TIC DISORDERS

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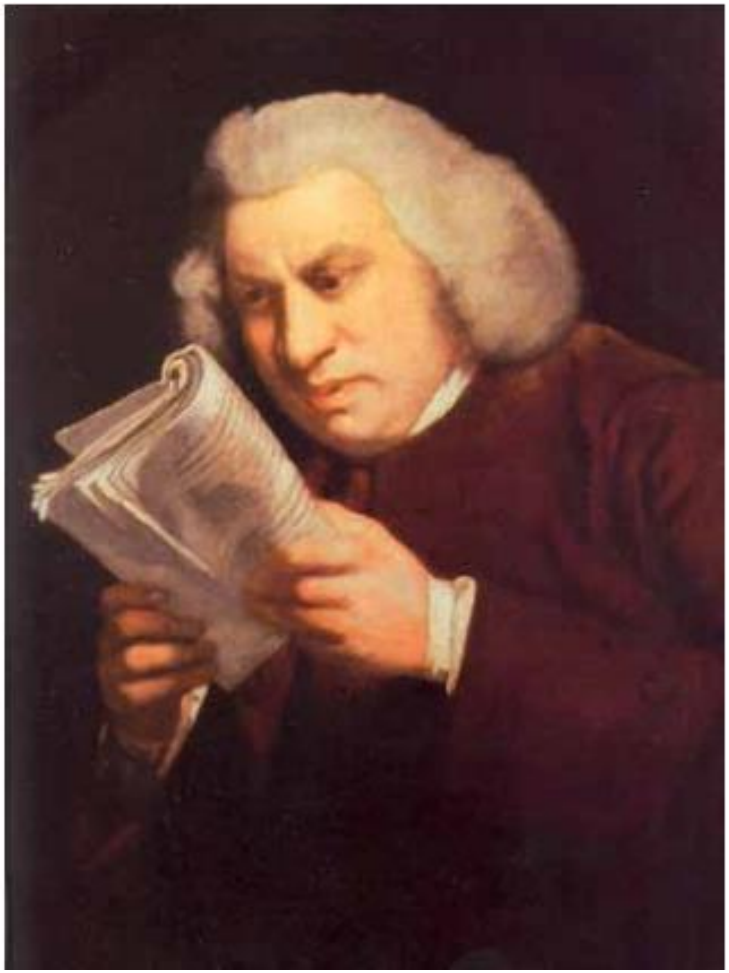
Outline

- The Basics
- Epidemiology
- Etiology
- Risk Factors
- Diagnosis
- Comorbidity
- Treatment

