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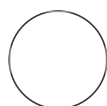
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Inducing Psychosocial Stress in the Laboratory: A Study Protocol for the Trier Social Stress Test (TSST) V.3

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ABSTRACT

This protocol details about a laboratory session aiming at inducing psychosocial stress in the laboratory using the Trier Social Stress Test (TSST). During the laboratory session participants report affect and dissociative states eight times. Heart rate, electrodermal activity, and respiratory rate are assessed continuously. Blood pressure is measured eight times and eight salivary samples are taken to determine cortisol levels.

GUIDELINES

Detailed guidelines on the implementation and execution of the Trier Social Stress Test are available here:

Kirschbaum, C., Pirke, K. M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test': A tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology*, 28(2), 76–81. <https://doi.org/10.1159/000119004>

Linares, N. F., Charron, V., Ouimet, A. J., Labelle, P. R., & Plamondon, H. (2020). A systematic review of the Trier Social Stress Test methodology: Issues in promoting study comparison and replicable research. *Neurobiology of Stress*, 13(5), 100–235. <https://doi.org/10.1016/j.ynstr.2020.100235>

MATERIALS

Protocol status: Working
We use this protocol and it's working

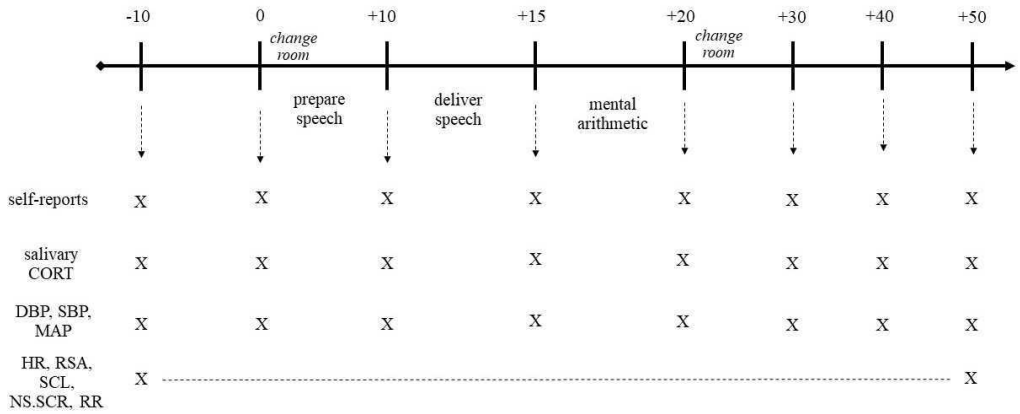
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Keywords: TSST, Trier Social Stress Test, Stress, HPA-Axis, Dissociation, Heart Rate, Electrodermal Activity, Cortisol, Affect, Blood Pressure

Self-report and physiological assessments during the Trier Social Stress Test (TSST) in the laboratory



Note. Room changes immediately after assessments 0 and +20. Self reports include assessments of affect and dissociation. CORT = cortisol, HR = heart rate, RSA = respiratory sinus arrhythmia (high-frequency heart rate variability), DBP = diastolic blood pressure, SBP = systolic blood pressure, MAP = mean arterial pressure, SCL = skin conductance level, NS.SCR = nonspecific skin conductance response, RR = respiratory rate. DBP, SBP, MAP, SCL, NS.SCR, and RR are assessed continuously.

This figure provides an overview of the eight distinct assessments throughout the laboratory session.

| A | B | C |
|-----------|-----|-----|
| 1022 - 13 | | |
| 1022 | | |
| 1009 | 710 | 411 |
| 996 | 697 | 398 |
| 983 | 684 | 385 |
| 970 | 671 | 242 |
| 957 | 658 | 229 |
| 944 | 645 | 216 |
| 931 | 632 | 203 |
| 918 | 619 | 190 |
| 905 | 606 | 177 |
| 892 | 593 | 164 |
| 879 | 580 | 151 |
| 866 | 567 | 138 |
| 853 | 554 | 125 |

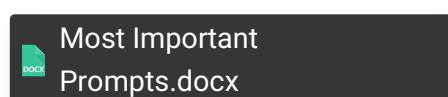
| A | B | C |
|-----|-----|-----|
| 840 | 541 | 112 |
| 827 | 528 | 99 |
| 814 | 515 | 86 |
| 801 | 502 | 73 |
| 788 | 489 | 60 |
| 775 | 476 | 47 |
| 762 | 463 | 34 |
| 749 | 450 | 21 |
| 736 | 437 | 8 |
| 723 | 424 | 0 |

This list is used during the second part of the Trier Social Stress Test ("mental arithmetic task").

