Great Ormond Street Hospital for Children NHS Trust

South London and Maudsley NHS Foundation Trust

Tics and Tourette Syndrome

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Tic: differential diagnosis

- Fidgeting
- Tremor
- Dystonia
- Akathisia
- Myoclonus
- Chorea
- Stereotypy
- Mannerism
- Seizure
- Compulsion

Outline

- Tics: recognition and challenges
- Assessment of Tourette Syndrome
- Epidemiology
- Comorbidities
- Treatment

Tic disorders (ICD-10)

- Transient tic disorder
- Chronic motor or vocal tic disorder
- Combined vocal and motor tic disorder (Tourette Syndrome)
- Other tic disorder
- Tic disorder, unspecified

Tic

- Sudden, rapid, repetitive, non-rhythmic movement or vocalisation
- Often premonitory urge
- Temporarily suppressible
- Simple or complex

Tourette Syndrome

- Vocal and motor tics
- Coprolalia
- Echolalia

Tourette Syndrome

- Vocal and multiple motor tics (not necessarily concurrently)
- Several times per day, almost every day
- Lasting longer than a year
- No more than 2 months without tics (?)
- Onset before the age of 18 years

Tourette syndrome: comorbidity

- Hyperkinetic disorder / ADHD – up to 50%
- OCD – up to 40%
- Obsessions/compulsions – up to 80%
- ASD and social communication difficulties – around 5 – 10% with ASD also have Tourette syndrome
- Learning difficulties
- Mood and anxiety disorders
- Aggressive outbursts – up to 70%

Tics: epidemiology

- Tics: 5 – 20% of children and adolescents
- 2-3 times more common in boys
- Tourette syndrome: approximately 1%
- Tourette triad: approximately 0.1%
- Usual onset: 5-7 years
- Usually deterioration around 10-11 years
- Most patients (up to 65%) have no or non-impairing tics by adulthood

Eur Child Adolesc Psychiatry (2011) 20:155–171
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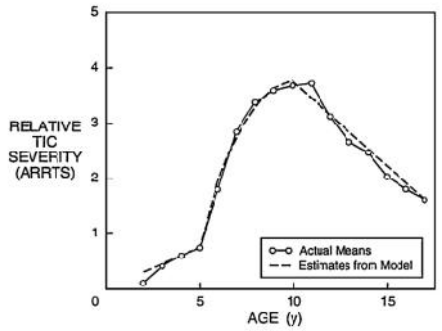
European clinical guidelines for Tourette Syndrome and other tic disorders. Part I: assessment

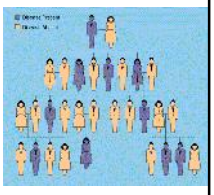
Danielle C. Cath · Tammy Hedderly · Andrea G. Ludolph · Jeremy S. Stern · Tara Murphy · Andreas Hartmann · Virginie Czernecki · Mary May Robertson · Davide Martino · A. Munchau · R. Rizzo · the ESSTS Guidelines Group



Cohen et al, 2013

Assessment.. The usual questions

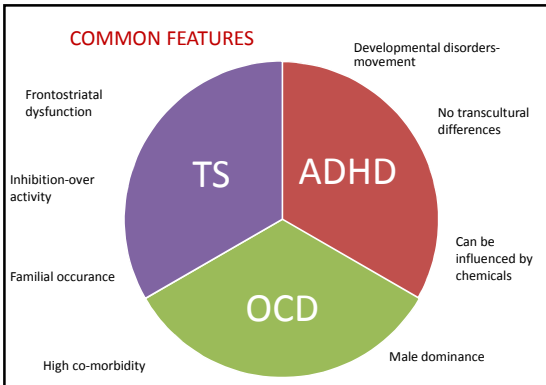
- Demographics (be curious ;-)
  - Age
  - Education level child and parents
  - Work status (parents)
  - Ethnicity child and parents
  - Marital status (parents)
- When did it start?
  - Age at onset tics/OCD/ADHD
  - Age at worst period ever
- Do family members have tics/OCD/ADHD?
  - Make a family tree



How do you know it's not ADHD?

Table 2
Differences of motor symptoms in ADHD and tic disorders

Tic disorders	ADHD
Fragments of normal movements	Generally increased motor activity
Circumscribed functional muscle groups	General motor hyperactivity
Suddenly occurring (independent of waiting situation)	Slowly increasing (intensified by waiting situation)
Fixed pattern of quick actions	Disorganised, tempo change
Badly modulated	Badly modulated
Uniformly repeated (often in bouts)	Temporally irregular-intermittent (changing intensity)



How do you know it's not OCD?