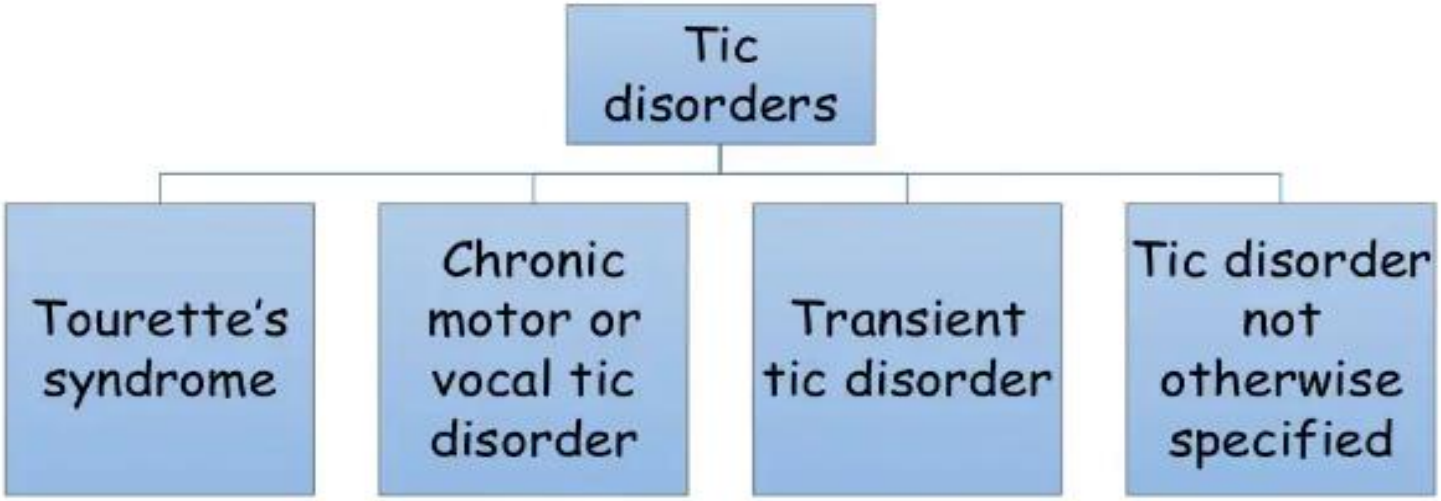


The Basics: Definition of a Tic

Motor movement or vocalization that is:

- Involuntary
- Sudden
- Rapid
- Recurrent/Repetitive
- Non-rhythmic
- Short bursts or series
- Various muscle groups
- Simple or complex
- Transient or chronic
- Premonitory urge

Types of tics disorders



Transient tic disorder

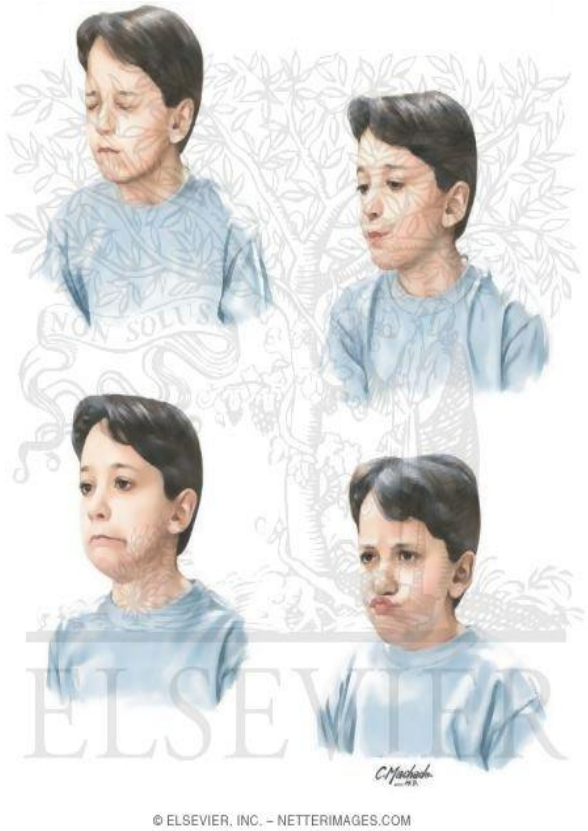
- Tic disorder affects up to 10 percent of children during their early school years
- One or more tics for at least 1 month
- Before the individual turned 18 years of age
- Motor tics are more commonly seen in cases of transient tic disorder than vocal tics.

Chronic motor and vocal tic disorder

- Before the age of 18
- 1 year or more
- motor or vocal, but not both
- Chronic tic disorder is less common than transient tic disorder
- less than 1 percent of children
- Tics usually disappearing within 6 years

Tourette's syndrome

- Complex neurological disorder
- Multiple motor tics
- One or more vocal tics
- between the ages of 5-10



History

- Dr. Georges Gilles de la Tourette, a French neurologist, first described an 86 year old woman with this condition in 1885. The disorder is named after him.

Symptoms

- Motor tics: These include tics, such as head and shoulder movements, blinking, jerking, banging, clicking fingers, or touching things or other people. Motor tics tend to appear before vocal tics, although this is not always the case.
- Vocal tics: These are sounds, such as coughing, throat clearing or grunting, or repeating words or phrases.

Symptoms

Motor Tics	Vocal Tics
• Eye blinking	• Coughing
• Rolling of eyes	• Throat clearing
• Grimacing	• Sniffing
• Shaking of head	• Whistling
• Twitching of shoulders	• Grunting
• Twitching of torso and pelvis	• Animal sounds
• Twitching of abdomen	• Uttering of syllables
• Movements of the hands and arms	• Uttering of words
• Movements of the feet and legs	• Shouting

Symptoms

- Simple tics: These are sudden and fleeting tics using few muscle groups. Examples include nose twitching, eye darting, or throat clearing.
- Complex tics: These involve coordinated movements using several muscle groups. Examples include hopping or stepping in a certain way, gesturing, or repeating words or phrases.

