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Effects of the Tennessee Prekindergarten Program on Children's Non-Academic Outcomes in Fourth through Sixth Grades

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SREE

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Tennessee Voluntary Pre-K Study Team

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Background and Objective

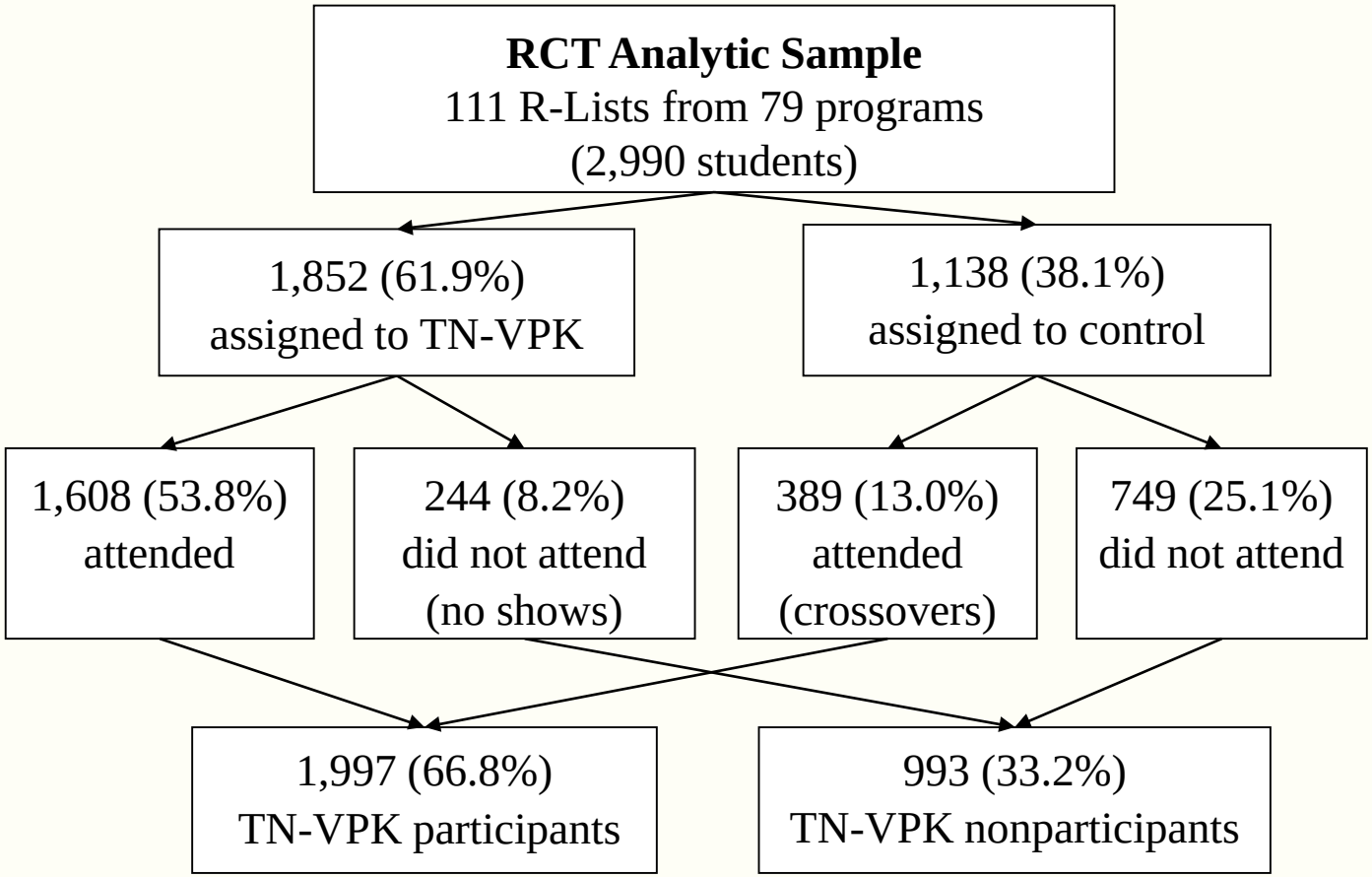
- Strong evidence of pre-k effects on kindergarten readiness (e.g., Gormley et al., 2005; Weiland & Yoshikawa, 2013)
- Not as much strong evidence about longer-term effects
- Follow-up study through 6th grade of a subsample from a large RCT of the Tennessee Voluntary Pre-K Program (TN-VPK)
- Investigated whether participation in TN-VPK had significant effects on conscientiousness, school engagement, delinquency, problem behaviors, peer relationships, and executive function in 4th through 6th grade

