Smooth pursuit eye movements can help improve motion prediction: healthy adults performed better in a motion prediction task during pursuit than during fixation (Spering, Schütz, Braun & Gegenfurtner, J. Neurophysiol. 2011).

**Eye soccer: did the ball hit or miss the goal?**

**How is the ability to predict visual motion affected by impairments in smooth pursuit eye movements?**

Patients with schizophrenia and clinically unaffected first-degree relatives show deficits in:
- Pursuit (e.g., velocity gain, saccade rate, predictive tracking) Holzman et al., 1974; O’Driscoll & Callahan, 2008
- Motion perception (e.g., higher direction detection thresholds) Butler & Javitt, 2005; Chen et al., 1999; 2003

**Methods**

**Procedure**
- Visual target (“ball”) moved towards “goal” at 10°/s; ball and goal disappear before hit/miss
- Pursuit condition: track ball; fixation condition: fixate goal
- Judgment: button press for ball “hit” or “miss” relative to goal.

**Patients**
- 15 patients who met DSM-IV (SCID-defined) criteria for schizophrenia
- Age: 40.9 yrs (SD 8.6); 14 male
- IQ (quick test): 97.2
- SES (Hollingshead Scale): 22.7
- All patients receiving typical/atypical antipsychotic medication
- Duration of illness: 19.1 yrs

**Controls**
- 16 adults with no history of SCID-defined Axis I psychiatric disorder
- Age: 31.9 yrs (SD 7.7); 11 male
- IQ (quick test): 101.3
- SES: 42.2

**Results**

- **Control group**
  - Motion prediction pursuit > fixation ($F = 5.81, p = .03$)
  - Performance increase with presentation duration ($F = 13.23, p = .002$)
  - Valid pursuit trials: 28.7% of total pursuit trials

- **Patients**
  - Motion prediction pursuit = fixation ($F < 1$)
  - No performance increase with presentation duration ($F < 1$)
  - Valid pursuit trials: 11.8% of total
  - Worse overall performance than controls (short: $p = .04$, long: $p = .0005$)

**Conclusions**

- Schizophrenia patients show lower pursuit gain than controls and no perceptual performance advantage during pursuit; consistent with impaired motion processing and reduced MT activity Butler & Javitt, 2005; Kim et al., 2005; 2006
- Impaired sensory input to frontal pursuit areas (FEF/SEF) could explain deficits in using extraretinal motion information
- Patients have higher eye position errors in trials with perceptual error, indicating an inability to compensate for sensory consequences of eye movements Lindner et al., 2005

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