Biometric Security Systems

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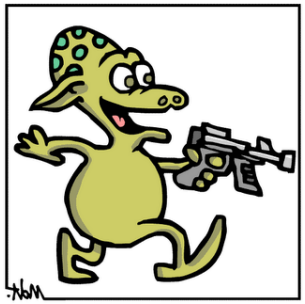
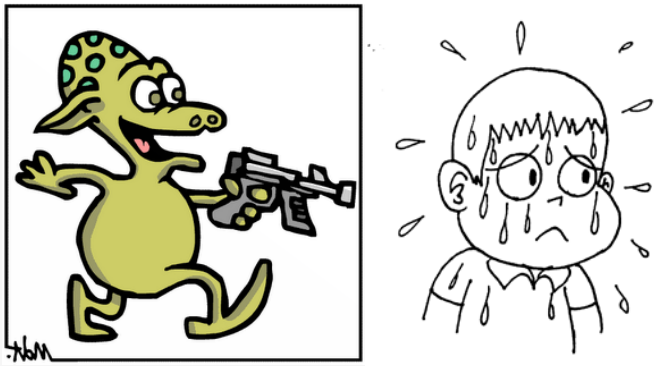
Biometric Security Projects

- Fighting Coercion Attacks using Skin Conductance



- Mobile Contextual Security

Fighting Coercion Attacks using Skin Conductance



- ***Fighting Coercion Attacks in Key Generation using Skin Conductance***
  - Payas Gupta and Debin Gao, Singapore Management University,
  - 19th USENIX Security Symposium, 2010

Keys and Coercion

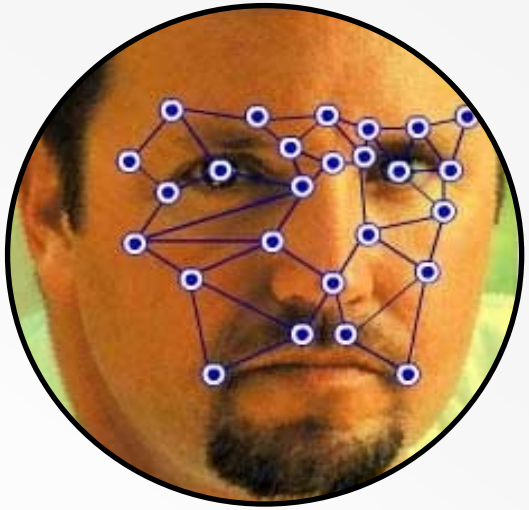
Unforgettability
Unforgeability
High entropy

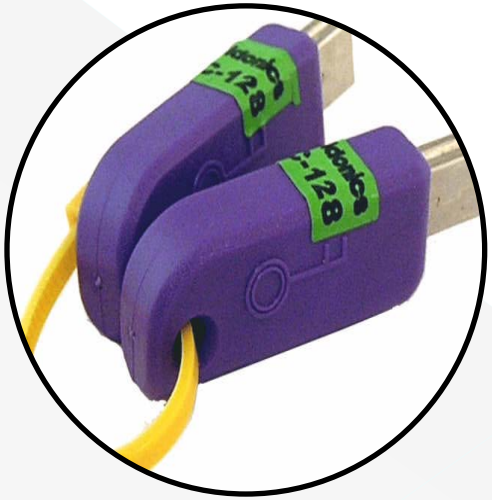
Coercion Attack

Password

1 0 1 1 0 0 0 1 0 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 0 1 0 1 0 1 0 1 0 1 0 1 0 1

Biometrics





USB

Coercion Attack

- Bank Vault
- Top Secret Lab
- Airplane Cockpit

Existing Approach (BKG)

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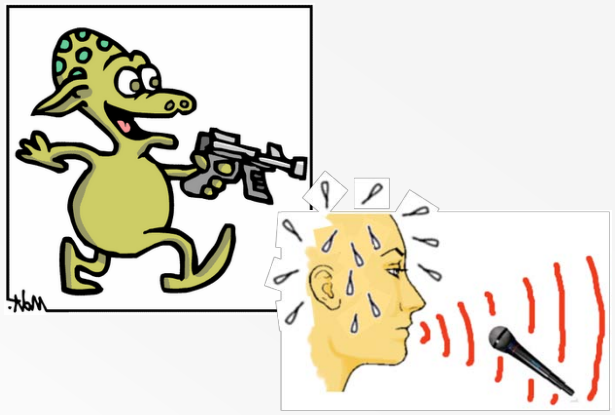
Problem with the **Existing Approach**: **Coercion Attack**