Tic	Obsessive–compulsive disorder
Differences	
Sudden, short (jerking)	Ritualized
Fragmented movements	Goal directed behaviour
Sensorimotor urges	Thoughts/fantasies (cognitive–emotional dissonance)
Not related to anxiety	Mostly related to anxiety
Ego-syntonic	Ego-dystonic
Involuntary (distorted sequences)	Voluntary (cyclic)
Onset in primary school (one peak)	Onset after primary school (two peaks)
Waxing and waning (from seconds to months)	Little changes over time
Also during sleep	Never during sleep
Similarities	
Decrease with concentration	Decrease with concentration
Increase with emotional excitement	Increase with emotional excitement
Suppressible (short term)	Suppressible (long term)

ADHD

- Childhood onset
- Prevalence around 3-5%
- 3 subtype
  - Inattentive
  - Hyperactive-impulsive
  - combined
- Different settings-same symptoms
- Most common co-morbidity: disruptive behavior, tics, learning difficulties

Tourette's Syndrome Triad ADHD-OCD-TS

- Frequently comorbid with ADHD and OCD
- Complex relationship, controversial
  - ADHD approx 50% of the cases
    - Shared genetic risk factors, two independent pathologies
  - OCD approx 30-40% of the cases
    - Similar background, intrinsically related
- Familial background

ADHD

- *Distractibility* <=inadequate inhibition of external stimuli
- *Impulsivity* <= inadequate inhibition of internal stimuli
- *Hyperacitivty* <= inadequate inhibition of both external and internal stimuli

Obsessive Compulsive Disorder

- Prevalence 1%
- Obsessive and compulsive symptoms can be normal developmental phenomena
- Autoimmune hypotheses
- Repetitive behavior
  - Obsessions
  - compulsions

Obsessions

Examples of obsessions:

- concerns with contamination (e.g., fear of dirt, germs or illness)
- safety/harm (e.g., being responsible for a fire)
- unwanted acts of aggression (e.g., unwanted impulse to harm a loved one)
- unacceptable sexual or religious thoughts (e.g., sacrilegious images of Christ)
- need for symmetry or exactness

Intrusions/ obsessions we all have…

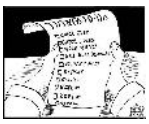
- Impulse to hit or hurt someone
- Imulse to yell curses in a silent church
- Impulse to destroy something
- Impulse to cause a collision while driving
- Impulse to push other people away from a crowd or a row
- Impulse to jump of the roof of a tall building, mountain or cliff
- Impulse to jump from the platform when a train arrives
- Impulse to drop a baby

- Etc.. etc. etc.

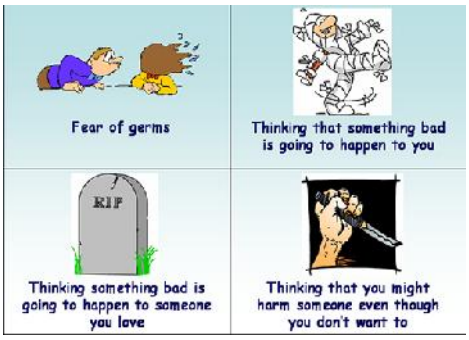
Compulsions

Examples of compulsions:

- Excessive cleaning (e.g., ritualized hand washing)
- Checking, ordering and arranging rituals
- Counting
- Repeating routine activities (e.g., going in/out of a doorway)
- Hoarding (e.g., collecting useless items)
- Mental rituals (e.g., silent recitation of nonsense words to vanquish a horrific image)



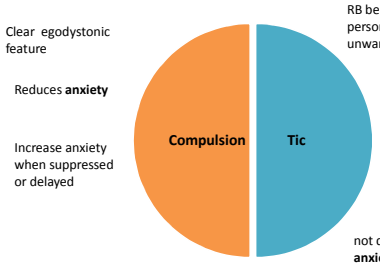
Obsessions



OCD

- Late onset
  - female
  - Mainly obsessions, anxiety
- Early onset
  - male
  - familial
  - chronic
  - More neurological soft signs, complicated birth etc
  - More rituals, tic, trichotillomania
  - Higher frequency of sensory phenomena

