Neurobehavioral Approaches to Maximize Health and Behavioral Functioning in Individuals with Angelman Syndrome: Lessons Learned (Part II)

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What you will learn about today

• Range of factors that are associated with physical and behavioral concerns in individuals with AS
• How knowledge about these factors can be used to improve physical and emotional health and reduce challenging behavior in individuals with AS
About Us

• Jane Summers, PhD (psychologist), Toronto
• Erick Sell, MD (neurologist), CHEO in Ottawa
• Melissa Carter, MD (clinical geneticist, developmental pediatrician), CHEO in Ottawa

• Mutual interest in seeing people with AS
• Neurology + behavior = Neurobehavioral approach

• Clinical aims:
  • Improve physical and emotional health, reduce occurrence of challenging behaviour
  • Enable individual with AS to reach full potential, maximize quality of life

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Information sources for presentation

• Health Watch Table for Individuals with AS (AS-HWT)
• Clinic in Ottawa
• On-line Behavior Modules
• Recent literature on AS
AS Health Watch Table (AS-HWT)

- Developed in 2015 by Cynthia Forster-Gibson, Joseph Berg and Marika Korossy
- Purpose is to provide anticipatory guidance for health/mental health concerns, monitor health/mental health needs across all ages/stages
- Reviews physical and behavioral/mental health issues and provides recommendation or guidance for how to manage them

www.surreyplace.on.ca/documents/Primary%20Care/HWT-AS10Sep2015.pdf
Areas covered in AS-HWT*

* We have added our own information in italics

• Genetics
• Neurology
• Musculoskeletal
• HEENT (Head, Eyes, Ears, Nose, Throat)
• Gastrointestinal
• Dental
• Endocrine & Sexuality (includes sleep and communication)

* Toileting
* Safety
* Pain/discomfort
* Family support needs
Ottawa Clinic: Behavior & Skills Assessment

- Service history
- Behavior/mental health issues
- Safety concerns
- Presence of challenging behavior, related factors
- Skill building approaches
- Parents’ needs for support and information

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Toileting
Toileting

Daytime bladder incontinence and nocturnal enuresis are common, more so in younger children and those with seizures. Incontinence can lead to physical discomfort, UTIs, dependence on caregivers and expense. Hesitancy, straining and interrupted stream have been found. Bladder may not be emptied entirely. Constipation may occur and be associated with mobility impairment, side effects of anti-convulsant medication.
Toileting (continued)

RECOMMENDATIONS: Toilet training programs can help with urinary continence and reduce accidents. Relaxed state on the toilet may make voiding easier. Reward for fully emptying bladder. For constipation, increase exercise, fibre and fluid; upright position on toilet, establish consistent habit time when defecation is likely. Track frequency, size and consistency of bowel movements if needed.
What we have learned

**Lessons**

• Many taken to toilet on schedule
• Constipation is common
• More are urine trained than bowel trained

**Implications**

• Constipation can be associated with pain and discomfort, can affect skills and functioning
• Lack of toilet skills can increase burden of care, expense
Case example: Lindsay – Severe constipation

Lindsay is a 20-year-old female with AS, del+. She has a seizure disorder and takes 4 anti-convulsant medications daily. She has reflux and doesn’t like to drink fluids. Lindsay is mobile and walks independently. She is time trained and will stay dry between trips to the bathroom.

Lindsay has a history of constipation. She was taken to the hospital 3 times in the past year in relation to constipation/bowel impaction. She was seen by a GI who was concerned about an expanded colon.
Lindsay (continued)

Lindsay’s mother noticed her abdomen becomes very bloated, her food consumption drops and her cognitive skills decline when she is constipated.

Lindsay is now taking Metamucil, mineral oil, restoralax, prune juice and prunes to prevent constipation. Her mother tries to get her to drink several glasses of water daily and maintain a regular exercise routine.
Pain and Discomfort
Pain and Discomfort

Pain and discomfort can present as distress, sleep disturbance or behavioral changes, such as an increase in aggression or irritability. Facial expression and vocalizations can change.