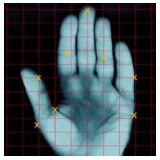


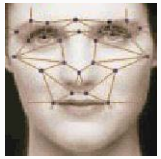
Voice

Correct

Cryptographic key

Authenticated

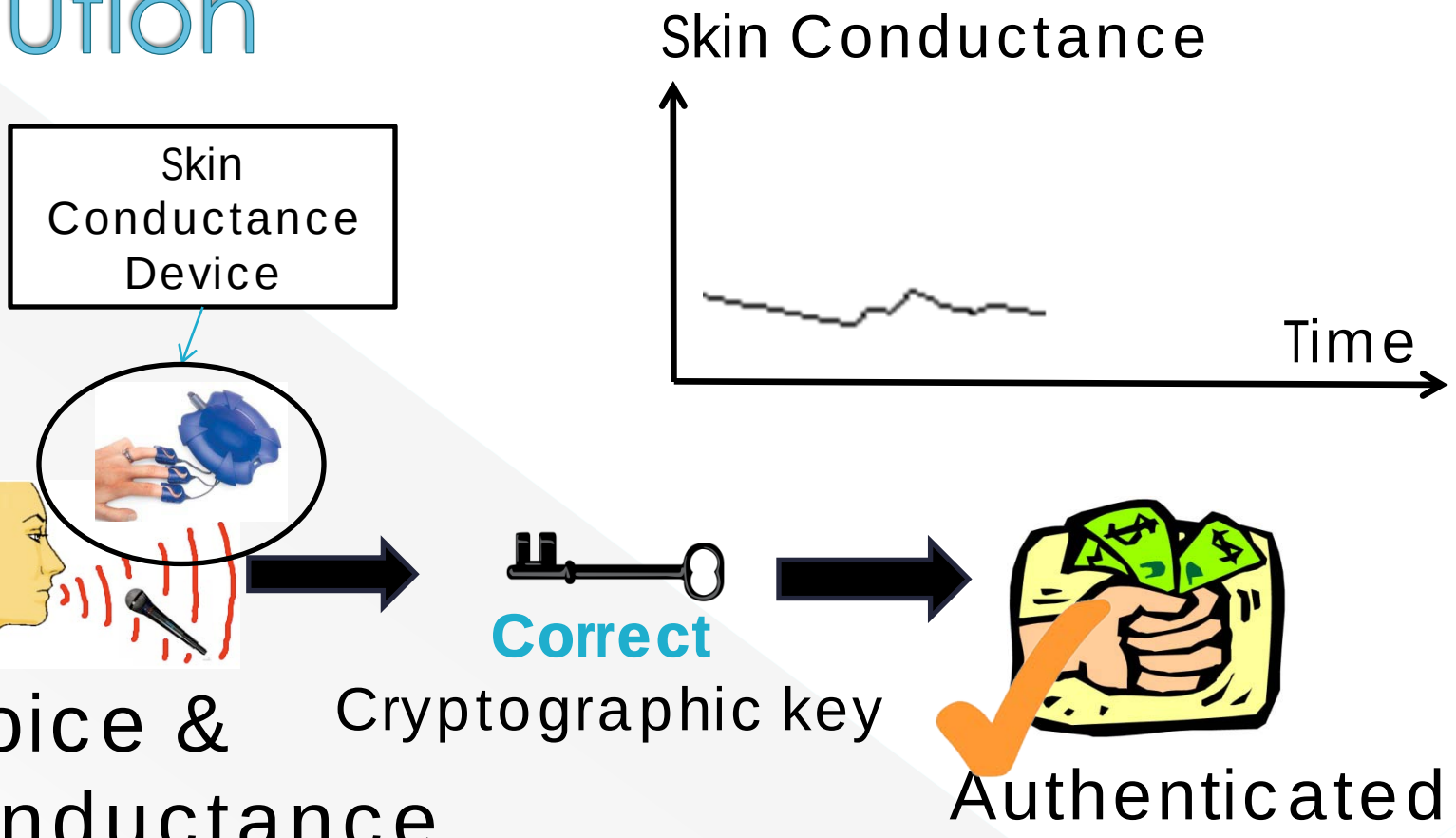




What is Coercion Resistance?

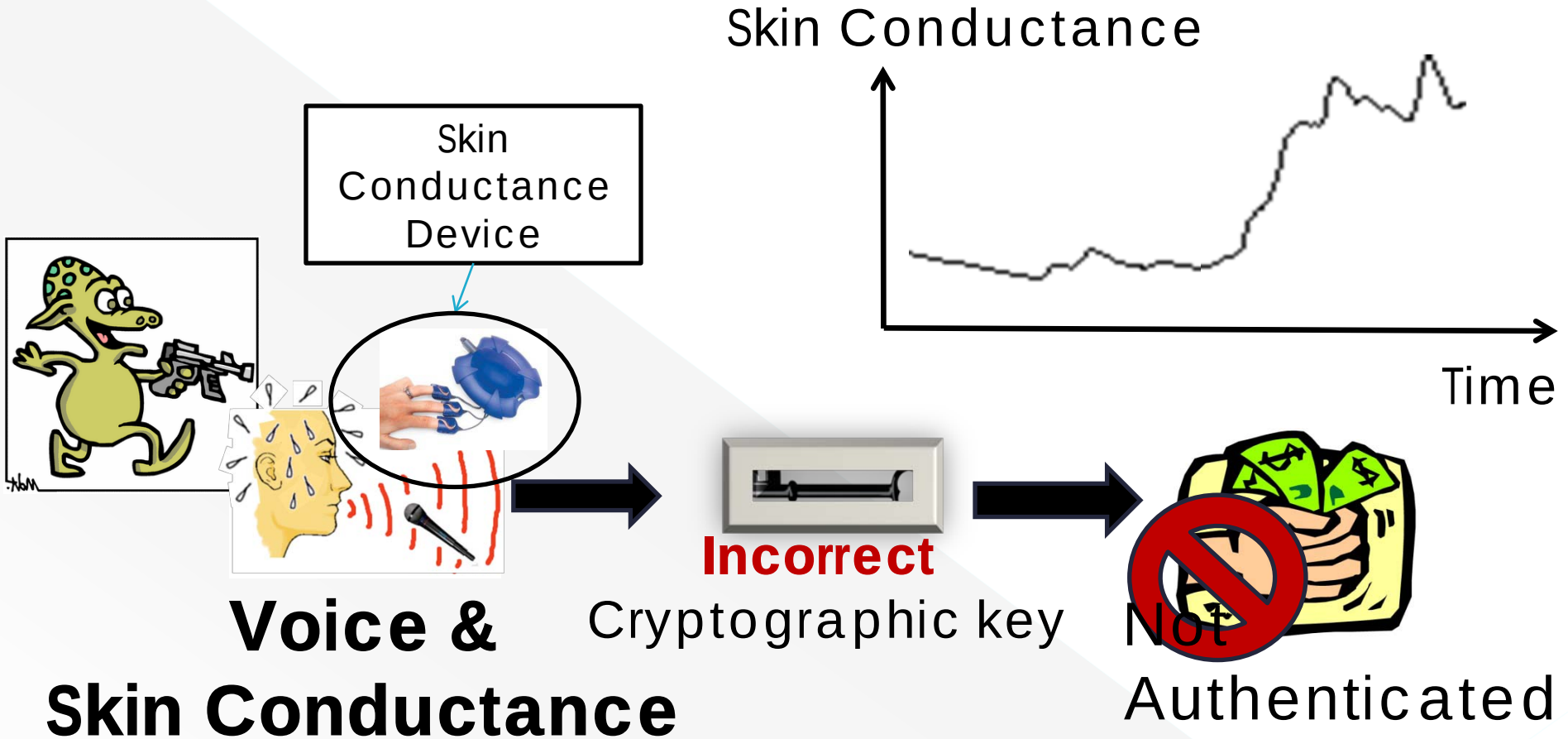
- Coercion-resistant security scheme
  - User does not have a choice
  - User does not have the capability
- Assumption: Attacker knows how the system works
- Implications: Attacker will not coerce the user
- Panic Passwords [**Clark '08**]
  - Can be used for authenticating under duress