Repetitive behavior in OCD, TS



Clear egodystonic feature

Reduces **anxiety**

Increase anxiety when suppressed or delayed

RB being experienced as personally uncomfortable, unwanted and senseless

response to a premonitory urge

they could be temporarily suppressed or delayed

not directly associated with an **anxious** mood nor with the wish to control a risk of damage

The NEW ENGLAND JOURNAL of MEDICINE

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Cognitive Behavioral Therapy, Sertraline, or a Combination in Childhood Anxiety

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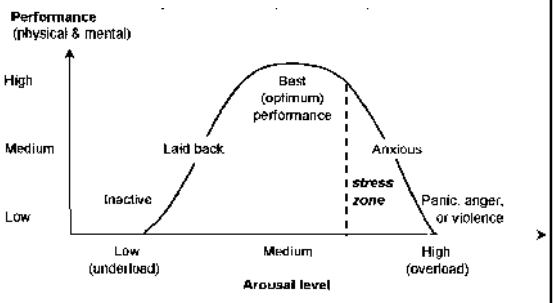
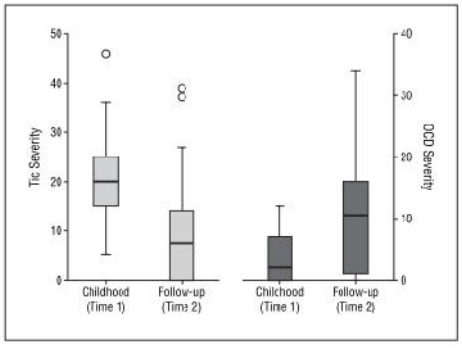
Anxiety disorders

- Common (4-8% of children and adolescents)
- Significant heritability
- Less likely to continue into adult life compared to behavioural disorders
- Significant comorbidity

	Combination Therapy (N=140)	Sertraline (N=133)	Cognitive Behavioral Therapy (N=139)	Placebo (N=76)	All Subjects (N=488)	P Value
Primary diagnosis of anxiety disorder — no. (%)						
Separation anxiety only	2 (1.4)	5 (3.8)	6 (4.3)	3 (3.9)	16 (3.3)	0.53
Social phobia only	14 (10.0)	19 (14.3)	16 (11.5)	6 (7.9)	55 (11.3)	0.51
Generalized anxiety only	10 (7.1)	8 (6.0)	11 (7.9)	4 (5.3)	33 (6.8)	0.87
Separation anxiety and social phobia	12 (8.6)	7 (5.3)	7 (5.0)	7 (9.2)	33 (6.8)	0.48
Separation anxiety and generalized anxiety	13 (9.3)	12 (9.0)	8 (5.8)	6 (7.9)	39 (8.0)	0.65
Social phobia and generalized anxiety	41 (29.3)	37 (27.8)	40 (28.8)	19 (25.0)	137 (28.1)	0.94
Separation anxiety, social phobia, and generalized anxiety	48 (34.3)	45 (33.8)	51 (36.7)	31 (40.8)	175 (35.9)	0.74
Secondary diagnosis of coexisting disorder — no. (%)						
Other internalizing disorder[a]	70 (50.0)	55 (41.4)	56 (40.3)	32 (42.1)	213 (43.7)	0.14
Attention deficit–hyperactivity disorder	16 (11.4)	17 (12.8)	16 (11.5)	9 (11.8)	58 (11.9)	0.98
Oppositional defiant disorder or conduct disorder	14 (10.0)	11 (8.3)	17 (12.2)	7 (9.2)	46 (9.4)	0.92
Tic disorder	4 (2.9)	5 (3.8)	2 (1.4)	2 (2.6)	13 (2.7)	0.70





Bloch et al, 2006

PANDAS

Psychoeducation

- The European guidelines recommends embedding each treatment within a psychoeducational and supportive context
  (Verdellen et al. (2011):European clinical guidelines for Tourette Syndrome and other tic disorders. Part III: Behavioural and psychosocial interventions)
- Psychoeducation alone may also be useful for families who do not engage with more comprehensive treatments due to very mild tics or lack of services

PANDAS

- Subgroup of children who develop tics/and or obsessive compulsive disorder in association with streptococcal infection
- Possible autoimmune-mediated effect - trials of immunomodulatory therapy had been tried
- Current clinical consensus is that tics or OCD should be treated in the usual way
- Antibiotics may be tried for acute onset tics/OCD with active infection

Main questions about psychoeducation

- For who?
- When?
- Why?
- What?
- How?

