Child Executive Functioning in Nebraska Educares

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VIDEO

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What are Executive Functions?

Brain-based skills involved in deliberate, top-down, goal-directed control of attention, thought, emotion and behavior

Cognitive processes located in the prefrontal cortex that coordinate and integrate the broader functions of thought, memory, emotions and motor movement. Likened to an Air Traffic Control Center.

– Cognitive Flexibility

– Working Memory

– Inhibitory Control

Why does EF matter for children?

EF provides a foundation for learning and adaptation across situations.

- In social situations; to change behaviors; for problem solving (get outside the box)

School Readiness

- Pay attention to teacher directions
- Remember and apply teacher directions
- Focus
- Transition
- Manage emotions
- Maintain positive peer relations
- Think with flexibility

Haight, Jones, Bailey, 2GenExec Funct, 2016; Toub, Reflection Sciences, 2017

Timeline of 3 years

Year 1

- Needs Assessment/Focus Groups
- Overview of Pyramid/Positive Behavior Supports
- Conscious Discipline Training
- Establishment of Behavior Support Teams
- Online CSEFEL modules

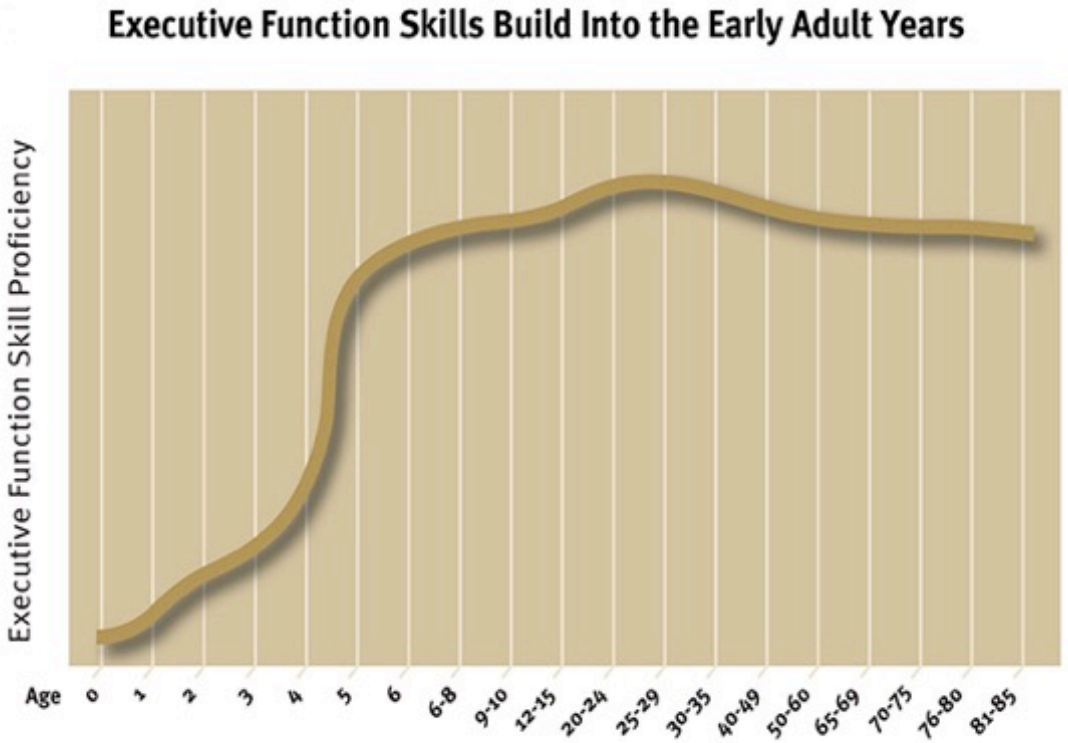
Year 2

- Executive Functioning and Safe from the Start Workshop
- MEFS administration (5 sites)
- Implementation of Pyramid Teams; Apply for NE Pyramid process
- Reflective Consultation Train the Trainer
- Planning for integration of parents

Year 3

- Safe from the Start Trauma Training (site level) Parents and Staff
- Brain Bags (3 for all; 4th for students transitioning to K)
- Reflective Consultation
- Parent Groups (Circle of Security; PBIS groups)
- Child Parent Psychotherapy (CPP)

Why is EF So Important in Educare?
How Do Executive Functions Develop?



Center on the Developing Child, 2011

Minnesota Executive Function Scale (MEFS)

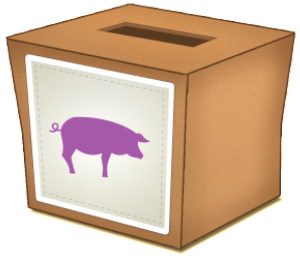
Carlson, S.M., & Zelazo, P.D. (2014)

Students in Nebraska Educares

- Assessed Fall and Spring (2016-2018)
- Beginning at age 2 years

Minnesota Executive Function Scale (MEFS™)

- First **objective**, **scientifically based** measure of EF
- Developed at the **University of Minnesota**
  - Over **9 years of research**
  - $1.3 million of funding from the **National Institutes of Health**
- Released in **September of 2014**, MEFS has already been used to assess executive function over 21,000 times in 100+ locations



Minnesota Executive Function Scale – Childhood Version

- Measure of Executive Function designed for convenient use with children **2-13 years**

- Sensitive to **individual differences** across wide ability range, including **very low** and **very high** functioning children

Minnesota Executive Function Scale Key Features

- Suitable for ages 2+ years
- Time to administer: 3-6 min (avg = 4 min)
- Multiple forms for repeated administration (e.g., to measure change)
- Adaptive
- Automated scoring
- Clear guidelines for using and interpreting the data
- Reliable (*ICC* = .94)
- Validated
- Normed (currently ~7,500 children and 600 adults)
- English, Spanish, Mandarin, Dutch, German, Swedish, Somali, Hmong

Psychometrics

Construct Validity:

Convergent: High correlations with other measures of EF including NIH Toolbox Battery of EF and Head-Toes-Knees-Shoulders (HTKS)

Divergent: Low correlations with IQ (Stanford-Binet Early 5; WPPSI

Criterion Validity:

High correlations with Woodcock-Johnson III-NU

MEFS and Educare Measures

Measure	1	2	3	4	5	6	7
MEFS F							
MEFS S	.347**						
PPVT F	.324**	.400**					
PPVT S	.425**	.429**	.768**				
PLS F	.391**	.435**	.672**	.647**			
PLS S	.382**	.486**	.616**	.611**	.752**		
DECA BC	-.068	-.096	-.097	-.078	-.148*	-.143*	
DECA PF	.250**	.265**	.327**	.303**	.334**	.292**	-.496**

**p<.01; *p<.05

Child Executive Functioning in Nebraska Educare Programs: The Role of Dosage

Dawn L. Davis, Ph.D., Helen Raikes, Ph.D., Evan Choi, Ph.D.; University of Nebraska-Lincoln

CYFS Summit on Research in Early Childhood

April 2018

EDUCARE

Agenda

- Background on Executive Function and Dosage
- Review of Current Study
- Findings
- Implications & Future Directions

Background on Executive Function and Dosage Research

- Dosage
  - Definition
  - Patterns of growth
- Variables that impact EF in young children
- EF and dosage
- Gaps in literature
  - Small but growing body around effective EF interventions
  - More needed on patterns of children's EF growth (what growth should be expected/indicate positive impacts?)