Solution



Along with **Voice**, use **Skin Conductance** as Emotional Response Parameter

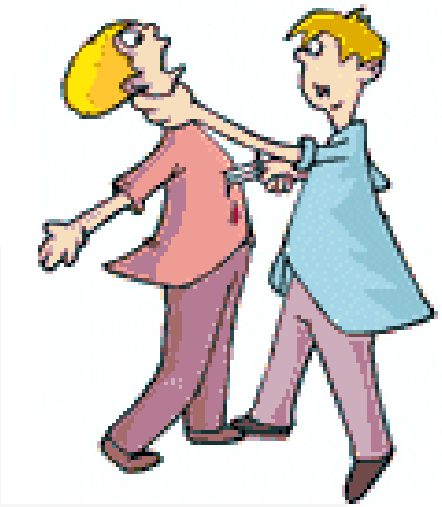
Solution



Along with **Voice**, use **Skin Conductance** as Emotional Response Parameter

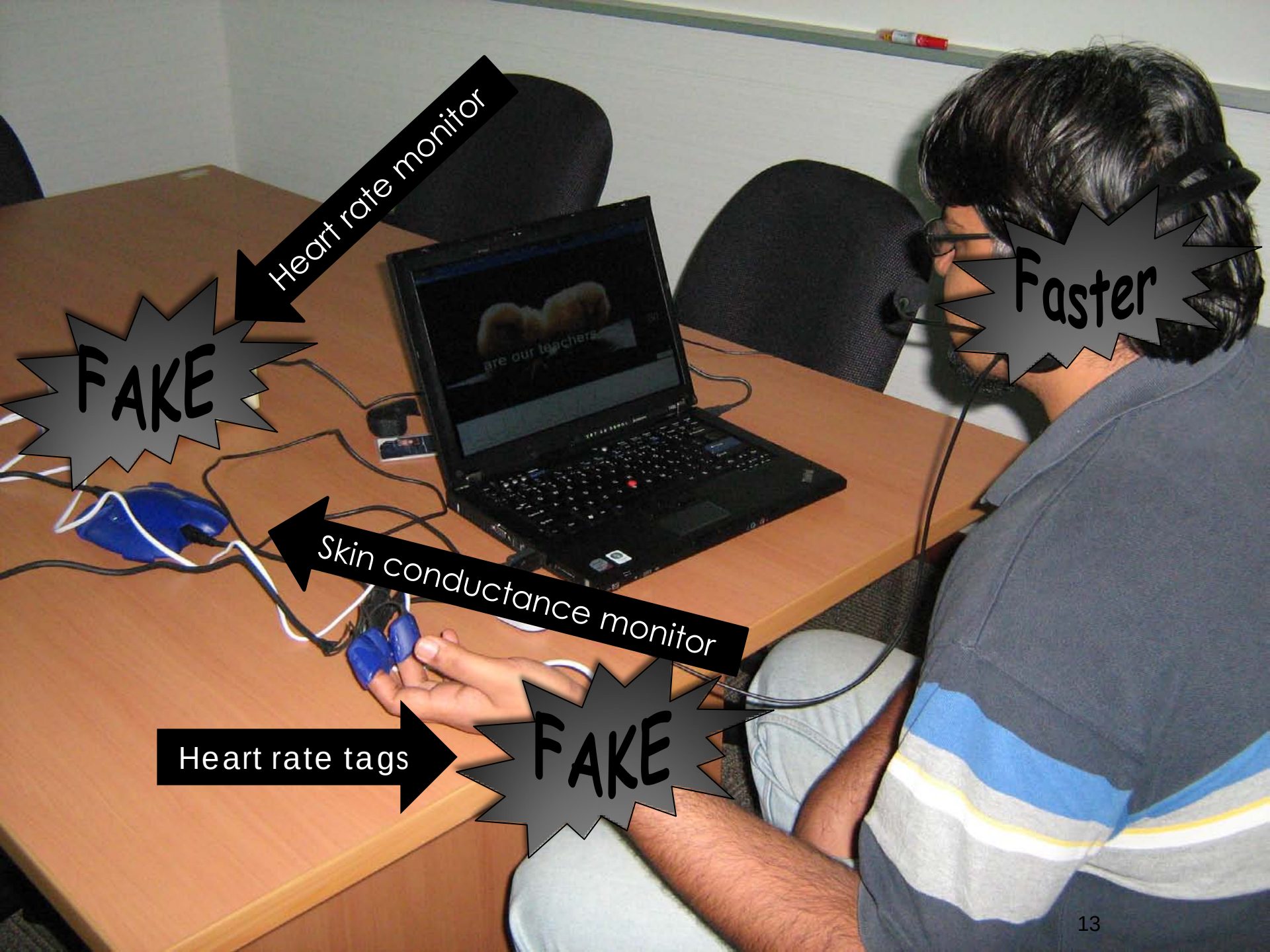
User Study in Coercion Attack

- How to show up results and to perform user study?



