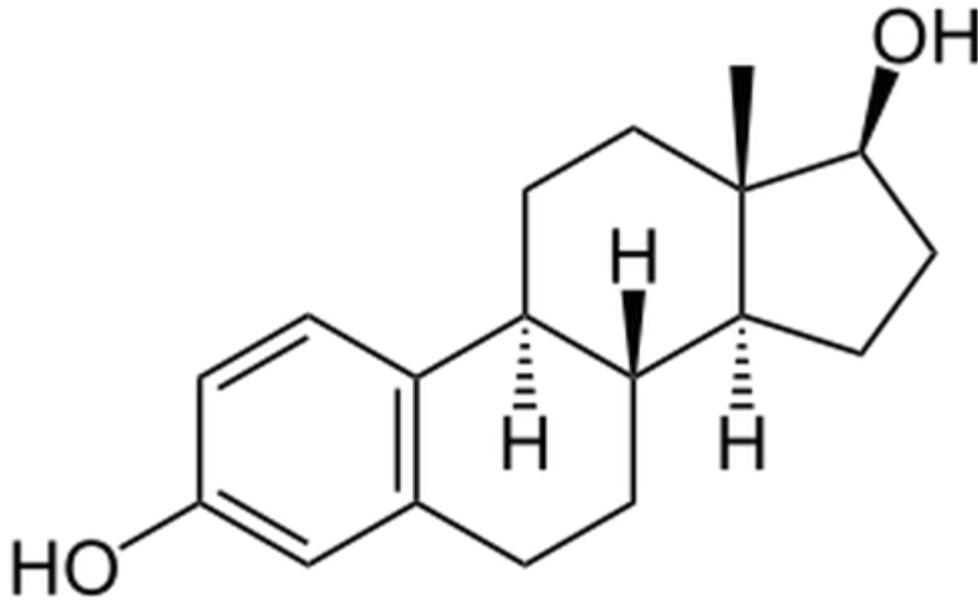


Emotions and hormones

Short term mood changes in relation to short term estradiol level changes.



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Abstract

Recent studies in psychobiology research have utilized saliva measurement for determining long term mood changes (Bosch 2014). However, the short term changes in emotions correlated to hormones remain largely undiscovered. In the current study the aim is to utilize saliva measurement to determine the estradiol values of subjects before and after a negative mood induction. Primarily two methods are utilized; mood induction and saliva measurement. The two methods have been proven to be some of the most effective for their respective fields, (Kučera and Haviger 2012)(Lewis 2006). The mood induction procedure (MIP) will be executed through the film and story method which has proven to be the most qualified mood induction method. (Westermann 1996). The aim is to determine if temporarily induced sadness leads to a short term drop in estrogen levels. Acquiring that knowledge could provide vital information for the further study of the relationship of hormones and mood, which in turn would open up for a new way of monitoring emotions in psychobiology. Knowledge of emotions could increase examination of various psychological conditions such as bipolar affective disorder and depression, by being able to determine the immediate biological responses to external effects. Furthermore this could help design new ways of treatment for psychological conditions as it enables a new way of exploring the relationship between hormones and mood.

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Background

In social interactions and scientific studies, visible physical changes have often been used to measure mood as this has been the most reliable strategy besides asking the subject, which includes the probability of bias (Vanman, Dawson, and Brennan 1998). These physical changes, as heart rate and dilating pupils have often been imprecise or difficult to determine (Köbele et al. 2010). This has created complications for the field of psychobiology especially in examining precise mood changes. Hormones have been linked to a fluctuation in moods (Mitchell and Phillips 2007), especially the hormone estrogen has in women, shown to be linked to depression. (Payne, 2003). Thus, associating hormones with moods seems logical. Modern technology has made it possible to determine mood through saliva (Inder, Dimeski, and Russell 2012) and over time the methods of measurement through saliva, have become more precise and it is now possible to measure steroids such as estrogen, cortisol and testosterone sufficiently accurate (Gavrilova and Lindau 2009). Both chronic changes (Payne, 2003) and acute changes in steroids have been measured (Peterson and Harmon-Jones 2012) and this presents a new way of monitoring temporary moods. Therefore, the question raised in the current study is as following: Can an acute mood change be determined through an acute hormone change?