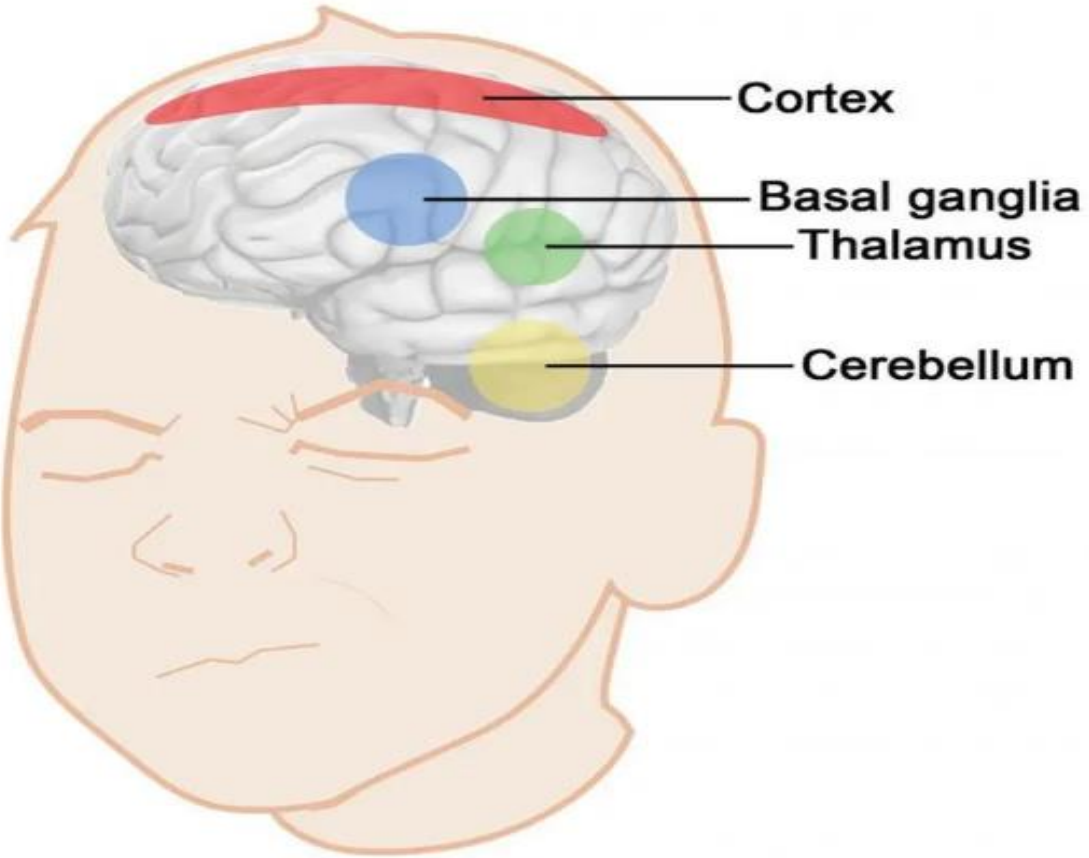
The symptoms of tic disorders may:

- worsen with emotions, such as anxiety, excitement, anger, and fatigue
- worsen during periods of illness
- worsen with extreme temperatures
- occur during sleep
- vary over time
- vary in type and severity
- improve over time

Epidemiology of tic disorders

- It is difficult to estimate
- 4-12% of all children
- 3-4% chronic tic disorder
- 1% Tourette's
- Children & adolescents 10 x > adults
- affect boys than girls by a ratio of 1.5–4:1
- The incidence of motor tics is higher in the winter months
- most common in the pediatric population
- Adult-onset primary tic disorder usually associated with underlying neuropsychiatric disorders (e.g., Down syndrome, Huntington's disease, neuroacanthocytosis