User Study - Demographics

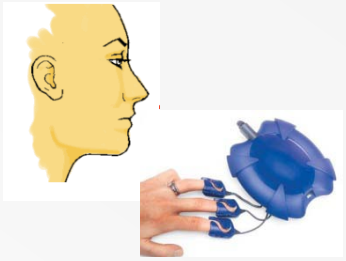
- Undergraduate and graduate students in the age from 18 to 28.
- 43 participants
  - 4 participants removed the measuring device from their fingers when they were nervous during the experiment.
- Therefore, successful participants – 39
  - 22 male and 17 female


Heart rate monitor
FAKE
Faster
Skin conductance monitor
Heart rate tags
FAKE

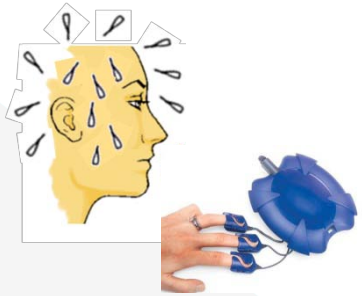
User Study

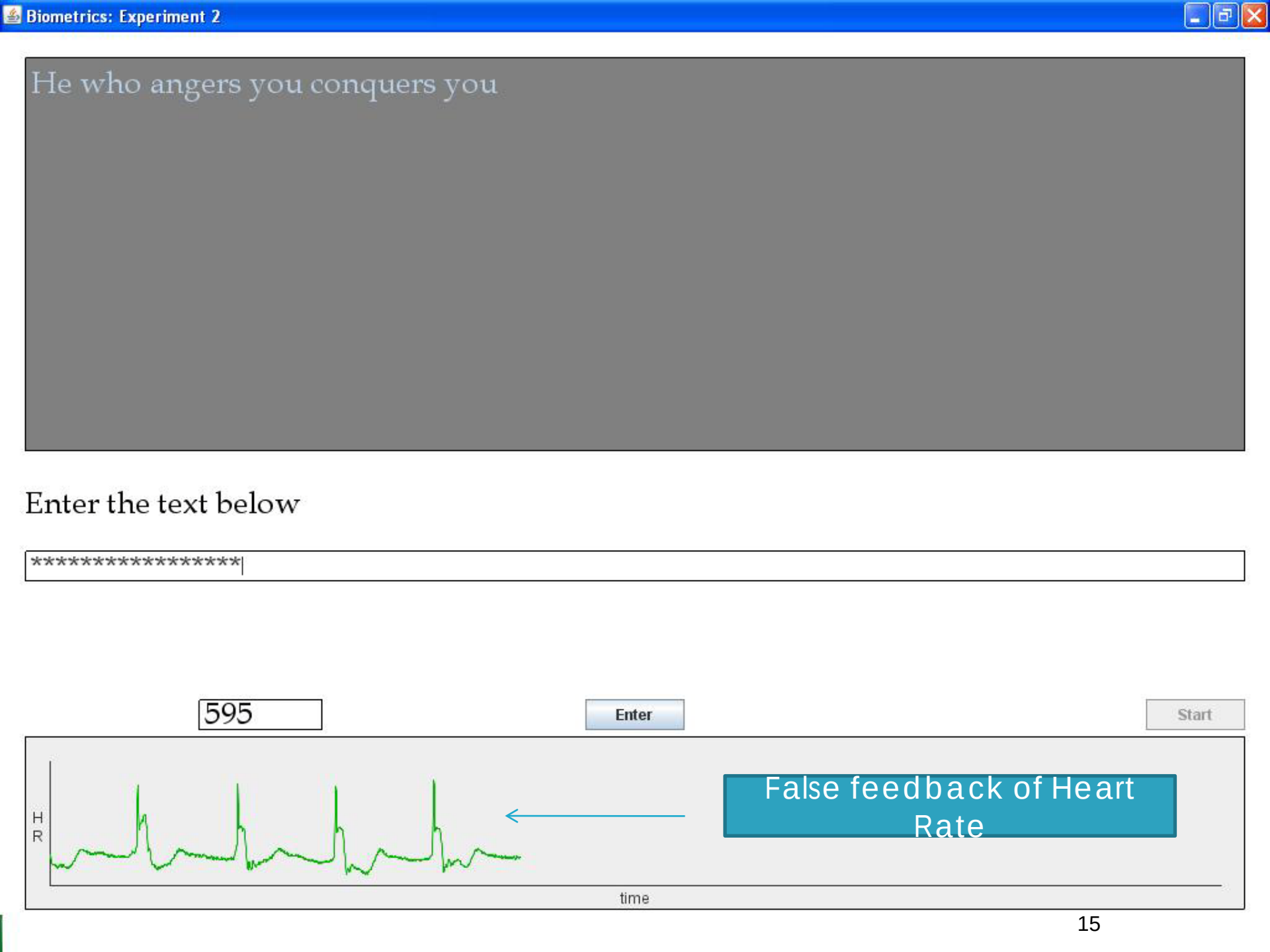
- Objective
  - Monitor Skin Conductance

