# Screen Time and Toddlers:

# What is the Impact on Developing Brains?

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# Learning Objectives

| | |
|---|---|
| State | State the current recommendations by the American Academy of Pediatrics for screen use in children. |
| List | List key areas of development that are negatively impacted by excessive screen use and the pandemic. |
| Describe | Describe strategies to help improve the negative consequences of excessive screen time and language poor environments. |

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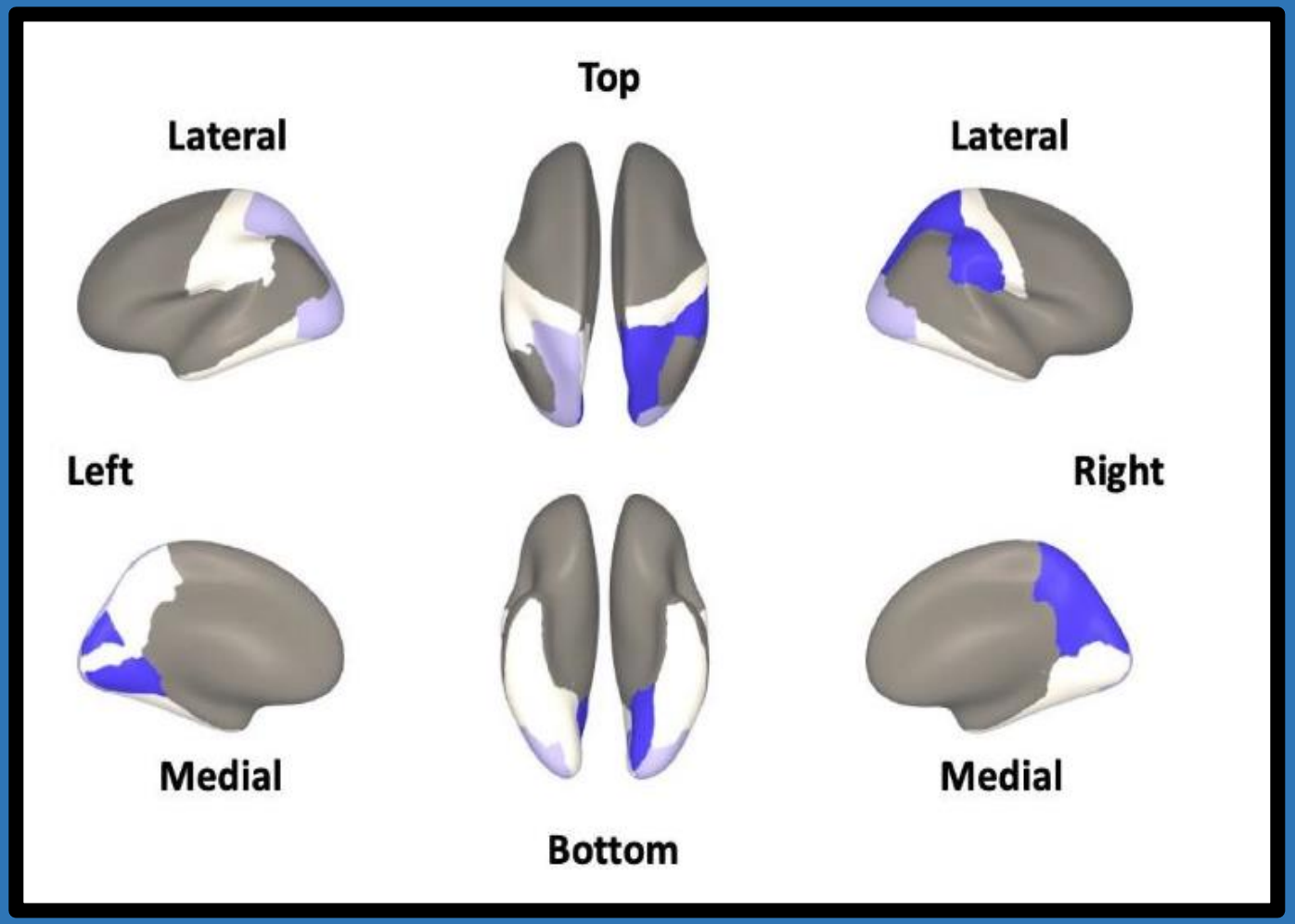
Do the best you can until
you know better.

Then when you know better,
do better.

-Maya Angelou

- **2010:** The iPad was introduced in 2010.
- **2011:** Rear entertainment systems (screens) appeared in the Honda Odyssey.
- **2014:** Wi-Fi became widely available.
- **2015:** Tablets designed for children began to appear.
- **2017:** First studies emerge on the impact of screen use in young children and language delays (van den Heuvel et al.)
- **2019:** Adolescent Brain Cognitive Development (ABCD) longitudinal study of approximately 11, 000 children 9–10-year-olds' use of digital media.
- **2020:** 46% of children ages 2-4 owned a mobile device and 67% of children at 5-8 (Common Sense Media).
- **2020:** Converging studies begin to provide **neurobiological evidence** of the impacts of **screen time on brain development in young children**.