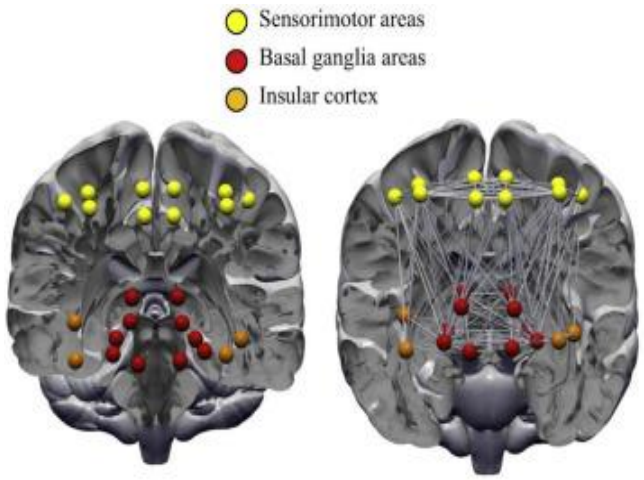
Etiology



Etiology

- Multifactorial: genetic, neurobiological, psychological, environmental
- Dysregulation in cortico-striato-thalamo-cortical circuits
- Deviations in dopaminergic and serotonergic systems
- Increased dopamine activity in basal ganglia→ deficient subcortical inhibition→

  impaired autonomic control of movement



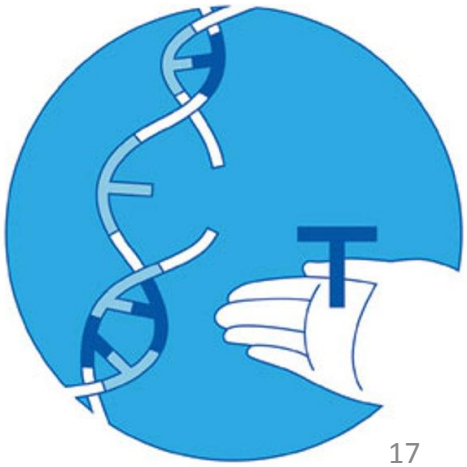
Environmental Factors

- prenatal and perinatal epigenetic factors

  pre-birth cohort study :
- alcohol use during pregnancy
- cannabis use during pregnancy,
- inadequate weight gain during pregnancy
- Rare secondary causes:
  - Tumors, poisonings, infection, head trauma

Genetic Factors

- 27 families with TS autosomal dominant transmission patterns
- MZ twins high concordance rates of 94% for tic disorders and 56% for TS
- a large number of different genes (tic disorders are not single-gene)
- the heritability of TS: 0.58–0.77



Genes

- CNTNAP2 gene on 7q35-q36 (insertion or translocation chromosome 2 and 7)
- NLGN4 gene on Xp22.32-p22.31(deletion exons 4, 5, and 6) TS and neuropsychiatric disorders: autistic spectrum disorder, ADHD, learning disorders, anxiety, and depression
- SLITRK1 gene on 13q31.1
- A mutation in the HDC gene affecting histaminergic neurotransmission
- IMMP2L gene on chromosome 7q31.1 in TS

Genes

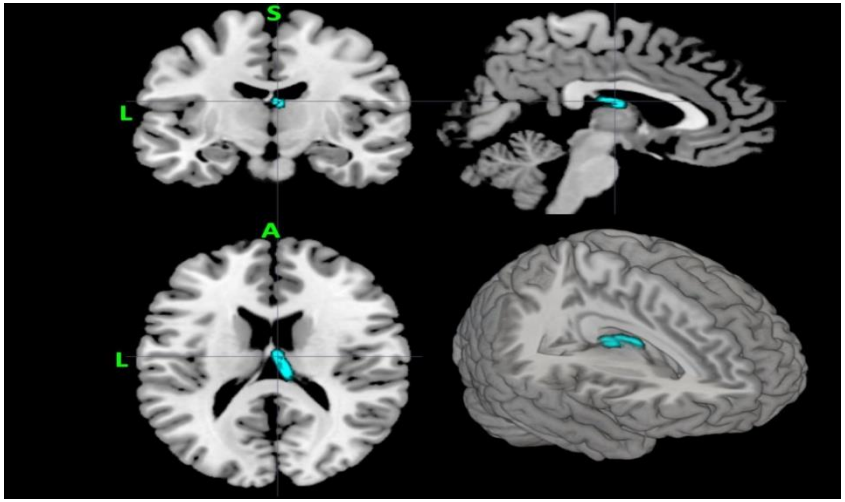
- Immp2l mutation caused an increase in cellular oxidative stress
- NRXN1, AADAC, CTNNA3, FSCB, KCHE1-KCHE2-RCAN1 (SNP)
- CNTN6 duplications (SNP)
- CELSR3 gene on chromosome 3p21.31
- ASH1L gene on chromosome 1q22
- OPRK1 gene on chromosome 8q11.23
- COL27A1 gene on chromosome 9q32-33(GWAS)