RECOMMENDATIONS:
Investigate and treat possible physical cause (GERD, headache, toothache, sore foot, uncomfortable clothing, etc.). Look for and address environmental factors (too loud, too hot/cold, too crowded).
What we have learned

Lessons

• Many lack concept of danger
• Some have swallowed hazardous items or choked
• Many show signs of pain

Implications

• Safety proofing and supervision
• Look for changes in typical behavior
• Failure to cry doesn’t mean there isn’t a problem
Non-Communicating Children’s Pain Checklist
(NCCPC; Breau et al., 2002)

• **Vocal** (moaning, whining, whimpering, crying, screaming)
• **Eating/sleeping** (eating less, increase or decrease in sleep)
• **Social** (cranky, irritable, less interaction, seeking comfort or contact)
• **Facial** (furrowed brow, not smiling, lips tight or puckered, clenching or grinding teeth, chewing)
• **Activity** (not moving, less active, agitated, fidgety)
• **Body/limb** (floppy, stiff, gesture to part of body that hurts, flinch or move body part away)
Sleep
Sleep Disturbance

High rates of sleep problems. Problems include decreased need for sleep, abnormal sleep-wake cycle, difficulties falling asleep or remaining asleep, reduced total sleep time, disruptive bedtime behaviors. Problems can have a significant impact on family functioning. Sleep is most affected in infancy and middle childhood and tends to improve in adolescence and adulthood.

RECOMMENDATIONS:
Implement consistent nighttime routine; modify sleep environment; consider trial of melatonin; possible referral to sleep specialist or clinic. Consider referral to behavioral specialist to assess parent-child interactions. Sleep apnea may be an issue but can be difficult to diagnose and treat. Removal of tonsils/adenoids, weight loss may help.
Meta-analysis of sleep studies

Key Findings:

- Problems with short sleep duration, length of time taken to fall asleep, awakening during the night and poor sleep efficiency were found from reviewing the literature

Sleep problems are reported to be extremely prevalent in individuals with developmental disabilities. The consensus guidelines for Angelman syndrome (AS) consider abnormal sleep-wake cycles and diminished need for sleep as associated features. We report an integrative research review and a meta-analysis of studies with sleep as the primary aim of investigation in an AS sample.

14 studies met eligibility criteria with half of them being surveys. Thirteen of the 17 conceptually formed sleep disorder item groups showed to be significant for individuals with AS. There is evidence that arousal during sleep, somnolence and possibly short sleep duration are the primary sleep problems in individuals with AS.

According to the results of this review and meta-analysis, there is clear evidence for sleep problems in individuals with AS. Individual effect sizes remain overall small, but nevertheless findings suggest disorders of arousal and sleepiness to be distinctive. In light of these findings, other sleep complaints in individuals with AS should be carefully examined. Consistent standards for research on sleep in individuals with AS are critical for new lines of investigation.
Health concerns and sleep problems

Key findings for children with AS:

• Night waking and early waking problems were common
• Night wakening appeared to decrease with age
• 71% were taking melatonin or other medication to improve their sleep quality
• Potential association between symptoms suggestive of reflux and sleep-disordered breathing (snoring, possible sleep apnea)
Parental input about sleep issues

Key findings:

- Impact of sleep problems – affected parents’ ability to function during the day, difficulty coping at work
- 68% of parents had tried behavioral approaches + medication
- 64% had seen a professional about child’s sleep problem
- 27% wanted information and supports to develop a behavioral intervention for their child
What we have learned

Lessons

• Many have problems falling asleep or going back to sleep
• Many have tried sleep medications

Implications

• Sleep problems may impact child’s learning and behavior, affect parents’ sleep and increase parent stress
• Consider link between pain/discomfort and sleep problems
Mental Health/Behavioral: Communication
Mental Health/Behavioral

- Language development is variably, though markedly impaired – majority do not develop speech; receptive language skills are always more advanced than expressive language skills and continue to improve even in adulthood.