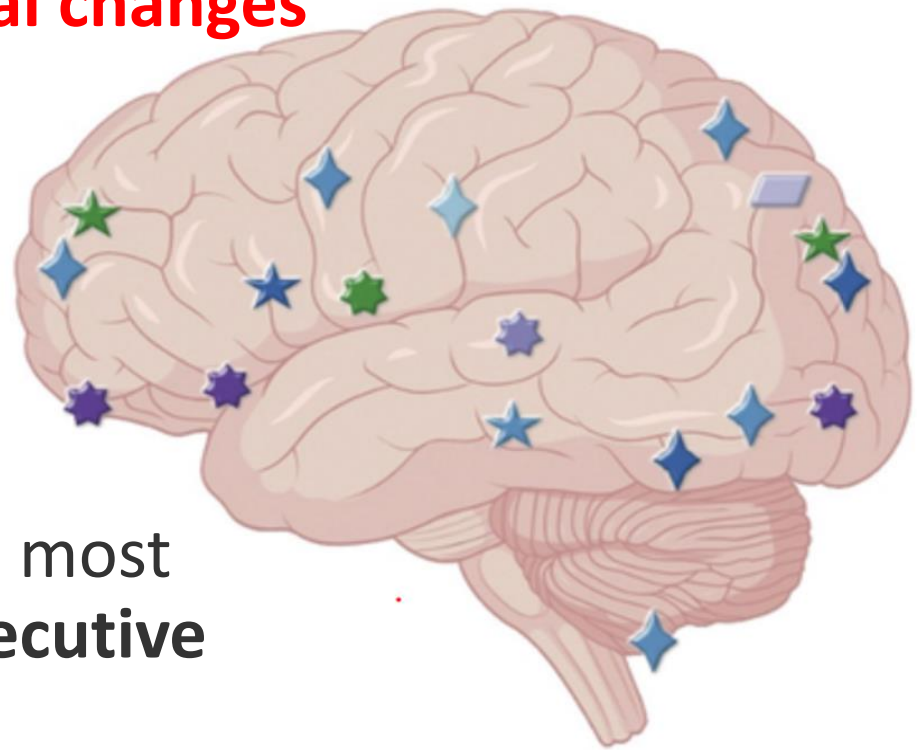
In children ages 3 to 5, higher screen time impacts development of brain areas responsible for **visual processing, empathy, attention, complex memory, social skills, understanding facial and emotional expressions, language, and early reading skills** (Hutton et al., 2022).




Increased screen time was associated with lower Cortical Thickness (CT) and Sulcal Depth (SD) in areas that support complex skills. Findings were **even stronger** when comparing to the 2019 ABCD study.

# Neurobiological Evidence

- A scoping review on the impact of digital use on young children (0-12 years of age) from 23 studies across 20 countries and 30,100 participants found **structural and functional changes across all areas of the brain**
  - frontal (**executive function**),
  - parietal (**sensory integration**),
  - temporal (**emotion, memory, and language**),
  - and occipital lobes (**visuospatial processing**),
  - brain connectivity, and brain networks with the most vulnerable area being the prefrontal cortex (**executive function**) (Dandan, et al., 2023).



# Children are not born with Executive Function skills – they are born with the potential to develop them.

Cognitive Flexibility = Problem Solving and Perspective Taking

Working Memory = Multi-Tasking

Inhibitory Control = Social-Emotional and Impulse Control

- **iPads are the new pacifiers (Wolf, 2018)**
- Which of these are not necessary for educational success?

| | | |
|---|---|---|
| Perspective taking | Problem solving | Identifying the problem |
| Controlling impulses | Paying attention | Ignoring distractions |
| Regulating emotions | Planning | Time management |
| Storing information | Self-monitoring | Remembering information |

Thinking about a problem in multiple ways

Completing multiple steps or applying multiple skills at one time

**Where, when, and how is executive function developed?**

# Play

**Play is a language rich experience.**

Developmentally appropriate play is the singular opportunity to promote the
social-emotional,
cognitive,
language,
and self-regulation skills
that build executive function
and a prosocial brain
that is ready for academic learning
(Yogman et al., AAP, 2018).

# The "Opportunity Cost" of Screen Use by Children **AND** Adults

- Screen-based activities **"COST" children the OPPORTUNITY** to engage in conversation and developmentally appropriate play with others.
- **Screen time diminishes the quantity and quality of interactions** between children and their parents, **resulting in fewer opportunities** for the child to practice and develop language (Mustonen, Torppa, & Stolt, 2022).
- 95% of parents say their tech use interferes with daily opportunities for talking, playing and interacting with their child (Common Sense Media, 2020).

# Screen Time is "The New Secondhand Smoke"

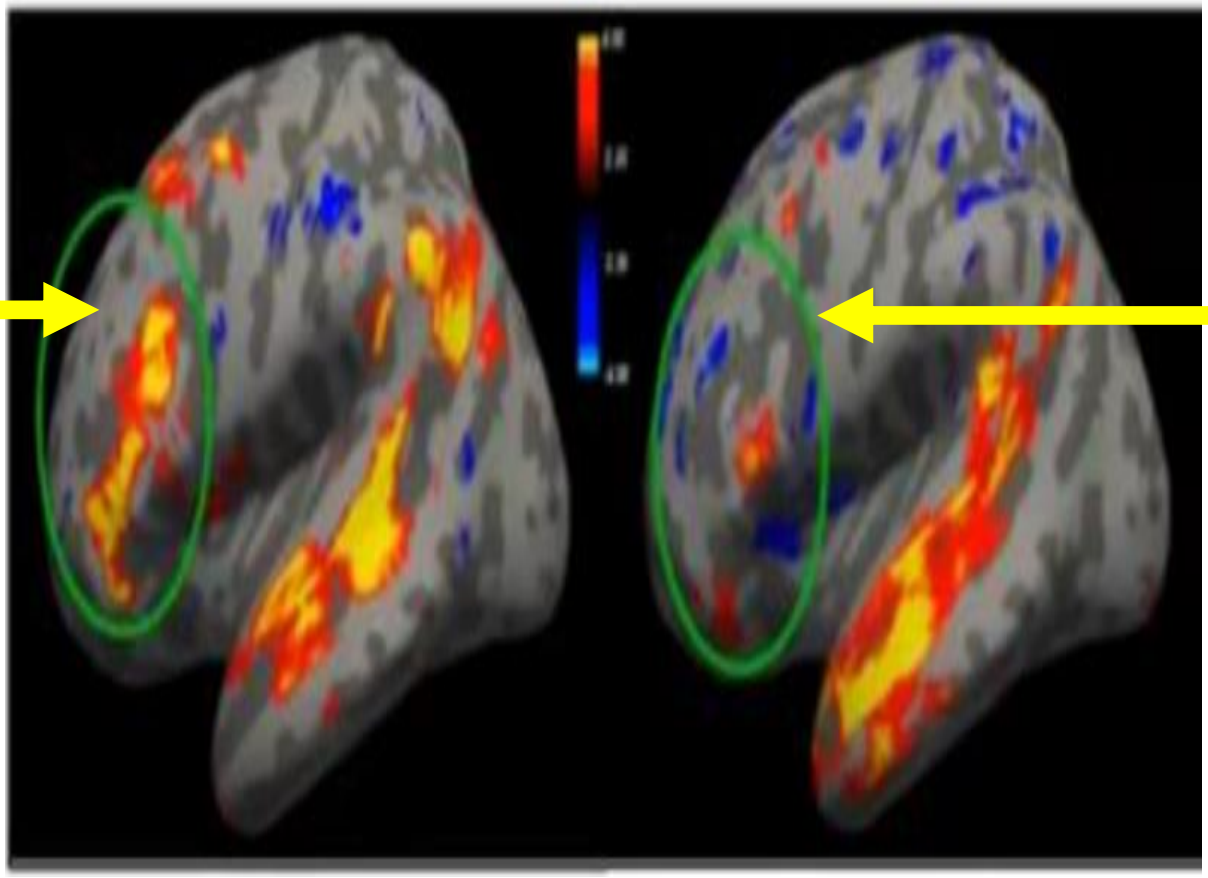
- Parental tech use is similar to secondhand smoke in that **it may endanger children's health and development in ways we don't fully understand yet** (Rodgers, 2020).