TN-VPK Program

- Started in 1998 with a small pilot program; legislation created the statewide program in 2005.
- Program profile:
  - 935 pre-k classrooms in 135 of the 136 TN school systems across all 95 Tennessee counties
  - Serving more than 18,000 children
  - Targeted: FRPL eligibility
  - 93% of classrooms in public schools
  - Full day, school year
  - Licensed teachers with aide
  - 20 children maximum
  - Curriculum from approved list
  - Met 9 of 10 NIEER benchmarks for quality programs

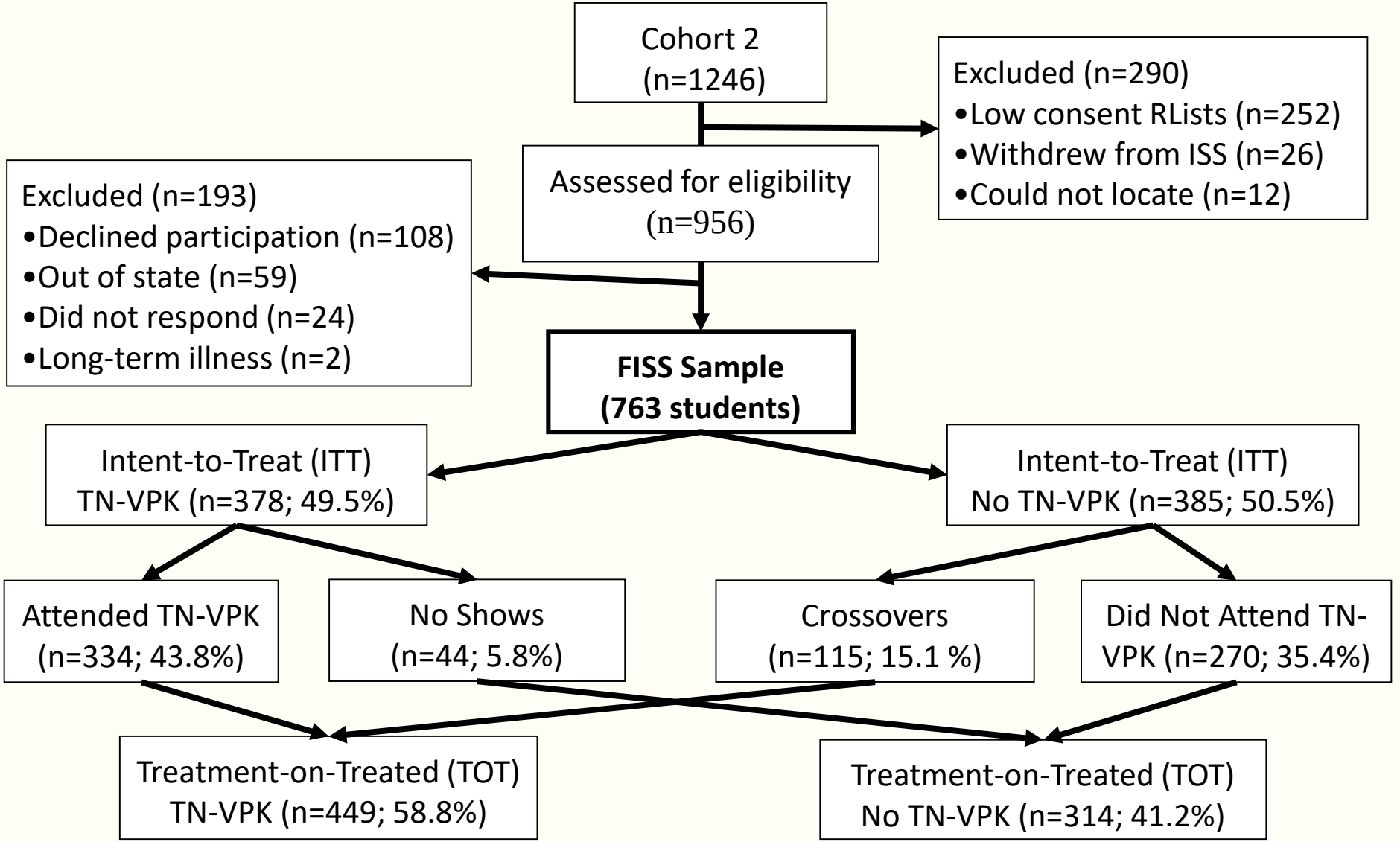
Full Randomized Sample (N = 2990)