RECOMMENDATIONS: Early and ongoing intervention by speech-language therapist is essential and should focus on nonverbal forms of communication. Use of augmentative and alternative communication aids, such as Pragmatic Organization Dynamic Display, picture cards, communication boards, speech generating devices, should be encouraged.
What we have learned

Lessons
• Most vocalize and use gestures
• Many use AAC
• Some words

Implications
• Many individuals with AS use aided (PODD, Proloquo) and unaided (gestures, signs, vocalizations, speech) approaches
• AAC devices should be present across environments and modeled by a range of communication partners
• Communication challenges linked to behavior problems
Challenging behavior
Mental Health/Behavioural

• Frequent laughter, apparently happy demeanor, easy excitability, hyperactivity, sleep disturbance, and aggressive behaviours such as grabbing and pulling, but not self-injury, are common

RECOMMENDATIONS: For hyperactivity, arrange consultation with occupational therapist for sensory issues, behavior therapist and then a psychiatrist to consider medication management for hyperactivity (atypical response to stimulant medication may occur). *Shape paying attention for longer periods of time; rearrange physical and teaching environment.*
Maladaptive behaviors in individuals with Angelman syndrome

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Maladaptive behaviors are challenging and a source of stress for caregivers of individuals with Angelman Syndrome (AS). There is limited information on how these maladaptive behaviors vary over time among individuals with AS due to different genetic etiologies.

In this study, caregivers of 301 individuals with AS were asked questions about their child’s behavior and completed the Autism Behavior Checklist-Community version (ABC-C). Developmental functioning was evaluated with either the Bayley Scales of Infant Development, Third Edition (Bayley-III) or the Mullen Scales of Early Learning (MSEL). Family functioning was assessed using the parent-completed Parenting Stress Index (PSI) and the Family Quality of Life questionnaire (FQOL). Approximately 70% of participants had AS due to a de novo deletion on the normally inherited copy of chromosome 15q11-13.

Results revealed that at baseline, individuals with AS had low scores in the domains of behavior (mean = 1.5, SD = 0.9), and communication (mean = 2.0, SD = 1.0). These scores increased with age, exceeding a score of 3.0 in both domains by age 14. Hyperactivity was strongly associated with increased irritability and decreased attention span, suggesting that individuals with AS have a biologically based hyperactivity phenotype. The frequency of aggressive behavior increased with age, with a significant increase in the frequency of physical aggression (pinching or biting) by age 10. Problems could be related to seizures, sleep, communication problems,

Key Findings

- Easy excitability, mouthing and fascination with water and short attention span were commonly reported by caregivers.
- On ABC-C, irritability is a problem and increased over time.
- Hyperactivity and short attention span are also significant concerns.
- Aggressive behavior increased over time and changed in form (↑pinching ←biting).
- Problems could be related to seizures, poor sleep, communication problems.
Challenging Behaviors in Young Children with AS

Key Findings for children with AS:

- CBCL concerns – speech problems, chews on things that aren’t edible, can’t concentrate for long
- Withdrawn behavior and symptoms of autism were prominent concerns in children with AS
What we have learned

Lessons

• Top behavioral concerns – aggression, short attention span
• Aggression – hair pull, grab, pinch, bite, slap

Implications

• Relationship between behavior and skill deficits
• Behavior can serve as a form of communication
Aggressive behavior

• Behavior that can result in harm to oneself, others or the environment
• Common forms of aggression in AS: hair pulling, grabbing, pinching, kicking, slapping
• In the absence of verbal and motor skills, aggression may be a way to “tell” people:
  • to pay more attention or stay connected
  • wants something
  • don’t like/don’t want something
  • not feeling well or unhappy
On-Line Behavior Modules

- Social and environmental influences on aggressive behavior
- Aggression as a communicative behavior
- Cognitive and sensory issues
- Mental health influences on aggressive behavior
- Neurologic and medical influences on aggressive behavior

www.angelmanbehaviors.org
Emotional and Mental Health
Mental Health/Behavioral
(continued)

• Emotional needs are often neglected in severe disability combined with limited communication

RECOMMENDATIONS: Work with the individual and family to optimize opportunities for inclusion, participation and friendship. Watch for changes in behavior that can occur in relation to stressors or major life events (moves, end of school, loss of family, friends, workers). Use tools that have been developed to identify possible signs of mental health problems in individuals with severe intellectual disability. Signs may include increased irritability and agitation or changes (increase/decrease) in sleep, energy, appetite and mood. Consider referral to psychologist or psychiatrist.
Anxiety symptoms and separation distress

Key findings:

• Created a questionnaire to assess anxiety and separation distress in children and adults with AS
• 41% of caregivers expressed concerns regarding anxiety; can happen if preferred caregiver is busy with someone else, tries to leave or someone gets in the way
• Fewer anxiety-related behaviors for deletion group
• Anxiety scores highest for adolescents and lowest for children under 5 years
• Sleep difficulties and aggressive behaviors predicted anxiety scores
Medication treatment for anxiety symptoms