Current Study: Research Questions

1. What is the relationship between **time in program** (dosage) and **child executive function** development?
   - Do we see the most growth in the first year and/or lowest skilled?
2. What other **child characteristics** impact the **executive function growth trajectories?**
   - Age and gender differences

Measures

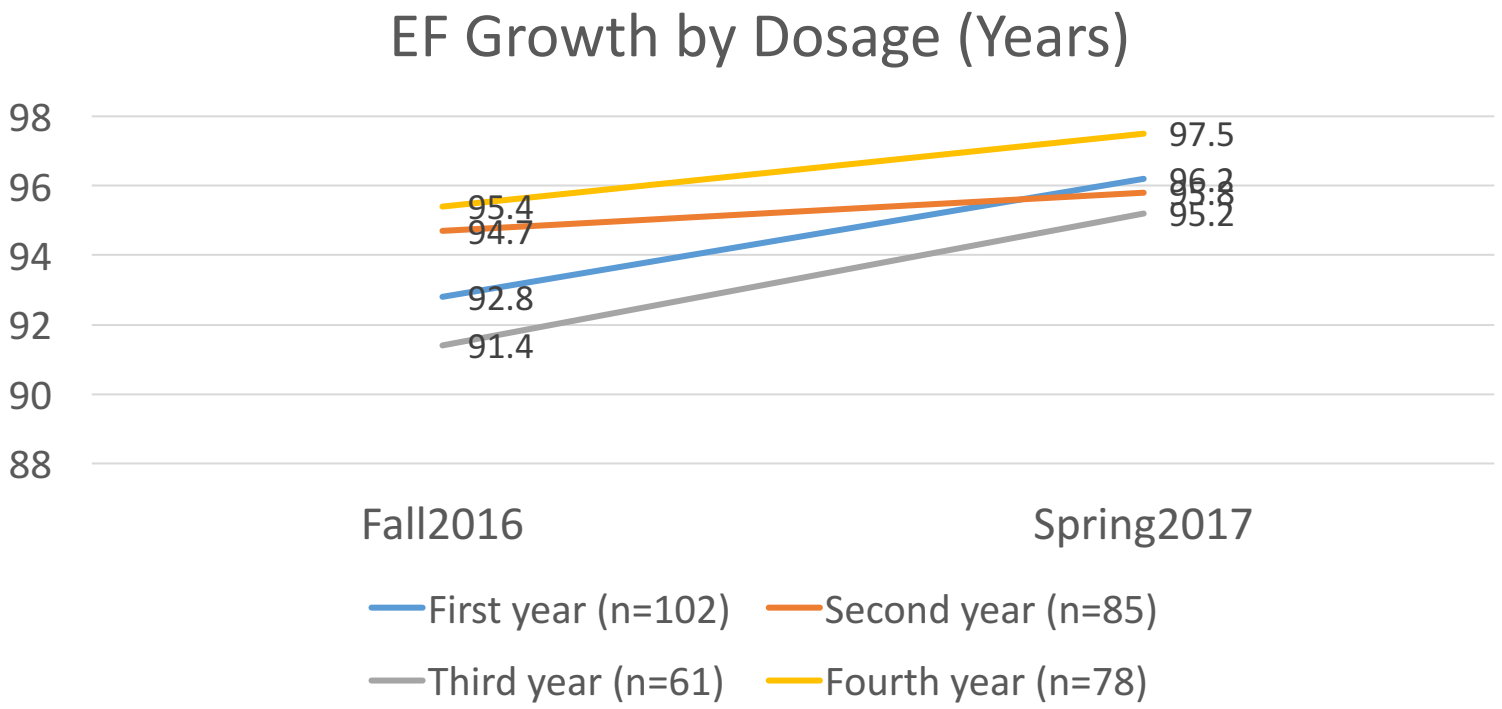
- Minnesota Executive Function Scale
  - Overall Executive Function
  - Standard Score for Fall 2016 and Spring 2017
- Dosage
  - New or Returner: Was this the child's first year in Educare?
  - How many years has the child been in Educare?
- Parent Interview/program information
  - Child Demographics (age, gender, race/ethnicity)

Current Sample

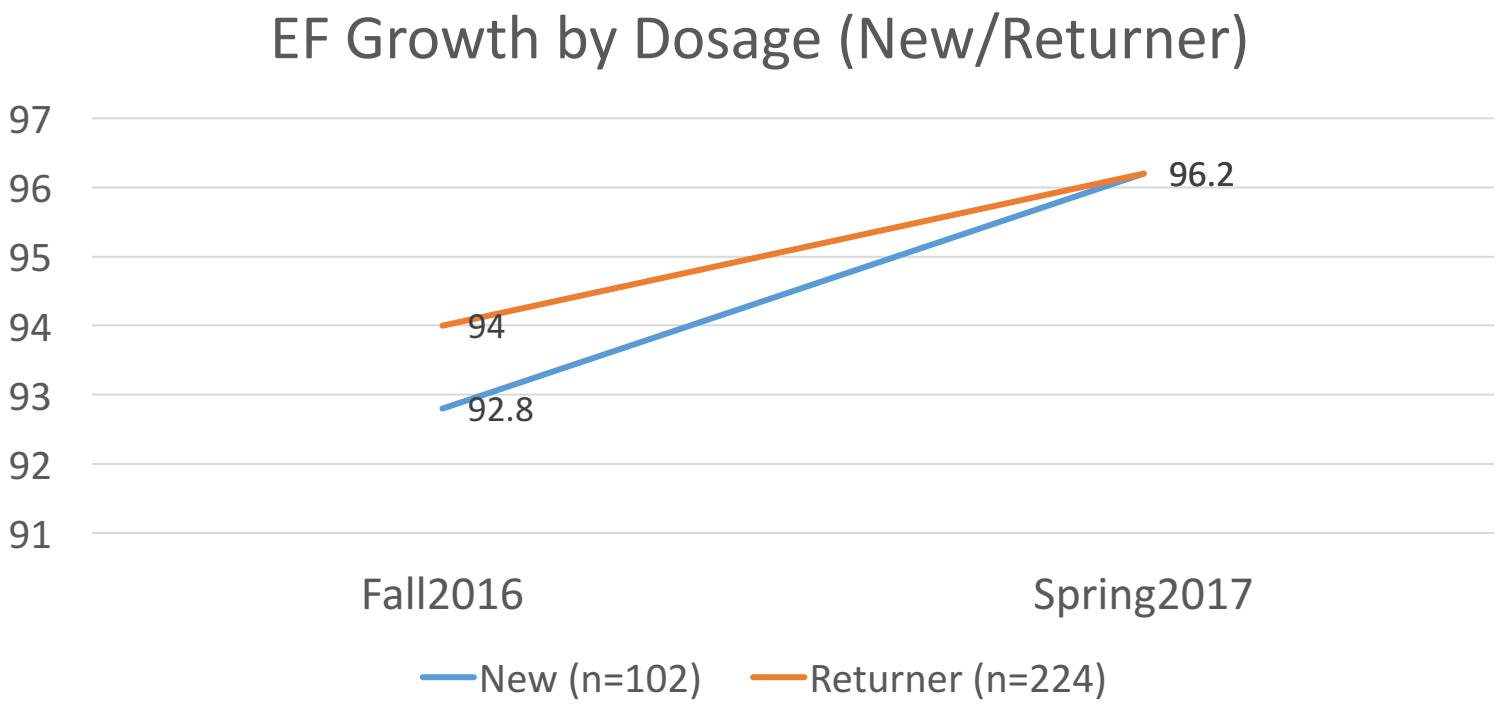
- 4 Nebraska Educare Programs
- Matched sample over 1 academic year, aged 3-years and older (n = 330)