Tourette Syndrome: Treatment

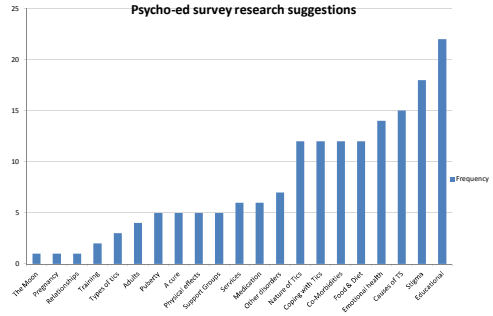
- Psychoeducation - reassurance
- Liaison with school
- Behavioural approaches: Habit Reversal and Exposure and Response Prevention
- Pharmacological treatment
- Psychosurgery (extremely rarely!)

Who to aim for?

- Child/ adult (as patient)
- Parents / partner
- Siblings
- Teachers
- Classmates
- Relevant others
- +1: general public ⟹ importance of increasing awareness of TS (diagnostic label alone is insufficient- Nussey, Pistrang, Murphy,2012)

What is the ideal time for psychoeducation?

- Right after the diagnosis



Importance of psychoeducation

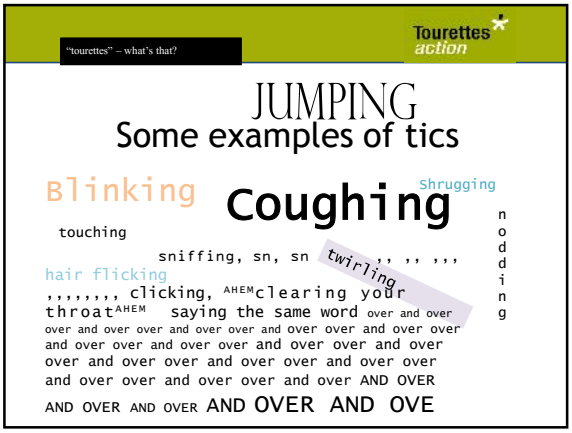
- Resolve misunderstanding, uncertainty and stigma in TS
- Improve knowledge, attitudes and behaviours
- Help the patient/environment to identify personal strengths
- Provide the child with the tools to explain to others (especially teachers and schoolmates)
- Help to understand the aim and the method of the behavioural therapy
- Provide educators with general information about TS

Content of psychoeducation

- Who has TS?
- Symptoms and natural history of TS
- Prevalence
- Types of tic disorders (DSM-V)
- Types of TS
- Types of tics
- Suppressing tics /Control
- Premonitory urges
- Causes of Tourette Syndrome
- TS and the brain
- Therapy
- Social difficulties and Comorbidity
- Other Risk or Protective Factors

Content of psychoeducation

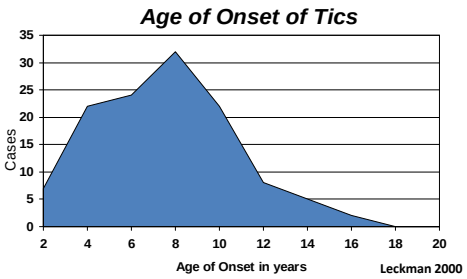
- Give information about the natural course of TS
- Provide support
- Point out what kind of therapy is available
- Suggest patient organizations (e.g. Tourette Action)
- Dispels myths



Tics Phenomenology

- *Involuntary* BUT may be suppressed
- *Premonitory urges* generally precede tics
- From simple to complex tics (examples)
  - Simple motor: eye blinking
  - Simple vocal: throat clearing
  - Complex motor: touching
  - Complex vocal: words and phrases

When do Tics Usually Start?



What is Tourette Syndrome ?