- First well-controlled experimental study of a state pre-k program with follow-up into middle school and beyond
- Oversubscribed schools asked to admit students in order from randomized lists (R-Lists) of applicants until seats filled
- Cohort 1 began pre-k in 2009; Cohort 2 began pre-k in 2010
- Findings have shown (Durkin et al., under revised review; Lipsey et al., 2018):
  - Significant, positive immediate effects of TN-VPK
  - Null or negative effects on long-term outcomes
- *Presentation on full RCT results through 6th grade by Dale Farran on 9/29 at 8:30am EDT*


RCT Analytic Sample
111 R-Lists from 79 programs
(2,990 students)
1,852 (61.9%)
assigned to TN-VPK
1,138 (38.1%)
assigned to control
1,608 (53.8%)
attended
244 (8.2%)
did not attend
(no shows)
389 (13.0%)
attended
(crossovers)
749 (25.1%)
did not attend
1,997 (66.8%)
TN-VPK participants
993 (33.2%)
TN-VPK nonparticipants

Follow-Up Intensive Substudy Sample (FISS N = 763)

- Designed FISS to support interviews with students, parents, and teachers from 4th through 8th grades.
- Focused on measures of possible mediators of TN-VPK effects.
- Focused on R-Lists from Cohort 2 original randomization with:
  - High proportions of children with earlier parental consent.
  - Good balance between the numbers of children in the treatment and control conditions.
- From low-income households. About 47% were male, 48% were white, 27% were Black, 24% were Hispanic, and 26% were non-native English speakers.
- No baseline differences between conditions on demographics.


Cohort 2
(n=1246)
Excluded (n=290)
•Low consent RLists (n=252)
•Withdrew from ISS (n=26)
•Could not locate (n=12)
Assessed for eligibility
(n=956)
Excluded (n=193)
•Declined participation (n=108)
•Out of state (n=59)
•Did not respond (n=24)
•Long-term illness (n=2)
FISS Sample
(763 students)
Intent-to-Treat (ITT)
TN-VPK (n=378; 49.5%)
Intent-to-Treat (ITT)
No TN-VPK (n=385; 50.5%)
Attended TN-VPK
(n=334; 43.8%)
No Shows
(n=44; 5.8%)
Crossovers
(n=115; 15.1 %)
Did Not Attend TN-VPK (n=270; 35.4%)
Treatment-on-Treated (TOT)
TN-VPK (n=449; 58.8%)
Treatment-on-Treated (TOT)
No TN-VPK (n=314; 41.2%)

Data Collection

- Interviewed parents over the telephone in January.
- Students' main classroom teacher completed an online survey in January.
- Interviewed students in person during March and April.
- As of sixth grade, 93.8% of the FISS sample had student interview data, 93.1% had parent interview data, and 89.8% had teacher survey data.
- Majority of the variables in the interview protocols overlapped so that parents and teachers usually responded to the same items about the student that the student self reported.

Factor Scores

- Created latent variable factor scores that combined data across measures and respondents.
- Missing values were estimated as the mean of 25 multiple imputations. The missing data rates ranged from 2.9% to 6.2% for student interviews, 4.2% to 6.9% for parent interviews, and 6.9% to 10.2% for teacher interviews.
- Principal axes factor analyses were applied to the multiple measures from the respective multiple respondents for each latent construct (Costello & Osborne, 2005).
- Created factor scores for the resulting dominant factors using Bartlett's technique (DiStefano et al., 2009).

Factors and Respondents

Latent Factor	Measures	Respondents
School Engagement	• Commitment to School (Thornberry et al., 1991)	Students
	• School Involvement (adapted from Schaefer et al., 2011 and Eccles & Barber, 1999)	Students
	• Attachment to Teacher (Smith et al., 1995)	Students
	• Closeness with the student	Teachers
Executive Function	• Picture Sequence Memory test from the Fluid Cognition Battery from the NIH Toolbox (Weintraub et al., 2013)	Students
	• Pattern Comparison Processing Speed test from the Fluid Cognition Battery from the NIH Toolbox (Weintraub et al., 2013)	Students
	• Stroop task (adapted from Holochwost et al., 2017)	Students

Factors and Respondents

Latent Factor	Measures	Respondents
Conscientiousness	• Big 5 Personality Inventory (John et al., 1991)	Students, parents, teachers
Peer Relations	• Self-Concept, Peer Belonging, and Friendship Intimacy from the Middle Years Development Inventory (Schonert-Reichl et al., 2012)	Students
	• Prosocial scale of the Strengths and Difficulties Questionnaire (Goodman, 1997)	Students, parents, teachers