Normal



Stressed



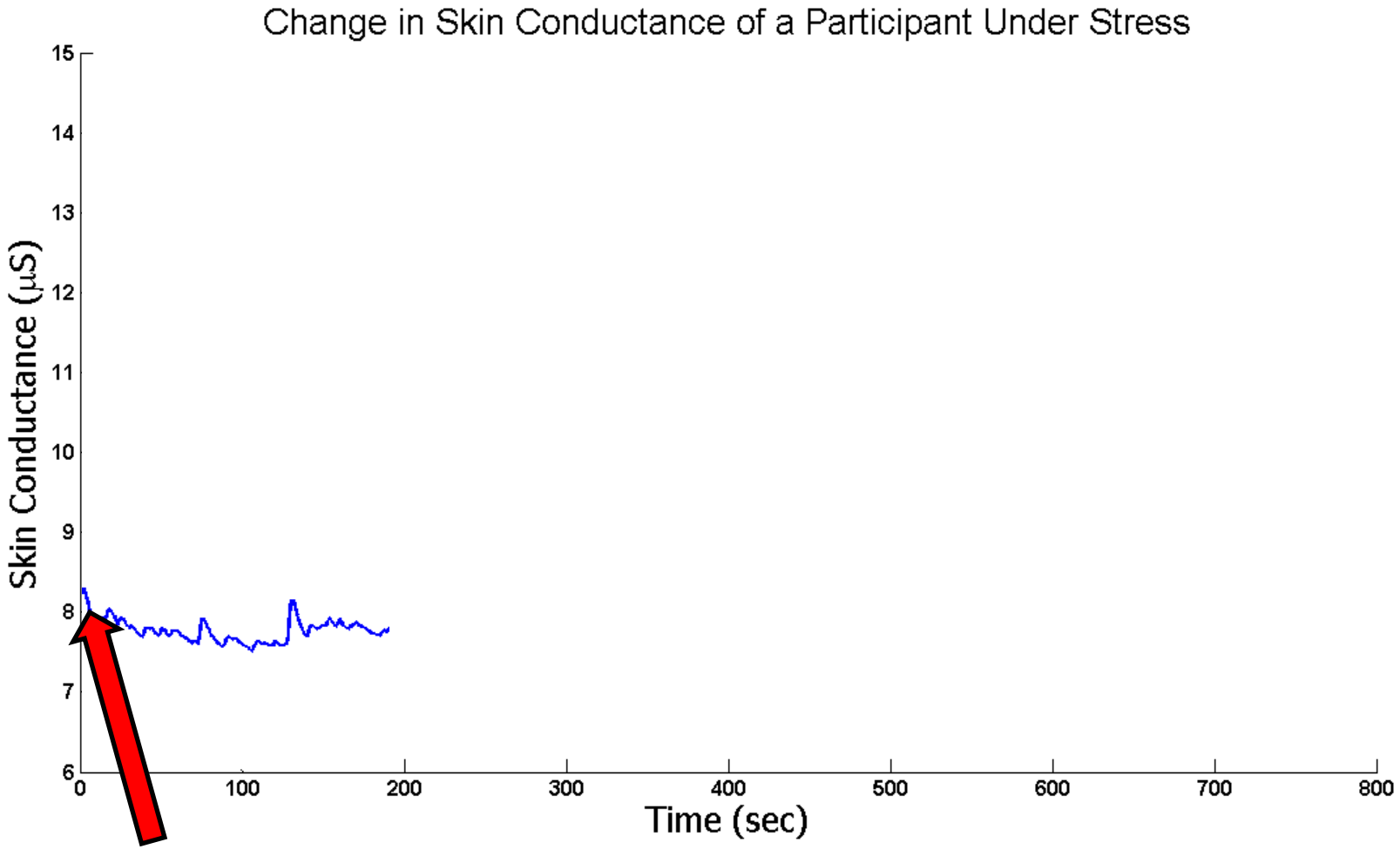

Biometrics: Experiment 2
He who angers you conquers you
Enter the text below
****
595
Enter
Start
H
R
time
False feedback of Heart Rate

What happened?