Immunologic Factors

- Abnormal immune
- Some cases of TS may represent a central nervous system autoimmune disorder following infection
- study of 150 children with tic disorders demonstrated a significant elevation of ASO titers in children with tics

Diagnosis

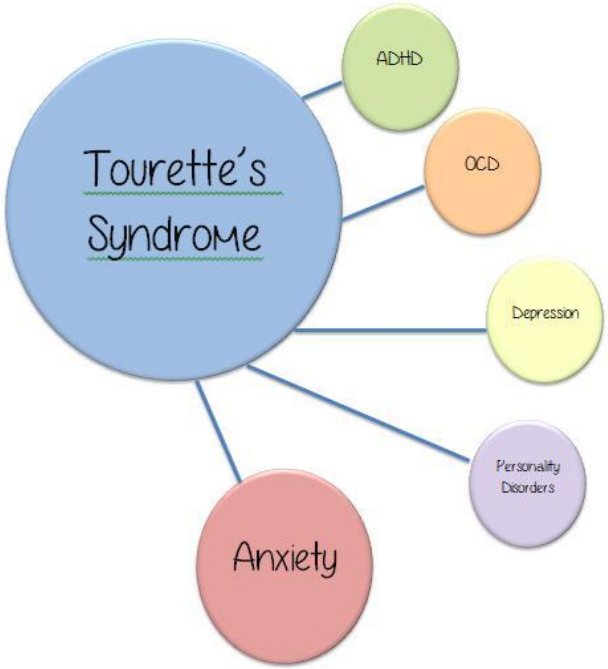
- Detailed medical history
- Standardized questionnaires:
- ✓ Child Behavior Checklist
- ✓ Strengths & Difficulties Questionnaire
- Interviews:
- ✓ Yale Global Tic Severity Scale
- ✓ Tourette's Syndrome Severity Scale
- Parental/Self Rating Scales
- ✓ Yale Tourette Syndrome Symptom List-Revised
- Physical & neurological exam
- To rule out other causes of tics, a doctor may suggest:
- ✓ blood tests
- ✓ MRI,CT, EEG



Comorbidities

Table H.2.4 Psychiatric disorders often associated with tic disorders

Comorbid disorder	% of children with tic disorder affected
Attention deficit hyperactivity disorder (ADHD)	40 – 60
Obsessive-compulsive symptoms	40 - 70
Anxiety disorders	25 – 40
Depressive symptoms	Around 50
Sleeping disorders	12 – 44



Treatment and coping

- Depends on the type of tic disorder
- Therapies:

  Exposure and response prevention (ERP)