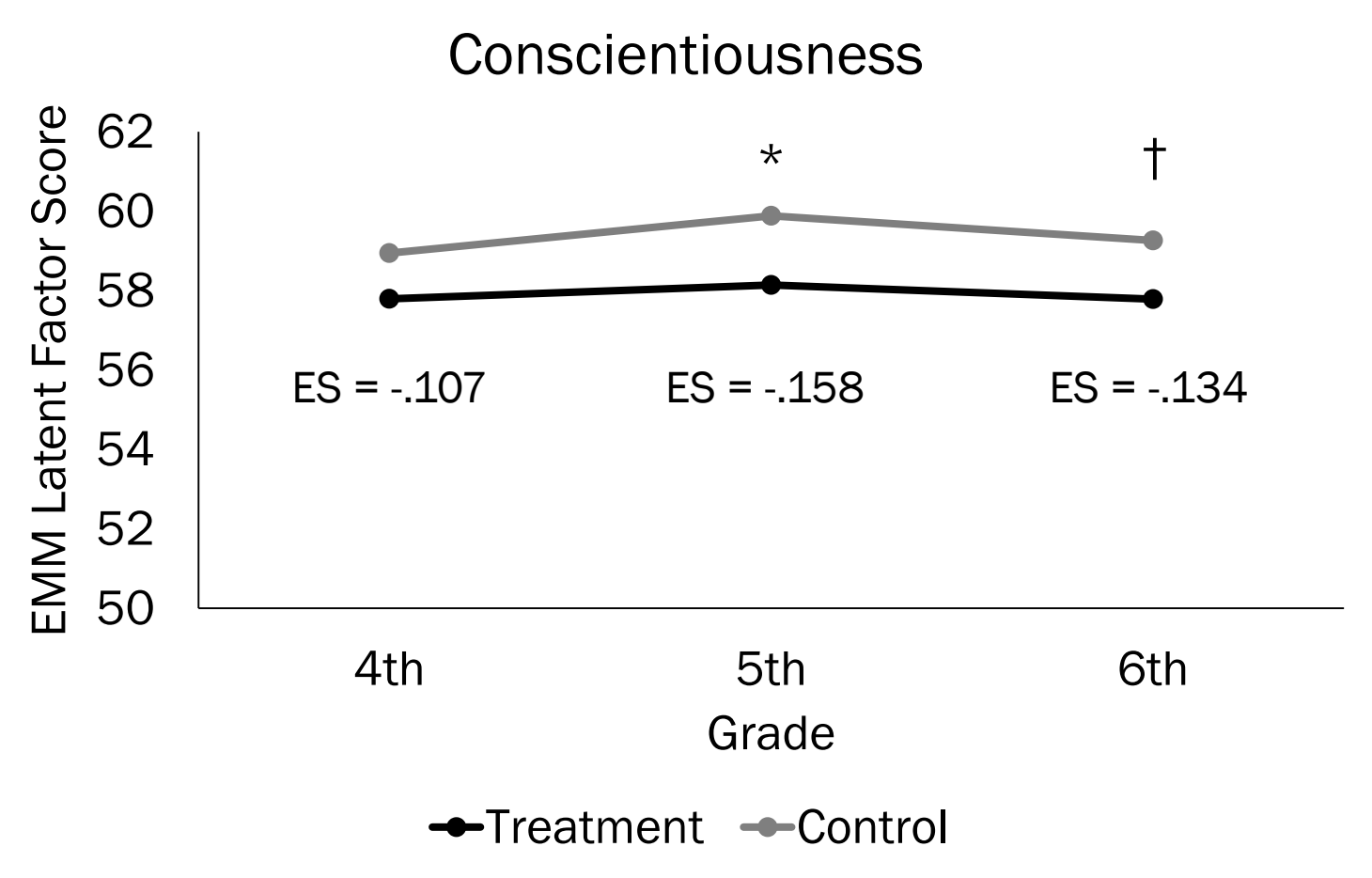
Factors and Respondents

Latent Factor	Measures	Respondents
Problem Behaviors	• Total Difficulties scale of the Strengths and Difficulties Questionnaire (Goodman, 1997)	Students, parents, teachers
	• Academic Classroom Behavior Record (Farran et al., 2003)	Teachers
Delinquency	• Peer Deviancy scale and the Delinquency subscale of the Problem Behavior Frequency scale (Miller-Johnson et al., 2004)	Students, parents, teachers
	• Prosocial scale of the Strengths and Difficulties Questionnaire (Goodman, 1997)	Students, parents, teachers

