

SUPPORTING COGNITIVE DEVELOPMENT IN HEART CHILDREN

PARENTING YOUR HEART CHILD CONFERENCE

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OUTLINE

- **Risk factors for cognitive differences**
- **Defining and measuring cognitive development**
- **Typical cognitive profile of children with CHD**
- **Cognitive milestones from infancy to adolescence**
- **Supporting cognitive development as a parent**

RISK FACTORS

- **Heart and brain connection**
 - Abnormalities in oxygenated blood flow prenatally
 - Additional risk factors:
 - Neurological injury
 - Use and duration of ECMO
 - Extended length of hospital stay
 - Prematurity (< 37 weeks)
 - Comorbid genetic disorder
 - Inadequate nutrition
 - Limited family resources

WHAT IS COGNITIVE DEVELOPMENT

- **How a person perceives, thinks, and gains understanding of his or her world through the interaction of genetic and learned factors**
- **Areas of cognitive development**
 - Intelligence
 - Verbal and Nonverbal Reasoning
 - Information Processing
 - Memory
 - Executive Functioning

WHAT IS COGNITIVE DEVELOPMENT

- **Executive functions are self-regulatory skills that affect:**
 - Planning
 - Organization
 - Flexibility
 - Generation of Information
 - Inhibition of Impulses
 - Self Monitoring
 - Working memory

HOW IS COGNITIVE DEVELOPMENT MEASURED

- **Developmental Tests**
 - Bayley Scales of Infant and Toddler Development
 - Mullen Scales of Early Learning
- **Intelligence (IQ) Tests**
 - Wechsler Preschool and Primary Scale of Intelligence (WPPSI)
 - Wechsler Intelligence Scale for Children (WISC)
 - Differential Ability Scales (DAS)
- **Executive Functioning Tests/ Measures**
 - Delis-Kaplan Executive Function System (DKEFS)
 - Behavior Rating Inventory of Executive (BRIEF)

COGNITIVE PROFILE FOR CHD

- **Infants**
 - Cognition not significantly different from norms
- **Toddlers and Preschoolers**
 - Cognitive scores varied but fall in the lower reaches of the average range
- **School age children**
 - IQ scores in lower reaches of the average range
 - Nonverbal IQ lower than verbal IQ
- **Adolescence**
 - Any deficits persist or worsen

COGNITIVE PROFILE FOR CHD

- **Mild cognitive impairment overall**
- **Areas most at risk:**
 - Executive functioning
 - Memory
 - Attention
 - Visual spatial processing
 - Visual motor integration

COGNITIVE MILESTONES: INFANCY

- **0-6 months**
 - Listens attentively to sounds and voices
 - Coordinates eye movements
 - Discovers hands and feet
 - Explores objects by mouthing
 - Smiles at image in mirror
- **6-12 months**
 - Finds hidden objects
 - Imitates gestures and actions
 - Manipulates objects purposefully

COGNITIVE MILESTONES: TODDLERHOOD

- **12-18 months**
 - Remembers where things are kept
 - Enjoys cause and effect relationship
 - Shows brief interest in picture books
 - Attempts simple puzzles
- **18-24 months**
 - Sorts shapes and colors
 - Imitates adults
- **2-3 years**
 - Comprehends size
 - Begins to understand time sequences
 - Counts and manipulates objects

COGNITIVE MILESTONES: PRESCHOOL

- **3-4 years**
 - Completes patterns
 - Begins to understand reasoning
 - Distinguishes between fact and fiction
- **4-5 years**
 - Understands opposites
 - Engages in imaginary play
 - Completes more complex puzzles

COGNITIVE MILESTONES: SCHOOL AGE

- **5-6 years**
 - Exhibits increased attention span and concentration
 - Understands simple classifications
 - Places blocks and nesting toys in order
- **6-9 years**
 - Accepts and understands rules
 - Draws symbolic pictures
 - Enjoys hobbies and collections
- **9-12 years**
 - Recognizes problems and can identify solutions
 - Has increased memory
 - Can understand others' perspective

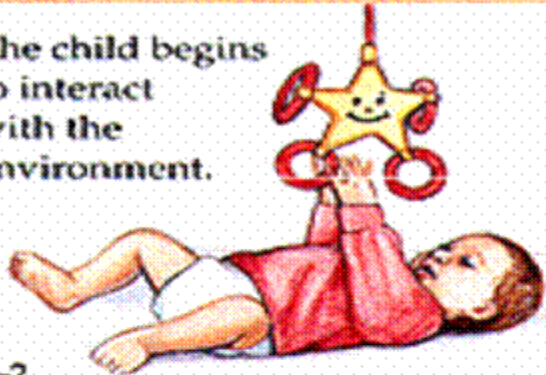
COGNITIVE MILESTONES: ADOLESCENCE

- **13-14 years**
 - Growing capacity for abstract thought
 - Mostly interested in present with limited thought to the future
 - Interests expand and become more important
- **14-18 years**
 - Greater capacity for setting goals
 - Interest in moral reasoning
 - Thinking about the meaning of life

COGNITIVE MILESTONES: PIAGET STAGES

SENSORIMOTOR STAGE

The child begins to interact with the environment.



0-2

PREOPERATIONAL STAGE

The child begins to represent the world symbolically.