Do not touch the 'X' key of the keyboard

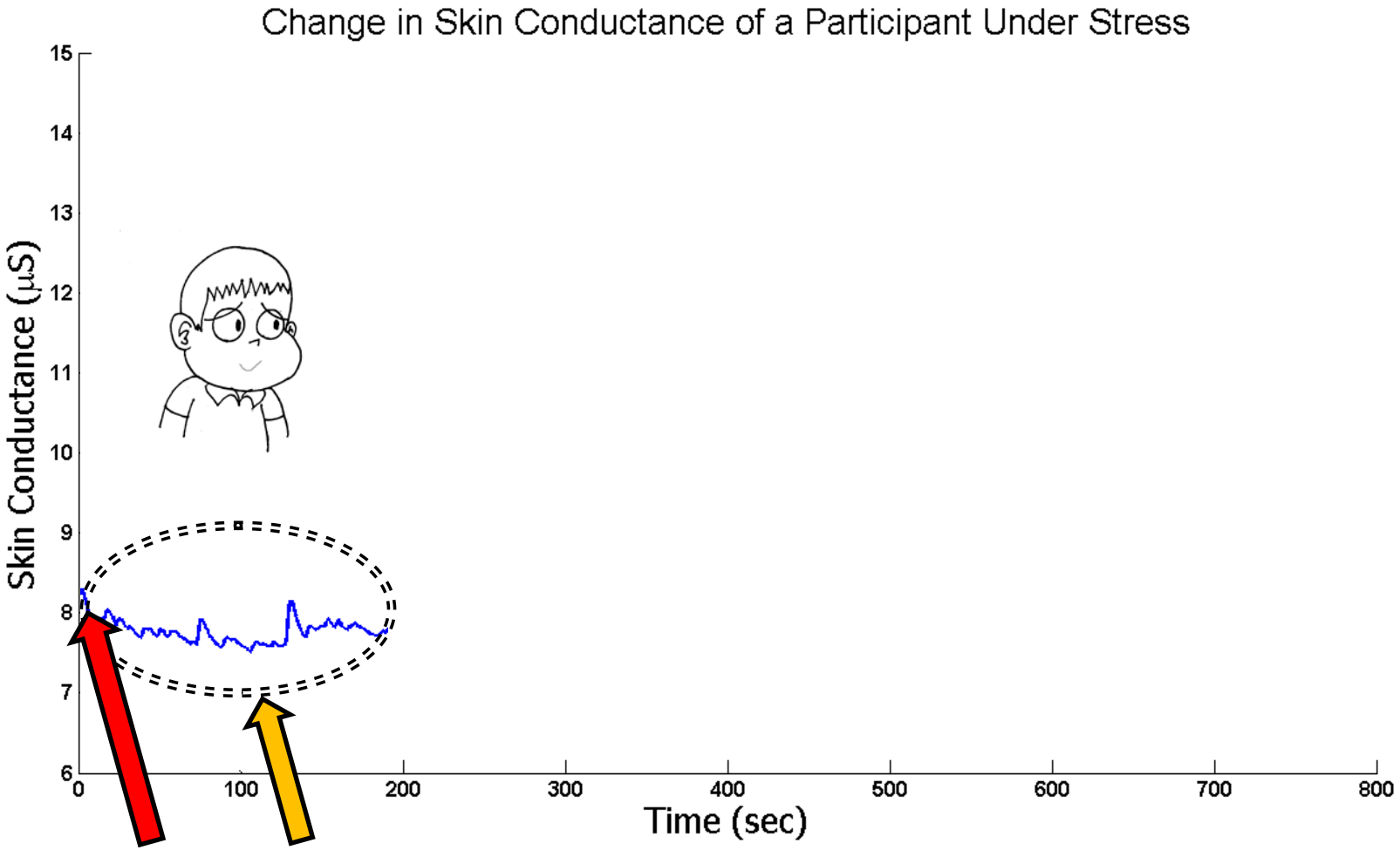

Yeah it was my mistake, I pressed the X key of your keyboard. I am ready to help you!!!
It was your fault
Who will pay for the device?
How will I recover my data?
I am sorry, but I did not press X key.
Your experiment sucks, your laptop sucks, moreover you suck

Events in Experiment 2



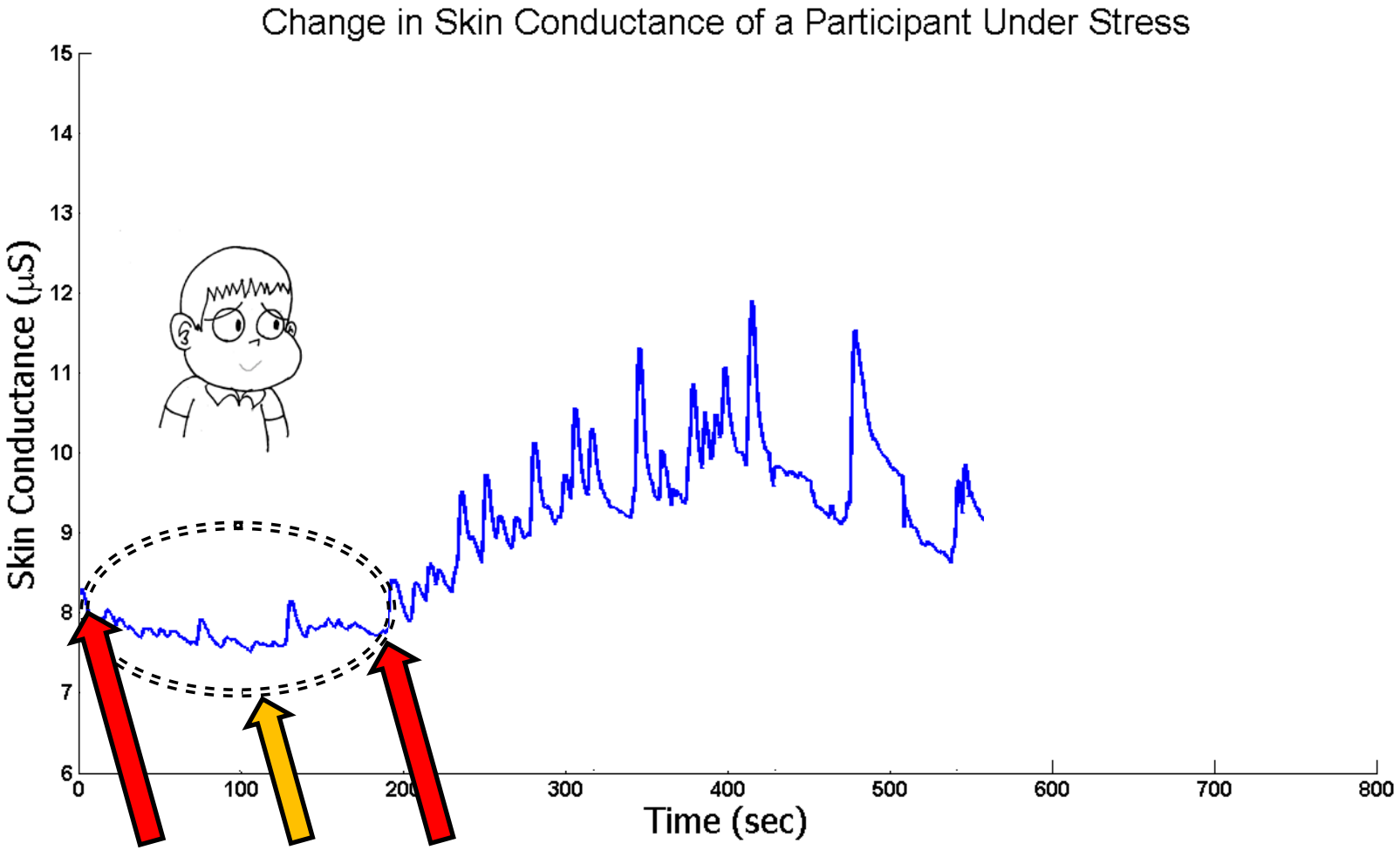
Examiner leaves the room, leaving the subject alone