- Neurological disorder, not learned, but still influenced by surroundings
- More common in males (2:1 to 4:1)
- Contributes to social, academic, and occupational problems

Course of TS

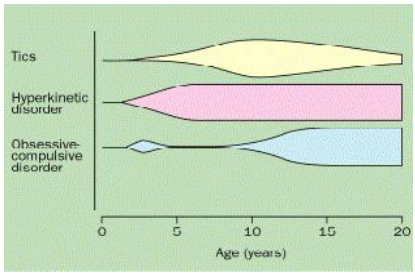
- As children grow into adulthood
  - Tics resolve in 50%
  - Tics become substantially less severe in 30-50%
  - Tourette syndrome is lifelong in the remainder of cases (5-10%)
- Adults may have a more chronic/severe form of the disorder

The natural course of TS

- Starts in young children
- Prevalence: 3- 8/1000 (Centers for Disease Control, 2009)
- Transient tics are common (24% in school-age group)
- Starts with motor tics, then vocal
- Starts in the head and face, then in the body
- Starts with simple tics, then more complex tics
- Peak severity is in early to mid teens

(Leckman et al. 2006, Bloch and Leckman,2009)

Natural History



(Leckman 2000)

Nature of tics

- Wax and wane; get better and worse over time
- Change; one tic stops and another starts
- May be made worse by stress and anxiety
- May be alleviated with relaxation or concentration on an absorbing task
- Individual differences in ability to suppress tics

Contextual Factors (Himle et al, 2014)

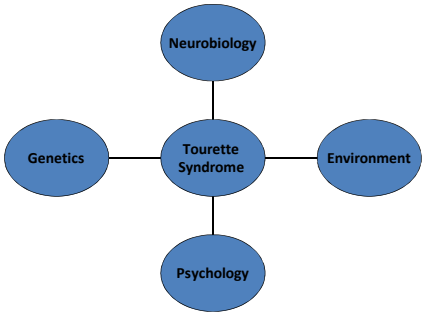
Increase

- Computer games
- Home after school
- Doing homework
- Fatigue
- ?viruses, PANDAS

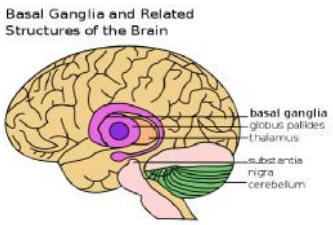
Decrease

- Engagement in activities, focussed attention and fine motor control (study, playing drums, doctor visits...)

What is Tourette Syndrome?



Show a brain image and create an memory that sticks



Risk from one single Parent with TS

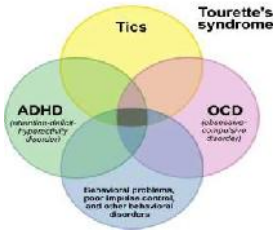
disorder	boy	girl
TS	10-15%	3-5%
Chronic Tic	15-20%	10-15%
OCB without Tics	3-7%	12-15%

Therapy of TS

Different ways to treat TS:

- Medication
- Comprehensive Behavioural Intervention Therapy (CBIT) (HRT, ER, functional intervention)
- Deep Brain Stimulation (DBS)
- Other approaches managing TS

Comorbidity



Bibliotherapy

- Child & family (Buffolano, 2008)
- Schools (Pruitt and Dornbush, 2011)
- Adults – bibliographies
- Media (Twitter, Youtube, TV)
- Charities and Support groups

Other comorbidities

- ASD (Importance of differentiation of tics from stereotyped autistic movements!)
- Mood disorders
  - Depression in patient with Tourette sy.13-76%, Lifetime risk: 10%, Prevalence: 1.8%-8.9% (Robertson,2006)
  - Depression in TS usually associated with comorbid disorders (OCD, ADHD) (Cavanna et al., 2009)
- Anxiety disorders
- Specific learning disorder

Effectiveness of psychoeducation

(Nussey, Pistrang, Murphy,2012)

- Altering content of information can alter outcomes
- Different tools have different efficiency (video more salient than written information?)
- Children requires more information than adults for attitude change
- Further research is required to design more effective psychoeducational interventions

Psychoeducation for Professionals

- Marcks, et al.(2004)
  - 35% of psychologists knew of HRT, <10% knowing how to implement it.
  - Only 14% of medical doctors had any knowledge of HRT
  - 46 % wanted to know more
- Woods, et al. (2010)
  - Adults (N = 672) and parents (N = 740)
  - 17% of adults and 24% of children had received BT for tics
  - treatment utilization
  - barriers to care
  - factors influencing the person with TD to forego BT for their condition
  - Problems seeking treatment
    - A knowledgeable treatment provider
    - Side effects, and cost
    - psychologists are less likely to be consulted than neurologists, psychiatrists and GPs
    - many treatments with limited empirical support are used
    - a limited number of service providers knowledgeable about TD

Psychological Interventions

Overview

- Why use psychological intervention for TS / tics?
- Does it work?
- What are the models
- How does it work?
- Adaptations
- What might the future look like?