Data Analysis

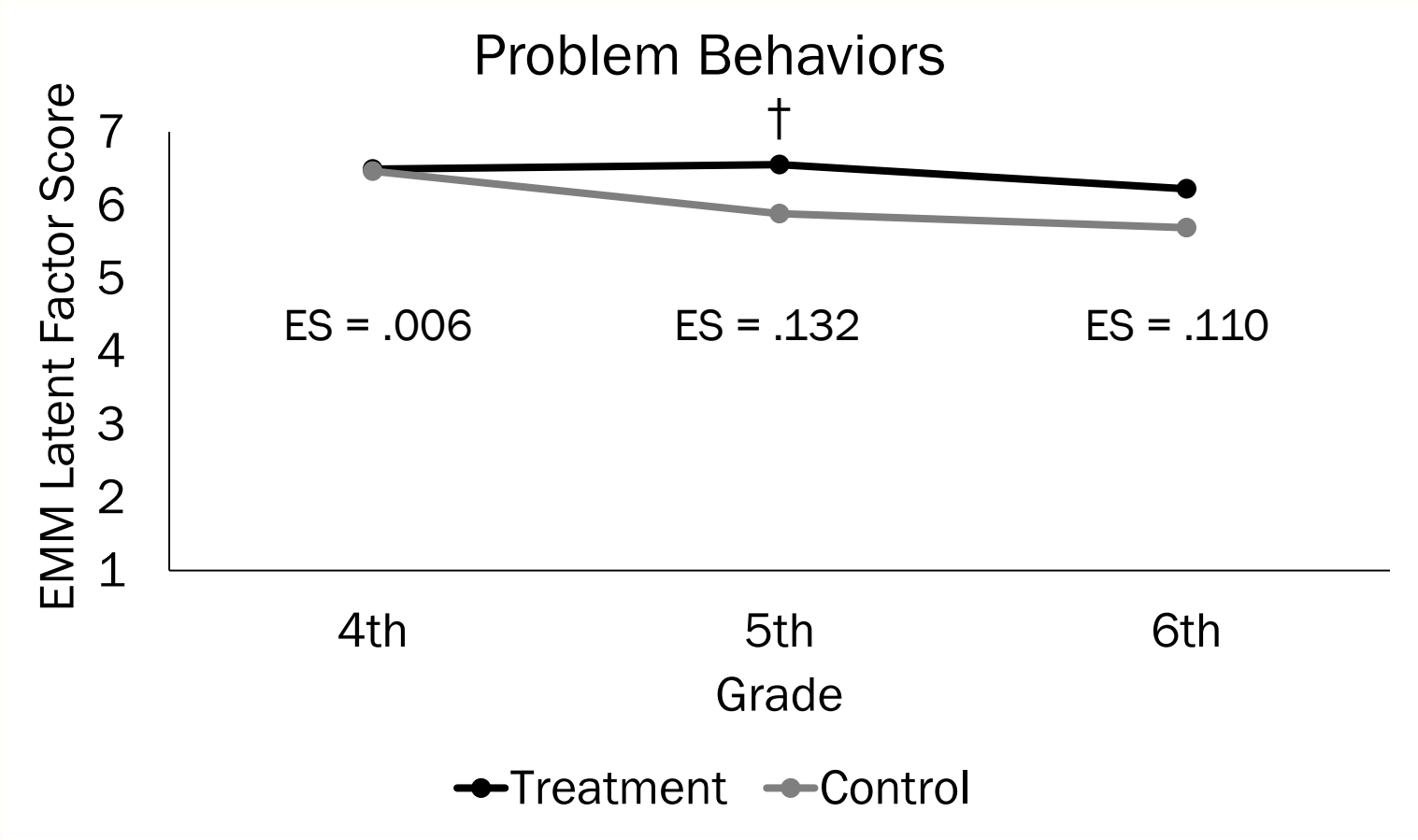
- Hierarchical linear models with children nested within randomized lists nested within districts.
- Demographic covariates were included in all models.
- ITT condition was used as a predictor in the primary analyses.
- A principal stratification strategy (Puma et al., 2010) was used to generate complier average causal effect (CACE) estimates, interpreted as TOT estimates.
- Weighting functions adjusted for differences between the FISS sample and a representative statewide demographic profile.

