Jennings, J.R., Berg, W.K., Hutchenson, J.S., Obrist, P., Porges, S.W., & Turpin, G. (1981). Publication guidelines for heart rate studies in man. Psychophysiology, 18, 226-231.

Shapiro, D., Jamner, L.D., Lane, J.D., Light, K.C., Myrtek, M., Sawada, Y., & Steptoe, A. (1996). Blood pressure publication guidelines. Psychophysiology, 33, 1-12.

Psychophysiological concepts: Stress, arousal, response/individual specificity, detection of deception

Topics

- Arousal: The notion of general arousal and why it does not hold.
- Stimulus-, individual-, and motivational-response specificity.
- Stress: Everybody knows what stress is - do we?
  * The General Adaptation Syndrome
- Biofeedback: A good idea and why it did not work.
- Detection of deception – does it work?

Learning objectives: You should be able to do the following

* Discuss critically the concept of 'arousal'. What is it and what is it not?
* Distinguish different response specificities and know why they are important.
* Discuss critically the concept of stress. What is it and what is it not, and what is the GAS?
* To know the history, promise, and current view of biofeedback.
*- To know the basic methods used in polygraphy and their advantages and disadvantages.

References

Hassett, J. (1978). A primer of psychophysiology. San Francisco, CA: Freeman. (pp. 136-148 on biofeedback)

Levine, P. (1986). Stress. In: M.G.H. Coles, E. Donchin, & S.W. Porges (eds.). Psychophysiology: Systems, processes and applications (pp.331-353). Amsterdam: Elsevier.

Stern, R., & Sison, C. (1990). Response patterning. In: J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 193-215). Cambridge: Cambridge University Press. (Specificity and arousal)

Electromyography

Topics

- The skeleto-motor system: A little bit of physiology
- Measurement and methodology: How to measure an EMG; problems and response scoring.
- Example: Orbicularis oculi EMG as a measure of eye-blink reflexes.

Learning objectives: You should be able to do the following

* Describe what is reflected in an EMG.
* Explain the basics of measurement and scoring of electromyographic activity.
* Discuss the pros and cons of physiological measurements in psychology using EMG as an example.
* To list and discuss some applications of the measures taken from this response system.

References

Tassinary L.G., & Cacioppo, J.T. (2000). The skeletomotor system: Surface electromyography. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 163-199). Cambridge: Cambridge University Press. **OR**

Cacioppo, J.T., Tassinary, L.G., & Fridlund, A.J. (1990). The skeletomotor system. In: J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 325-385). Cambridge: Cambridge University Press. (Good basic introduction).

Fridlund, A.J., & Cacioppo, J.T. (1986). Guidelines for human electromyographic research. Psychophysiology, 23, 567-589.

Schmidt, R.F., & Thewes, G. (1989). Human Physiology. Berlin: Springer. (pp. 62-72).

The ocular and the respiratory system

Topics

- The eye: A little bit of anatomy
- Changes in pupil diameter (pupillometry) and eye movements
- Smooth pursuit movements and schizophrenia
- Why we breath and how
- The measurement of respiratory activity

Learning objectives: You should be able to do the following

* Explain the basics of measurement and scoring of ocular and respiratory activity.
* Distinguish different types of eye-movements.
* To list and discuss some applications of the measures taken from these response systems.

References

Stern, J.A., & Dunham, D.N. (1990). The ocular system. In: J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 513-553). Cambridge: Cambridge University Press.

Harver, A., & Lorig, T.S. (2000). Respiration. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 265-293). Cambridge: Cambridge University Press.

A short look at psychoneuroimmunology and psychoendocrinology

Topics

- A little about the endocrine system
- Psychology and hormones? Beyond the GAS.
- A little bit about the immune system
- Stress and strain and the immune system

Learning objectives: You should be able to do the following

* To explain why immunological and endocrinological measures are of importance to psychophysiologists.
* Explain the basics of measurement of immune and endocrinological activity.
* Discuss critically the validity of some measures of immune activity for psychological research.
* To list and discuss some applications of the measures taken from these response systems.

