



SLEEP DISTURBANCES IN
INDIVIDUALS WITH DOWN
SYNDROME: AN OVERVIEW

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ABOUT THE SPEAKER

- Doctoral student at UNC Charlotte, Health Psychology (Clinical Track)
- MA in psychology from UNC Charlotte
 - Thesis: stress, sleep, inflammation, and cognitive decline
- Research: Focus on sleep and inflammation on health in individuals with Down Syndrome; Health impact of poor child sleep in parents of children with Down Syndrome
- Sister of the most wonderful brother with Down Syndrome



OVERVIEW

1. Brief Introduction
2. Sleep Disturbances
 1. Sleep quality
 2. Sleep duration and behavioral sleep disturbances
 3. Sleep apnea
 4. Parasomnias
 5. Sleep-related movement disorders
3. Explanations for Sleep Disturbances
 1. Physiological characteristics
 2. Psychological characteristics
4. Consequences of Sleep Disturbances
 1. Cognitive and performance deficits
 2. Mood and mental health
 3. Physical Health
5. Treatment Recommendations

INTRODUCTION

- Approximately 70 million Americans have chronic sleep problems
- Sleep difficulties in individuals with DS: 76% in children, 85% in adults
- Theories: Gene-dosage theory
 - extra chromosome -> 50% increase of variance in gene expression
- Differences we see in individuals with Down Syndrome:
 - Morphological characteristics
 - Height/weight differences
 - Different in IQ



SLEEP DISTURBANCES

SLEEP QUALITY

- Restorativeness of sleep
 - sleep onset latency, perceived sleep quality, sleep consolidation, daytime dysfunction
 - Poor SQ has been associated with daytime sleepiness, poorer self-rated health, lower daytime functioning
- Variable results
 - PSQI results show “good” sleep quality (2.6)
 - Parental perception of sleep quality in their children: 51.8% of children had issues initiating sleep, 54% excessive daytime sleepiness, 60% of parents had talk to pediatrician about sleep issues
 - Further parental study found that parents reported 83% of their children had poor sleep quality
- Issue with validated self-report measures for individuals with DS

DURATION AND BEHAVIORAL SLEEP DISTURBANCES

- Duration = time slept at night
 - children with DS found to sleep 38 min longer than non-DS
 - however, less consecutive sleep -> frequent nighttime awakenings
- Behavioral sleep disturbances/Behavioral insomnia = bedtime resistance and delayed sleep onset
 - 22.7% of individuals with DS have behavioral sleep disturbances
 - “always awake at night” - participants
 - higher behavioral sleep disturbances in DS were associated with lower IQ
 - lower behavioral sleep disturbances were associated with residing with family
- Very limited data
- Importance of identifying early

OBSTRUCTIVE SLEEP APNEA

- Studies suggest 50 - 100% of individuals with DS develop obstructive sleep apnea
- Higher risk among adults
 - thyroid function/body weight
- Often undiagnosed/untreated for children with DS as it is seen as “normal” for DS presentation
- Study in adults with and without sleep apnea showed that individuals with SA had:
 - lower sleep efficiency (67 vs 88%)
 - shorter sleep duration (307 vs 380 min)
 - a higher obstructive apnea-hypopnea index (37 vs 16)
 - lower arterial oxygen saturation (75 vs 93)

PARASOMNIAS

- Such behaviors are more frequent in children with DS than non-DS children
- Study on children with DS showed that:
 - 34% had Bruxism at least twice a week
 - 29% had sleep talking at least twice a week

SLEEP-RELATED MOVEMENT DISORDERS

- Prevalence of sleep movement disorders is 9.4% in pediatric DS populations compared to less than 1% in pediatric non-DS populations
 - retrospective hospital study suggested that 1/3 of pt met criteria for PLMD
- Lower sleep efficiency in children with DS with SRMD than without
 - 85 vs 69%
- In cohort of children with DS with RLS:
 - 75% experienced insomnia
 - 50% had issues falling asleep
 - 94% experienced sleep-disordered breathing
 - 56% had suspected or confirmed family history of PLMD



POSSIBLE EXPLANATIONS FOR
SLEEP DISTURBANCES

PHYSIOLOGICAL CHARACTERISTICS – THYROID DYSFUNCTION

- Hypothyroidism in individuals with DS
 - 15% of infants
 - 23.5% of 0-18yrs old
 - 39-61% of adults
 - general non-DS population: 5%
- No study of hypothyroidism and sleep in individuals with DS
- In non-DS individuals, thyroid dysfunction is associated with:
 - worse sleep quality
 - OSA
 - shorter duration
 - longer sleep latency