Results



* $p < .05$, † $p < .10$

Results



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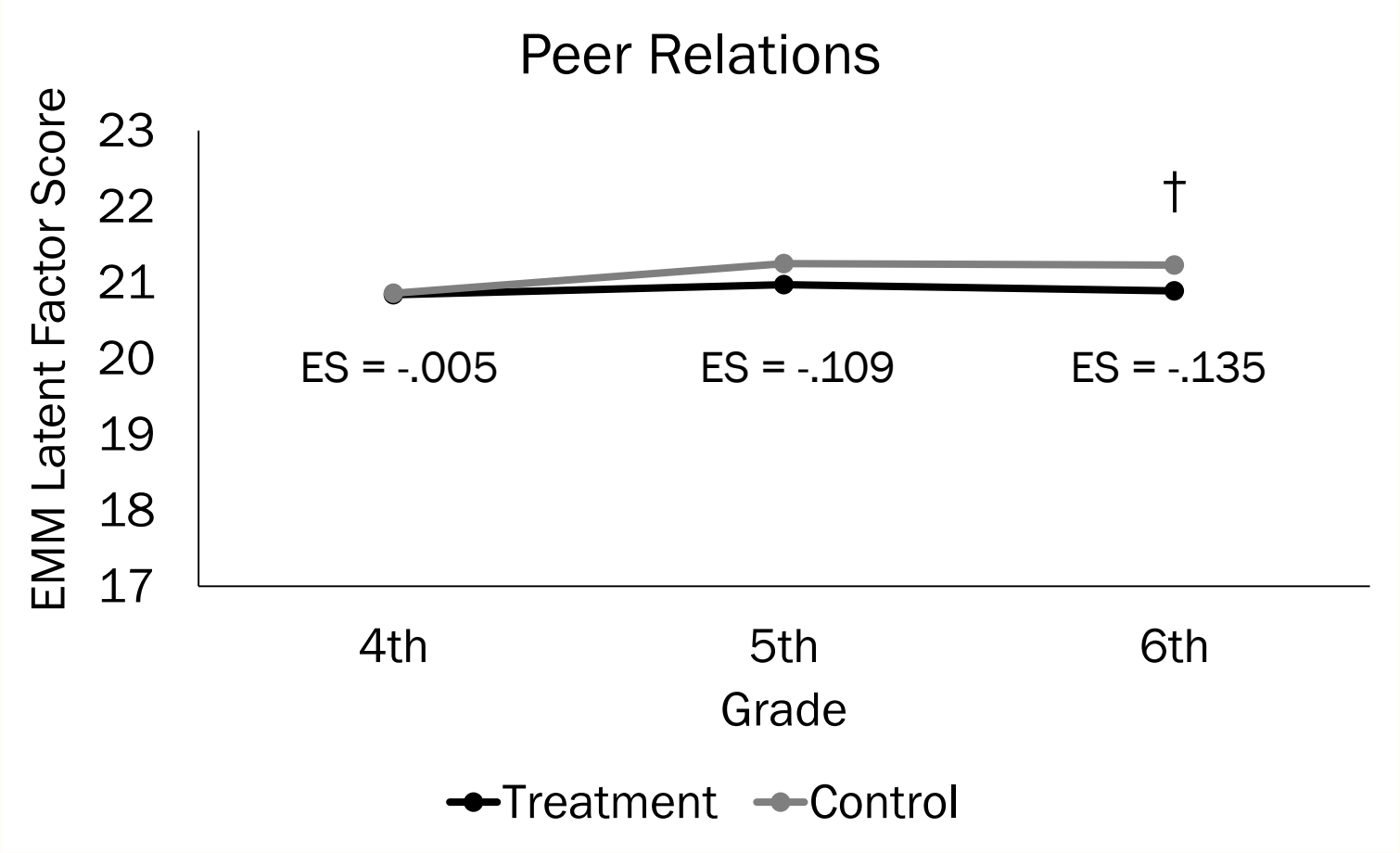