References

Lovallo, W.R., & Thomas, T.L. (2000). Stress hormones in psychophysiological research: Emotional, behavioural and cognitive implications. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 342-367). Cambridge: Cambridge University Press.

Kennedy, S., Glaser, R., & Kiecolt-Glaser, J. (1990). Psychoneuroimmunology. In: J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 177-190). Cambridge: Cambridge University Press.

The sexual response system

Topics

- The sexual response system: Some basic physiology.
- Models of the sexual response cycle: Ellis, Masters and Johnson, Kaplan.

- How to measure sexual arousal.
- Applications: Diagnostic and treatment of sexual disorders.

Learning objectives: You should be able to do the following

* Distinguish and discuss critically different models of the sexual response cycle.
* Describe different ways to measure sexual arousal.
* Provide examples of the use of psychophysiological measures in applied settings.

References

Geer, J.H., & Janssen, E. (2000). The sexual response system. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 315-341). Cambridge: Cambridge University Press. **OR**

Geer, J.H., & Head, S. (1990). The sexual response system. In J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 599-630). Cambridge: Cambridge University Press.

Masters, W.H., Johnson, V.E., & Kolodny, R.C. (1992). Human sexuality. New York, NY: HarperCollins.

Electroencephalography and evoked brain potentials

Topics

- Physiological basis of the EEG.
- Measurement issues: 10-20 system, electrode montages, and EEG artefacts.
- Spontaneous EEG: Frequency bands and phasic events
- Applications: Abnormalities, sleep, and hemispheric asymmetries
- Evoked potentials: Definition and measurement
- CNV, N1, MMN, P3, N4 and friends

Learning objectives: You should be able to do the following

* Describe the measurement of an EEG.
* Distinguish the different frequency bands of spontaneous EEG and relate them to psychological states.
* Discuss critically the methodology used to derive ERPs.
* Distinguish different classes of ERPs and describe the most frequently researched components.
* Provide examples for the use of EEG and ERPs in research and applied settings.

References

Davidson, R.J., Jackson, D.C., Larson, C.L. (2000). Human electroencephalography. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 27-52). Cambridge: Cambridge University Press.

Fabiani, M., Graton, G., & Coles, M.G.H. (2000). Event related brain potentials: Methods, theory and applications. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berentson (eds.). Handbook of Psychophysiology (pp. 53-84). Cambridge: Cambridge University Press. **OR**

Coles, M.G.H., Gratton, G., & Fabiani, M. (1990). Event related potentials. In J.T. Cacioppo & L.G. Tassinary (eds.), Principles of Psychophysiology (pp. 413-455). Cambridge: Cambridge University Press.

Brain imaging techniques

Topics

- Structural imaging: CT, MRI
- Functional imaging: PET and fMRI

Learning objectives: You should be able to do the following

* Know the basic principles involved in MRI, PET and fMRI.
* Discuss critically the advantages and disadvantages of brain imaging methodologies.

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Video: PAGE series: Models of the human brain and their applications, Episode 13: Brain imaging techniques.

References

(That's part of the stuff I used to set up the course - do not try to read all of it unless you really feel like it).

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PSYC3222: Psychophysiology: Methods and Applications
Tutorials and Practicals

Tutorials and practicals will cover the same topic. The big idea is that you do and practice in the lab sessions what you have watched during the tutorial. You practice in the teaching lab (Rm. 424). In order to get access, you have to book lab-time on a booking sheet that is fixed on the lab door. You can book the lab for 1 hour at a time. One hour should be sufficient to get all the stuff done you need for your workbook. If you should need additional time then you may book a second slot - after you have completed your first lab period. There are no advance bookings for second sessions. You should try to get through your lab sessions in the week after the tutorial. Keep in mind that the set-up of the lab may be changed from week to week, i.e., it may not be possible to do the lab work with the student lab in some weeks. On the other hand, there is (almost) nothing that could not be organised, so do not worry if you run out of time. The practical part of the course could turn into a disaster - there is a multitude of things that can go wrong. However, with some common sense from all people involved we should be fine.