| | | | |
|----------|-----|-----|-----|
| 1022 - 7 | | | |
| 1022 | | | |
| 1015 | 749 | 483 | 217 |
| 1008 | 742 | 476 | 210 |
| 1001 | 735 | 469 | 203 |
| 994 | 728 | 462 | 196 |
| 987 | 721 | 455 | 189 |
| 980 | 714 | 448 | 182 |
| 973 | 707 | 441 | 175 |
| 966 | 700 | 434 | 168 |
| 959 | 693 | 427 | 161 |
| 952 | 686 | 420 | 154 |
| 945 | 679 | 413 | 147 |
| 938 | 672 | 406 | 140 |
| 931 | 665 | 399 | 133 |
| 924 | 658 | 392 | 126 |
| 917 | 651 | 385 | 119 |
| 910 | 644 | 378 | 112 |
| 903 | 637 | 371 | 105 |
| 896 | 630 | 364 | 98 |
| 889 | 623 | 357 | 91 |

| | | | |
|-----|-----|-----|----|
| 882 | 616 | 350 | 84 |
| 875 | 609 | 343 | 77 |
| 868 | 602 | 336 | 70 |
| 861 | 595 | 329 | 63 |
| 854 | 588 | 322 | 56 |
| 847 | 581 | 315 | 49 |
| 840 | 574 | 308 | 42 |
| 833 | 567 | 301 | 35 |
| 826 | 560 | 294 | 28 |
| 819 | 553 | 287 | 21 |
| 812 | 546 | 280 | 14 |
| 805 | 539 | 273 | 7 |
| 798 | 532 | 266 | 0 |
| 791 | 525 | 259 | |
| 784 | 518 | 252 | |
| 777 | 511 | 245 | |
| 770 | 504 | 238 | |
| 763 | 497 | 231 | |
| 756 | 490 | 224 | |

This list is used during the second part of the Trier Social Stress Test ("mental arithmetic task") in cases where the participant has substantial arithmetic difficulties.



This document lists the most important prompts for the Trier Social Stress Test (in German).


SAFETY WARNINGS

- ! The Trier Social Stress Test is known to produce a moderate stress response in most participants including temporary increases in negative affective states and physiological reactivity. In participants with a history of trauma, the Trier Social Stress Test may result in temporary increased levels of dissociative states.

BEFORE START INSTRUCTIONS

Participants should have at least 60 minutes resting time upon arriving at the laboratory before the laboratory session begins to stabilize physiological responses, which may vary across participants. Participants are asked to abstain from brushing or flossing their teeth, smoking, using substances, drinking alcohol or caffeinated beverages, engaging in physical exercise, and eating during this time.

Before the TSST

- 1 Before the TSST, the investigator shows and explains to the subject the devices for the assessment of heart rate (Vivalink ECG Patch), electrodermal activity (Empatica Smartwatch), and blood pressure (iHealth BP Cuff). The subject is instructed to put the devices on. The investigator makes sure that the devices are functioning as intended and that data transmission is running.
- 2 It is explained to the participant that saliva samples will be taken during the laboratory session and that the samples will be used to measure cortisol levels.
- 3 The investigator then instructs the participant to use the m-path experience sampling application on the participant's smartphone to enroll in a survey repeatedly assessing affective and dissociative states. The participant is informed that the accuracy of the information is very important for the research project, and that questions are to be answered as it is in the current moment.
- 4  Measurement (-10). Assessment of affective and dissociative states via m-path application. The investigator instructs the participant to sit down and take a saliva sample (product: Sarstedt Salivette Cortisol). Meanwhile, first blood pressure measurement in sitting position on the non-dominant arm. 10m



00:10:00 before next
measurement

- 5 Measurement (0). Assessment of affective and dissociative states via m-path application. The investigator instructs the participant to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.



TSST - Prepare Speech

18m 15s

- 6 The investigator brings the participant to a separate room. One female and one male (active and passive stressors) already sit in the room. They are instructed to maintain serious mood, not to speak, laugh or the like, possibly answer the greeting of the subject with a curt "hello", and not to avoid eye contact.
- 7 The investigator reads the following instructions to the participant:
Your task now is to give a speech to this committee for an application. You're about to have 5 minutes here to prepare for this speech. You can take notes on this, but you must not use them during the speech. Imagine that you have applied for a job that fits your previous career and that you have been invited to interview there, or that you are applying for a promotion that means more money, more responsibility and more interesting tasks for you. You are expected to give a free speech. You are required to explain to the committee in 5 minutes why you believe you are the best candidate for this position. To do this, stand behind the microphone after your preparation time so that your voice is recorded. Note that you will also be recorded by the camera. The devices are used for later voice and behavior analysis. Committee members are trained in behavioral observation and will take notes during the speech. Don't be alarmed by this. You should try to make the best impression possible and embody the applicant's role as best you can during the speech. The committee reserves the right to ask further questions if any ambiguity arises. After your speech, which should last five minutes, the committee will give you a second task, which will also be explained by the committee. This will again take 5 minutes. Do you have any questions?
- 8 The investigator, the active, and the passive stressor leave the room.

5m



00:05:00 prepare
speech

- 9 The active and passive stressor enter the room and sit down.