Why Psychological Therapies?

- Limited efficacy medication / surgical interventions
- Historically, behavioural therapies have shown promise
- Learning more about the relationship between therapy and the brain (Porto et al, 2009)

European Clinical Guidelines for Tourette Syndrome and other Tic Disorders
ECAP, 2011

I: Assessment
II: Pharmacological Treatment
III: Behavioural & psychosocial interventions (Verdellen et al, 2011)
IV: Deep Brain Stimulation

- 140 articles
- No meta-analyses
- 12 (systematic) reviews
- 8 controlled trials (7 RCT's)

- No studies comparing behavioural therapy with medication
- No Cochrane reviews

Beliefs about Behavioural Therapy

Woods, TSA USA 2009

–Rebound effects (Woods et al, 2008, Verdellen et al, 2007 & Himle and Woods, 2006)

–Symptom substitution (Woods et al, 2001 & Woods, 2003)

–HRT will inhibit other functional behaviours (Woods CPT task, 11% reduced accuracy when focused on suppression & distraction)

Tourette Syndrome and Tics

– Tics:
  - Behavioural Therapies
  - Function based interventions

– Acceptance:
  - Learning adequate coping strategies
  - Cognitive therapy
  - Social skills training
  - Self-esteem work
  - Patient organizations (Tourette Action, TSA- USA)

– Co-occurring conditions:
  - OCD: behavioural therapy (ERP), medication
  - Impulse control disorders: self-monitoring techniques
  - ADHD: medication, behavioural therapy
  - Anger Management: Cognitive Behavioural Therapy

"Young man, go to your room and stay there until your cerebral cortex matures."

Premonitory Urge (Tic signals)

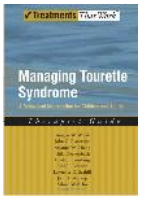
- Sensory discomfort in muscle or muscle groups preceding tic
- Physical tension, pressure, tickle, itch, or other sensory experience
- Results in relief of sensation
- "just right" in order to relieve sensation
- Is it the premonitory urge which is involuntary or the tic?

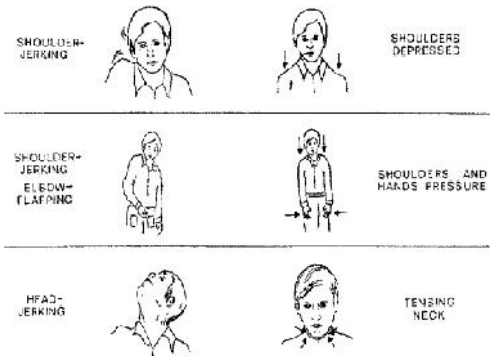
Competing Response
(Woods et al, 2008 CBITs)

Tic	Competing Response
Head jerking	Tense neck muscles gently, fixate eyes
Jaw movement	Let jaw hang loose while relaxed breathing, holding breath for 2-3 seconds before exhale
To even up	Hold arms at side
Facial grimacing	Purse lips together
Curling toes	Press all toes flat on ground
Picking lips	Place hands on knees
Mouth opening	Purse lips, push teeth together
Neck rolling	Tense neck muscles with chin positioned downwards
Spitting	Purse lips and use diaphragmatic breathing
All vocal tics	Diaphragmatic breathing and relaxation

Habit Reversal Training

- Awareness Training
- Competing Response
- Relaxation
- Social Support



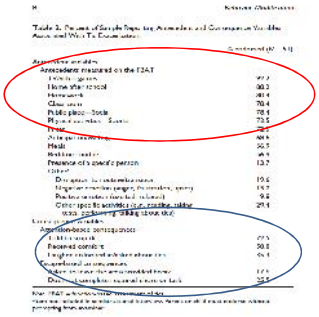


Habit Reversal Training

Conclusions:
- HRT has been studied for over 30 years
- 7 RCTs have been published
- N's between10-124; adults and children, TS/CTD
- Controls have either been WL, Supportive Therapy (ST) or another behavioural treatment (MP, CBT, ERP)
- Superiority to Waiting list, MP, ST
- Comparability to CBT, ERP

Overall:
- HR can be considered an evidence based treatment
- Awareness training and competing response training seem to be the active components

Antecedents (Himle et al, 2014)



Exposure and Response Prevention

Intervention:

Prolonged exposure to sensations while resisting tics

2 case studies (1 N=4, 1 N=1): positive results

1 RCT comparing ER (n=22) with HR (n=21)
(Verdellen et al., 2004)

ER=HR

ES YGTSS: HRT 1.06, ERP 1.42

Indications for habituation, no rebound effects

Conclusion:

ER is a promising treatment for tics, which needs further research

Does Symptom Substitution Occur?