A few practical hints:

- At times you are going to work with a computer (IBM compatible PC using the Windows 95 operating system). Make certain that you are familiar with the basics of operating this machine and its operating system (e.g., starting programs, copying files to disc). There are several people using the computer at any time - make sure that you copy your files on a disc. The magic word is backup - you will not loose your work if you do it. Moreover, you will have to submit copies of the files that you collected with the student lab as part of your workbook.
- Never-ever put software on the computer (programs, games etc.). This is a guarantee for picking up a virus - and it takes time to get rid of these, which will mean that others - and you - cannot use the lab.
- Computers are temperamental creatures at times. The lab computer, for instance, makes a funny noise when it is started up. Don't worry - so far it has done only predictable things (sort of).
- Before you start fiddling with the equipment: Read through the instructions (the ones you are looking at at the moment, the ones placed in the lab) and make sure that you know what they refer to. There will also be a folder with additional information in the lab (manuals etc).
- Clean the lab (including the re-usable electrodes you used) after use. Electrodes are cleaned with a wet paper tissue - wipe off the gel, but leave the grey coating on them. Leaving the lab tidy will prevent problems with the people who come after you - and they will do more nasty things to you if they have to clean your mess than you can dream of.
- Please be careful when attaching or removing measurement devises. The leads are very small and designed to break - so that we have to buy replacements.
- It is up to you to check that the equipment is ok before you start.

- If you use the student lab: After you finish recording always switch the Biopac off. You may leave the computer on if there is someone coming after you.
- Do not fiddle with the devices that are plugged in to the Biopac box. If you think they do not work, or need different ones, call Ottmar or Roderick.
- Anything between skin and electrodes will increase resistance and impair your measurements. Ask your subjects to wash the areas from which you want to record with water and soap before you attach electrodes. Wearing stockings for ECG sessions or facial make-up for EOG recordings is not a bright move.
- Be warned: Things will go wrong! Equipment was built to break down, wires are prone to come off etc. On the other hand rest assured: It is impossible to electrocute subjects (or yourself) and you will not be held responsible if something breaks (unless you break something on purpose). Just notify if something is broken - or you suspect it to be broken - so that it can be fixed and we can go on with the practicals.

Important !!!!

If you run into trouble in the lab, the most important thing is not to panic. In most cases the trouble is not your fault. What you should do is suspend the recording and take some time to think. It might be a good idea to consult your partner and the list of basic checks. If that does not solve the problem: Get help from either Ottmar or Roderick.

What follows is a short description of what you are to do in the lab sessions. Your tasks will be explained in more detail in the tutorials. Additional materials such as copies of manuals are located in a folder that is kept in the lab.

Practical 1: Get to know the Biopac Student lab

The aim is to get to know the student lab (Biopac student laboratory) and its basic functions. This includes the basic operations of the computer and the options that you have for data processing. The Biopac student lab is a very nice solution that makes the introduction to Psychophysiology really easy (some say too easy). It may not seem to you that way, but just ask someone who did the subject before 1999 or have a look at the ink smudges on the wall in Rm 424. The Biopac beats the hell out of the old polygraph we had before. It is very nice and neat - and herein lies its problem: Quite a few things written in the manuals are wrong - or at least over simplified. I'll take great pleasure in pointing them out to you as we go along.

What I want you to do this week is to have a fiddle with an example recording that is stored on the computer (all part of the package). Just run through the basic tutorial as described in the lab folder. A few thoughts to guide you through:

- You will be asked to measure things using the Biopac from next week: Do the exercises!
- Keep in mind that most of the pictures in the manual show Mac-screens - the Windows' screens look different.

- There is no printer attached - so you can skip the bits on printing.