Gender	Race/Ethnicity	Age (in months, as of Fall 2016)	Dosage
51% Female	43% White 28% Native American 22% Black 7% Other/Multi-racial	Mean = 46.1 months (StdDev = 7.4 months) 46% 3 year olds 45% 4 year olds 9% 5 year olds	31% in 1st year 26% in 2nd year 19% in 3rd year 24% in 4th+ year

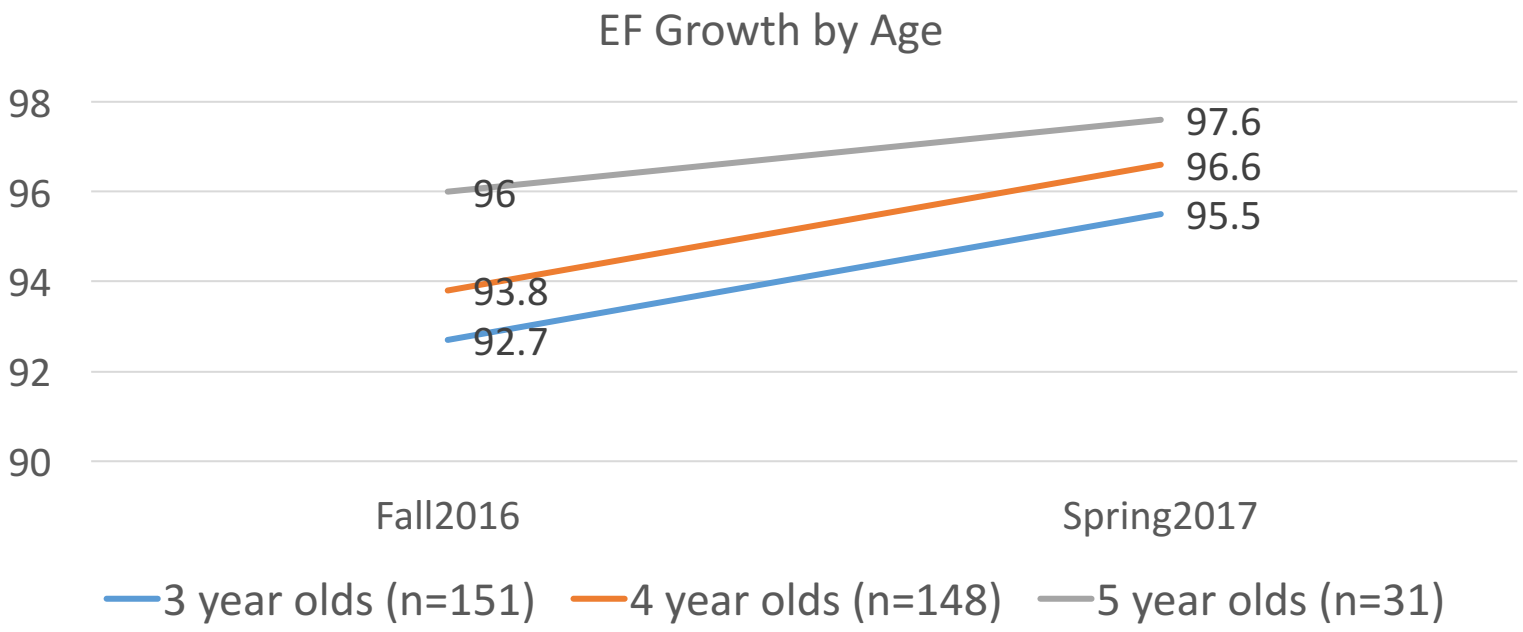
Findings 1a: What is the relationship between **time in program** (dosage in years) and **child executive function** development?



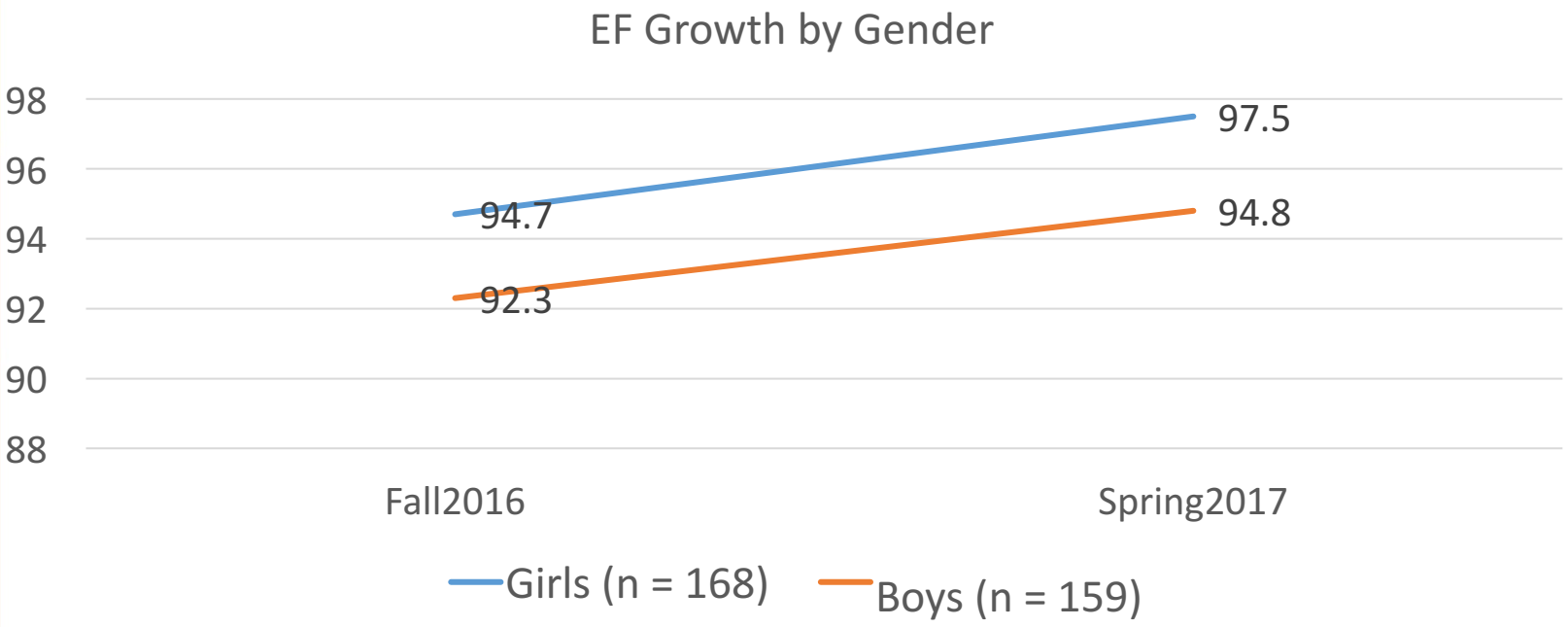
Findings 1b: What is the relationship between **time in program** (new or returner) and **child executive function** development?