Events in Experiment 2



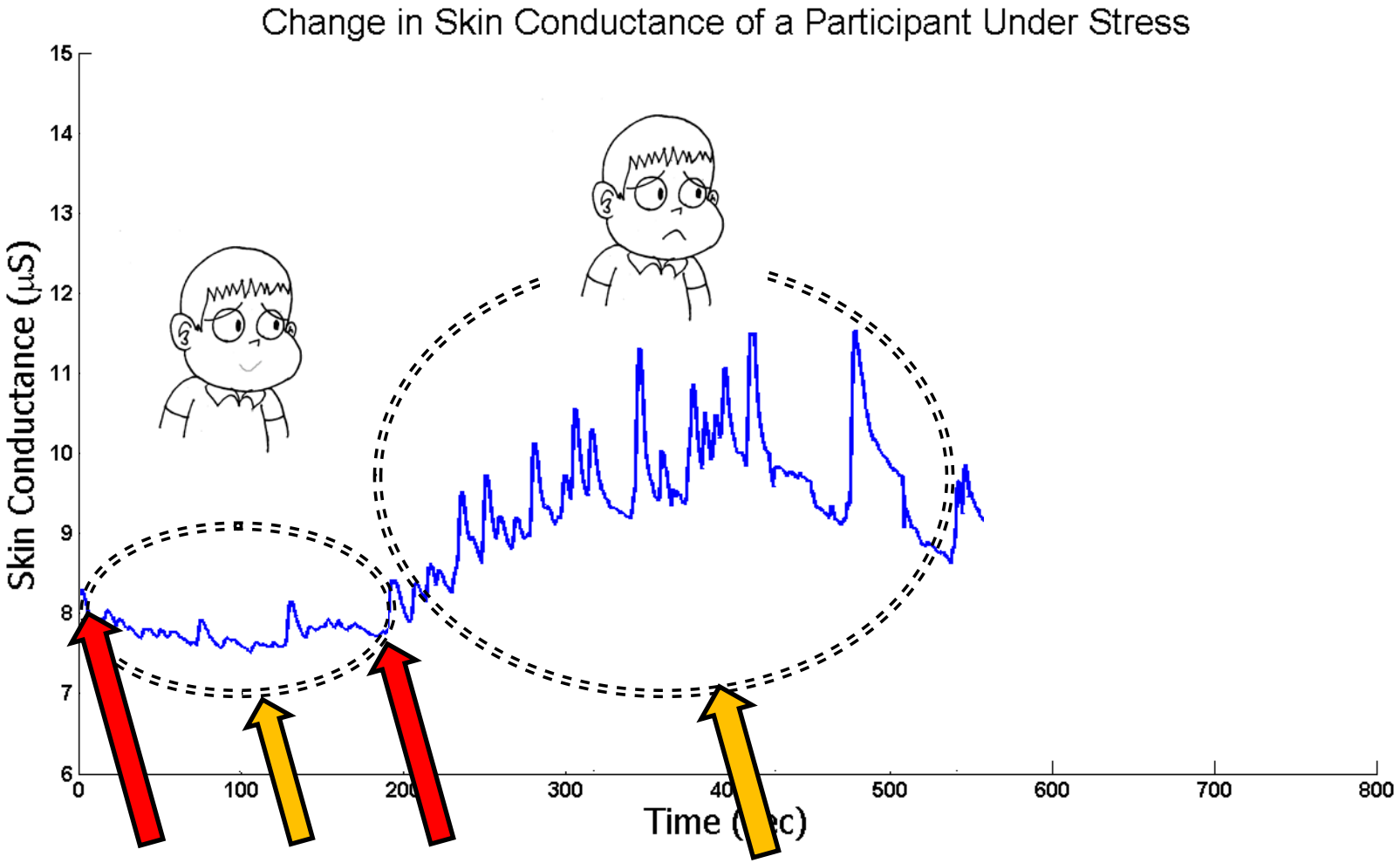
Subject sits in-front of a PC and is asked to type a few sentences.

Events in Experiment 2



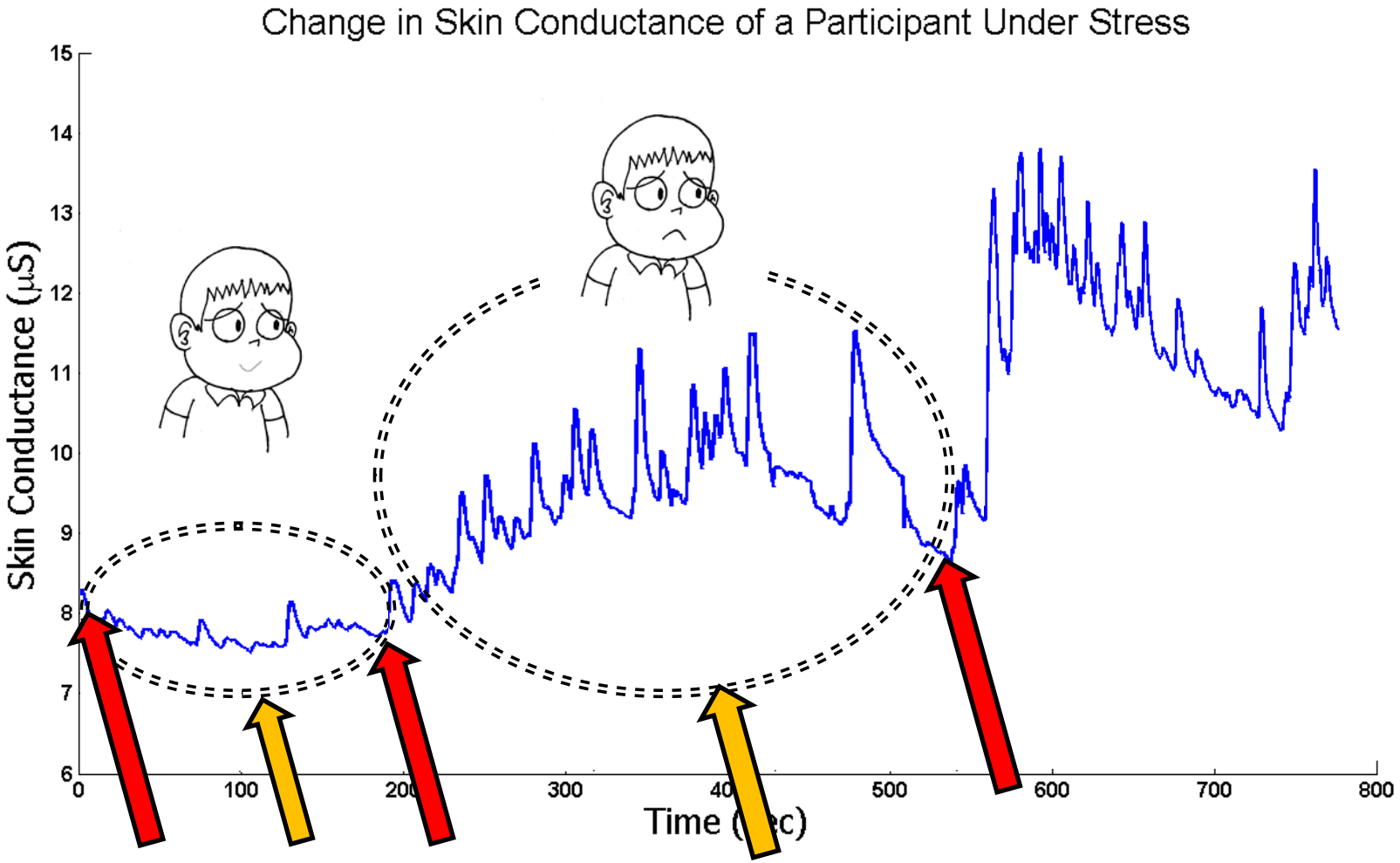
The core of the experiment begins when the PC shuts off as the subject is typing a letter