Once you are through the entire thing do the following:

- Find the first R-wave after the 10th second of the recording (you may have to change the values of the horizontal axis and Zoom in on the first few heart beats after second 10).
- Measure the duration of the first R-R interval (should be 90.9 bpm). What is the duration of the next one in bpm and time?
- Measure the height of the pulse (foot-point to maximum) that follows the first R-wave after second 10.
- Transfer the measurements in the Journal.

Do not save the changes to the File!!!

For your workbook

Transcribe the values on a piece of paper for your lab book.

Practical 2: Skin conductance

Your task is to record some skin conductance. For this we will use Lesson 9, but only parts of it. We will only use the GSR channel, not Respiration or ECG. Have a read of the Intro for Lesson 9. Quite a few mistakes in here (like talking resistance and measuring conductance or GSR being sensitive mainly to emotion ;-)). Anyway. The Biopac is set up so that the GSR coupler is in channel 3 and that is all you need. Attach the electrodes to your subject and you are ready to roll. Your subject should sit in the comfy chair in the subject's room. O.K Here we go:

- Start the Biopac lab and select Lesson 9.
- Type in as file name: '<your name>_2', to indicate that this is your practical 2.
- Once everything is ready to go, click on Calibrate.
- The Biopac will complain that some Devices are missing. Tell it to ignore this. While calibrating ask subject to take a deep breath. You should see a response here (usually small).
- If you are happy with the calibration, go on to recording. What you need is about 60 s worth of SC.
- Once you got this, stop the recording and click on 'Done' if you are happy with it.
- Measurement: Select a period of 1-min.
  Count the number of SCR.NS (spontaneous skin conductance responses, i.e., responses that occur in absence of a stimulus. These are defined as any observable SCR regardless of size).
  Determine the Skin conductance level (SCL) at 0 s, 30 s and 1 min.
- Place the measurements in the journal part of the screen.
- Save your recordings and measurements. Copy your folder '<your name>_2' to a floppy.
- Clean the electrodes - wipe gel off with a wet paper towel.

For your workbook

In your workbook include the floppy with your recordings and scoring.

Practical 3: A little experiment

You are to run a little experiment measuring SCRs in response to simple stimuli. The stimuli (tone and light) will be generated by an ancient stimulus generator, which is located under the bench top. We will use the SCR option from Lesson 9 again for the recording. Do everything up to the recording stage as you did it last week:

- Start the Biopac lab and select Lesson 9.
- Type in as file name: '<your name>_3', to indicate that this is your practical 3.
- Once everything is ready to go, click on Calibrate.
- The Biopac will complain that some Devices are missing. Tell it to ignore this. While calibrating ask subject to take a deep breath. You should see a response here (usually small).
- Now you are ready to run the experiment. The Experiment is a simple habituation experiment. After a rest period of 2 min during which SC is recorded your participant is presented with 12 habituation stimuli, a change stimulus, and another habituation stimulus, e.g., 12 tones, light, tone. Habituation stimuli are tones for some, and lights for others. To determine the experimental condition your subject will be in draw one of the tickets from the box marked 'Treatments'. You will find 'Tone' or 'Light' on your ticket. Stimuli are presented by pressing the buttons marked 'Tone' or 'Light' on the old stimulus generator, which sits under the bench. The stimulus will stay on for 4 s and then switch off. Concurrently with pressing the stimulus button, add a marker to your recording (F9). Before starting the experiment close the door between the lab and the subject's cubicle so that your subject can enjoy the experience and make sure they are wearing the headphones. Run a baseline for one minute to determine SCR.NS (see practical 2) before presenting stimuli. Now present your subject with a sequence of stimuli consisting of 14 stimuli. All inter stimulus interval should be about 15 s, i.e., wait 15 s after the offset of the previous stimulus before you present the next stimulus (you can time that with your watch). After you are finished with the recording switch roles.
- Measurement:
  Count the number of spontaneous SCRs during the 1 min rest period.
  Score the stimulus elicited SCRs for each of the 14 stimuli. Stimulus evoked responses are responses that start within a time window of 1 to 4 s after stimulus onset. If more than one response starts in this latency window take the largest.
- Place the measurements in the journal part of the screen together with a record of the experimental condition. Also, fill in one of the protocol sheets available in the lab and submit it to the course co-ordinator by Monday, March 17th.
- Save your recordings and measurements. Copy your folder '<your name>_3' to a floppy.