- Excessive amounts of screen use by the child **and/or** the parent has a negative impact on play-based and other activities that enhance cognitive and social-emotional skills necessary for kindergarten readiness (Sigman, A., 2017; Pagani et al., 2010).

Continuous partial attention: **being physically present, but emotionally disconnected**.

The greater the **conversational turns,** the greater the verbal abilities regardless of socio-economic status or the volume of adult speech and conversational turns support cortical growth in **language and social processing regions of the brain** (Romeo, 2018, 2021).

1,220 turns per day
Verbal score = 121

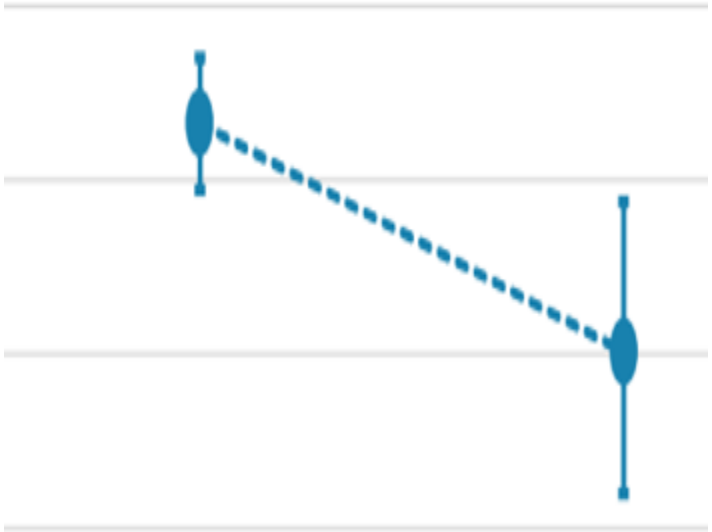


580 turns per day
Verbal score = 90

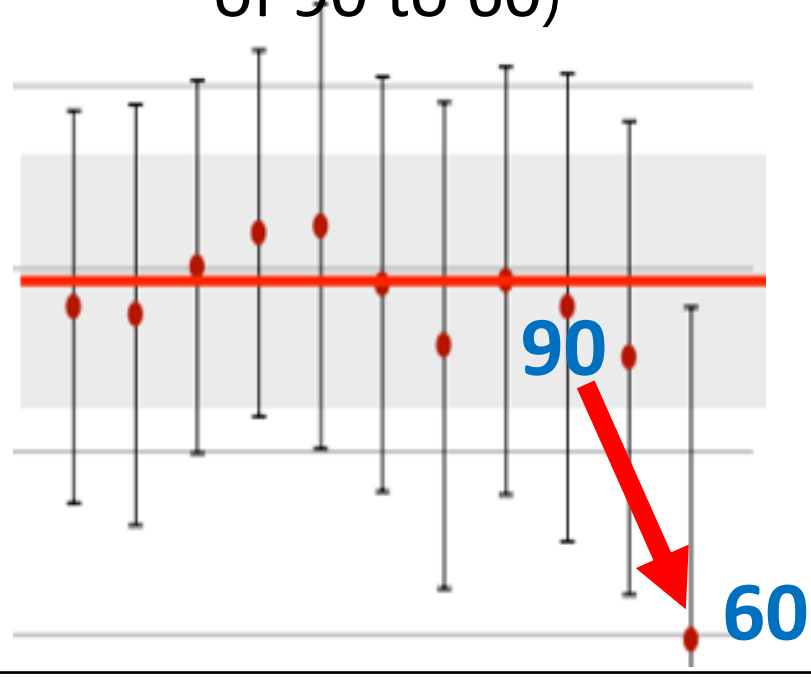
# Longitudinal Data (Deoni et al., 2022)

A year into the pandemic, the average performance of 1,700 children ages 3 months - 3 years of age was the **lowest it had been since researchers began tracking it in 2010** with an average decrease of 24.6 points across composite values (cognition, verbal development, and nonverbal development).

