Artifact

EEG

Background Noise

Artifact
Artifacts

Slow Transients
- baseline DC shifts
- eye movements

Fast Transients
- muscle movement
- ECG
Artifacts

- **Artifact** - any signal not originating in the brain.

- **Sources**:  
  - EEG equipment  
  - Electrical interference outside of child or equipment  
  - Electrodes and leads  
  - Participant
Artifacts: EEG equipment

**Electrostatic induction** - if one unscreened conductor has an alternating potential with respect to earth, another conductor will have an opposite potential induced upon it; [e.g., acts like a battery]

- induced conductance is small between body and ground but with amplification may be large relative to EEG signal;

Solution: shielded cables, and shielded, grounded equipment.
Artifacts: EEG equipment

Electromagnetic induction - conductor carrying a current has an electromagnetic field in its vicinity which is capable of inducing a voltage in another nearby conductor; [transformers]

- If scalp wires near equipment, equipment may induce a current in the loop involving head and wires;
- Problem worsens if equipment not properly shielded or grounded and linked together, causing loop to get larger, producing larger noise levels;

Solution: all earth connections made to a SINGLE point (PREFERABLY, an earth pin).
Electromagnetic Induction
Artifacts: Electrodes & Leads

1) **movement** of electrode relative to scalp (results in change in contact resistance or a disturbance of electrode potential);

2) **loose electrodes** - repetitive discharge without apparent electrode movement;

3) **junction** between dissimilar metals (e.g., input lead plug & socket or between electrode and snap clip);

4) Artifacts from a single channel generally confined to the troublesome component point (unless….).
Artifacts: Participant

1) muscle potentials (tenseness, fatigue, uncomfortable);

2) eye movements:
   a) ~100 mV potential difference between eye, fluids, tissue;
   b) eyeball or eye lid movements affect adjacent electrodes (usually + relative to posterior leads);
   c) closed or blinking eye lids: + deflection
   d) open eyelids: - deflection

Solution: alert subjects; fixation, relaxation, high frequency filters (but could risk confusing muscle artifacts with beta wave).
3) **cardiac activity** - sawtooth wave synchronous with pulse; 
- more of risk with "monopolar leads" or with non-cephalic references; use bipolar cephalic leads since heart electrical field is equipotential across the head; 
- more often with wide spaced electrodes as in the case with reference under the ear; [ECG artifact (with R wave) difficult to eliminate] 
- vein pulse easier to control by moving electrode small amount,
4) perspiration: causes slow swings in EEG, usually in many channels at same time;
   - due to changes in electrode contact resistance & skin potential;

Solution: cool the subject, reduce time constants by increasing high pass filter setting (to cut out slow frequencies);
Artifacts: Eye Blinks
Artifacts: Eye movements

Vertical
Artifacts: Body Movements
Artifacts: Face Movements
Artifacts: Chewing Movements
Artifacts: Head Side Movements
Artifacts: Response Movements
Artifacts

- As a general rule, if there is noise in the subject's record:
  - First assume that the problem is not in the equipment but in the application to the child.
  - Artifacts seldom due to equipment failure.
  - Second, after eliminating subject-related possibilities, check equipment.
QUESTIONS ???