For your workbook

In your workbook include the floppy with your recordings and scoring. The data from this experiment are to form the basis for your lab report. They will be returned to you for write up.

Practical 4: ECG

The aim of this practical is to record an ECG and to extract some information from it. To get the ECG, follow the instructions for Lesson 5, ECG-1. Be careful when attaching the electrodes. They really stick where you put them, so do not put them on hairy areas. We will follow the instructions in the manual with some slight exceptions:

- Create a new folder '<your name>_4'.
- The four recording conditions are: Sitting, standing up, sitting while breathing heavily, sitting after 20 sit-ups.
- Please perform the following measurements on three consecutive heart beats from each recording condition and store the values in the Journal:
  R-R interval in bpm and time
  Amplitude and latency of the T-wave (peak R-wave to peak T-wave).
- Place the measurements in the journal part of the screen
- Save your recordings and measurements. Copy your folder '<your name>_4' to a floppy.

Now switch roles so that your partner can record an ECG.

For your workbook

In your workbook include the floppy with your recordings and scoring.

Practical 5: ECG and finger pulse

We will use Lesson 7, ECGP for this practical. Follow the manual in setting up and executing the recording. We will add a slight modification:

- Create a new folder '<your name>_5'.
- Record only two conditions: sitting relaxed with arm on arm rests and arm held high above head.
- Measurements: Please score from three consecutive heart beats for each condition:
  ECG: R-R interval in bpm and time
  Pulse: The amplitude (min to max) of the finger pulses.
- Place the measurements in the journal part of the screen
- Save your recordings and measurements. Copy your folder '<your name>_5' to a floppy.

For your workbook

In your workbook include the floppy with your recordings and scoring.

Practical 6: Blood pressure

The measurement of blood pressure is a central part of any visit to the doctor. Now it is your turn. There are several different methods of measuring blood pressure, but the most frequently used one is the indirect method developed by Riva-Roci and Korotkoff. This method involves a Blood-pressure meter and a Stethoscope. Seat your subject in a comfortable position in the subject's chair so that the left arm rests on the arm rest (palm up). The arm should be slightly flexed at the elbow. Locate the brachial artery by feeling for the pulse just above the elbow crease on the ventral side.

Place the cuff around the upper arm so that the lower edge of the cuff is 2-3 cm above the elbow crease. Place the stethoscope above the brachial artery below the cuff. Listen to the pulse - you'll hear nothing. Inflate the cuff to 160 mm Hg, but go higher if you hear pulsatile sounds. The cuff will only inflate if the valve screw is closed. Deflate the cuff pressure slowly (2-3 mmHg/s) until you hear a Korotkoff sound. The pressure that is present when you hear the first sound is your measure of the systolic pressure. Deflate the cuff further until the noises disappear. The last sound signals the diastolic pressure.

Repeat this procedure several times so that you know what you have to listen for. After you know what it involves, run a little experiment. Seat your subject and measure blood pressure three times. The measurements should be separated by 3 minutes. Take the cuff off and ask your subject to walk quickly down the staircase to the ground floor and up again. Repeat the three blood pressure measurements. After completion, swap.

A second method to measure blood pressure is the oscillometric method, which is used by the Dinamap recorder. The oscillometric method exploits the fact that the pressure in a cuff that is fixed around the arm will vary if blood pulses underneath it. The heart pumps blood under the cuff, which results in an extension of the arterial wall. This pulsatile flow results in an oscillation of the air pressure in the cuff that can be measured. The Dinamap records change in these oscillations and uses them to determine systolic, diastolic and mean arterial pressure. In addition it measures heart rate. The value of the systolic pressure is defined as the cuff pressure at which the pressure in the cuff starts to oscillate - due to the fact that blood flows under the cuff. The mean arterial pressure is taken at the point when the oscillations are largest, and the diastolic pressure is defined when the oscillations disappear (See graph in the lab folder for illustration).