**Two-year-olds decreased conversational turns from 35-50 exchanges to 15-25.**

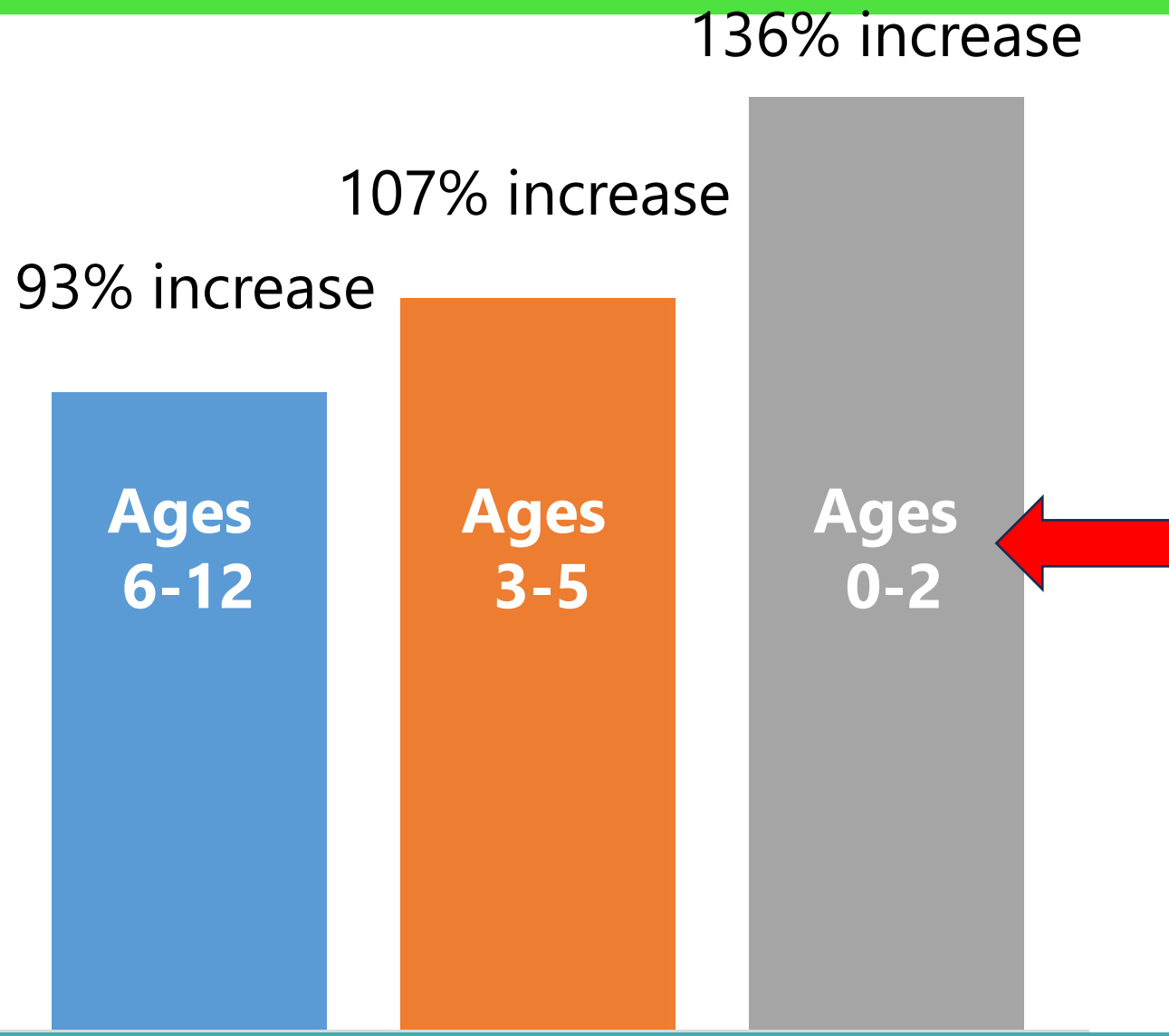


Children one year of age when the pandemic began had a significant decrease in verbal scores (from standard score of 90 to 60)



# Increases in Speech-Language Disorders (Kahn, Freeman, & Druet, 2023)

New ICD-10 diagnoses for developmental disorders for speech and language increased 110% from pre-pandemic (January 2018-December 2019) to post-pandemic (January 2021 – December 2022) for children birth-12 in the U.S.

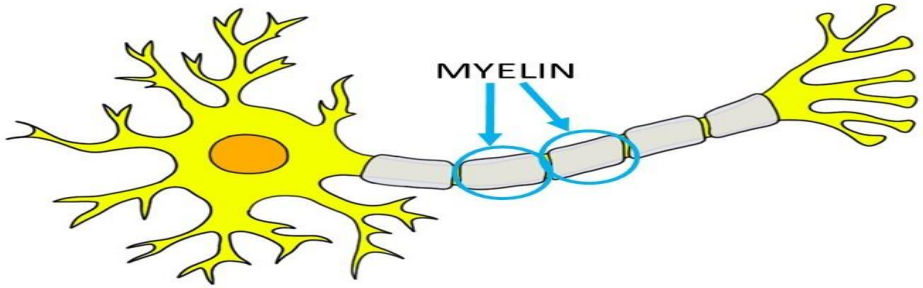


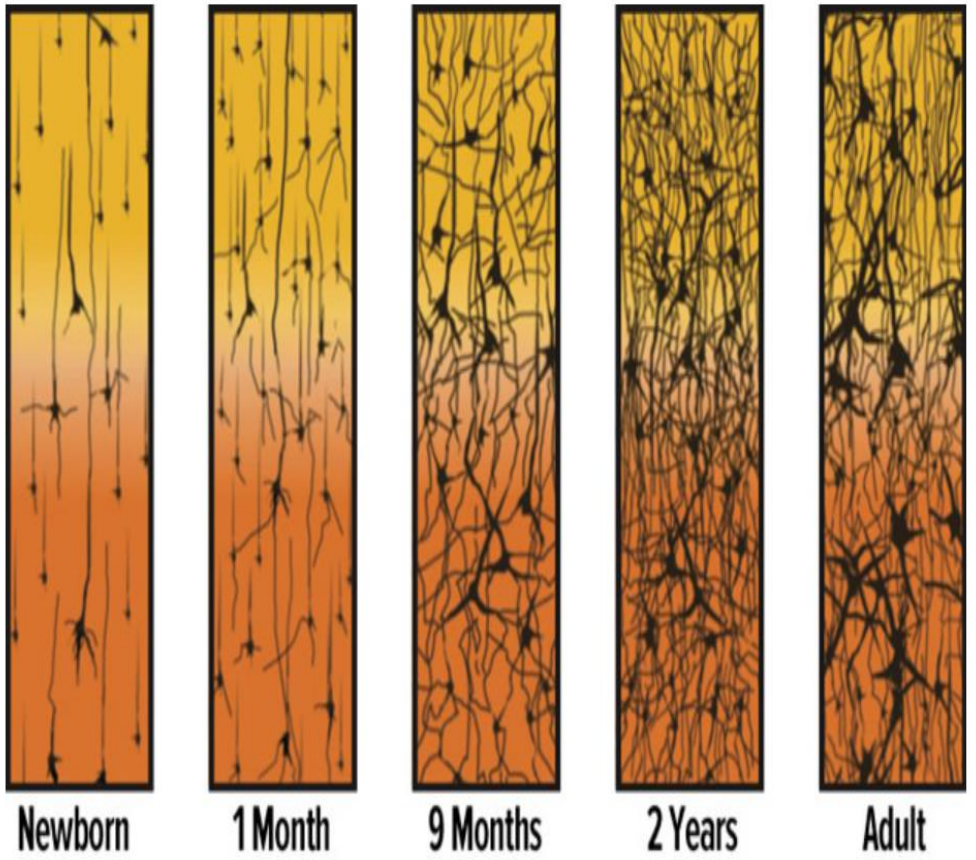
# Critical Periods of Development

- At birth, a child's brain already has nearly all the neurons it will ever have, and it **triples in size** over the course of **the first three years** in response to what we learn from **interactions with other people, our environment, and interaction with objects.**