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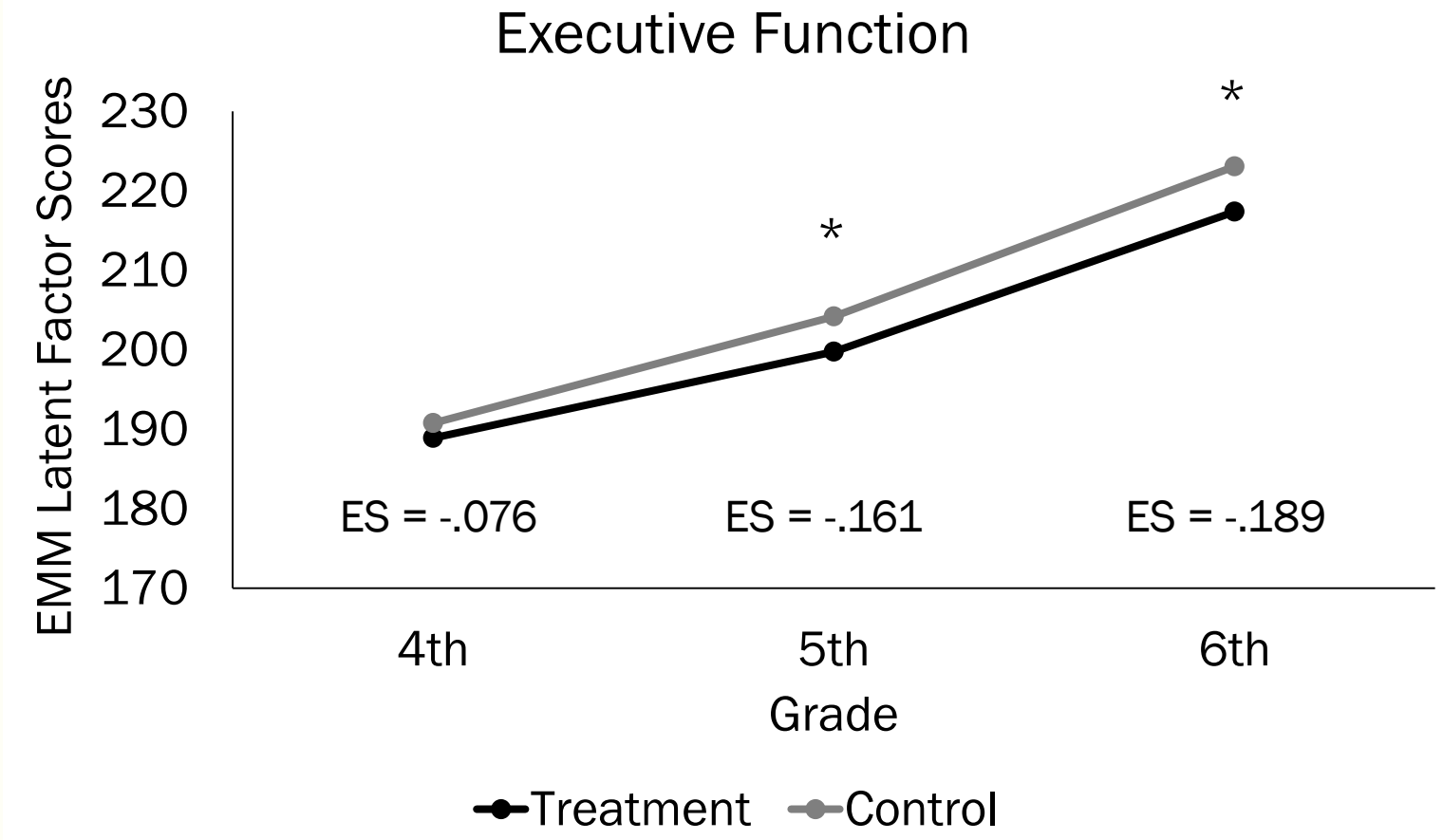

* $p < .05$, † $p < .10$

Summary of Results

- Unexpectedly, children who attended TN-VPK had consistently negative effects on conscientiousness and executive function in 5th and 6th grade.
  - Some marginal negative effects on problem behaviors in 5th and peer relations in 6th grade.
- Contrary to the idea that pre-k will produce non-cognitive effects that account for longer-term positive effects expected from pre-k (e.g., graduating, lower incarceration rates; Heckman et al., 2013).
  - Heckman and colleagues (2013) focused on the Perry Preschool program.

Discussion

- Expected positive long-term effects of statewide pre-k are often based on studies of smaller, single-site, intensive programs like Perry Preschool.
- Scaled-up, statewide programs may lead to different effects.
  - Locating pre-k in public elementary schools rather than community-based centers.
  - Push-down from older grades focused on content and skills seen as related to academic achievement (e.g., Bassok et al., 2016; Brown, 2009).
  - Potentially less focused on social-emotional development and executive function skills.

Discussion

- Compare to counterfactual environment
  - Majority of children in control condition (around 63%) stayed at home their pre-k year.
  - Were children getting an extra year of support more focused on those non-academic skills at home?
- Stronger mother-child attachment security predicts later growth in executive function (Regueiro et al., 2020).
- Research suggests increased self-regulation and self-control fosters conscientiousness (Eisenberg et al., 2014).

Discussion

- Currently examining the mediating effects of these factors on later outcomes.
- We need to consider the structure and focus of pre-k environments in large, statewide pre-k programs.
- Expansion of these programs needs to be carefully considered.
- Less expectation of one year of pre-k to cause all these longer-term effects.