How to use the Dinamap:

* Squeeze excess air from the cuff before wrapping it securely around the upper arm over the brachial artery. Your subject should sit on a chair in a relaxed manner.
* Control settings: These should always be set like this, but it cannot hurt to check. Mode: Auto; Alarm limits: OFF; High/Low: LOW; Add Minutes: All switches down; Power: OFF.

!!! Important !!!

Never switch the Dinamap on if the cuff is not fixed around the arm of the subject. This will blow the cuff - which can be regarded as very silly behaviour.

* Switch Power to ON. It may be that the power-point is switched off (better safe than sorry).

The measurements will begin after about 20 s. The cuff will be inflated to 160 mm Hg and the pressure will be gradually reduced to determine the different pressure values. At the end of the measurement period, the results will be displayed on the four displays. After 1 min the next measurement cycle is initiated. Run your subject through 3 measurement cycles while seated and note down the results. At the end of the third cycle ask the subject to stand up and complete another three cycles. At the end of the third cycle switch Power to OFF. Now you can remove the cuff. Switch roles and repeat the measurements. When you have finished, switch off the power point.

For your workbook

Note down the blood pressure values you measured during the two little experiments. Write a sentence or seven that summarises your observations. Compare the three values within each session (pre, post) and across sessions.

Practical 7: Biofeedback of skin temperature

The purpose of this practical is twofold: Give you an opportunity to play around with a temperature measuring device and demonstrate a simple example for biofeedback. More detailed operating instructions for the feedback unit are in the lab-folder. The unit is set up for use. Control settings:

* Power/Input: Off; recorder: Off; Audio output: Minimum; Slope: -

Start by putting the sensor under the plastic air shield and measure the room temperature. You do this by switching the Power/input switch to In 1. Make sure that the silver surface of the thermistor does not touch anything. The air shield prevents interference from air streams within the lab. The sensor is rather slow in its response, i.e., it may take several minutes for it to settle down. After the thermistor has stabilised, start the experiment. Seat the subject so that they cannot see the display and fix the headphones. Attach the thermistor to the second digit of the middle finger (back of the hand) and ask for the hand to be placed under the plastic cover. The thermistor should be fixed with the silver surface touching the skin using a small piece of tape. Do not wrap tape all around the finger - that might affect your measurement. Wait for the measurement to be stable - again, that can take several minutes. When the reading is stable, start a 5 min baseline and note down a temperature measure every 30 s. One increase and one decrease session follow baseline. One person does the increase first; the second the decrease. Before the start of the session instruct your subject to increase/decrease the skin temperature. If the temperature changes in the desired direction, the presentation rate of the feedback tone will increase. Turn the audio volume to max and set slope to + for increase condition (- for decrease condition). Adjust the relative feedback scale by turning the offset button until the needle is centred. Record the temperature every 30 s for 5 min. You may have to adjust the offset control if the needle goes out of range. After 5 minutes, set the Audio output to minimum and change the slope. Now ask your subject to change the temperature in the opposite direction. Set audio output to maximum and record temperature for another 5 min. Swap sides with your subject and run the experiment with a reversed order of decrease and increase.

Don't forget to switch off the feedback unit.

For your workbook

Draw a graph that depicts skin temperature as a function of time and session (3 graphs, one value per 30 s). Comment on the results in a few sentences.