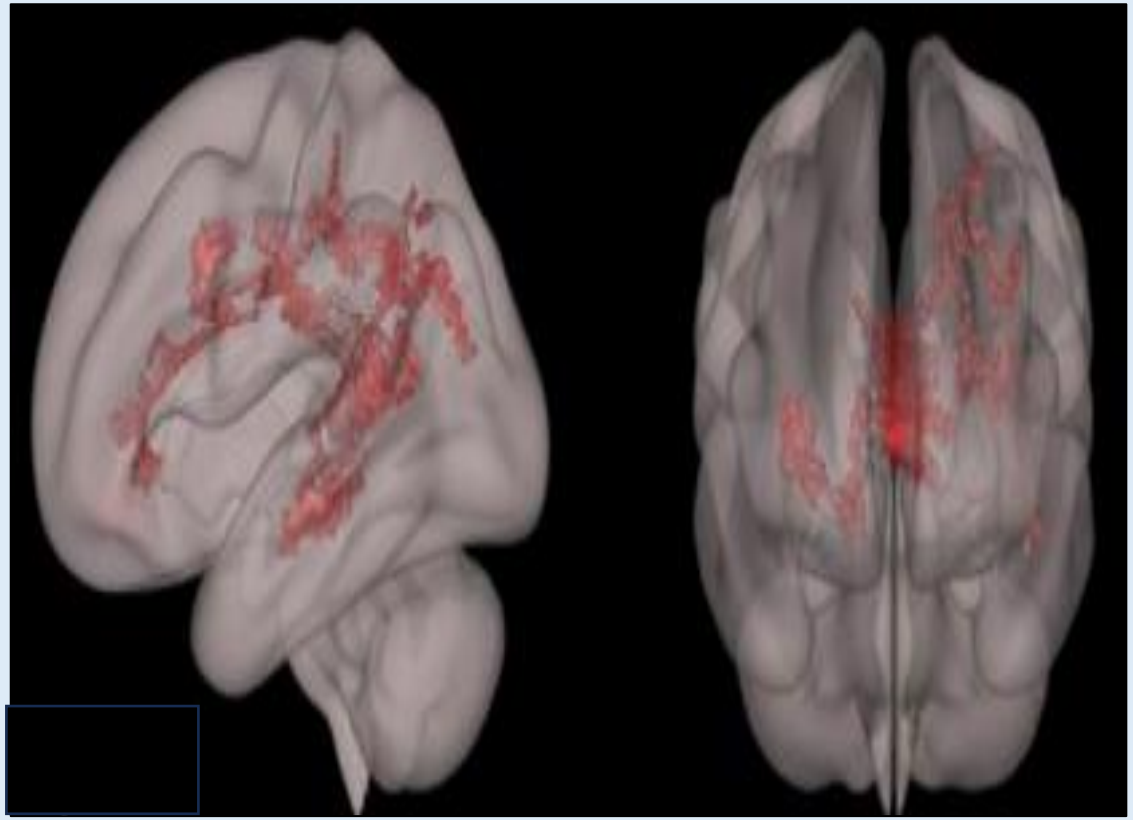
- The connections within the brain (synapses) are formed at a **faster rate during these years than at any other time in the life of a human** and are extremely responsive to external stimuli (Huttenlocher, 2002).

Between birth and age three all learning takes place in a social context, **through our relationships with others; *it cannot be replicated any other way.***