Findings 2a: What other **child characteristics** impact the **executive function growth trajectories? AGE**



Findings 2b: What other **child characteristics** impact the **executive function growth trajectories? GENDER**



Findings 2c: What other **child characteristics** impact the **executive function growth trajectories? AGE, GENDER, DOSAGE (new/returner)**

Age	Fall2016				Spring2017			
	F		M		F		M	
	New	Ret	New	Ret	New	Ret	New	Ret
3 years	92.2	93.8	92.9	90.8	96.4	95.8	96.2	93.1
4 years	95.5	96.5	90.8	92.6	100.2	98.5	93.7	95.0
5 years	n/a	97.7	94.8	94.9	n/a	100.2	91.8	96.9

Conclusions & Discussion

What information resulted from this investigation? What are the key take-away points?

- EF growth across subsamples (but still lag behind advantaged peers)
- Younger and newer children tended to start off with lower EF scores
- Differences seen across gender and age

Limitations

- Not a RCT
- Do not have baseline data for children who enrolled prior to MEFS data collection
- No specific EF intervention in program
- Only two time points
- Only one measure of EF and doesn't breakout EF components

Implications

How can information from this study inform or advance early childhood practice?

- EF is an important area and warrants attention and interventions
- EF strategies in ECD may improve children's school readiness

How can information from this study inform or advance early childhood public policy?

- Continued support for high quality ECD programs, particularly those with an EF component

Implications & Future Directions

How can lessons from practice or policy inform this line of research?

- Targeted EF interventions may result in positive outcomes and continued growth after first year

What additional research is needed to inform or advance early childhood practice and/or policy?

- Further explore factors associated with EF (role of adults, etc.)
- Include additional EF measures
- Look at age of entry and possible impacts/key time periods
- Are we seeing a 'ceiling effect' or limit to growth that can be made?

Thank you!

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Differences in Executive Function by **sex** & by **parent-child interaction**

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Princess Nourah University & University of Nebraska-Lincoln

CYFS Summit on Research in Early Childhood

April 2018

EDUCARE

Agenda ..

- Differences in executive function (EF)
  - Lincoln Educare
    - demographics
  - By sex

- Parent-child relationship
  - Overview & measures
  - Relationship with EF
  - Differences by sex

Differences in EF .. By sex

- No gender differences in the development of executive function (Welsh, Pennington, & Grossier, 1991)
- Females have better executive function abilities
  - Working memory (Anderson et al, 2001)
  - Set-shifting and problem solving (Luboyeski, Han, Lansing, Holdnack, & Delis, 2009)
- Measures
  - MEFS
  - Parent interview (demographics)

Lincoln Educare

- Diverse
  - Many different races
  - More than 9 languages spoken
  - About half are single parents
  - Different levels of education

Lincoln Educare

Races:		Education:		Home languages	
Black	39%	Have no high school	20%	English	71%
White	33%	Have high school	16%	Arabic	10%
Native American	3%	Have technical training	34%	Spanish	9%
Asian	4%	Have two years or		Creole	4%
Multi	16%	more of college	18%	Kaghana	3%
				Chinese, Tigrinya …	1%
Ethnicity:		**Family structure**		**Gender**	
Hispanic	11%	Single	51%	Male	53%
Non-Hispanic	89%	Two-parents	49%	Female	47%