Practical 8: Electromyogram

It's back to the Biopac. The electromyogram reflects the electrical activity that accompanies the contraction of striated muscles. This electrical activity is small in amplitude, but can be measured with the right equipment. Please follow Lesson 1, EMG-1. As usual, there will be some changes:

- Create a new folder '<your name>_8'.
- We will only record from your dominant arm. Ask your subject to sit relaxed and then gradually tense the forearm muscles in four graded steps - relax, level 1, relax, level2 etc.
- Measurements: Please score for the four bursts of EMG:
  Raw EMG: min, max and range
  Integrated EMG: Range and area under the curve
- Also, have a look at the EMG under some level of zoom. Can you see what the signal consists of?
- Place the measurements in the journal part of the screen
- Save your recordings and measurements. Copy your folder '<your name>_5' to a floppy.

For your workbook

In your workbook include the floppy with your recordings and scoring.

Practical 9: The spirometer

The Spirometer is used to measure some of the components that make up the lung capacity. The components that you are going to measure are Tidal Volume (TV), Expiratory Reserve Volume (ERV), Inspiratory Reserve Volume (IRV) and Vital Capacity (VC). Vital capacity and Residual Volume add up to the total lung capacity. The residual volume is the volume of air that is always left in your lungs. If it was not there your lungs would collapse. The TV is the volume of air inhaled and exhaled during normal breathing. The IRV is the maximum volume of air you can inhale on top of the air inhaled during normal breathing. The ERV is the maximum volume of air you can exhale on top of the air exhaled during normal breathing. The VC is the maximum amount of air that you can inhale and exhale. The VC can be measured directly or calculated as the sum of TV, IRV, and ERV. The VC varies between subjects from 3000 to 6500 ml. It depends on the size, the gender, the weight, and the physical fitness of the individual.

The measurement principle of the spirometer is simple. It consists of two vessels, a large one that contains water and a smaller one that is inverted and suspended in the water. A counterweight and indicator are attached to the inverted vessel. Air blown into the inverted container will make it rise and move the indicator along a scale. The scale is calibrated in litres and allows measurements of the air volume exhaled into the vessel.

There are three things to keep in mind:

(a) for each subject, use a sterile mouthpiece from the container marked 'fresh mouthpieces' which you drop into the container marked 'used mouthpieces' after you are finished;

(b) always return the horizontal scale of the spirometer to 0 before you begin a new trial;

(c) only exhale into the spirometer, but do not inhale from it - unless you want to know what the air in the ancient pyramids tastes like.

- Measuring Tidal Volume: Ask your subject to sit by the spirometer and breath quietly for 1 min. After inhaling a normal breath, ask the subject to exhale into the mouthpiece in an unforced, normal way. Note the change on the horizontal scale and bring it back to zero. Ask your subject to perform this exercise four times with a break of one minute between trials.
- Measuring Expiratory Reserve Volume: Ask your subject to stand by the spirometer and breathe quietly for 1 min. After a normal exhalation, ask the subject to forcibly exhale into the mouthpiece all the additional air possible. Note the change on the horizontal scale and bring it back to zero. Ask your subject to perform this exercise four times with a break of one minute between trials.
- Measuring Inspiratory Reserve Volume: Ask your subject to stand by the spirometer and breathe quietly for 1 min. Ask your subject to inhale as deeply as possible and to normally exhale into the mouthpiece without forcing the air out. Note the change on the horizontal scale and bring it back to zero. Ask your subject to perform this exercise four times with a break of one minute between trials. You calculate the inspiratory reserve volume by subtracting the tidal volume from the value determined here.
- Measuring Vital Capacity: Ask your subject to stand by the spirometer and breathe quietly for 1 min. Ask the subject to inhale as much air as possible and to forcibly exhale into the mouthpiece all the air possible. Note the change on the horizontal scale and bring it back to zero. Ask your subject to perform this exercise four times with a break of one minute between trials.

After going through this routine swap roles.

For your workbook

Calculate your own average TV, ERV, IRV, and VC from your data. Drop the first measure in each series, it is a practice trial, and average numbers 2 to 4. Use this average to calculate IRV. Add the values for TV, ERV, and IRV, which should equal VC. If they do not, any idea why? Write a sentence or three on a piece of paper. There is a formula to predict VC:

- Males: VC = 0.052H - 0.022A - 3.60
- Females: VC = 0.041H - 0.018A - 2.69

(VC = Vital capacity in l, H = Height in cm, A = age in years).