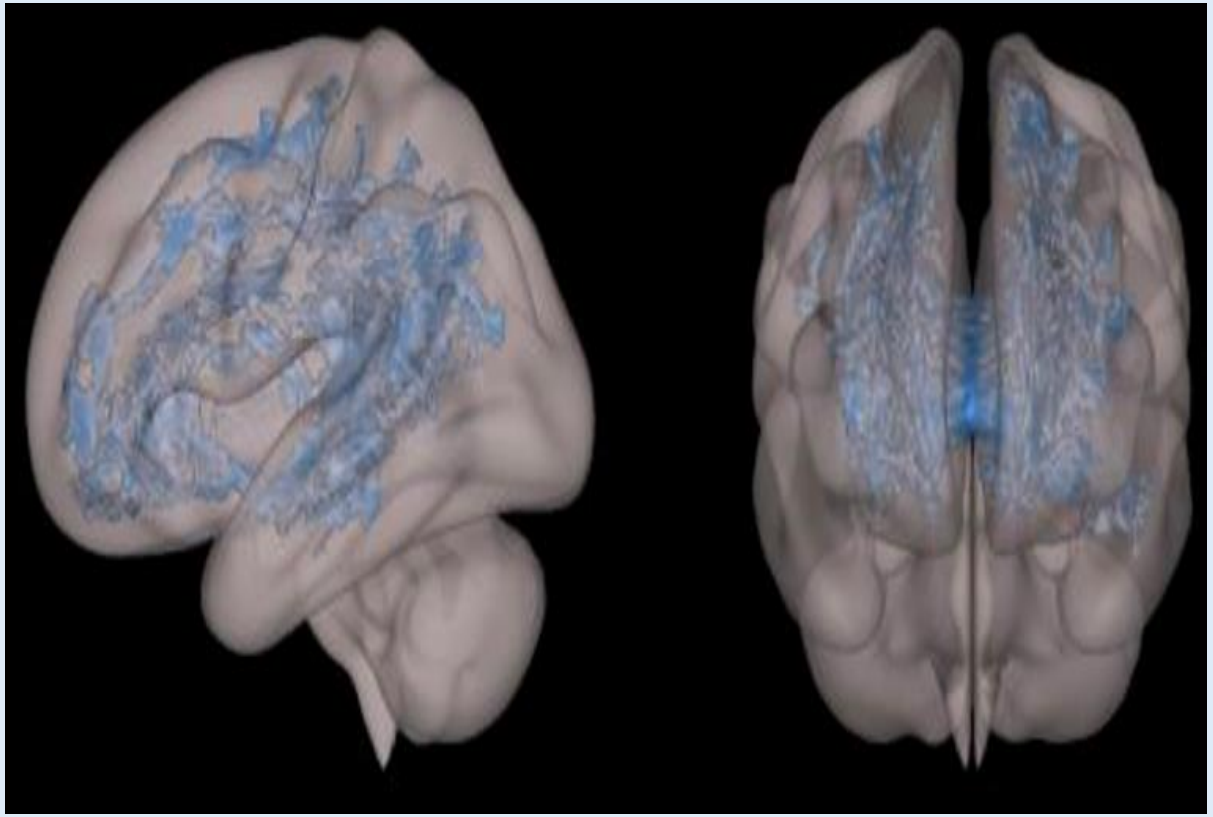


Preschooler who is read to often



Preschooler who **spends two or more hours a day** on screens.



To learn is to mylenate and a well-myelinated brain signal travels over 100 times faster than an unmyelinated brain signal.

# Screen Time Recommendations of the American Academy of Pediatrics


*Unless video chatting with parent or relative.

*Via co-viewing high quality content

*Screen time is a total amount per day which includes use of screens during the school day for *passive* activities.

A meta-analysis based on 29,017 children revealed that daily screen time **increased from 1.4 hours** pre-pandemic **to 2.7 hours** during the pandemic (Plamondon et al., 2023).

# The Amount of Screen Time

- Screen use **before the age of 2** resulted in significantly **lower emotional scores and higher risk of conduct problems, learning problems, and difficulties with impulsivity and hyperactivity** ***independent of excessive use*** (Xiang et al., 2022).

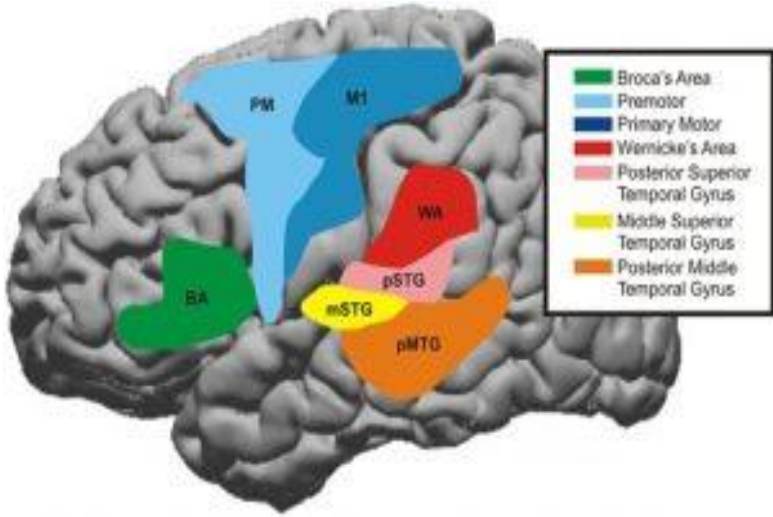
- Children with **more than one hour of daily screen time prior to the start of kindergarten** were more likely to be vulnerable in **all five developmental domains** (physical health and wellbeing, social competence, emotional maturity, language and cognitive development as well as communication skills) compared to children reporting up to one hour of screen time per day (Kerai et al., 2022).

- Screen use among **pre-kindergarten** children **that exceeded the AAP guidelines** was associated with lower measures of micro-structural organization and **myelination** of areas of the brain that support **language and emergent literary skills as well as corresponding cognitive assessments** (Hutton et. al., 2020).

# Language and Emergent Literacy

**The areas of the brain that we use for reading are the same as the language areas. Whether you speak it, read it or write it – its all language. The only difference is the modality of presentation.**

- The role of **early oral language experiences** is related to the anatomical connections of the brain for shaping the white matter tracts that are ultimately used for reading and whose integrity is **correlated with reading proficiency** (Torre, McKay &Matejko, 2019).




- Because **the areas of the brain that we use for reading are the same as the language areas,** early intervention programs aiming to close the achievement gap should **focus on increasing children's conversational turn taking** to capitalize on the early neural plasticity underlying cognitive development (Romeo, 2018).

# Screen Time and Social Development (Pragmatics)

- In children birth to two years of age, neuronal pathways **developed *through audiovisual means*** compete with preferences for social processing which **negatively affects development of social brain pathways** and cause global developmental delay (Heffler & Oestreicher, 2015).
- Screen time was positively correlated with the Childhood Autism Rating Scale **(CARS)** (Dong et al., 2021), the Social Communication Questionnaire **(SCQ)** (Alrahili et al., 2021), and the Modified Checklist for Autism in Toddlers – Revised **(M-CHAT; R)** (Md Zaki Fadzil & Murad, 2020; Dikkala et al., 2022).
- In four-year-olds, **the greater average screen time, the poorer the social skills**. However, **pretend play moderates the relationship between greater screen time and children's social skills** (Perez, 2023).

Increased hours spent screens as being associated with a **higher chance of developmental disorders, *including Autism***
(Sarfraz, Shlaghya, & Narayana, 2023; Alrahili et al., 2021; Hu et al., 2020; Md Zaki Fadzil et al., 2020; Dehiol et al.,2022; Dieu-Osika et al., 2020; Chen et al. 2021; Bibi et al., 2022; Wu et al., 2017; Slobodan et al., 2019; Kushima et al., 2022).

However, **once excessive exposure was stopped there was a significant improvement in their symptoms**
(Dehiol et al., 2022; Dieu-Osika et al., 2020).

It is **not** that screens ***cause*** ASD,
but disproportionate digital interactions
as opposed to human interactions during
critical periods of development
can negatively impact
the development of …
social communication,
language, and
emotional regulation skills.