  Habit reversal therapy
- medications
- deep brain stimulation

Medication

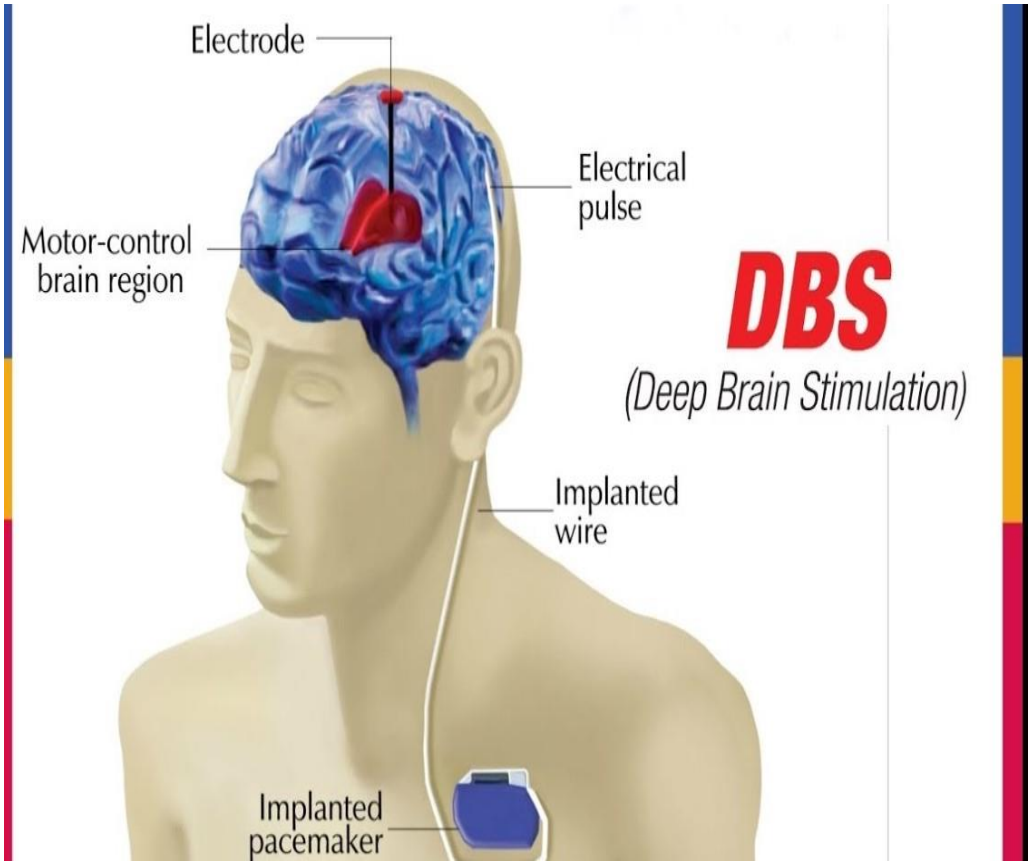
- Anti-seizure medications
- Botox injections
- Muscle relaxants
- Medications that interact with dopamine

Fluphenazine, haloperidol (Haldol), risperidone (Risperdal) pimozide (Orap) Tetrabenazine (Xenazine)

risperidone, pimozide and aripiprazole.

Deep brain stimulation

- Deep brain stimulation (DBS) is an option for people with TS whose tics do not respond to other treatments
- DBS involves the implantation of a battery-operated device in the brain.



Coping and self-help tips

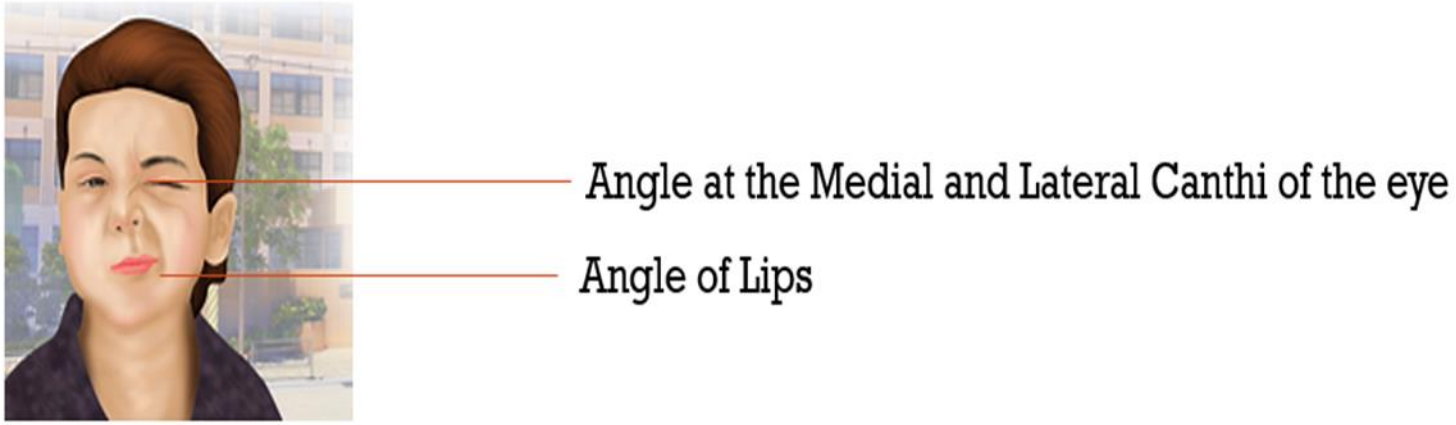
- avoiding stress and anxiety
- getting enough sleep
- join a support group for people with TS and other tic disorders
- reach out to friends and others for help and support
- remember that tics tend to improve or disappear with age
- Parents of children with tics may wish to
- inform teachers, caregivers, and others who know the child, about the condition
- help boost the child's self-esteem by encouraging interests and friendships
- ignore times when a tic occurs, and avoid pointing it out to the child