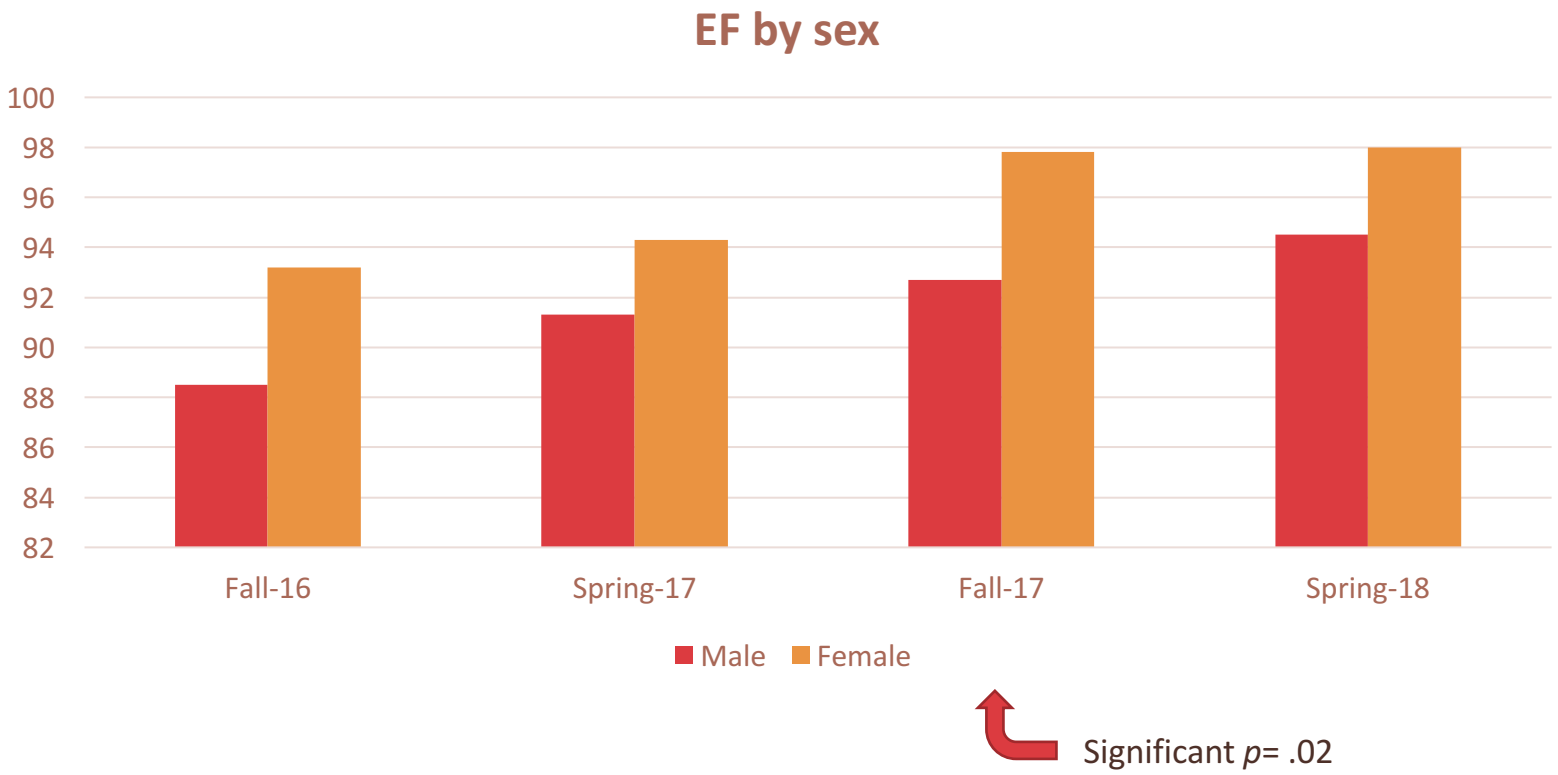
Research Questions

EF differences by sex

- Do boys differ from girls in their level of executive function skills?
- Do boys' executive function growth differ from girls during preschool?