Calculate your predicted VC and compare to the measurement. Write a few sentences: are they discrepant ? Is there any explanation that you could come up with?

Practical 10: Respiration and autonomic responses

Back to the Biopac. Respiration is most often taken as a control measure to assess respiration induced artefacts. For that purpose, respiration is measured with chest belts of different make that use different measurement principles. The big idea is not to get a quantifiable measure of respiration in ml, but an indication of whether respiration is regular and even, or irregular and

disrupted by deep breaths. The purpose of the experiment is to assess the effect of respiration on heart rate and skin conductance. Thus, you will measure three dependent measures, respiration, ECG, here displayed as a cardiotachogram, and SC. We'll use Lesson 9 - yet again - for -this exercise.

- Create a new folder '<your name>_10'.
- Record the three measures for 1 minute while your subject is relaxed. Then ask it to take a deep breath. Stop the recording after this.
- Measurements:
  Please score from the 1-min baseline the duration of each of three consecutive respiratory cycles.
  Comment on the effects that the deep breath has on SC and Cardiotachogram.
- Place the measurements and comments in the journal part of the screen
- Save your recordings and measurements. Copy your folder '<your name>_10' to a floppy.

For your workbook

In your workbook include the floppy with your recordings and scoring.

Practical 11: Eye-movements

Eye-movements are recorded to either monitor the subject's gaze or as an artefact control during EEG recordings. An easy way of recording eye movements is by means of an EOG. EOGs can be recorded to monitor horizontal or vertical eye-movements. Follow Lesson 10, EOG-1, but we will record only a horizontal EOG.

- Create a new folder '<your name>_11'.
- The Biopac will complain that there is no vertical EOG connected. Ignore it.
- We will record three EOG segments. One with horizontal movements unguided, one with guided horizontal movements, and one with unguided vertical movements. Ask your subject to fixate the centre spot indicated on the wall of the room. For the first recording, ask your subject to move their eyes from the centre to the left spot and then to the right and back. Repeat this movement. For the second recording, ask the subject to hold one finger about 50 cm in front and to move it from left to right slowly while maintaining fixation on the fingertip. And for the final one, ask the subject to fixate centre spot indicated on the wall of the room. Then move your gaze to the top spot and down to the lowest spot. Repeat.
- Measurements:
  Compare the two horizontal recordings: Do you see any differences.
  What can you observe during the vertical movement?
- Place your comments in the journal part of the screen
- Save your recordings and measurements. Copy your folder '<your name>_11' to a floppy.

Change roles with your subject and run through the procedure again.

For your workbook

In your workbook include the floppy with your recordings and scoring.

List of basic checks

There are a thousand things that can go wrong if you want to record physiological responses. Usually it all comes down to some basic problems that can be fixed easily. About 90% of all problems are covered by the first two laws of Psychophysiology: 'It works better if you switch it on' and 'It works better if you plug it in'. That holds in particular in countries with switches on power points. A few other problems are listed below:

- - SC:
  * The measurement looks ok, but drops away from time to time: Are the electrodes attached properly, i.e., they make contact without being too tight. If that does not do it: There might be a broken wire in one of the electrodes. Get assistance.
  * There are no SCRs even when your subject takes deep breaths: About 5% of the population do not show SCRs. You just may be lucky to have picked one of those. Nevertheless, you can try more radical things such as asking them to pinch themselves. That sometimes does the trick.
- ECG:
  * The ECG is upside down: Check the allocation of leads to electrodes.
  * There is no ECG, but (a) noise (b) a flat line: Check for the first two laws and: Make sure that the electrodes are attached properly. If the problem persists, swap electrodes, one of them might be broken.
- Respiration:
  * The respiration curve seems very flat. Loosen/tighten the respiration belt. It will not work properly if it is too tightly/loosely attached.

The list was far longer when we were working with the polygraph.