Active stressor: **"Your preparation time is over. Please pause and take the next measurement"**

Measurement (+10). Assessment of affective and dissociative states via m-path application. The

participant is instructed to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.

TSST - Deliver Speech

18m 15s

- 10 Active stressor: **"Now come forward. (Pause) Stand behind the microphone on the floor marker (cross) and begin your presentation when the recording equipment is turned on."**

5m

Passive stressor: turn on camera / recorder, start stopwatch.

Active stressor: **"Please start your presentation now."**

 00:05:00 deliver speech

- 10.1 During the presentation, the active and passive stressors are instructed to seek and maintain eye contact with the subject, alternate taking notes and looking up to the subject, remain silent for at least 15 seconds during pauses in the subject's speech, not to respond to questions from the subject, but point to the task and that everything else will be clarified after the test, let the subject speak freely for as long as possible, and to make sure that the subject talks about her personality, and does not present professional qualifications or the like.

- 10.2 If necessary, the active stressor intervenes:
"We already have your resume/credentials, please continue to tell us about your personal attributes."
"Please talk about your negative qualities".

- 10.3 After 3 minutes the active stressor may ask:
"Why do you think you, of all people, are particularly suited for this ...?"
"Why are you more suitable than other applicants?"
"What qualities of yours tend to make you unsuitable for the job?"
"What leadership qualities do you possess?"
"Describe for us any other ... , that you have done or could do."
"How do you feel about teamwork?"
"Where do you see your position on a team?"
"Think about your last failure. How did you handle it?"

If these questions are too difficult, the active stressor may ask:

- "Explain how your hobbies relate to"**
"What other interests do you have?"
"Describe for us a normal day in your life."
"Explain why it is important for you to perform."
"What do you think of the statement: 'A bird in the hand is worth two in the bush'?"
"Do you consider yourself a person who cares about his independence?"
"Do you think it's important to develop throughout your life?"

"How do you feel about friends?"

- 10.4** The minimum speaking time is 3 minutes. The active and passive stressors are instructed to ignore objections. If necessary, the active stressor will repeatedly ask the participant to continue speaking.

"You still have time. Go ahead."

"Your speech time is not over yet."

- 11** After 5 minutes, the active stressor says: **"That should be enough here for now. We will explain the second task to you in a moment."**

- 12** Active stressor: **"Please pause and take the next measurement"**



Measurement (+15). Assessment of affective and dissociative states via m-path application. The participant is instructed to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.

TSST - Arithmetic Task

18m 15s

- 13** Active stressor: **"We will now explain the second task to you. This is an arithmetic task. You are to calculate backwards to zero in steps of 13 as quickly and correctly as possible. You will start at 1022. If you miscalculate, we will point this out to you and you will start again at 1022. Do you have any more questions? Please start now."**

5m

Passive stressor: restart stopwatch.



00:05:00 arithmetic task

- 13.1** If the participant miscalculates:

Active stressor: **"Stop. 1022."**

Active stressor: **"Error. 1022."**

- 13.2** The minimum speaking time is 5 minutes. The active and passive stressors are instructed to ignore objections. If necessary, the active stressor will repeatedly ask the participant to continue or restart the task.

Active stressor: **"Start over at 1022."**

- 13.3** If the participants looks at the ceiling or elsewhere in the room:

Active stressor: **"Look at the camera, please!"**

(when asked, say that looking to the camera is necessary for sufficient video recording)

13.4 If the participants speaks quietly:

Active stressor: **"Please speak up!"**

(when asked, say that speaking loudly is necessary for sufficient audio recording)

13.5 In case of severe arithmetic difficulties, reinforcement by affirmative nodding. If necessary the task will be modified:

Active stressor: **"We'll change the task a little bit. Now calculate backwards in steps of 7. Start again at 1022."**

If this still is too difficult, ask to add 7s.

14 After 5 minutes, the active stressor says: **"Thank you very much. The interview is now over. Please take a seat and wait for the interviewer."**

Passive stressor: Switch off audio and video recorders.

15 Active stressor: **"Please pause and take the next measurement"**

10m



Measurement (+20). Assessment of affective and dissociative states via m-path application. The participant is instructed to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.

The committee leaves the room and the investigator enters the room.



00:10:00 before next
measurement

After the TSST

18m 15s

16 The investigator brings the participant to a separate room.

17 The investigator instructs the participant: **"Please take the next measurement"**

10m



Measurement (+30). Assessment of affective and dissociative states via m-path application. The

investigator instructs the participant to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.



00:10:00 before next
measurement

18

The investigator instructs the participant: **"Please take the next measurement"**

10m



Measurement (+40). Assessment of affective and dissociative states via m-path application. The investigator instructs the participant to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.



00:10:00 before next
measurement

19

The investigator instructs the participant: **"Please take the last measurement"**



Measurement (+50). Assessment of affective and dissociative states via m-path application. The investigator instructs the participant to take a saliva sample (product: Sarstedt Salivette Cortisol). Blood pressure measurement in sitting position on the non-dominant arm.