# Rates of Autism in the United States (CDC)

| 1 in 150 | 1 in 44 | 1 in 36 |
|---|---|---|
| **Year Reported 2007** | **Year Reported 2021** | **Year Reported 2023*** |
| Survey Year 2000 | Survey year 2018 | Survey year 2020* |
|  | | *320% increase from survey year 2000 |

*Pandemic began March 2020

# Educational Programs


*Screen changes every 3 seconds

- Children 12 months and younger are not able to follow the changing scenes on a screen or a program's dialog because they haven't learned the words, concepts, context and syntax.
- It is not until the age of around 18 months that a baby's brain has developed to the point where symbols on a screen begin to represent their equivalent in the real world.
- <u>So, what's keeping them engaged?</u>
  - The exciting colors, quick scene changes, the exciting music, stimulating sounds, and over exaggerated characters *which provide no educational or developmental benefit*.

# Educational Apps

- Most apps have **no evidence of effectiveness,** target only rote academic skills, are not based on established curricula, and use little or no input from developmental specialists or educators (Chiong & Shuler, 2016; Christakis et al., 2013).
- Research shows that screens **do not make children learn faster or better than human interaction** (Teichert, 2020).
- Higher-order thinking skills and executive functions essential for school success, such as task persistence, impulse control, emotion regulation, and creative, flexible thinking, are **best taught and learned through unstructured and social (not digital) play** (Shaheen, S., 2015) **as well as responsive parent–child interactions** (Blair et al., 2011).






# YouTube Videos

- For every 30-minute increase of screen time per day there is 2.3 times greater risk of language delay (van den Hewel, 2019).

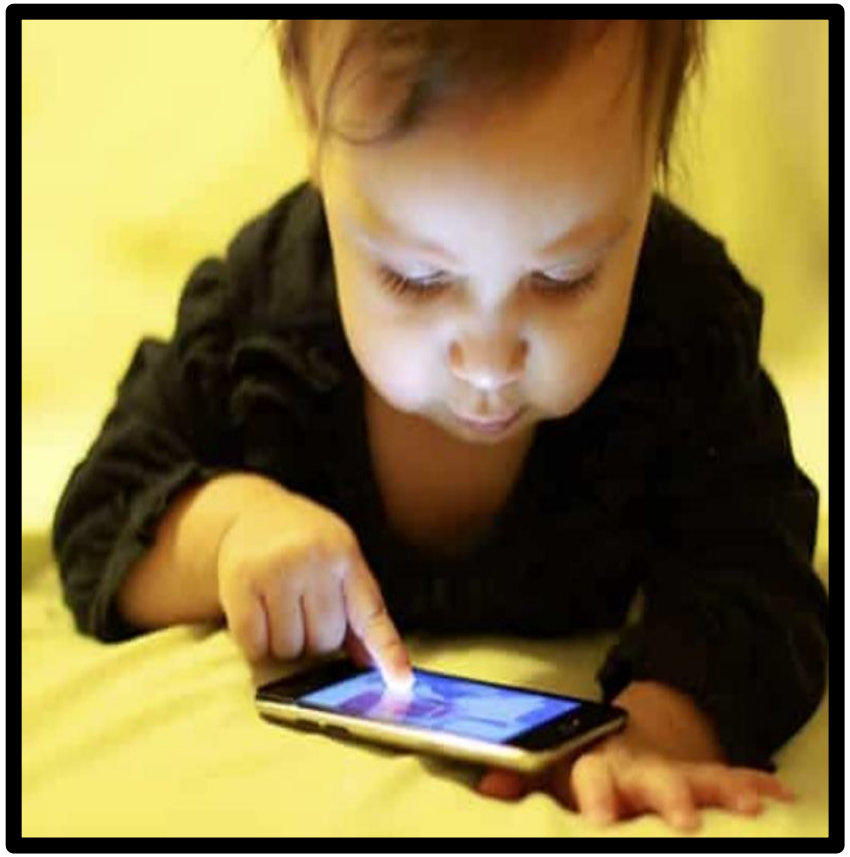
- Children who watch videos before the age of 3 are more likely to have attention problems
  - **For every hour per day**, there is a 10% risk of attention problems than those children who never watched videos (Christakis, 2004, 2009).
  - 2 hours = 20% risk
  - 3 hours = 30% risk
  - 4 hours – 40% risk

# “But It Keeps Them So Calm…”

- The reason why screens appear to calm children is because every bit of their brain is working to keep up with the pace of the visual stimuli.

- When the visual processing system is **super-focused,** the vestibular system (which is closely associated with mood) is **turned off** because all the brain’s energy is focused on processing ***at the same pace as the visual content.***

- Once the hyperstimulating content is removed, the visual system is now super **UN**focused, and the vestibular system is **Un**locked (mood comes back on).



Strong evidence shows that **raising parents' awareness** and other straightforward actions may significantly lower children's screen time (Sigman, 2012).

Excessive screen time can impinge on children's ability to develop optimally; it is **recommended that pediatricians and health care practitioners guide parents on appropriate amounts of screen exposure and discuss potential consequences of excessive screen use** (Madigan et al., 2019).