PHYSIOLOGICAL CHARACTERISTICS - OBESITY

- Numerous definitions
- BMI over $30\text{kg}/\text{m}^2$, however...
- For this presentation: excessive body fat accumulation
- 23-70% of youth with DS are considered overweight or obese
 - compared to about 14 - 20% of non-DS children
- In adults, 70.6% of males and 95.8% of females

PHYSIOLOGICAL CHARACTERISTICS - OBESITY

- Bidirectional nature
- In children with DS, obesity is associated with lower arterial oxygen saturation
 - > as with sleep apnea
- Another study showed similar results: comparative study of children with DS who were obese and not obese: obesity associated with sleep apnea
- Data from non-DS individuals:
 - too short and too long sleep durations associated with obesity
 - poor sleep quality is associated with higher BMI and body fat percentage

PHYSIOLOGICAL CHARACTERISTICS - CRANIOFACIAL IRREGULARITIES

- Higher prevalence of craniofacial morphologies
- Associated with the development of OSA and other sleep disturbances
 - possibly due to disrupted airflow
- Further, in non-DS individuals, these craniofacial anomalies are associated with OSA

PSYCHOLOGICAL CHARACTERISTICS - INTELLIGENCE

- Intelligence varies but IQ is generally between 35 – 69 in individuals with DS
 - neurotypical 85-115
 - lower intelligence may be due to cortical thickness
- Non-DS studies suggest that higher intelligence is associated with higher nighttime sleep efficiency
- Understanding of importance of sleep and sleep-promoting behaviors



CONSEQUENCES OF SLEEP
DISTURBANCES

COGNITIVE AND PERFORMANCE DEFICITS

- Studied in non-DS on memory, learning, attention and sleep
- Risk for AD
 - individuals with DS risk for developing AD is 40-80%
- Associations between beta-amyloid accumulation, sleep, and cognitive impairment found in individuals with DS
 - BA accumulations were associated with longer nighttime awakenings
 - BA accumulations were associated with poorer performance in memory, executive functioning, and motor planning/coordination tasks

MOOD DISORDERS AND MENTAL HEALTH

- Studies suggest an association between mood disorders and sleep in DS
- One study found:
 - 90% of individuals with DS who had major depressive episodes had OSA compared to 44% of individuals without DS
 - Severe sleep apnea was found in 54% of participants with DS with major depressive episodes, compared to 11% of controls
- Lack of research with other mood disorders in DS
- Lots of overlap in non-DS pts

PHYSICAL HEALTH – CARDIOVASCULAR DISEASE

- High prevalence in DS
- About 50% of babies born with congenital heart disease & require open heart surgery
- Limited data
- Study compared CV effects as a consequence of sleep disturbed in children with and without DS
 - children with DS had lower parasympathetic activity -> lower autonomic CV control
 - children with DS had larger drops in oxygen saturation and lower overall oxygen saturation
 - > lower oxygen available when sleeping
- Cardiac impact from poor sleep may be exacerbated in children with DS

PHYSICAL HEALTH – METABOLIC DISEASES

- DS may be considered a metabolic disease
 - altered metabolism caused by extra copy of 21st chromosome
 - diabetes and obesity very common
- No data on sleep and metabolic syndrome/disease
 - elements seem overlapping



TREATMENT
RECOMMENDATIONS

TREATMENT RECOMMENDATIONS

- Invasive and cost-intensive tx are most common
 - continuous positive airway pressure machines
 - bilevel positive airway pressure machines
 - surgery
- Research in children with DS show no difference in surgical and nonsurgical tx
- Tx should be personalized to unique needs
- Limited data on non-invasive tx
- Non-DS tx include myofunctional therapy and sleep hygiene
 - Weight management may also be strategy

CONCLUSION

- Very little data -> NEED for research
- Modifiable and non-modifiable risk factors
- Current tx is very limited
 - cost-intensive and invasive
- Efforts should be made to explore behavior tx to help individuals with DS and their loved ones

THANK YOU!

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Please feel free to reach out to me with any questions, comments, interest in research collaboration, or to request the full list of references!