Key findings:

- 3 adult cases
- Anxiety and distress symptoms - excessive swallowing and vomiting; sweating and loud vocalizations; pacing; aggression, self-harm and property destruction; sleep disturbance
- Triggers or contributing factors – separation from preferred caregiver; stressful environment; pain and discomfort; sensory overload; expressive communication deficits; limits being set
- Buspirone was associated with reduction in symptoms
Skill Building
Mental Health/Behavioral (continued)

• Interventions based on applied behavior analysis (ABA) are being used to teach adaptive and communication skills to improve individuals’ functioning and address behaviours that challenge people and services.


If behavior changes/occur, evaluate for medical cause. Consider emotional needs and possible mental health issues.
Why are skill building approaches important?

• Increase individual’s independence and sense of competence
• Reduce care needs
• More skills = better emotional health and quality of life, reduction in challenging behavior
One example of a skill building approach

Key findings:

- Behavioral strategies were used to teach functional skills (motor imitation, visual matching, following instructions) to 3 children with AS
- Parents reported positive changes in child’s development after intervention
- Had favorable views toward the intervention (worth time and effort, would recommend to other parents, more hopeful about child’s future afterward)
Neurodevelopmental outcomes in children with Angelman syndrome after 1 year of behavioural intervention

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Abstract
Objective: To examine the impact of teaching approaches based on the principles of applied behaviour analysis (ABA) on neurodevelopmental outcomes in children with Angelman syndrome (AS).
Method: A non-randomized pre-test-post-test control group design was used. The intervention group consisted of four children with AS aged 3.1–9.2 years. Controls were other children with AS who were individually matched on the basis of chronological age, gender and molecular sub-type. Children in the intervention group were provided two-to-three ABA-based therapy sessions per week over a 1-year period. Standardized measures of cognitive, adaptive and language functioning were administered at baseline and after 1 year.
Results: There were no statistically significant differences between the two groups at baseline or after 1 year. However, positive trends were observed in the intervention group for some cognitive and adaptive measures.
Conclusion: ABA-based intervention improved aspects of neurodevelopment for some children with AS and warrants further study.

Key findings:

- 4 children with AS received 1 year of behavioral intervention, compared to 4 children with AS who did not
- Children in intervention group showed non-significant trend toward improved fine motor and receptive language scores on a cognitive measure after 1 year
Clinical and Information Needs
Unmet clinical needs

Key findings:

- Literature review
- Found that some issues get better with age (hyperactivity) while some issues can get worse (movement disorders, aggression and anxiety)
- High unmet clinical needs in the areas of motor functioning, communication, behavior and sleep for individuals with AS and their families
Parent information needs

Key findings:

- Highest information needs for health (specifically seizures, reflux, bone/joint problems), communication (expressive communication) and sleep issues
- Mobility issues were also identified
Clinical Trials
Key Findings:

- Assessed parents’ knowledge and perspectives on clinical trials for AS and other rare genetic disorders
- In general, parents viewed trials to reduce symptoms associated with their child’s syndrome in a positive light
- Many identified behavior and IQ as priority areas
- Speech/communication was identified as priority area for ~75% of AS group
Possible outcome measures for clinical trials

Using Behavioral Approaches to Assess Memory, Imitation and Motor Performance in Children with Angelman Syndrome: Results of a Pilot Study

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**ABSTRACT**

**Purpose:** This study was designed to assess memory, imitation of motor actions and motor performance by 12 children (age range 40–151 months) with Angelman syndrome (AS), a rare neurogenetic disorder associated with learning and memory impairments. **Methods:** Children’s functioning was assessed at several time points over a 3-month period. **Results:** Memory and motor performance tests had acceptable test-retest and inter-rater reliability whereas the motor imitation test did not. Children were able to recall action sequences after a 24-h delay. Memory and motor performance scores were correlated with children’s chronological age and raw scores on subdomains of the Vineland-II. **Conclusions:** These behavioral tests require further development and evaluation but may show promise to accompany standardized assessments that are currently in use with children with AS.
Thanks

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• Parents and families from Ottawa Clinic

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