Estrogen

Many studies show that a drop in estrogen levels in women trigger depressive symptoms (Payne 2003). Sadness in particular is important to the studies concerning this topic as the cause of this emotional variation can be ascribed to the estrogen estradiol estrogen, influencing the serotonergic system by increasing neurotransmitters such as serotonin, dopamine and norepinephrine (Archer 1999). A study by Biegon and McEwen (1982) showed a direct link between a decrease in serotonin receptors and an acute estradiol treatment in rats.

The research concerning estrogen and its mood affecting properties is often deduced on the background of long-term mental-illness such as various forms of depression (Wharton et al. 2012). However, this paper will focus on the short-term effects on hormones resulting in a change in mood. Short term mood changes, often expressed in emotions such as anger, sadness and happiness are essential for our understanding of biological reactions to external effects. A similar study has already been executed concerning the hormone testosterone in relation to the emotion of anger. (Peterson and Harmon-Jones 2012). The study concludes, that a direct relationship between the hormone and the emotion can be made.

Saliva

Steroid hormones such as estrogen can enter saliva from plasma, in a constant saliva/plasma ratio which can lead to precise conclusions on the plasma hormone level measuring the saliva (Bosch, J.A. 2014). The estrogen estradiol enters saliva through passive diffusion and has a high saliva/plasma ratio as it is lipophilic and a light compound. Saliva measurement has proven to be a highly effective and a precise noninvasive form of gaining information of a subject's hormone level (Worthman, Stallings, and Hofman 1990). The alternative, an invasive method could change the mood of a subject, and bias the results of the test. Furthermore the test is easy to conduct. (Gavrilova & Lindau 2009)

Method

The purpose of this research is to compare the baseline estrogen value of healthy subjects between the age 20-30, to the values found after affecting them with a mood induction procedure, using film. The subjects will then self-report upon their mood which will be compared to the measured estrogen values. The study will involve 20 subjects, with an equal number of both sexes. Half of the group will be a control group while the other ten will be the tested group. The control group is important for determining the relevance of the mood induction procedure contrary to the changes in estrogen levels of those, whom have not experienced a mood induction procedure. There are two primary aspects of method for this research paper. One is the saliva measurement the other is the mood induction method including the self-report.

Mood induction through film

One part of this clinical experiment is the mood induction procedure (MIP). The primary goal of this approach is to get the subjects in a certain state of mood/emotion, to measure the biological response. A study concerning this topic revealed that the most effective way of inducing a negative mood, is the film/story method (Westermann 1996). The subject is introduced to a film or story material and then asked to visualize and take emotionally part in the material presented. Before and after the film clip or story the subjects are asked to rank their current mood in a questionnaire on a scale from 1-10. They are asked to undergo the saliva test immediately after answering the first questionnaire and 20 minutes after the MIP.

The induction of negative moods, has been chosen because of the relationship between depression and estradiol values as mentioned earlier. In this context it is important to consider the "emotional blend", which can occur during MIP tests, as emotions seldom

occur as a singularity(Kučera and Haviger 2012). Even though these emotional variations should not affect the saliva measurement, it can affect the self-report results.

Saliva

Saliva measurement is a widespread method for measuring various physiological processes as expressed in changing levels of cortisol, estrogen and testosterone.(Inder, Dimeski, and Russell 2012). To collect the saliva samples, a saliva testing kit for estradiol with polyethylene swabs will be used. Each subject from the study receives a swab before and approximately 20 minutes after the MIP, which they will be instructed to chew on lightly for approximately 2 minutes(Ibid). The sample will then be collected and stored at -20°C until further analysis. The samples will be analyzed by a specialized laboratory.

Design of experiment

A clinical study is elementary for executing this study. The study involves a great amount of different stages which all have to be planned in detail. There are numerous different approaches and methods which have been considered before the final study design was chosen. The discussion paragraph will go into detail with the drawbacks and advantages of the chosen methods.