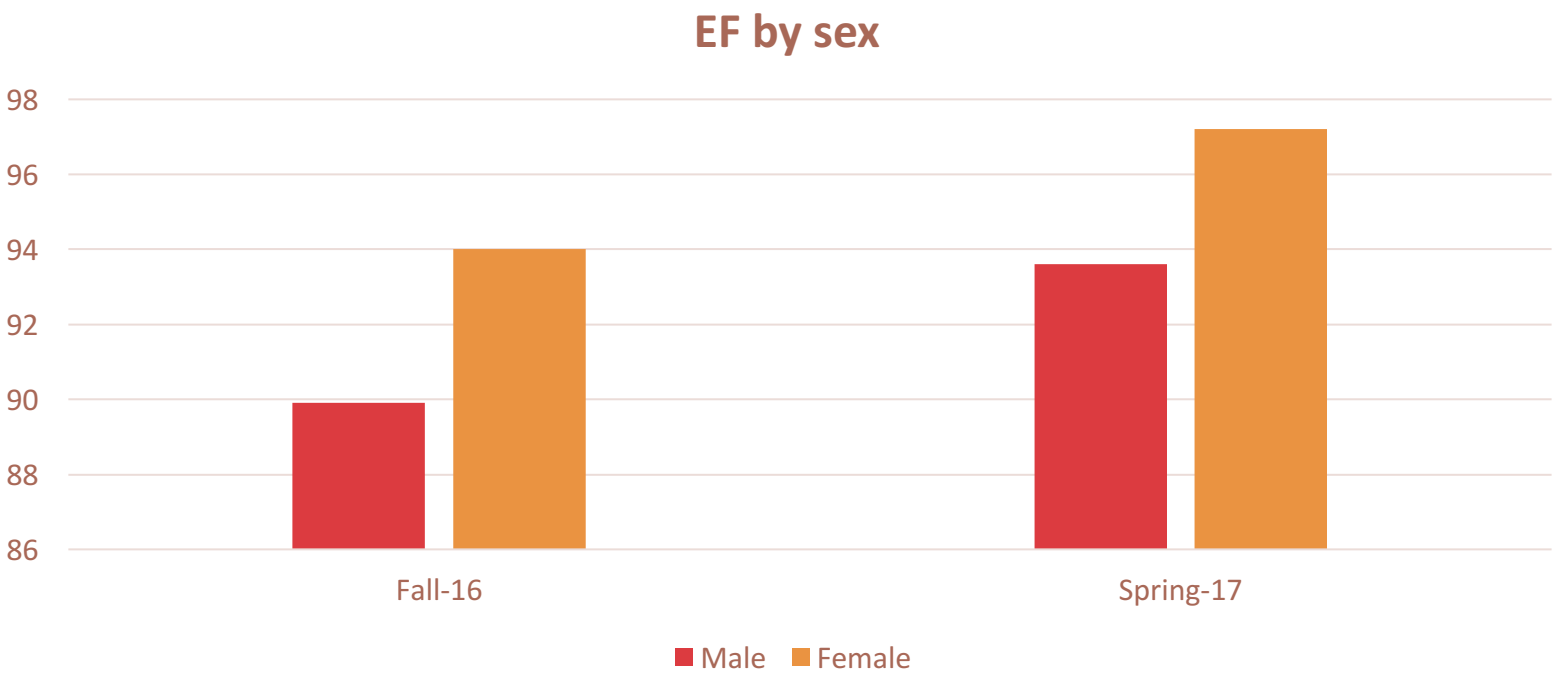
Matched - participants for two years

(fall-16, spring-17, fall-17, & spring-18), male=18, female=23



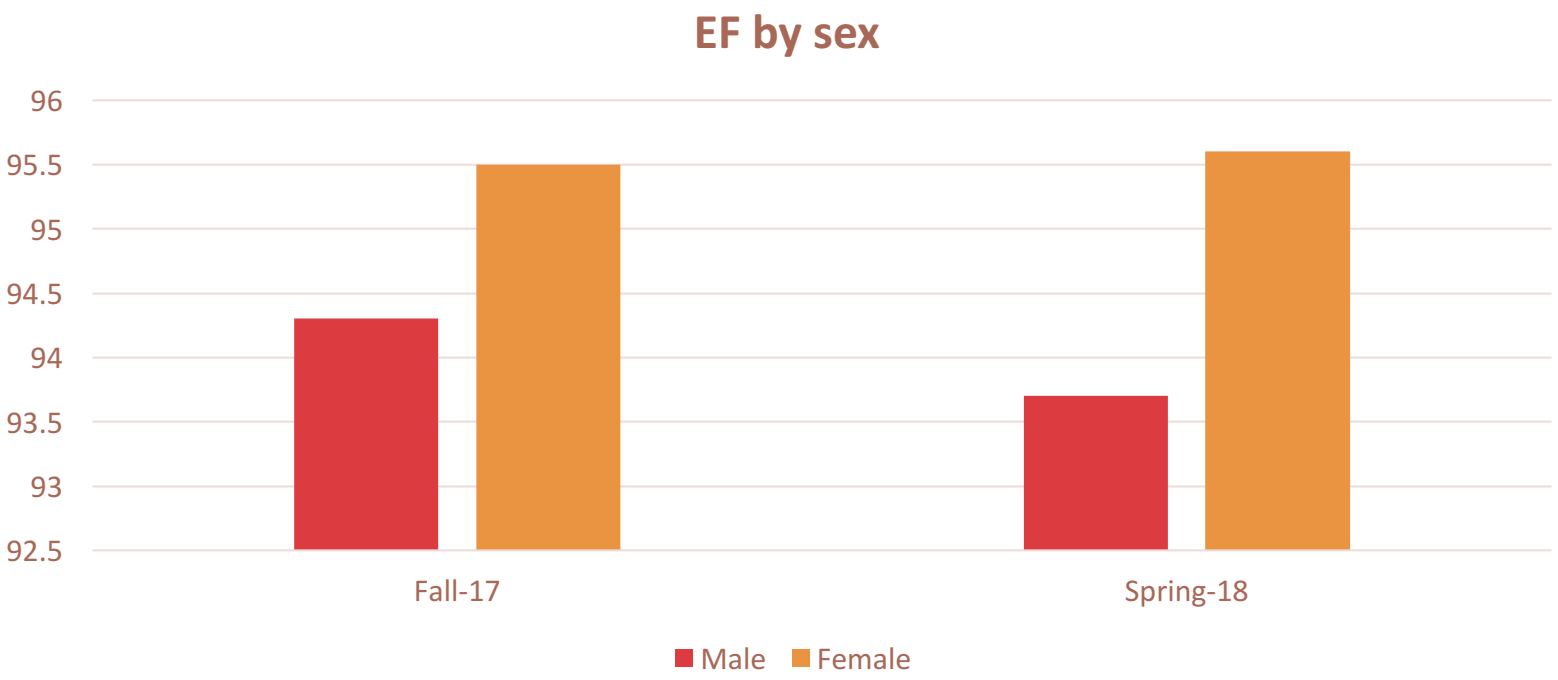
Matched - participants for each year

(fall-16, spring-17) – male=34, female=44, not significant



Matched - participants for each year

(fall-17, spring-18) – male= 5 , female= 9, not significant



Child-Parent relationship

- **Parental relationship influence EF, especially in low-SES families** (Rhoades, Mark, Lanza & Blair, 2010)
- **Low-SES children can benefit from going to high-quality childcare** (Yazejian et al., 2015)
- **Measure**
  - Child Parent Relationship Scale, Short Form (CPRS-SF) (parent-report) , Conflict and Closeness subscales (Pianta, 1992)
  - **Conflict**: e.g., "Your child easily become angry with you."
  - **Closeness**: e.g., "If upset, your child will seek comfort from you."
  - 1-5 Likert scale
  - Once a year, Fall-16 & Fall-17

Research Questions

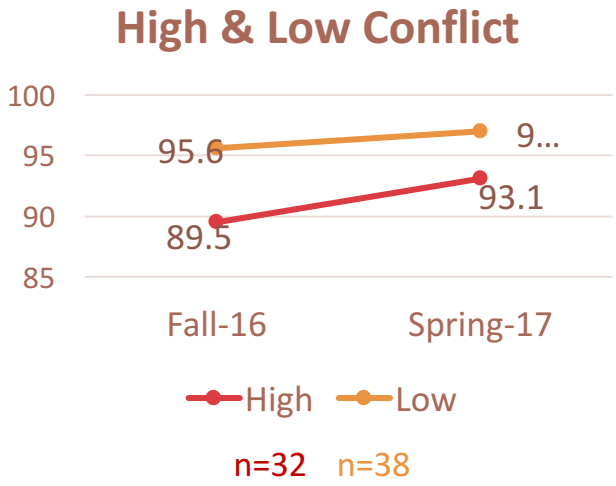
EF & CPRS – differences by sex

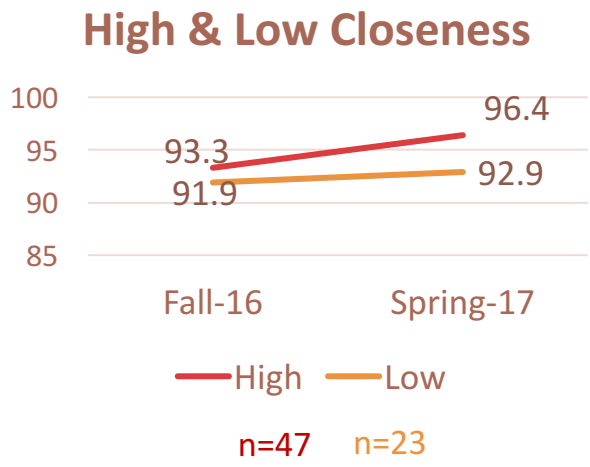
- Do conflict and/or closeness in parent-child relationship associate with children's executive function skills?
- Do conflict and/or closeness in child-parent relationship predict children's executive function skills?
- Does the influence of child-parent relationship on executive function differ for boys from girls?

Matched - EF & CPRS

(Fall-16, Spring-17)

- Child-parent conflict relationship is negatively correlated with children's EF in Fall-16
  - r=-.310*, *p*=.009