Events in Experiment 2



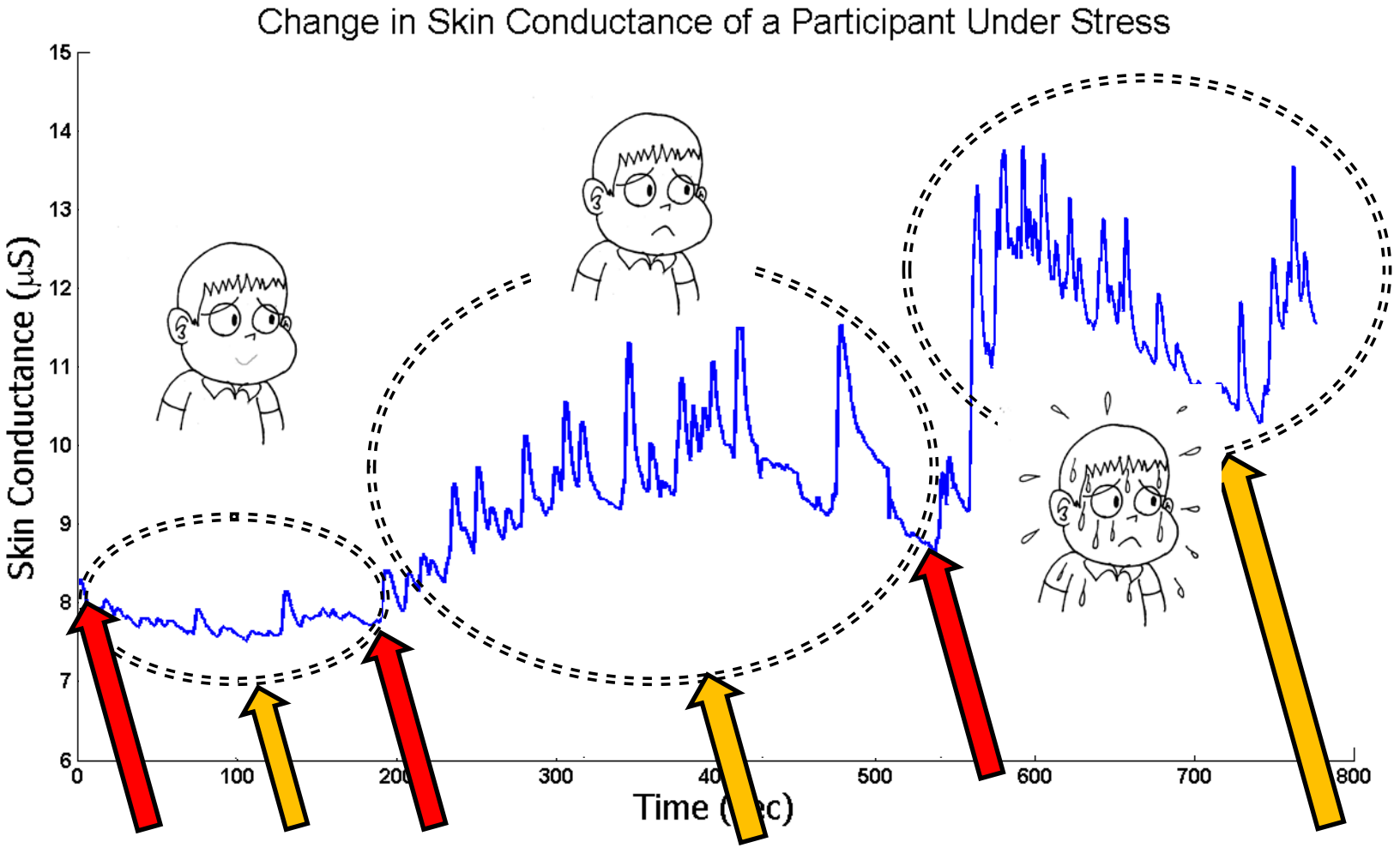
As a result, subject succumbs to stress.

Events in Experiment 2



Examiner enters the room

Events in Experiment 2



And, falsely accused the subject for inappropriate handling of PC and corresponding data loss