Managing Tourette Syndrome using Artificial Intelligence

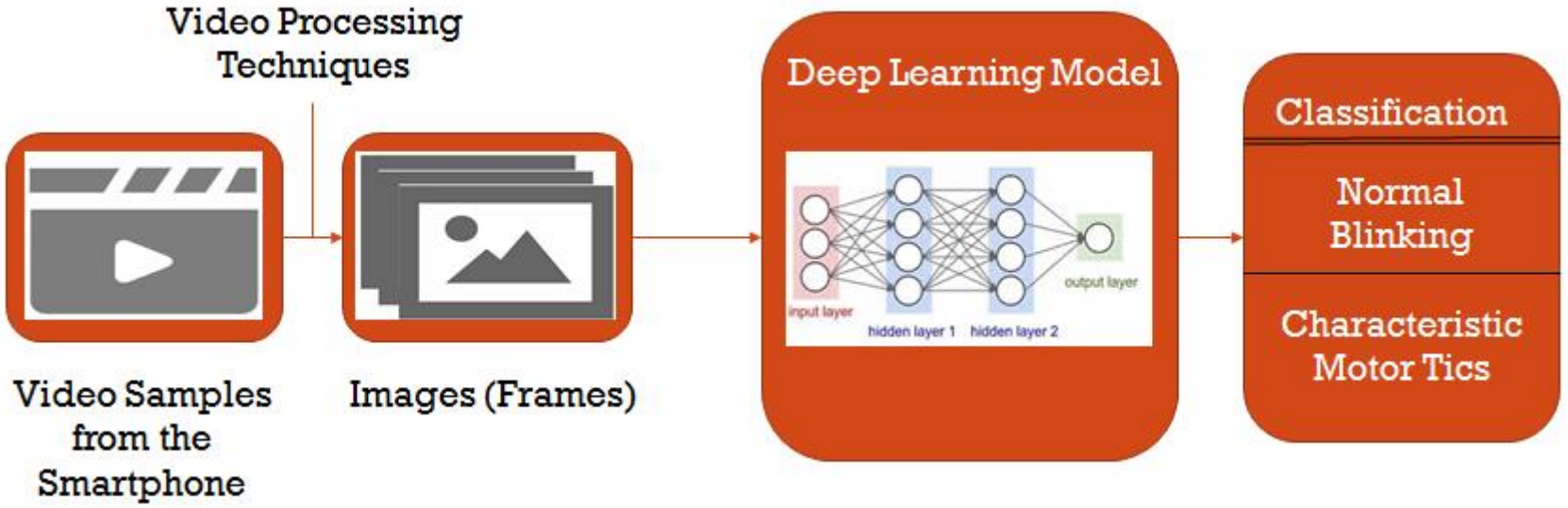
- To develop an AI-powered model which could detect the frequency of eye blinking, thereby making the patient aware of the severity of his/her condition
- To help the patient in managing the Tourette Syndrome better