2-6 or 7

CONCRETE OPERATIONAL STAGE

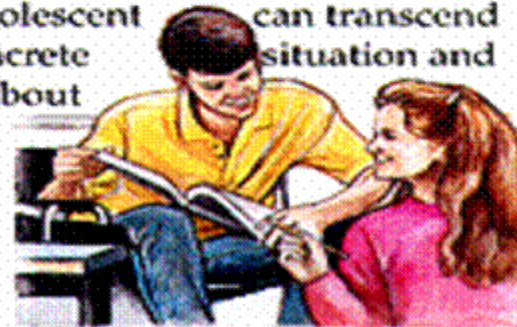
The child learns rules such as conservation.



7-11 or 12

FORMAL OPERATIONAL STAGE

The adolescent can transcend the concrete and think about the future.



12-Adulthood

SUPPORTING COGNITIVE DEVELOPMENT

- **Infancy**
 - Read early and often
 - Provide developmentally appropriate toys for sensory play
 - Practice with learning object permanence (peek-a-boo, pop-up toys)
 - Play music and sing nursery rhymes
- **Toddlerhood and Preschool**
 - Practice counting, shapes, and colors
 - Play with household objects
 - Encourage make believe play
 - Introduce working memory games (concentration, go fish, Simon Says)
 - Introduce sorting and classifying activities

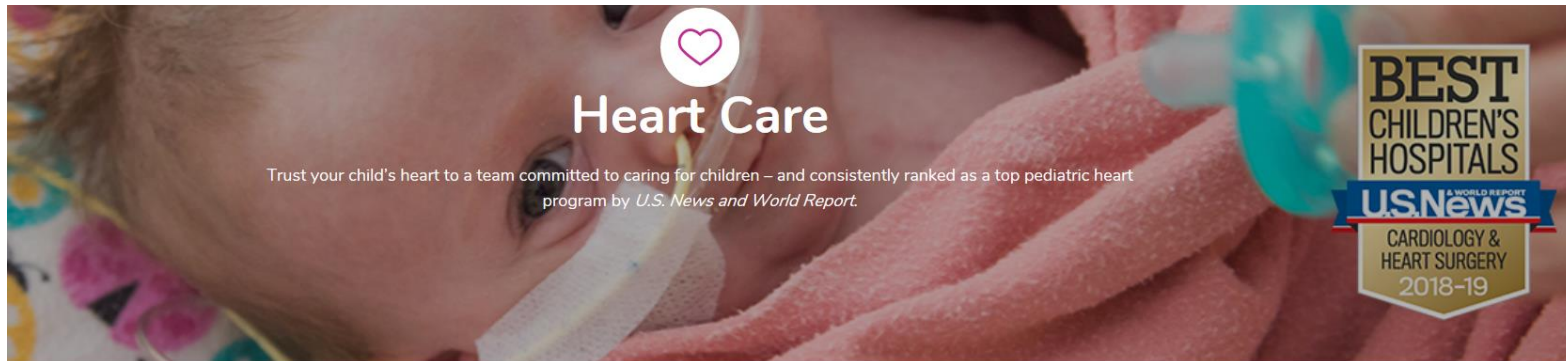
SUPPORTING COGNITIVE DEVELOPMENT

- **School age**
 - Use planning and organization tools
 - Establish a routine
 - Offer choices
 - Ask questions to help with problem solving
 - Encourage hobbies
- **Adolescence**
 - Discuss goal setting and attainment
 - Encourage classes that emphasize perceptual and verbal reasoning skills (geometry, algebra, debate, philosophy)
 - Create opportunities to practice daily living skills

SUPPORTING COGNITIVE DEVELOPMENT

- **Participate in neurodevelopmental evaluations and reevaluations**
- **Seek intervention for clinically significant problems with executive functioning**
 - Medication management or behavioral therapy for ADHD
 - Working memory training (Cogmed)
 - Mindfulness training
 - Academic accommodations

CHOA CARDIAC NEURODEVELOPMENTAL PROGRAM



Cardiac Neurodevelopmental Program

Research shows that children with heart conditions are at risk for motor and language delays, learning difficulties, attention problems, and social challenges. The American Heart Association and the American Academy of Pediatrics recommend that children with some heart conditions, such as those needing surgery in the first months of life, be seen in a cardiac neurodevelopmental program. This allows early identification of developmental issues and can aid in securing the appropriate supportive resources.

Children's is a founding institutional member of the Cardiac Neurodevelopmental Outcome Collaborative, which is an international group of healthcare professionals committed to partnering with families to optimize neurodevelopmental outcomes for congenital heart disease through clinical and research initiatives across the lifespan.

At Children's, our team of experts can identify and help your child work through any developmental issues. We provide:

- Comprehensive assessment of developmental skills during critical phases between infancy and age 21
- Experts with extensive experience working with children with heart disease
- Recommendations for support, intervention, community resources, and guidance with school planning

[Learn more about ways to support the developmental needs of your child with congenital heart disease](#)

[Infants to preschool](#)

Go To	
Cardiac Neurodevelopmental Program	>
Helpful Resources	>
Quick Links	
Sibley Heart Center Cardiology	>
Make an Appointment	>
Kids at Heart	>
Related Topics	
Medical Professionals	>
Research	>
Cardiology Fellowship Program	>
Contact Us	
Appointments: Phone: 404.785.2849	



RESOURCES

www.familyatheart.org

www.lhm.org.uk

www.mendedlittlehearts.org

www.tchin.org

<http://www.choa.org/campbraveheart>

www.heart.org

www.familyatheart.org

www.kidshealth.org/parent/medical/heart/congenital_heart_defects.html

www.chop.edu/healthinfo/congenital-heart-disease.html

<http://www.achaheart.org/>