1. Phase.This phase will focus on selecting a number of suitable participants. As this is a pilot study the number of participants will only be 10, plus the control group of an equal size. The factors which are significant for the aptness of the participants are mental health and age furthermore the number of male and female subjects should be equal in both the tested group and the control group.

2. Phase. This is the pre-experiment phase. In this phase the subjects will be presented with the first questionnaire. After filling in the questionnaire and ranking their moods they will be asked to perform a saliva test. The cottons swabs are then stored in a freezer until further analysis.

3. Phase. In this, the subjects will be instructed. Here the difference between the control group and the tested subjects occur. The tested subjects will be instructed to take part in the film they are shown as this has shown to yield the biggest emotional change(Westermann, 1996). The control group will not be instructed to achieve a certain mood.

4.Phase. In this phase the MIP will be conducted. The tested group will be shown a negative mood induction film, and control group a neutral mood induction film. The

subjects will be viewing the film clip individually and the length of both films will be approximately 30 minutes.

5. Phase. After the viewing of the film clip, the subjects are asked to fill out the questionnaire and 20 minutes after the film clip was shown, another saliva sample will be collected. This concludes the test.

6. Phase. The processing of the samples is an elementary part. The analysis will not be executed by the primary investigator (Mira Backes) but by another team. The results will then be data processed and the hypothesis can now be confirmed or discarded, etc.

7. Phase. The final phase. The results can now be used for archiving funding for a bigger study if they prove valuable. This is merely a pilot study and a larger group of subjects should be used, if the results are to hold greater scientific value. If a bigger study is conducted it can be used as a basis for additional research in the field of psychobiology.

Budget

Conversion of valuta was done at: www.valutakurser.dk 25.10.2015 kl 18:17

Estradiol (E2) Elisa test (1pcs)¹

-Unit Price: 288.50 \$=1941.66

Salivette Cotton Swab without prep 100/bag²

-Unit price: 91.39 \$=614.47 ,- kr

Shipping

-15 \$=100.95 ,- kr

Mood induction film clip(negative and neutral)

-1000,- kr

Honorarium

-250,- pr. subject

250x20=5000,- kr

Lab assistant wage

-185 pr. hour³

185x20= 3700,- kr

Rent of test rooms

-5000 ,- kr

The, coffé etc. for subjects

-200,- kr

¹ <http://www.scimart.com/product/detail/Estradiol-E2-ELISA/> Visited 25.10.2015 16:04

² <http://www.scimart.com/product/detail/salivette-cotton-swab-wo-prep-100pack/> Visited 25.10.2015 16:10

³ <http://xn--ln-lka.info/laborant-l%C3%B8n> Visited 25.10.2015 17:00

Wage of main investigator

-1000,- kr

Unexpected expenses

-2000,-

Total budget

15557.1,- kr

Discussion

When writing a study, some methods must be chosen while others are to be disregarded. This has its dangers as every method has its advantages but also drawbacks. The saliva method is one of the easiest way to sample steroids (Inder, Dimeski, and Russell 2012), as it is noninvasive and can be conducted by the subject alone (Gavrilova and Lindau 2009). However studies showed that the results of these test are affected by the medium in which they are collected (Ibid). The study showed a difference of 30 % if the swabs used for collection where cotton instead of polyethene. Therefore it is elementary to use homogene sampling swabs, so that the results are not affected in this study.

There are different risks when utilising MIP. The choice of material is very important when using the film/story method, as it should evoke the desired effect by all contestants. It is essential to choose a film clip which has been tested beforehand, for its mood induction properties. Furthermore the researcher should decide if the subjects are to be informed of the films desired effects as this could increase the risk of bias (Westermann, 1996).

I believe that if this study is concluded successfully it could help improve our modern understanding of emotions. This has a variety of benefits for both medical treatment of mental illnesses but also for the further study of human emotions. Increasing knowledge of estrogens moods effects, could also help the development of drugs used in the treatment of menopausal syndromes affecting women.

Thanks

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<https://upload.wikimedia.org/wikipedia/commons/0/00/Estradiol.svg>

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