Methods

- Installation of a dedicated application in the Patient's smartphone
- Screening of Patient's ocular movements from the visuals recorded through the front camera of smartphone, which can be customized
- Classification as Normal Blinking or Characteristic motor tics
- Frequency of eye blinks is calculated
- Association of frequency with the activity performed
- The AI model uses Image Processing Techniques to learn the characteristic features of Motor tics which are not seen in Normal Blinking.
- These AI model is trained using Deep Learning models like VGG-16, InceptionV3, CNN, ResNet50 and LSTM with a training : testing ratio as 80:20



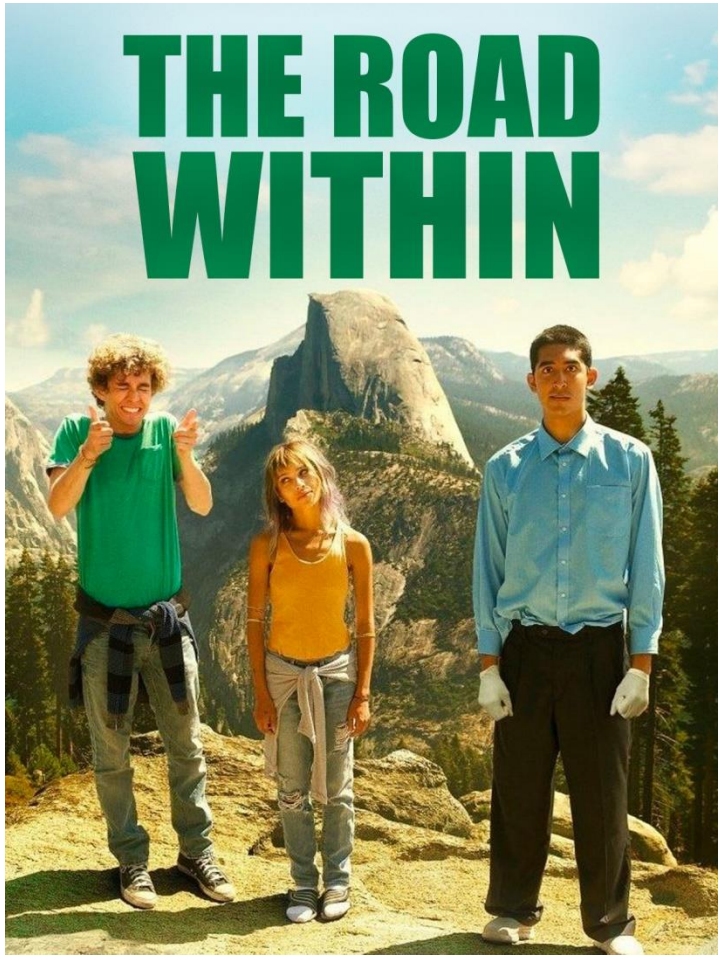
Architecture

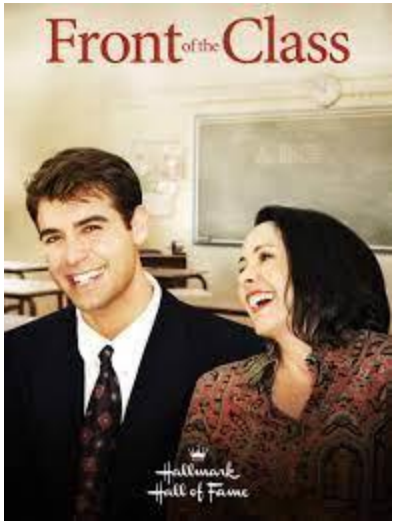


Famous people with TS

- Billie Eilish. ...
- David Beckham. ...
- Dan Aykroyd. ...
- Wolfgang Amadeus Mozart. ...
- Dash Mihok. ...
- Howard Hughes. ...
- Jamie Grace Harper. ...
- Tim Howard

Tourette's movie





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- Tic Detection in Tourette Syndrome Patients Based on Unsupervised Visual Feature Learning Junya Wu , 1 Tianshu Zhou,2 Yufan Guo,3 Yu Tian,1 Yuting Lou,3 Hua Ru,2 Jianhua Feng , 3 and Jingsong Li 1,2(2021)
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- **THANK YOU**
  “NECESSITY IS THE MOTHER OF INVENTION”