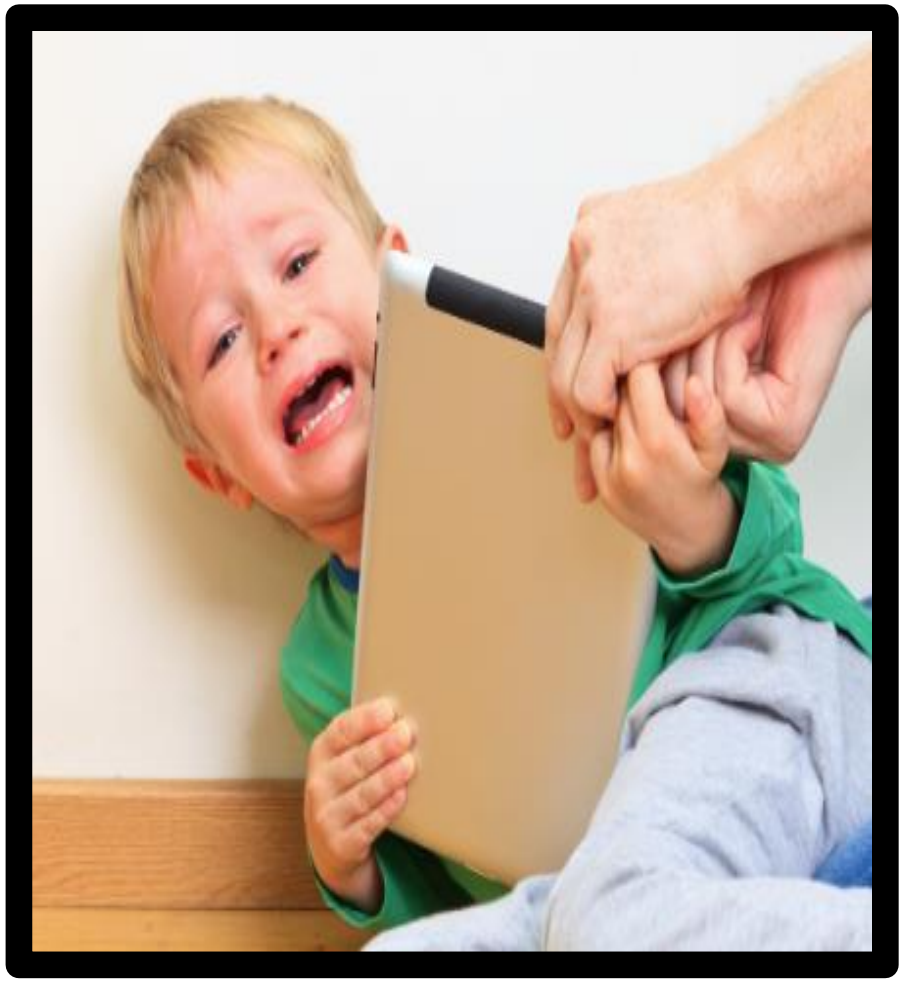
**C**onnect. **C**o-view. **C**onverse.

# A Simple Guide for Adults for When to Use Digital Devices:

## *Would I read a book now?*

# Clues That Screens May Be Becoming an Obstacle

1. Getting angry or upset when asked to turn off or put away screens
2. Insisting on more and more screen time
3. Spending time off screens thinking about how and when they will get back online
4. Preference for spending time on screens as opposed to with other humans
5. Use of technology as an escape from reality
6. Inability to calm or regulate emotion without technology
7. Deterioration of mental health or behavior (depression, anxiety, irritability, etc.)
8. Negative impacts on **sleep** or eating



# Screen Time Tips

1. Know the AAP screen time recommendations
2. Understand “the why”
3. Watch for negative changes in behavior
4. Create **tech free** times and locations AND **tech “possible”** times and locations (as appropriate)
5. Be in control of the charger and/or password
   (*Parenting does not get easier.)*
5. Use and set up timers
6. Change device setting to grayscale
7. Plan ahead
8. Teach screen time etiquette
9. Balance screen time with other activities

# GROWING UP WITH TECH

s, tablets, smart phones, and computers, are part of
ır every day lives, but does that mean that they are
fe for children? The American Academic of Pediatrics
warns that excessive screen time can negatively
mpact a child's development, but why is that and
what can we do in a world full of screens?

## Critical Periods of Development

From birth through the age of three, the brain grows faster tha
during any other time of a child'
life. This happens through
interactions with other people, t
world around them, and physicall
interacting with toys and object
Play and conversation are the
most important tools necessary
for building a brain that will be
ready for academic learning.

To be ready for academic learning, children need to...

- grow a large vocabulary,
- take turns in conversation,
- understand another person's perspective,
- attempt multiple ways to solve a problem,
- have task persistence,
- think about things outside of the "here and now",
- ignore distractions,
- manage their emotions,

...but none of these skills can be learned from a screen.

## What About Educational Apps and YouTube Videos?

Most videos have a screen changes every 3 to 7 seconds. This trains the brain to seek out new and interesting content just as frequently. Most educational apps have no research to support that they lead to better academic outcomes and do not lead to applying skills in the real world. Videos and apps are also


recommends...

- No screen time for children birth to 18 months unless video chatting.
- Co-viewing of digital content for less than an hour a day for 18-24 month old children.
- No more than 1 hour per day for children ages 2 - 5 which includes time spent in front of screens at school for passive activites.

**Conversation, play, and reading to your child are the best ways to grow a brain that is ready to learn!**

For more information, contact Angie Neal, M.S.C.C.C.-S.L.P. - wordnerdspeech@gmail.com



# TALKING TIPS

| | | |
|---|---|---|
| ASK QUESTIONS THAT CANNOT BE ANSWERED WITH ONE WORD (E.G., TELL ME THREE THINGS ABOUT YOUR DAY). | START A CONVERSATION BY SAYING... I REMEMBER WHEN... DO YOU REMEMBER WHEN... I WONDER IF... | WAIT FOR THEM TO RESPOND. GIVE THEM UP TO 3 SECONDS. |
| (SIMILAR TO HOW COOKING SHOW HOSTS TALK TO THEIR AUDIENCE). | ASK QUESTIONS ABOUT WHAT THE CHILD IS INTERESTED IN OR IS DOING. | DESCRIBE WHAT THE CHILD IS DOING SUCH AS "I SEE THAT YOU ARE..." (SIMILAR TO HOW SPORTS BROADCASTER TALKS TO THEIR AUDIENCE). |
| | COMMENT ON WHAT OTHERS ARE DOING DURING PLAY... "HEY, DID YOU SEE WHAT ___ IS DOING WITH ___?" | WHEN YOUR CHILD IS UPSET SAY... "YOU LOOK LIKE YOU ARE FEELING ----------. HOW ABOUT SMELL THE FLOWERS (DEEP INHALE) AND BLOW OUT THE CANDLES (EXHALE) |
| TALK THROUGH WAYS TO SOLVE PROBLEMS... "I WONDER WHAT WOULD HAPPEN IF I TRIED TO..." | ASK THINKING QUESTIONS LIKE... IF YOU HAD $100 DOLLARS, WHAT WOULD YOU BUY? WHAT DO YOU THINK YOU WILL BE DOING IN 10 YEARS? | SOME OF THE BEST TIMES FOR CONVERSATION ARE: IN THE CAR/WHILE TRAVELING AROUND TOWN, DURING MEALS, BEFORE BED, |

# THANK YOU!

# Q&A

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