More information available at:

https://my.vanderbilt.edu/tnprekevaluation/

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Detailed Results: 4th Grade

	ITT						TOT	
	Treatment Group Mean	Control Group Mean	Pooled SD	Coefficient for T-C Difference	Effect Size	p-value	Coefficient for T-C Difference	Effect Size
Fourth Grade (Unweighted Values)								
Conscientiousness	57.79	58.94	10.78	-1.153	-.107	.143	-1.961	-.182
School Engagement	7.93	7.99	1.15	-.056	-.049	.523	-.096	-.084
Delinquency	1.30	1.24	1.59	.058	.037	.632	.099	.063
Problem Behaviors	6.49	6.46	4.86	.030	.006	.933	.052	.011
Peer Relations	20.84	20.86	2.72	-.015	-.005	.944	-.025	-.009
Executive Function	188.88	190.74	24.25	-1.855	-.076	.322	-3.162	-.130
Fourth Grade (Weighted Values)								
Conscientiousness	56.25	57.40	10.83	-1.141	-.105	.158	-1.941	-.179
School Engagement	7.82	7.93	1.18	-.107	-.090	.239	-.183	-.155
Delinquency	1.39	1.38	1.62	.006	.004	.961	.010	.006
Problem Behaviors	7.16	6.95	4.99	.202	.041	.597	.345	.069
Peer Relations	20.64	20.87	2.75	-.227	-.083	.291	-.387	-.141
Executive Function	189.45	191.63	24.33	-2.172	-.089	.255	-3.703	-.152
	N = 363-369	N = 375-378		N = 738-747			N = 738-747	

Detailed Results: 5th Grade

	ITT						TOT	
	Treatment Group Mean	Control Group Mean	Pooled SD	Coefficient for T-C Difference	Effect Size	p-value	Coefficient for T-C Difference	Effect Size
Fifth Grade (Unweighted Values)								
Conscientiousness	58.14	59.88	11.04	-1.746*	-.158	.031	-3.016*	-.273
School Engagement	7.62	7.73	1.23	-.103	-.083	.283	-.178	-.145
Delinquency	1.18	1.05	1.48	.126	.086	.264	.218	.148
Problem Behaviors	6.55	5.88	5.07	.671†	.132	.080	1.151†	.227
Peer Relations	20.97	21.25	2.59	-.281	-.109	.163	-.486	-.188
Executive Function	199.74	204.15	27.33	-4.405*	-.161	.040	-7.623*	-.279
Fifth Grade (Weighted Values)								
Conscientiousness	57.00	58.06	11.28	-1.054	-.093	.214	-1.821	-.161
School Engagement	7.54	7.68	1.24	-.145	-.117	.135	-.251	-.203
Delinquency	1.22	1.14	1.51	.085	.056	.467	.147	.097
Problem Behaviors	7.02	6.30	5.16	.713†	.138	.073	1.225†	.238
Peer Relations	20.86	21.10	2.61	-.239	-.091	.247	-.413	-.158
Executive Function	198.59	205.63	27.26	-7.039*	-.259	.001	-12.180*	-.446
	N = 354-359	N = 368-373		N = 722-732			N = 722-732	

Detailed Results: 6th Grade

	ITT						TOT	
	Treatment Group Mean	Control Group Mean	Pooled SD	Coefficient for T-C Difference	Effect Size	p-value	Coefficient for T-C Difference	Effect Size
Sixth Grade (Unweighted Values)								
Conscientiousness	57.78	59.26	11.00	-1.48†	-.134	.073	-2.55†	-.232
School Engagement	7.24	7.19	1.33	.05	.039	.618	.09	.067
Delinquency	1.23	1.16	1.68	.07	.043	.577	.13	-.074
Problem Behavior	6.22	5.69	4.78	.53	.110	.148	.91	-.191
Peer Relations	20.89	21.23	2.58	-.35†	-.135	.080	-.60†	-.234
Executive Function	217.37	223.03	29.89	-5.66*	-.189	.017	-9.76*	-.326
Sixth Grade (Weighted Values)								
Conscientiousness	56.53	57.73	11.10	-1.19	-.108	.157	-2.07	-.187
School Engagement	7.16	7.18	1.33	-.01	-.009	.914	-.02	-.015
Delinquency	1.32	1.24	1.75	.09	.051	.516	.15	-.088
Problem Behavior	6.63	6.10	4.91	.53	.107	.163	.91	-.186
Peer Relations	20.83	21.29	2.55	-.46*	-.180	.023	-.79*	-.311
Executive Function	213.88	223.23	31.77	-9.35*	-.294	.000	-16.14*	-.505
	N = 349-351	N = 366-368		N = 715-719			N = 715-719	