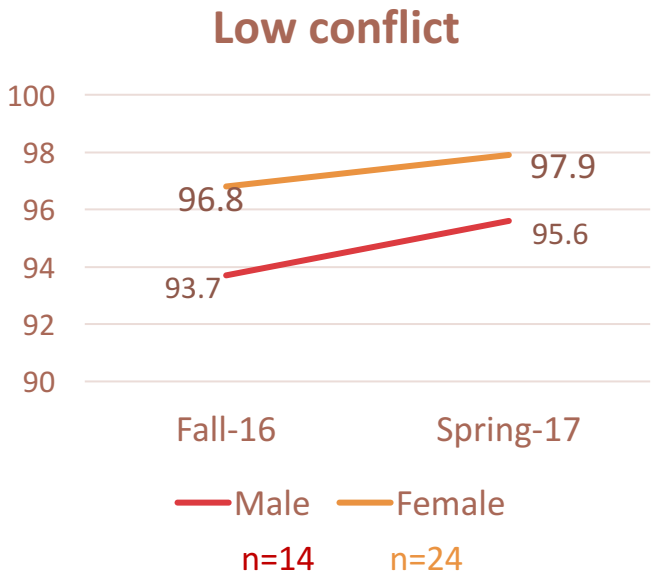


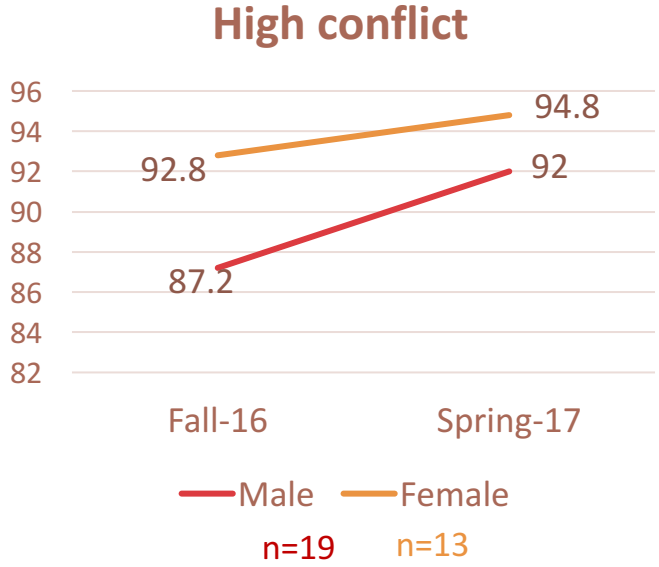


Matched - EF & CPRS

(Fall-16, Spring-17)

- Differences by sex
  - Boy-parent conflict relationship is negatively correlated with children's EF in Fall-16
    - r= -.399* , *p*= .02
  - Boys grew more than girls

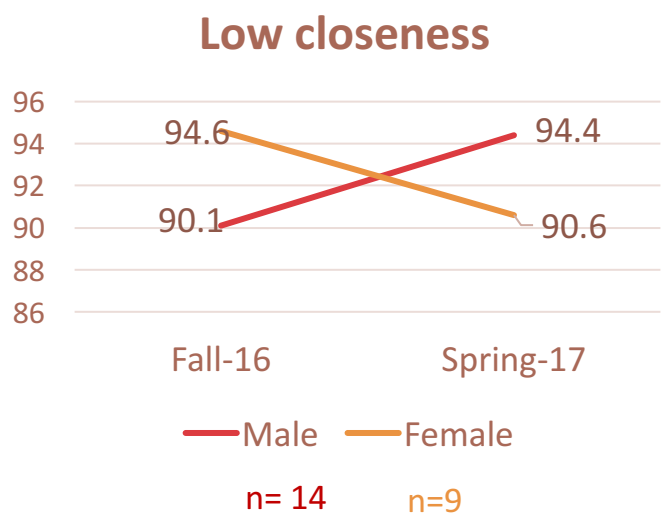


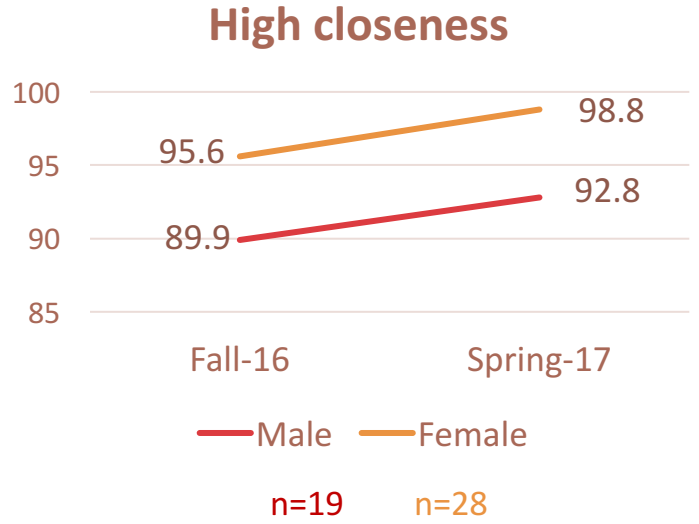


Matched - EF & CPRS

(Fall-16, Spring-17)

- Differences by sex
  - Girl-parent close relationship is positively correlated with children EF in Spring-17
    - r= .477**, *p*=.003





Conclusion ..

- Females tend to have higher executive function skills than males during early childhood
- Children with higher conflicted relationship tend to have a lower executive function skills, but grew the most
- Boys' EF more than girls are more likely to be negatively influenced by a conflicted relationship.
- Girls' EF more than boys are more likely to benefit from a close parent-child relationship

Limitation ..

- Need a bigger sample
- Need to measure CPRS two times Fall-Spring
- A detailed measure of EF

Implication ..

- More attention to environmental factors
  - Parent-child relationship
- Provide different EF enhancement opportunities for boys and girls
- An advocacy plan for the importance of high quality early childhood care

Future direction ..

- Need more/ different EF measures
- Maybe call for a qualitative study that looks at Parent-child relationship and interaction (Observation)
- Investigate cultural desirability that may influence parental self-report

Thank you

April 24, 2018

Investigating Mobile Media's Effect on Children's Executive Function

Jan Esteraich, M.S.

University of Nebraska Lincoln

Young children, mobile media, and executive function

Young children, mobile media, and executive function

Time Content Context

Time: Higher tablet time associated with lower effortful control, but only among children who slept less than 10.6 hours/night (Nathanson, et al., 2018).

Content: Educational television programming has been positively related to EF (Nathanson, et al., 2014).

Context: Toddlers learned novel words just as well from video chat as from live interactions (Roseberry, Hirsh-Pasek, and Golinkoff, 2014).

- **Parent Co-use:** Scaffolding and autonomy support are strong predictors of children's current and future EF

Research Questions

Primary (RCT – Two treatment groups and a control group)

1: Do children who use high-quality apps demonstrate a greater gain in EF than children who use apps of their choice?

2: Do children who co-use high-quality apps daily with their parents demonstrate a greater gain in EF than children who use the same apps independently?

Secondary

3: How does a child's amount of time using a mobile device in a relate to his/her EF?

4: How does a child's amount of time co-using a mobile device with a parent relate to his/her EF?

5: How does the amount of time a child uses a mobile device interact with the amount they co-use with a parent to his/her EF?