- Vocal tics decreased, untreated motor tics did not change or decreased
  - 83% reduction in vocal tics
  - 26% reduction in motor tics
- Untreated symptoms may improve following behavioral intervention
- Other studies evaluating habit reversal have also not found symptom substitution

Woods et al. (2003). Journal of Applied Behavior Analysis

Which Approach?

- Patient needs
- 1 RCT compared ER with HR (Verdellen et al, 2004)
  - No significant difference between ER and HR was found
- ERP
  - Several tics
  - Strong premonitory urges
- HRT
  - A few different tics
  - Weak premonitory urges
  - No tics during the session
  - Inattention (Woods et al, 2008)

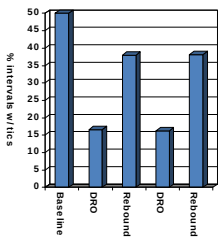
Psychoeducation

- Child & family (Buffolano, 2008)
- Schools (Pruitt and Dornbush, 2011)
- Group work (Psychoeduation- Murphy & Heyman, 2007; Anger Management - Sudkolsky et al 2009)
- Charities and Support groups
- GOSH website

Is there a Rebound Effect?

- 7 children with TS
- Three conditions
  - Baseline
  - Reinforced suppression
  - Rebound evaluation
- All conditions were 5 min
- Tics were reduced in suppression condition
- Rebound did not occur

Himle & Woods (2006)
Behaviour Research and Therapy



Psychoeducation Group: Child

- Tourette Syndrome & Tic Management
- Self-esteem building
- School & bullying
- Anger
- OCD and Anxiety
- Attention Building
- Executive Function
- Review, quiz & feedback

Habit Reversal Training Group: Child

- Psychoeducation
- Tic awareness / Tic signal / Functional analysis
- Tic hierarchy detection & description
- Competing response and relaxation (Tic 1)
- Competing response training (Tic 1)
- Competing response (Tic 2)
- Competing response (Tic 3)
- Relapse prevention

Toolkit

Therapeutic Approaches

- Activity based
- Behavioural approaches
- Social learning approach (e.g. modeling)
- Developing Problem-solving
- Independence building
- Toolkit booklet

Toolkit

Toolkit

Toolkit

Cost-effective Interventions

Behaviour Research and Therapy

Shorter communication

A randomized pilot trial comparing videoconference versus face-to-face delivery of behavior therapy for childhood tic disorders

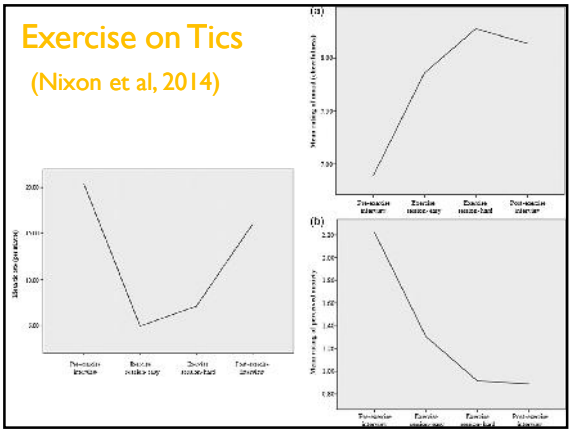
Michael B. Himle [a], Melinda Freitag [a], Michael Woltkerb [b], Shana A. Franklin [b], Laura Ely [b], Douglas W. Woods [b]