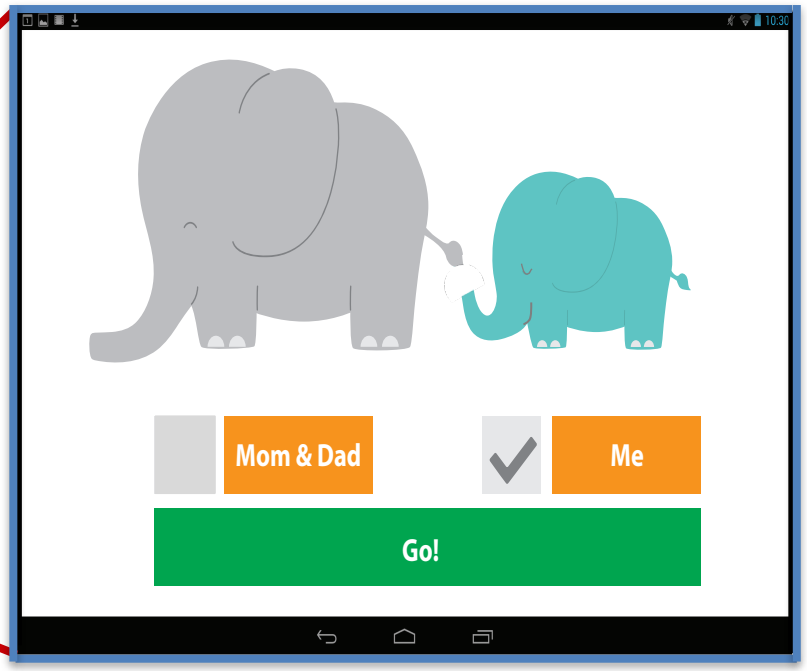
The Tablet and Apps Used in the Research

Twenty-three high-quality educational apps,
and a time measurement app

Measurement App

- **Who** is using the tablet,
- **What app** is being played, and
- **Amount of time** in the app

Login-in screen



Design

Random assignment

- **Group 1:** Participants used the research tablets in place of their own devices.
  n = 24
- **Group 2:** Same as Group 1, *PLUS* parents co-used an additional 15 min/day.
  n = 26
- **Control**: Children continued to use their own mobile devices
  n = 25

Methods

N = 75 Head Start Parents and their Children – from 3 Sites

Measures

- Minnesota Executive Function Assessment (child measure)
- Time Log from app
- Parent Media Diary
- Pre-intervention Parent Survey
- Post-intervention Parent Survey

Findings
Time Use

	Child Use Hr. / week	Co-use Hr. / week
Group 1	3.6 (30 min/day)	.90 (8 min/day)**
Group 2	3.4 (30 min/day)	2.4 (20 min/day)**
Control	4.2 (36 min/day)*	3.1 (27 min/day)*

- Children used the tablet about 3 days a week (not everyday)

* Control group time was from parent estimates or media diary, which typically are higher than actual use.

** Co-use was from Media Diary estimates

Findings
Primary Research Questions

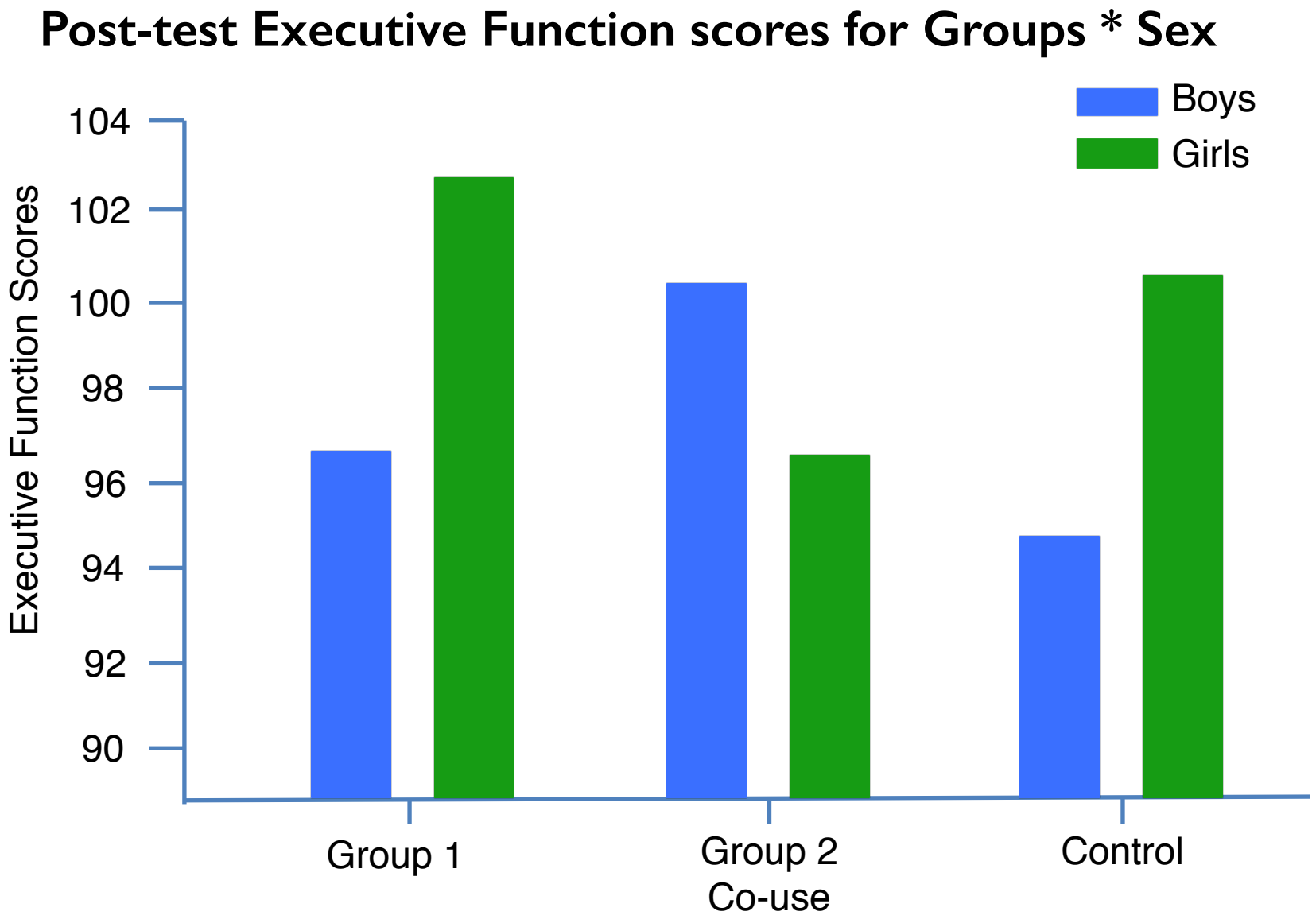
Repeated measures ANOVA

Within-subjects factor: Time (Pre-, Post- EF scores)

Between-subjects factor: Group membership (G1, G2, C)

No differences between groups

- No difference between children who used high-quality apps and children who used their own devices.
- No difference between children who co-used high-quality apps and those who used the apps independently.


Post-test Executive Function scores for Groups * Sex
Boys
Girls
Executive Function Scores
104
102
100
98
96
94
92
90
Group 1
Group 2
Co-use
Control

Key Points

- **Young children may not be spending as much time on mobile devices as we think.** The measurement app showed children spent about 70 minutes a day, three times a week using the tablets.
- **This research opens the possibility that boys' and girls' EF development reacts differently to co-use** of the same apps. More research is needed.
- **More accurate measure** of the amount of children spend on mobile media devices resulting in a better understanding of how valid parent self-report and media diaries are, and more accurate analyses.

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