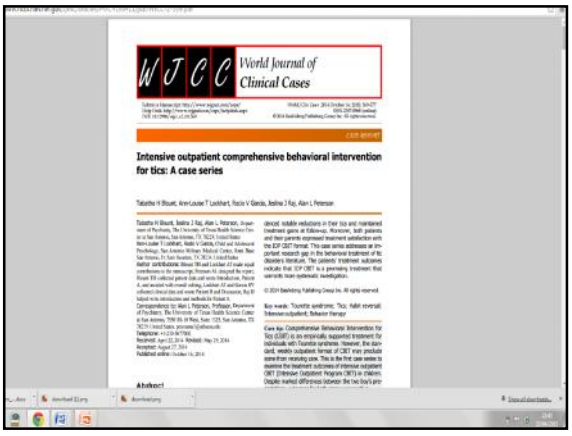
ARTICLE INFO

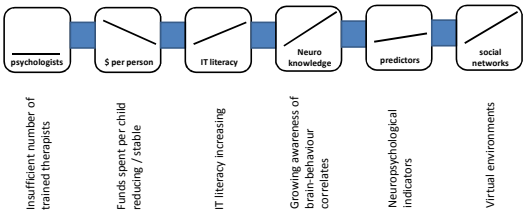
ABSTRACT

Exercise on Tics

(Nixon et al, 2014)





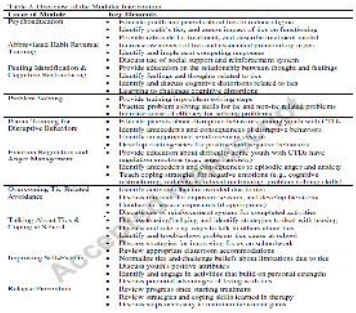


Factors that will impact on behavioural treatments

FUTURE TRENDS

Living with Tourette Syndrome

(Storch et al, 2014)



Psychopharmacology

Tourette Syndrome: Pharmacological treatments

- Studies of pharmacological interventions in TS can be hard to interpret:
- Large interindividual variation in tic frequency and severity. Small studies may include patients that are very different at baseline
- The severity of tics in individuals varies markedly over time, making it difficult to separate drug effect from natural variation
- No adequate studies. Publication bias.
- Comorbidities
- Complementary or alternative therapies (around 50% report benefit from these)

FGAs - Pimozide

- Cochrane review (Pringsheim et al, 2009): Pimozide has demonstrated robust efficacy in a meta analysis of 6 trials
  - pimozide vs.haloperidol (one trial),
  - pimozide vs. placebo (one trial)
  - pimizide vs. haloperidol and placebo (two trials)
  - pimozide vs.risperidone (two trials)
- More effective than placebo, as effective as risperidone and slightly less effective than haloperidol in reducing tics. It was associated with fewer adverse reactions compared to haloperidol but did not differ from risperidone
- ECG essential
- Most authors now do not recommend FGA

Tourette Syndrome: Pharmacological treatments

- Clonidine
- Aripiprazole
- Risperidone
- (Haloperidol)
- (Pimozide)
- Other antipsychotics
- Other medication (baclofen, nicotine, pergolide, metoclopramide, botulinum toxin, ondansetron, clomiphene, tramadol, ketanserin, cyproterone, levetiracetam)

- Treatment of comorbidity!

SGAs

- Aripiprazole: 10-week multicentre double-blind randomised placebo-controlled trial (N=61) demonstrated the efficacy of aripiprazole in tic reduction in TS. Increased mean body weight (by 1.6kg), body mass index, and waist circumference (Yoo et al, 2013).
- Risperidone has been shown to be more effective than placebo in a small (N=34), randomised study. Fatigue and increased appetite and a mean weight gain of 2.8kg over 8 weeks was reported (Scahill et al, 2003).
- Same monitoring rules with use of SGAs for psychosis (NICE 2014)

Clonidine

- Start low and increase slowly (25 – 50 mcg daily in divided doses initially increased by 25 mcg per week)
- Usual dose 3-5 mcg/kgr/day
- Sedation can be problematic (or welcome...)
- Beware: possibility or rebound hypertension on discontinuation (reduce even more slowly by 25mcg every 1-2 weeks) and warn families from the start
- ECG not universally advised but advisable.

(Tourette's Syndrome Study Group, 2002, Murphy et al, 2013, Maudsley Guidelines, In press)

Treatment of ADHD in Tic disorders

- Methylphenidate, clonidine, guanfacine, desipramine and atomoxetine
- Not increasing frequency or severity of tics overall
- They may worsen tics in individual cases
- In such cases use of alpha agonists/atomoxetine
- Desipramine use limited due to safety concerns

Cochrane Review, Pringsheim et al, 2011

Tics/Tourette treatment principles

Take home messages

- Do not panic!
- Assessment of impairment and what drives it
- Psychoeducation is first line intervention
- Rationale and proportionate treatment
- Evaluate comorbidities: Tics may just be the ticket to your clinic!
- Benefit vs. Risk of treatment
- Remember it will most likely get better!

Thank you

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